STATE DEPARTMENT OF EDUCATION
OCTOBER 21, 2021

SUBJECT

Developments in K-12 Education

BACKGROUND/DISCUSSION

Sherri Ybarra, Superintendent of Public Instruction, will share developments in K-12 Education with the Board, including:

- Tracking of changes in school operating status
- Partnership with Idaho Digital Learning Academy for online substitute teacher training
- PEBT update
- Schoolhouse.world update
- Federal ESSER funds update

BOARD ACTION

This item is for informational purposes only.

SUBJECT
Advanced Opportunities Annual Report

REFERENCE

October, 2018	Board received the statutorily required report for Advanced Opportunities program managed by the State Department of Education (Department).
October 21, 2020	Board received FY 20 Advanced Opportunities Annual Report

APPLICABLE STATUTE, RULE, OR POLICY
Idaho State Board of Education Governing Policies & Procedures, Section III.Y.
Section 33-4602, Idaho Code
Idaho Administrative Code, IDAPA 08.02.03 – Section 106, Advanced Opportunities

BACKGROUND/DISCUSSION
Student participation and usage in Advanced Opportunities is reported annually to the Idaho State Board of Education. The report outlines the various uses of the program including college credit, high school overload and workforce training courses as well as various approved exams. The report also includes usage of the Early Graduation Scholarship.

IMPACT
This report provides the Board with the statutorily required update on the usage of funds appropriated for the Advanced Opportunities program.

ATTACHMENTS
Attachment 1 – Advanced Opportunities Annual Totals Fiscal Year 2021 Report

BOARD STAFF COMMENTS AND RECOMMENDATIONS
Pursuant to Administrative Code, IDAPA 08.02.03.007, Advanced Opportunities are defined as Advanced Placement courses, dual credit courses, technical competency credit, and International Baccalaureate programs. This program mirrors the Board's definition of Advanced Opportunities established in Board Policy III.Y. In addition to this definition set in Idaho law, IDAPA 08.02.03.106, requires all high schools in Idaho to provide Advanced Opportunities or to provide opportunities for student to take courses at a postsecondary campus. Board Policy III.Y. establishes the parameters, including minimum standards, by which the postsecondary institutions may offer Advanced Opportunities to secondary students. Chapter 51, Title 33, Postsecondary Enrollment Options, enacted in 1997, is the enabling section of Idaho Code, allowing secondary students to take postsecondary courses and defines dual credit courses.

Section 33-4602, Idaho Code, Advanced Opportunities was enacted in 2016 and establishes a program by which all public school students in grades 7 through 12 are entitled to $4,125 that can be used toward the students' cost for participating in Advanced Opportunities as well as the cost to take postsecondary credit-bearing or career technical certificate examinations and secondary overload courses. This funding may be used for dual credits taken either at the high school or on the postsecondary institution campus and will reimburse up to $75 per credit of the cost. This program also limits the reimbursement for secondary overload courses to $225 per course.

In addition to the certificate or credit costs that are covered by this program, students who graduate one year or more early are eligible for an Advanced Opportunities scholarship. The amount of the scholarship is equal to 35% of the statewide average daily attendance-driven funding per enrolled pupil for each year the student graduated early. Students must apply for the scholarship within two years of graduating from a public school. The Advanced Opportunities program managed by the Department was amended in 2019 to also include career technical workforce training courses, such as federally registered apprenticeships, up to $500 per course and $1,000 per year.

In FY 20, the legislature appropriated $20,000,000 for the Advanced Opportunities program and $29,700,000 for FY 21. In years when the appropriation does not cover the cost of the $4,125, the overture is covered by the Public Education Stabilization Fund (PESF). This program has consistently incurred more expenses than funds appropriated. For FY 22, the Legislature has frozen withdrawals from the stabilization fund. If expenses exceed appropriations in FY 22, the funds distributed directly to school districts and charter schools per support unit will be reduced to cover the amount. In FY 20, $5.2M was withdrawn from PESF to cover the expenses and approximately $25M has been withdrawn from PESF since the program's inception. On average, the program has grown by approximately $3.6M per year over the past three years.

Students may participate in any of the Board's Advanced Opportunities outside of the state funded program established in Section 33-4602, Idaho Code, at their expense. The report provided in Attachment 1 provides participation and cost information.

A dual credit report has also historically been provided to the Board at its regular December Board meeting. The dual credit report provides information on the impact dual credit courses have on student behavior, the participation of Idaho's various student population in taking dual credits and participation numbers for all student taking dual credits at our public postsecondary institutions.

Additionally, Board staff, through the Board's college and career advising initiative, are working with school districts and charter schools in developing programs to provide meaningful advising and pathways for their students participating in Advanced Opportunities. This work is being done in collaboration with the Idaho

Digital Learning Academy, the Department, and the Division of Career Technical Education.

BOARD ACTION

This item is for informational purposes only.

ADVANCED OPPORTUNITIES

Annual Totals FY 2021

IDAHO STATE DEPARTMENT OF EDUCATION
STUDENT ENGAGEMENT & SAFETY COORDINATION | ADVANCED OPPORTUNITIES

650 W STATE STREET, 2ND FLOOR
BOISE, IDAHO 83702
208 332 6800 OFFICE
WWW.SDE.IDAHO.GOV

CREATED 08/16/2021

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FY 21 ADVANCED OPPORTUNITIES TOTALS

Overall Program Total	
Payment Totals	$21,375,966.50
Student Served	37880

Use by Grade

Grade	Students Using A.O.	Total Student Population	Participation Percentage	Student Participation-Overload	Student Participation-Dual Credit	Student Participation-Exams	Total Amount Spent	Average Amount Spent per Student
7	329	25198	1.31%	465	11	0	$39,460.00	$119.94
8	828	25204	3.29%	1155	69	25	$86,851.00	$104.89
9	4089	24811	16.48%	3239	8012	599	$1,013,420.00	$247.84
10	8948	24596	36.38%	3576	39428	2491	$3,466,534.00	$387.41
11	12638	23077	54.76%	3582	91702	6996	$7,667,766.50	$606.72
12	12824	22576	56.80%	4238	79051	8743	$6,798,026.00	$530.10

Examinations

Students Served	**11467**

	Amount	Number of Exam Funding Requests
Exam Total	**$1,239,359.50**	**18854**
Advanced Placement (AP)	$934,369.00	14170
International Baccalaureate (IB)	$67,949.00	571
Professional Certification Exams (CTE)	$226,007.50	3961
College Level Examination Program (CLEP)	$11,034.00	152

Overload Courses

Students Served	**10355**

	Amount	Number of Overload Funding Requests
Overload Total	**$1,562,522.00**	**16255**
Idaho Digital Learning Alliance	$503,430.00	9706
Districts	$1,050,427.00	6467
Other	$4,345	62

Dual Credit

Students Served	**27130**

	Amount	Number of Dual Credit Funding Requests	Total Number of Credits
Dual Credit Total	**$17,894,016.00**	**70661**	**218273**
Dual Credit Tuition Only	**$16,205,266.00**		
Out-of-district Tuition Only	**$1,693,100.00**		
Boise State University	$2,044,862	9005	27366
College of Eastern Idaho	$301,745	1280	4124
College of Southern Idaho	$3,074,104	13466	41320
College of Western Idaho	$4,457,047	18597	59981
Idaho State University	$1,692,277	7348	22814
Lewis-Clark State College	$586,038	2577	7893
North Idaho College	$1,262,776	6373	17159
University of Idaho	$664,633	3096	8866
Brigham Young University-Idaho	$18,160	165	449
Northwest Nazarene University	$1,961,565	8158	26249
Treasure Valley Community College	$98,215	433	1512
Other	$43,814	183	596

Workforce Training Courses

Students Served	**126**

	Amount	Number of Workforce Training Funding Requests
Workforce Training Total	**$69,260.00**	**189**
College of Eastern Idaho	$9,327.00	23
College of Southern Idaho	$633.00	3
College of Western Idaho	$31,350.00	66
Idaho State University	$16,100.00	67
Lewis-Clark State College	$2,850.00	6
North Idaho College	$9,000.00	24

Early Graduation Scholarship

Early Graduation Scholarship	Eligible Students	Students Awarded Scholarship
Students	349	73

Early Graduation Scholarship	Amount
Post-secondary Scholarships	$109,297
School District Awards	$501,647

DEMOGRAPHIC INFORMATION

Total Students Served	37880

Race	Number of Students	Percent Participating in Adv. Ops.	Statewide Comparable Percent
American Indian	243	0.64%	1.10%
Asian	708	1.87%	1.17%
Black or African American	300	0.79%	1.14%
Hispanic	5276	13.93%	18.70%
Native Hawaiian or Pacific Islander	104	0.27%	0.30%
White	30255	79.87%	74.64%
Multiple	994	2.62%	2.95%

Gender	Number of Students	Percent Participating in Adv. Ops.	Statewide Comparable Percent
Female	21592	57.00%	48.78%
Male	16266	42.94%	51.22%
Unknown	22	0.06%	

Other Demographics	Number of Students	Percent Participating in Adv. Ops.	Statewide Comparable Percent
Private/Homeschool	248	0.65%	NULL
Free/Reduced Lunch	6517	17.20%	27.29%
Special Education	794	2.10%	10.25%

Other Demographics	Number of Students	Percent Participating in Adv. Ops.	Statewide Comparable Percent
504	1811	4.78%	5.83%
At Risk	1739	4.59%	11.10%
English Learners	498	1.31%	4.27%
Gifted	3103	8.19%	5.47%
Neglected/Delinquent	0	0.00%	NULL
Homeless	321	0.85%	1.80%

STUDENT USAGE

Student Amount Expended	Number of Students
$4,125	**1758**
> $3,500	2088
> $3,000	2564
> $2,500	4743
> $2,000	9594
> $1,500	17204
> $1,000	31129
> $500	58477
> $0	121421
Total Number of Students Who Have Used Advanced Opportunities	**127557**

DISTRICT PARTICIPATION AND EXPENDITURES

ID	L.E.A. Name	FY 21 A.O. Payments	Student Participation	Total Student Population	Participation Percentage	Participation Rank	Average Expenditure per Student	Expenditure Rank
58	ABERDEEN DISTRICT	$36,180.00	85	329	25.8%	59	$425.65	82
381	AMERICAN FALLS JOINT DISTRICT	$57,405.00	136	701	19.4%	93	$422.10	83
482	AMERICAN HERITAGE CHARTER DISTRICT	$10,620.00	21	130	16.2%	114	$505.71	62
476	Another Choice Virtual Charter District	$945.00	6	377	1.6%	153	$157.50	142
492	ANSER CHARTER SCHOOL	$285.00	4	100	4.0%	148	$71.25	151
72	BASIN SCHOOL DISTRICT	$21,685.00	38	160	23.8%	70	$570.66	35
33	BEAR LAKE COUNTY DISTRICT	$97,490.00	182	517	35.2%	28	$535.66	49
477	BLACKFOOT CHARTER COMMUNITY LEARNING CENTER, INC.	$465.00	6	74	8.1%	138	$77.50	148
55	BLACKFOOT DISTRICT	$156,085.00	275	1992	13.8%	123	$567.58	38
61	BLAINE COUNTY DISTRICT	$209,815.00	542	1577	34.4%	32	$387.11	92
234	BLISS JOINT DISTRICT	$2,175.00	6	54	11.1%	129	$362.50	104
1	BOISE INDEPENDENT DISTRICT	$1,278,911.00	4044	12031	33.6%	36	$316.25	116

93	BONNEVILLE JOINT DISTRICT	$1,227,742.00	2312	6344	36.4%	21	$531.03	50
101	BOUNDARY COUNTY DISTRICT	$94,234.00	143	616	23.2%	76	$658.98	19
365	BRUNEAU-GRAND VIEW JOINT DIST	$8,475.00	30	149	20.1%	88	$282.50	125
412	BUHL JOINT DISTRICT	$31,026.00	91	574	15.9%	116	$340.95	112
111	BUTTE COUNTY JOINT DISTRICT	$26,325.00	38	174	21.8%	81	$692.76	17
132	CALDWELL DISTRICT	$249,841.00	601	2549	23.6%	71	$415.71	85
121	CAMAS COUNTY DISTRICT	$4,110.00	19	97	19.6%	91	$216.32	136
432	CAMBRIDGE JOINT DISTRICT	$3,620.00	7	78	9.0%	135	$517.14	56
555	CANYON-OWYHEE SCHOOL SERVICE AGENCY (COSSA)	$2,965.00	41	130	31.5%	45	$72.32	149
422	CASCADE DISTRICT	$3,000.00	7	88	8.0%	139	$428.57	81
151	CASSIA COUNTY JOINT DISTRICT	$252,342.00	516	2535	20.4%	86	$489.03	67
417	CASTLEFORD DISTRICT	$23,175.00	47	140	33.6%	37	$493.09	65
181	CHALLIS JOINT DISTRICT	$3,105.00	10	155	6.5%	142	$310.50	118
161	CLARK COUNTY DISTRICT	$3,450.00	15	55	27.3%	57	$230.00	134
491	COEUR D'ALENE CHARTER ACADEMY DISTRICT	$126,018.00	172	491	35.0%	29	$732.66	15
271	COEUR D'ALENE DISTRICT	$557,991.00	946	4838	19.6%	92	$589.84	29
455	COMPASS CHARTER SCHOOL	$196,245.00	210	456	46.1%	12	$934.50	5
242	COTTONWOOD JOINT DISTRICT	$62,649.00	86	191	45.0%	14	$728.48	16
13	COUNCIL DISTRICT	$22,775.00	68	140	48.6%	9	$334.93	115
342	CULDESAC JOINT DISTRICT	$17,000.00	18	29	62.1%	2	$944.44	4

314	DIETRICH DISTRICT	$15,525.00	35	103	34.0%	33	$443.57	75
523	ELEVATE ACADEMY INC.	$11,005.00	53	370	14.3%	120	$207.64	138
221	EMMETT INDEPENDENT DIST	$126,175.00	252	1204	20.9%	83	$500.69	63
456	FALCON RIDGE CHARTER SCHOOL	$90.00	2	64	3.1%	150	$45.00	155
531	FERN-WATERS PUBLIC CHARTER SCHOOL, INC.	$855.00	12	24	50.0%	8	$71.25	150
413	FILER DISTRICT	$92,175.00	177	802	22.1%	79	$520.76	55
59	FIRTH DISTRICT	$74,820.00	121	383	31.6%	44	$618.35	22
487	FORREST M. BIRD CHARTER DISTRICT	$26,485.00	67	264	25.4%	63	$395.30	91
495	FORRESTER ACADEMY, INC.	$810.00	7	124	5.7%	144	$115.71	144
215	FREMONT COUNTY JOINT DISTRICT	$76,290.00	201	1020	19.7%	90	$379.55	95
373	FRUITLAND DISTRICT	$74,635.00	157	818	19.2%	96	$475.38	68
71	GARDEN VALLEY DISTRICT	$19,265.00	41	133	30.8%	48	$469.88	71
498	GEM PREP: MERIDIAN, INC.	$6,705.00	26	144	18.1%	101	$257.88	130
796	GEM PREP: NAMPA, INC.	$1,950.00	11	110	10.0%	133	$177.27	141
534	GEM PREP: ONLINE	$103,414.00	138	294	46.9%	11	$749.38	13
496	GEM PREP: POCATELLO, INC.	$4,575.00	16	92	17.4%	103	$285.94	124
282	GENESEE JOINT DISTRICT	$31,400.00	53	140	37.9%	18	$592.45	28
192	GLENNS FERRY JOINT DISTRICT	$5,625.00	22	192	11.5%	127	$255.68	131
231	GOODING JOINT DISTRICT	$62,421.00	125	623	20.1%	89	$499.37	64
148	GRACE JOINT DISTRICT	$13,310.00	45	263	17.1%	106	$295.78	122
233	HAGERMAN JOINT DISTRICT	$22,500.00	37	149	24.8%	66	$608.11	23

415	HANSEN DISTRICT	$13,835.00	34	155	21.9%	80	$406.91	86
479	Heritage Academy District	$165.00	3	39	7.7%	140	$55.00	154
305	HIGHLAND JOINT DISTRICT	$9,675.00	16	71	22.5%	77	$604.69	25
370	HOMEDALE JOINT DISTRICT	$51,780.00	137	581	23.6%	72	$377.96	97
73	HORSESHOE BEND SCHOOL DISTRICT	$7,530.00	21	110	19.1%	97	$358.57	107
795	IDAHO ARTS CHARTER SCHOOL	$12,580.00	54	448	12.1%	126	$232.96	133
489	IDAHO COLLEGE & CAREER READINESS ACADEMY	$24,355.00	64	293	21.8%	82	$380.55	94
469	IDAHO CONNECTS ONLINE CHARTER DISTRICT	$23,625.00	85	229	37.1%	19	$277.94	127
91	IDAHO FALLS DISTRICT	$338,317.00	832	4837	17.2%	105	$406.63	87
468	IDAHO SCIENCE & TECHNOLOGY CHARTER	$810.00	14	85	16.5%	111	$57.86	153
485	IDAHO STEM ACADEMY DBA BINGHAM ACADEMY CHARTER DISTRICT	$29,490.00	52	115	45.2%	13	$567.12	39
452	IDAHO VIRTUAL ACADEMY	$160,890.00	363	1788	20.3%	87	$443.22	76
457	INSPIRE VIRTUAL CHARTER	$31,665.00	79	1053	7.5%	141	$400.82	90
466	iSUCCEED VIRTUAL HIGH SCHOOL	$57,592.00	152	1017	15.0%	119	$378.89	96
251	JEFFERSON COUNTY JT DISTRICT	$407,627.00	875	2888	30.3%	49	$465.86	72
261	JEROME JOINT DISTRICT	$189,124.00	326	1947	16.7%	110	$580.13	33
2	JOINT SCHOOL DISTRICT NO. 2 (WEST ADA)	$3,404,289.50	6065	19070	31.8%	43	$561.30	41

304	KAMIAH JOINT DISTRICT	$25,620.00	49	211	23.2%	75	$522.86	54
391	KELLOGG JOINT DISTRICT	$14,045.00	24	459	5.2%	146	$585.21	31
283	KENDRICK JOINT DISTRICT	$7,650.00	20	118	17.0%	108	$382.50	93
414	KIMBERLY DISTRICT	$160,755.00	298	862	34.6%	30	$539.45	48
470	Kootenai Bridge Academy	$27,675.00	31	351	8.8%	137	$892.74	7
274	KOOTENAI DISTRICT	$6,300.00	6	64	9.4%	134	$1,050.00	1
641	KTEC - Kootenai Tech Ed Campus	$32,515.00	182	364	50.0%	7	$178.65	140
3	KUNA JOINT DISTRICT	$357,898.00	684	2714	25.2%	64	$523.24	53
84	LAKE PEND OREILLE DISTRICT	$106,368.00	313	1626	19.3%	95	$339.83	114
272	LAKELAND DISTRICT	$272,900.00	338	2124	15.9%	115	$807.40	9
341	LAPWAI DISTRICT	$26,235.00	65	216	30.1%	50	$403.62	89
340	LEWISTON INDEPENDENT DISTRICT	$305,274.00	545	2139	25.5%	61	$560.14	42
458	LIBERTY CHARTER	$83,785.00	105	297	35.4%	27	$797.95	10
182	MACKAY JOINT DISTRICT	$6,761.00	18	110	16.4%	113	$375.61	99
321	MADISON DISTRICT	$264,210.00	560	2531	22.1%	78	$471.80	70
21	MARSH VALLEY JOINT DISTRICT	$45,325.00	84	600	14.0%	121	$539.58	47
363	MARSING JOINT DISTRICT	$63,410.00	114	391	29.2%	54	$556.23	43
421	MCCALL-DONNELLY JT. SCHOOL DISTRICT	$66,553.00	195	620	31.5%	46	$341.30	110
11	MEADOWS VALLEY DISTRICT	$1,706.00	15	73	20.6%	84	$113.73	145
136	MELBA JOINT DISTRICT	$94,741.00	174	440	39.6%	17	$544.49	45
785	MERIDIAN MEDICAL ARTS CHARTER	$183,257.00	184	195	94.4%	1	$995.96	2

768	MERIDIAN TECHNICAL CHARTER DISTRICT	$34,879.00	68	202	33.7%	34	$512.93	58
134	MIDDLETON DISTRICT	$355,888.00	751	2077	36.2%	22	$473.89	69
433	MIDVALE DISTRICT	$5,575.00	11	65	16.9%	109	$506.82	61
331	MINIDOKA COUNTY JOINT DISTRICT	$239,069.00	362	1994	18.2%	99	$660.41	18
813	MOSCOW CHARTER SCHOOL	$360.00	4	37	10.8%	131	$90.00	146
281	MOSCOW DISTRICT	$111,197.00	190	1098	17.3%	104	$585.25	30
193	MOUNTAIN HOME DISTRICT	$99,971.00	293	1587	18.5%	98	$341.20	111
244	MOUNTAIN VIEW SCHOOL DISTRICT	$22,945.00	80	526	15.2%	118	$286.81	123
392	MULLAN DISTRICT	$300.00	1	48	2.1%	152	$300.00	121
418	MURTAUGH JOINT DISTRICT	$42,612.00	71	163	43.6%	15	$600.17	26
131	NAMPA SCHOOL DISTRICT	$791,354.00	1556	6311	24.7%	67	$508.58	59
372	NEW PLYMOUTH DISTRICT	$105,890.00	164	458	35.8%	25	$645.67	21
302	NEZPERCE JOINT DISTRICT	$6,825.00	15	64	23.4%	73	$455.00	74
149	NORTH GEM DISTRICT	$11,975.00	21	81	25.9%	58	$570.24	36
480	NORTH IDAHO STEM CHARTER ACADEMY DISTRICT	$61,089.00	110	209	52.6%	4	$555.35	44
493	NORTH STAR CHARTER DISTRICT	$66,146.00	109	363	30.0%	51	$606.84	24
465	NORTH VALLEY ACADEMY	$14,775.00	40	78	51.3%	6	$369.38	102
135	NOTUS DISTRICT	$6,525.00	26	169	15.4%	117	$250.96	132
351	ONEIDA COUNTY DISTRICT	$56,086.00	153	1720	8.9%	136	$366.58	103
171	OROFINO JOINT DISTRICT	$83,915.00	160	538	29.7%	53	$524.47	52
137	PARMA DISTRICT	$132,380.00	163	485	33.6%	35	$812.15	8

497	PATHWAYS IN EDUCATION - NAMPA, INC.	$1,050.00	3	293	1.0%	154	$350.00	108
371	PAYETTE JOINT DISTRICT	$57,290.00	184	641	28.7%	55	$311.36	117
44	PLUMMER-WORLEY JOINT DISTRICT	$4,575.00	9	179	5.0%	147	$508.33	60
25	POCATELLO DISTRICT	$858,023.00	1471	5879	25.0%	65	$583.29	32
273	POST FALLS DISTRICT	$353,770.00	464	2737	17.0%	107	$762.44	12
285	POTLATCH DISTRICT	$13,185.00	35	195	18.0%	102	$376.71	98
201	PRESTON JOINT DISTRICT	$140,394.00	390	1196	32.6%	40	$359.98	106
513	PROJECT IMPACT STEM ACADEMY, INC.	$450.00	2	53	3.8%	149	$225.00	135
453	RICHARD MCKENNA CHARTER HIGH SCHOOL	$900.00	3	422	0.7%	155	$300.00	120
316	RICHFIELD DISTRICT	$6,675.00	13	79	16.5%	112	$513.46	57
252	RIRIE JOINT DISTRICT	$57,506.00	89	374	23.8%	69	$646.13	20
382	ROCKLAND DISTRICT	$6,481.00	34	95	35.8%	26	$190.62	139
475	SAGE INTERNATIONAL SCHOOL OF BOISE	$32,148.00	75	414	18.1%	100	$428.64	80
291	SALMON DISTRICT	$28,072.00	104	363	28.7%	56	$269.92	128
243	SALMON RIVER JOINT SCHOOL DIST	$5,400.00	11	45	24.4%	68	$490.91	66
60	SHELLEY JOINT DISTRICT	$101,813.00	244	1048	23.3%	74	$417.27	84
312	SHOSHONE JOINT DISTRICT	$18,195.00	45	220	20.5%	85	$404.33	88
537	SHOSHONE-BANNOCK JR-SR HIGH DISTRICT	$1,800.00	5	NULL	NULL	156	$360.00	105
52	SNAKE RIVER DISTRICT	$91,035.00	243	946	25.7%	60	$374.63	100

150	SODA SPRINGS JOINT DISTRICT	$115,102.00	213	405	52.6%	5	$540.38	46
292	SOUTH LEMHI DISTRICT	$4,180.00	15	45	33.3%	38	$278.67	126
41	ST MARIES JOINT DISTRICT	$49,350.00	83	431	19.3%	94	$594.58	27
322	SUGAR-SALEM JOINT DISTRICT	$88,860.00	295	822	35.9%	24	$301.22	119
461	TAYLORS CROSSING CHARTER SCHOOL	$18,105.00	41	126	32.5%	41	$441.59	78
401	TETON COUNTY DISTRICT	$52,866.00	114	851	13.4%	124	$463.74	73
460	THE ACADEMY AT ROOSEVELT CNTR	$3,960.00	50	116	43.1%	16	$79.20	147
494	THE POCATELLO COMMUNITY CHARTER SCHOOL, INC.	$270.00	4	76	5.3%	145	$67.50	152
559	THOMAS JEFFERSON CHARTER DISTRICT	$12,306.00	58	159	36.5%	20	$212.17	137
287	TROY SCHOOL DISTRICT	$34,665.00	38	122	31.2%	47	$912.24	6
411	TWIN FALLS DISTRICT	$733,719.00	1290	4334	29.8%	52	$568.77	37
262	VALLEY DISTRICT	$10,830.00	29	257	11.3%	128	$373.45	101
139	VALLIVUE SCHOOL DISTRICT	$888,861.00	1533	4264	36.0%	23	$579.82	34
451	VICTORY CHARTER SCHOOL	$65,160.00	88	255	34.5%	31	$740.45	14
463	VISION CHARTER SCHOOL	$168,580.00	175	312	56.1%	3	$963.31	3
393	WALLACE DISTRICT	$7,620.00	22	199	11.1%	130	$346.36	109
431	WEISER DISTRICT	$85,400.00	251	775	32.4%	42	$340.24	113
232	WENDELL DISTRICT	$53,520.00	121	476	25.4%	62	$442.31	77
83	WEST BONNER COUNTY DISTRICT	$6,745.00	26	409	6.4%	143	$259.42	129
253	WEST JEFFERSON DISTRICT	$24,281.00	43	311	13.8%	122	$564.67	40

202	WEST SIDE JOINT DISTRICT	$92,344.00	174	370	47.0%	10	$530.71	51
464	WHITE PINE CHARTER SCHOOL	$120.00	4	163	2.5%	151	$30.00	156
288	WHITEPINE JT SCHOOL DISTRICT	$8,675.00	11	109	10.1%	132	$788.64	11
133	WILDER DISTRICT	$4,530.00	29	227	12.8%	125	$156.21	143
462	XAVIER CHARTER SCHOOL	$38,844.00	89	270	33.0%	39	$436.45	79

NOTES

Note: All figures are based on data available from July 1, 2020 to July 1, 2021. Information reported can be subject to change. Student usage is compiled from July 1, 2016 to July 1, 2021.

SUBJECT

Progress Update on Mastery-Based Education

REFERENCE

October 2014	Board adopted recommendations for implementing the 2013 Task Force recommendations, including implementation of those regarding mastery-based education in Idaho's public schools.
May 2015	Board received a presentation from the Foundation for Excellence in Education regarding mastery-based education and possible partnership opportunities.
January 2016	Board endorsed the Governors 2016 Legislative Initiatives, including funding for the mastery-based education pilot programs.
June 2017	Board received a brief update from the State Superintendent of Public Instruction on the mastery-based pilot program.
August 2017	Board received a presentation from the State Department of Education regarding the progress of the mastery-based education initiative.
December 2017	Board received an update from the State Department of Education on the implementation of the mastery-based education initiative.
February 2018	Board acted to support SB 1059 (2018), to lift the cap and expand the mastery-based education initiative and formalize the Idaho Mastery Education Network (IMEN).
October 2019	Board received an update from the State Department of Education regarding determining mastery for credit and financial literacy.
February 2020	Board received an update on status of mastery education initiative.

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-1632, Idaho Code, Mastery-Based Education
IDAPA 08.03.03 – SECTION 004.01.l College and Career Readiness Competencies
IDAPA 08.03.03 – SECTION 140.01. Workforce Skills

BACKGROUND/DISCUSSION

This update, from the Mastery-Based Education Coordinator, will focuses on the significant and continued progress made towards supporting mastery.
Essential Message:

1. **Legislative Statute** and **Investment** has allowed mastery to continue to **grow** across the state and **create**, high quality, diverse, rich and responsive resources.
2. The **Idaho College and Career Readiness Competencies** provide an opportunity to ***unite*** a diverse range of perspectives and offers students a chance to develop ***Life Ready*** skills.

Ongoing statute guided efforts include:

A. Provide ongoing outreach and communication
B. Facilitate and maintain the Idaho Mastery Education Network. The network shall:
   (i) Advise the Superintendent of Public Instruction and the State Board of Education on the progress of the transition to mastery-based education;
   (ii) Develop evidence-based recommendations for continued implementation;
   (iii) Implement the policies of the legislature and the State Board of Education for the transition to mastery-based education; and
   (iv) Provide network resources, including professional development, coaching, and best practices, to Idaho public school districts and charter schools;
C. Create a sustainability plan for statewide scaling of mastery-based education

IMPACT

This report will provide the Board with an update on the Master-based Education efforts in Idaho public schools.

ATTACHMENTS

Attachment 1 – Mastery Update Presentation

STAFF COMMENTS AND RECOMMENDATIONS

In 2014, the Board facilitated the work of five (5) subcommittees working on recommendations for implementing the 2013 Education Improvement Task Force Recommendations. The Structure and Governance Subcommittee's responsibilities included implementation strategies for the shift to a mastery-based system where students advanced based upon content mastery, rather than seat time requirements. The subcommittee found there were no prohibitions in state law to moving to a mastery-based system, and that there is specific authorization in Administrative Code that allows school districts and charter schools to develop their own mechanisms for assessing student mastery of content and awarding credits for the mastery at the secondary level. The subcommittee recognized that there were some barriers in how school districts reported students in specific grade levels to the state for funding. However, most barriers were largely perceived rather than actual obstructions. The full recommendations may be viewed on the Board's website (https://boardofed.idaho.gov/resources/task-force-for-improving-education/).

Section 33-1632, Idaho Code, requires the State Department of Education to: (a) provide ongoing statewide outreach and communication to increase awareness and understanding in mastery-based education; (b) facilitate and maintain the Idaho mastery education network; and (c) create a sustainability plan for statewide scaling of mastery-based education.

As identified in the original subcommittee of the Governor’s Task Force for Improving Education, state law and administrative code allow for school districts and charter schools to implement a master-based education system. The purpose of the original incubators was intended to be used to identify barriers, real and perceived, that were keeping school districts from implementing mastery-based systems. Implementation of mastery-based education through the incubators identified local barriers such as student management systems and professional development needs, but no statute or administrative code changes were identified.

Working with a broad group of stakeholders and the Planning, Policy and Governmental Affairs Committee of the Board, Board staff brought forward recommendations for developing a common understanding of college and career readiness in FY 2017. The Board adopted the work group’s recommendations and approved College and Career Readiness Competencies at the June 15, 2017 regular Board meeting. These competencies were then included in the state content standards and incorporated into administrative rule through the negotiated rulemaking process and became effective March 28, 2018

BOARD ACTION

This item is for informational purposes only.

Mastery-Based Education Annual Report October 2021

Aaron McKinnon
Mastery-Based Education Coordinator

Supporting Schools and Students to Achieve
SHERRI YBARRA, ED.S., SUPERINTENDENT OF PUBLIC INSTRUCTION

A Brief History of Mastery-Based Education in Idaho

- **2013 Governors Task Force #1 Recommendation**
- **2016 Legislative Support Statute §33-1632; $1.4 million**
- **2016-2020 IMEN, *INCUBATION***
- **Today: Resources and continued growth!**
- **Future: Mastery and the Competencies to Scale**

MBE Annual Report | 2

From There to Here: A Flower Analogy

IMEN Cohort Progress 2021-2022

- **Cohort 1:** Established 2016-2017, **14** Schools in 2021-2022
- **Cohort 2:** Established 2019-2020, **10** Schools in 2021-2022
- **Cohort 3:** Established 2021-2022, **16** Schools
  - Several lab to lighthouse, “proof of concept” schools/districts under development

Essential Resources

- Idaho College and Career Readiness Competencies
  - *Poised to Unify* ALL the Independent Programs & Perspectives
    - 2017 SBOE approved
    - 2020 SDE operationalized
    - Aligned to Higher ED ***and*** Work Force through NACE
    - Supports legislative intent
      - Ex: HB §172 Credit for extended learning opportunities
  - *Primed to Establish* "Life Ready" students

    "*College and Career Readiness* is the attainment and demonstration of requisite competencies that broadly prepare high school graduates for a successful transition into some form of postsecondary education and/or the workplace".

    And "graduate(s) will need to possess (them) in order lead a successful and meaningful life".

ISBOE College and Career Readiness 6/15/2017

MBE Annual Report | 5

Essential Resources

MBE Framework

- ***Statute*** based
- Guides ***ALL*** Mastery work including the development of all other support resources

4 Components of the Framework:

- Students Empowered
- Learning Personalized
- Competencies Demonstrated
- Mastery Recognized

MBE Annual Report | 6

Support Resources

Staging Guide: Organized by the Framework, over 100 accessible resources for ***everyone***, in ***any stage*** of implementation

Professional Development:

- Responsive to prioritized Framework "shifts"
- Based in Canvas

- **Revamped, Resource Rich Website**
  - Now available!

MBE Annual Report | 7

Application Process: Framework Aligned

Each school reflected on each component of the Framework, identified their strengths, areas for improvement, recognized evidence, and set goals.

We have data to show growth
relative to their framework aligned, statute based goals.

Presentation Title | 8

Take Away's…

1. ***Legislative Statute and Investment*** has allowed mastery to ***grow*** across the state and ***create*** high quality, diverse, rich, and responsive resources.
2. The ***Idaho College and Career Readiness Competencies*** provide an opportunity to ***unite*** a diverse range of perspectives and offers students a chance to develop ***Life Ready*** skills.

Presentation Title | 9

On Going *Statute* Efforts to "move Idaho toward MBE"

Provide ongoing outreach and communication

Facilitate and maintain the Idaho Mastery Education Network

The Network shall:

- I. Advise the Superintendent
- II. Develop evidence-based recommendations
- III. Implement legislative and board policies
- IV. Provide network resources

Create a sustainability plan for *statewide scaling* of mastery-based education

Presentation Title | 10

What can the Board do?

COLLABORATE and *CONSULT*
to ***elevate*** and ***scale***
your competencies
and ***mastery-based principles***
across the state,
through ***Primary, Secondary,*** and ***Higher Ed***
learning environments.

Presentation Title | 11

Questions?

Aaron McKinnon | Mastery-Based Education Coordinator
Idaho State Department of Education
650 W State Street, Boise, ID 83702
208 332 6952
amckinnon@sde.idaho.gov
https://www.sde.idaho.gov/mastery-ed/

Supporting Schools and Students to Achieve
SHERRI YBARRA, ED.S., SUPERINTENDENT OF PUBLIC INSTRUCTION

SBOE Mastery Update October 21-22, 2020 | 12

SUBJECT

Professional Development Update

REFERENCE

June 10, 2020	The Board approved the use of the ESSER 10% SEA reserve funds for grants to local education agencies and for funding for professional development to provide social emotional and behavioral health supports remotely.
October 2020,	The Board was provided an update on the Department's efforts to provide professional development resources to the school districts and charter schools as part of the K-12 Developments agenda item.
April 2021	The Board was provided an update on the Department's efforts to provide professional development resources to the school districts and charter schools as part of the K-12 Developments agenda item.

APPLICABLE STATUTE, RULE, OR POLICY

House Bill 358 (2021), Sections (6), (7), and (9)

BACKGROUND/DISCUSSION

The Superintendent's office receives an annual appropriation for professional development in all content areas as specified in the annual appropriations bill, which for the current Fiscal Year 2022 is HB358. This update is to provide the Board with an update and overview of professional development programs currently being provided as well as programs under development.

ATTACHMENTS

Attachment 1 – Professional Development Presentation

BOARD STAFF COMMENTS AND RECOMMENDATIONS

The Legislature appropriates funding for the specific purpose of providing professional development for certificated staff each year. In FY 21, the Legislature appropriated approximately $12.35M, of which $9.85M was distributed to the school districts and charter schools and $2.5M in the Central Services portion of the Public Schools appropriation was used by the State Department of Education to provide professional development.

For FY 22, the legislature has specified the following requirements specific to professional development funding:

- House Bill 358 (2021), SECTION 6. PROFESSIONAL DEVELOPMENT. Of the moneys appropriated in Section 3 of this act, the Department of Education may expend up to $2,700,000 for professional development, teacher training, and to track usage and effectiveness of professional development efforts at the state and local levels.

- HB 385 (2021) SECTION 4. PROFESSIONAL DEVELOPMENT. Of the moneys appropriated in Section 3 of this act, $10,850,000 from the Public School Income Fund shall be distributed for professional development that supports instructors and pupil services staff to increase student learning, mentoring, and collaboration. Professional development efforts should be measurable, provide the instructors and pupil services staff with a clear understanding of their progress, be incorporated into their performance evaluations, and, to the extent possible, be included in the school district or public charter school continuous improvement plans required by Section 33-320, Idaho Code. Funding shall be distributed by a formula prescribed by the Department of Education, and the Department of Education shall track usage and effectiveness of professional development efforts at the state and local levels.

In addition to the general fund appropriations for professional development noted above, school districts and charter schools may also use federal coronavirus funds toward professional development and federal Title funding for professional development.

BOARD ACTION

This item is for informational purposes only.

Content and Curriculum

Supporting Schools and Students to Achieve

SHERRI YBARRA, ED.S., SUPERINTENDENT OF PUBLIC INSTRUCTION

9/15/2021

Professional Development

Gifted and Talented Education (GATE)

- Updated Best Practices manual
  - Written in 1997, revised in 2005
    - Time to revise
    - Align with the National Association for Gifted Children's Programming Standards
- Reduced number of pages from 153 to 60
- Alignment with §33-2003; IDAPA 08.02.03.171
- New Idaho Framework link here
- Regional Facilitators link here

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Professional Development

Arts and Humanities

- In partnership with
  - Idaho Arts Education Association (IAEA)
  - Idaho Dance Education Organization (IDEO)
  - Idaho Music Education Association (IMEA)
  - Idaho Association of Teachers of Language and Culture (IACTFL)
  - IAEA Fall conference
    - Visual and Media Arts through STEM lens
  - STEAM, Master Classes, Book Study

IAEA Conferences & PD webpage

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Professional Development

- Arts and Humanities
  - In partnership with IAEA, IDEO, IMEA, IACTFL
    - IDEO Annual Fall conference
    - IMEA Idaho All-State Inservice conference
      - Mentor program
    - IACTFL Yearlong Virtual Conference and PD series

IDEO Annual Fall Conference

IMEA Mentorship Kickoff Conference

IACTFL Conference and PD

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Professional Development

- Instructional Technologies
  - HB358
  - Professional Development
  - Certifications
  - Growth of Programs

https://www.sde.idaho.gov/academic/information-tech/

Professional Development

Science
- Think, Make, Create trailers
- Implementing the Science Standards course
- P20 conference
- Picture Perfect
- Book Study
- ISAS
- Science coaches
  - Newsletter
  - Website
  - Resources

Unpacking the 3D Science Standards
Phenomenon

Professional Development

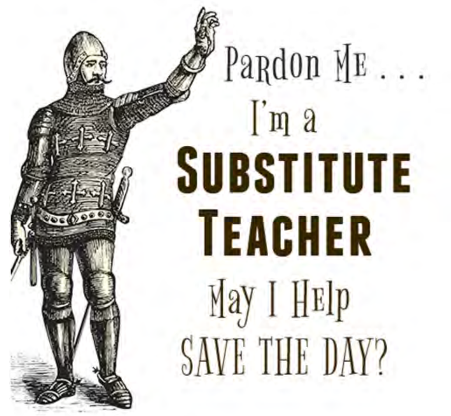
- Math
  - Regional Math Centers (RMC)
    - Focus shift
      - Projects
        - Targeted school support, Teaching Mathematical Thinking (TMT), Math Transitions Network (MTN), Teacher Leadership Development (LeaDs)
    - Math Transitions Network
        - Catalyzing Change
    - iSTEM
    - How the Brain Learns Mathematics

Professional Development

- English Language Arts and Literacy
  - K-3 Summit
    - SMART
    - Reading Coach Academy
  - Idaho Builds Capacity Project (IBC)
  - Reading Coach training
  - Response To Intervention (RTI)/Multi-Tiered Systems of Support (MTSS)

In development

- Substitute teacher training
- Statewide mentor teacher network



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Questions

Todd Driver | Director, Content & Curriculum
Idaho State Department of Education
650 W State Street, Boise, ID 83702
208.332.6800
tdriver@sde.idaho.gov
www.sde.idaho.gov

Supporting Schools and Students to Achieve
SHERRI YBARRA, ED.S., SUPERINTENDENT OF PUBLIC INSTRUCTION

SBOE / October 2021| 10

SUBJECT

Learning Loss Grant Update and September Report

APPLICABLE STATUTE, RULE, OR POLICY

Executive Order 2020-07
House Bill 356 (2021)

BACKGROUND/DISCUSSION

The 2021 Legislature enacted House Bill 356, which outlines funding and reporting requirements for programs addressing K-4 and K-12 learning loss. Through House Bill 356 (2021), the legislature appropriated $215 million from the Federal COVID-19 Relief Fund for the Public Schools Educational Support Program's Division of Children's Programs. Within this bill, $15 million was appropriated to address K-4 learning loss and $5 million was appropriated to address K-12 learning loss. The appropriation language included several requirements for each program, including reporting.

The reporting requirements for the K-4 and K-12 learning loss funding are as follows:

> *"The Department of Education shall report to the State Board of Education and the Joint Finance-Appropriations Committee by no later than September 15, 2021, and provide a second report no later than December 31, 2021, on the uses of funds and effectiveness of the programs and efforts."*

The Department provided this report to the Board Office in September for distribution to Board members. This presentation provides an update on the learning loss grants and summarizes the September 15th report and the planned December deliverables.

IMPACT

Summarizing the use of the Governor's "Learning Loss" funds meets the requirements in the authorizing legislation and provides information about how local education agencies are addressing unfinished learning.

ATTACHMENTS

Attachment 1 – Update on Governor's Learning Loss Grants
Attachment 2 – Complete September Learning Loss Report

BOARD STAFF COMMENTS AND RECOMMENDATIONS

In addition to reporting requirements established by the state legislature, ARP Act ESSER funding also places reporting requirements on the state and local education agencies on the effectiveness of the use of the federal funding and the evidence based supports implemented by school districts and charter schools. It will be important to help limit the reporting burdens on the school districts and charter schools by coordinating the reporting around student growth and program effectiveness as much as possible.

BOARD ACTION

This item is for informational purposes only.

Governor's Learning Loss Grant

HB356

Supporting Schools and Students to Achieve

SHERRI YBARRA, ED.S., SUPERINTENDENT OF PUBLIC INSTRUCTION

9/15/2021

Governor's Building Idaho's Future

- $10 million appropriated for Fiscal Year 2021
  - $5 million for K-4 learning loss
  - $5 million for K-12 learning loss
- $20 million appropriated/re-appropriated for Fiscal Year 2022
  - $15 million for K-4 learning loss
  - $5 million for K-12 learning loss

Presentation Title | 2

Learning Loss Source of Funds & Timeline

- These are Coronavirus Relief Funds allocated through the Governor’s Coronavirus Financial Advisory Committee
  - US Treasury Department guidance applies https://www.federalregister.gov/documents/2021/01/15/2021-00827/coronavirus-relief-fund-for-states-tribal-governments-and-certain-eligible-local-governments
- Expenses must be incurred by December 31, 2021
  - An additional 90 days is allowed to draw down funds

K-4 Metric

- Performance on the Idaho Reading Indicator
  - Spring 2021 to September 2021 Students demonstrate at least 50% of the growth needed to reach “at grade level” performance.
  - Spring 2021 to December 2021 students reach “at grade level” performance.

K-12 Metrics

- Required:
  - Idaho Reading Indicator for grades K-3.
  - ISAT interim comprehensive assessment/shortened interim comprehensive assessment (recommended) or locally-selected, evidence-based mid-year assessment in December 2021.
  - Number of students who successfully participated in a credit recovery course over the summer or in the fall.
  - Successful completion of intervention for students at risk for not making standard grade progression.
- Additional Reporting Metrics:
  - Change in the percentage of students who are chronically absent.
  - A school or district metric for addressing learning loss.

Currently

- Review committee
  - Team members from Finance, Federal Programs, and Content & Curriculum
    - 15 Million allocated for K-4
    - 5 Million allocated for K-12

Contact

Todd Driver | Director Content & Curriculum

Rick Kennedy | Instructional Technologies

Linda Becker| Grants and Contracts

tdriver@sde.Idaho.gov · rkennedy@sde.Idaho.gov · lbecker@sde.Idaho.gov

Idaho State Department of Education
650 W State Street, Boise, ID 83702
208.332.6800
https://www.sde.idaho.gov/

Supporting Schools and Students to Achieve

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Presentation Title | 7

SEPTEMBER REPORT

COVID-19 K-4 and K-12 Learning Loss Funds

IDAHO STATE DEPARTMENT OF EDUCATION

650 W STATE STREET, 2ND FLOOR
BOISE, IDAHO 83702
208 332 6800 OFFICE / 711 TRS
WWW.SDE.IDAHO.GOV

CREATED 09/13/2021

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This document meets the September reporting requirement associated with K-4 and K-12 "learning loss" funds distributed to districts and charters following the 2021 legislative session.

The main findings are as follows:

- Nearly two-thirds of districts and charter schools applied for these funds.
- The State Department of Education has currently received over $2 million in reimbursement requests for summer programs.
- However, most districts and charter schools have not yet submitted reimbursement requests for using these funds between their initial availability in mid-summer and the current reporting date.
- Reimbursement requests lag actual expenditures, but other reasons for the modest use of learning loss funds during the summer include: limited time with the funds, challenges with staffing based on fatigue from a difficult school year, and the ability to use other sources of funding to support interventions during this period.
- Programs and interventions using the learning loss funds will be more extensive during the 2021-2022 school year, which will be reflected in the December reporting period.
- Even with the limitations in measuring implementation over this early period, districts and charter schools still reported supporting thousands of Idaho students using these funds.
- The most frequent use of K-4 funds was for summer reading/early literacy programs. Districts and charter schools reported serving over 6,000 students with this type of intervention during the summer.
- For the K-12 funds, the largest number of students were supported in credit recovery programs, which reached over 3,000 students during the summer.
- Data from the fall Idaho Reading Indicator indicate that, on average, students who ended last school year at the lowest performance tier showed substantial growth. However, the majority of these students will need to demonstrate accelerated growth to be reading at grade level by the end of the calendar year.

BACKGROUND

The Sixty-sixth Idaho Legislature appropriated $20 million from the Federal COVID-19 Relief Fund to address "learning loss" associated with COVID-19. Of this total, the Legislature appropriated $15 million for K-4 programs and $5 million for K-12 programs. A portion of these funds were made available for Fiscal Year 2021 to support immediate implementation, with the full amount re-appropriated for Fiscal Year 2022 to continue any interventions.

The intent language in House Bill 356 specified that the K-4 funds were to be distributed based on the number of students at the lowest performance level on the most recent Idaho Reading Indicator (IRI). For the K-12 funds, House Bill 356 tasked the State Department of Education with developing a distribution formula based on assessment scores when possible. Consistent with this guidance, the Department used the distribution formulas below.

K-4 Funding Formula

The K-4 funding was based on the on the number of students in kindergarten through third grade who scored "Below Grade Level" on an April 2021 IRI administration. For districts and charter schools unable to assess in the April time period, the Department incorporated data from January through March 2021. The minimum distribution was $6,000.

K-12 Funding Formula

The K-12 funding was allocated using a combination of FY 2021 mid-term Average Daily Attendance (ADA) and academic performance. The base distribution was as follows:

- Mid-term ADA < 25 = $3,250
- Mid-term ADA between 25-100 = $130 per ADA
- Mid-term ADA > 100 = $13,000

The funding remaining after the base distribution was allocated based on an "academic need" value. The Department calculated this value based on percentage of kindergarten through third grade students who scored "Below Grade Level" on the April IRI (incorporating January-March, if needed) and the percentage of students in grades six through twelve identified as "At Risk" in the March data districts and charter schools submitted via the Idaho System for Educational Excellence (ISEE).

Participation

The Department shared information about the learning loss funds during the spring and early summer, before inviting interested districts and charter schools to apply. Districts and charter schools could apply for the K-4 funding, the K-12 funding, or both. Nearly two-thirds of districts and charter schools participated. The table below summarizes participation by funding category.

Participation Type	Number of Districts and Charter Schools
K-4 Only	5
K-12 Only	19
Both K-4 and K-12	96

Reporting Requirements

House Bill 356 also provided the Department with responsibility on reporting to the State Board of Education and the Joint Finance Appropriation Committee on the use and effectiveness of the learning loss funds and associated programs. The first report is due no later than September 15, 2021 and the second is due by December 31, 2021.

In applying for the funds, districts and charter schools agreed to several requirements necessary for the Department to meet this reporting obligation. Those receiving the K-4 funds were to administer the fall IRI by September 10, 2021 to students supported over the summer using the learning loss funds to track progress towards reading at grade level by the end of the calendar year. Those receiving the K-12 funds had the same fall IRI requirement and were also originally asked to administer an Idaho Standards Achievement Test (ISAT) interim comprehensive assessment (ICA) or shortened interim comprehensive assessment (SICA) to supported students. However, due to the challenges with implementing this metric at the opening of the school year, the ISAT interim component has been deferred until later in the year. Additionally, as some districts and charter schools are already using locally-selected assessments, such as NWEA MAP and Star assessments, the Department anticipates providing flexibility to incorporate data from these tests in lieu of the recommended ICAs or SICAs.

In addition to using assessment data to measure progress for students supported during the summer, the Department developed a reporting form for districts and charter schools to share the number of students successfully served over the summer by each of the following types of programs using the K-4 or K-12 funds:

- Summer reading/early literacy program
- General content remediation for ELA/Literacy
- General content remediation for Math
- Intervention for students at risk of not being promoted to the next grade
- Credit recovery
- Absenteeism

Districts and charter schools could also provide information about any other programs or local assessments and were told to provide a brief narrative description of their activities using the learning loss funds during the summer.

The following sections of this report summarize the current fund usage based on reimbursement requests along with the information available via the reporting form and IRI results.

REIMBURSEMENTS

K-4 Reimbursement Summary	Reimbursement Data
Number of Districts/Charter Schools Submitting Reimbursement Requests	29
Reimbursed Expense by Purpose…	
Purchased Services (not including Professional Development)	$120,598.81
Salaries/Benefits	$977,175.70
Supplies/Materials	$57,462.09
Travel for Students/Transportation	$17,548.19
Total	$1,172,784.79

Districts and charter schools may have expended funds that they have not yet submitted for reimbursement, which would not be included in this table.

K-12 Reimbursement Summary	Reimbursement Data
Number of Districts/Charter Schools Submitting Reimbursement Requests	33
Reimbursed Expense by Purpose…	
Purchased Services (not including Professional Development)	$63,083.72
Salaries/Benefits	$635,114.92
Supplies/Materials	$134,280.60
Travel for Students/Transportation	$94,413.38
Total	$926,892.62

Districts and charter schools may have expended funds that they have not yet submitted for reimbursement, which would not be included in this table.

PROGRAM SUMMARY

K-4 Program Summary	Number of Students Successfully Supported
Summer/reading early literacy	6,137
General content remediation for ELA/Literacy	2,466
General content remediation for Math	2,623
Intervention for Students at risk of not being promoted to the next grade	419
Credit recovery	34
Absenteeism	430

K-12 Program Summary	Number of Students Successfully Supported
Summer/reading early literacy	838
General content remediation for ELA/Literacy	1,682
General content remediation for Math	1,690
Intervention for Students at risk of not being promoted to the next grade	1.664
Credit recovery	3,029
Absenteeism	403

The narratives submitted by each district and charter school during this reporting period are included in Appendix A.

ASSESSMENT SUMMARY

All K-3 students have to participate in the IRI at the start of the school year in either August or September. The Department asked districts and charter schools to assess students supported by the K-4 or K-12 learning loss funds in a summer reading/early literacy program by September 10th to facilitate the required reporting. This analysis is restricted to students who were "Below Grade Level" on the spring 2021 IRI, as they were prioritized for these funds. However, the data may include students who were tested during this early administration period but who were not supported by the learning loss funds during the summer. The data are also for all Idaho schools with results during this time period and are not matched to enrollment records. Consequently, readers should be cautious in using these results to draw conclusions about the effectiveness of summer intervention programs.

Between May and August/September, the IRI performance tiers incorporate expected scale score changes. For some grades, this expected change includes a regression or stalling during the summer. The table below shows the expected May to August and May to September scale score growth based on the IRI performance tiers. Next to each is the average observed growth for students in this analysis. Students are counted in August if their first assessment this year was in that month and in September if their first assessment this year was in that month. At all grades, the average IRI scale score growth for this group exceeded the expected summer progress.

Grade Transition	May to August Expected	May to August Observed (Mean)	May to September Expected	May to September Observed (Mean)
KG to 1st Grade	-2	.4152941	0	1.770492
1st Grade to 2nd Grade	0	3.395531	1	3.201613
2nd Grade to 3rd Grade	1	4.037037	3	4.596047

Total N = 7,627

Another way to analyze the fall IRI results is using the three reporting tiers: At Grade Level, Near Grade Level, and Below Grade Level.

Among the students who were Below Grade Level in the spring and who tested by the September 10th deadline, 2.9 percent were At Grade Level in the fall, 16.3 percent were Near Grade Level in the fall, and 80.8 percent remained Below Grade Level in the fall.

Taken together, these results highlight that students can demonstrate growth, but may not cross the threshold to the next performance tier. This finding is reinforced by the final outcome measure in included in this assessment summary, which is the percent of students who made sufficient growth to be on track to be At Grade Level by the end of the calendar year.

This calculation is based on a linear trajectory between the student's spring score and the minimum scale score to be At Grade Level in December. Among the students in this analysis group, 9.2 percent were on track to move from Below Grade Level in spring to At Grade Level in December. These figures will be updated in the December reporting period.

Additional assessment data will be included in the December report.

APPENDIX A

Districts and charter schools were asked to provide a brief narrative description of their use of the learning loss funds over the summer. Responses below are for the districts and charter schools that responded by the September 10, 2021 deadline. The Department consolidated responses for districts and charter schools that submitted multiple responses with slight edits for readability.

COEUR D' ALENE	Coeur d'Alene Public Schools added a variety of resources for students during the summer including specialized learning in our summer school. We converted our fleet into "Imagine Busses" traversing our communities providing reading buddies and free resources, and built student capacity through leadership development and mentorship programs. As we have just completed our first week, we do not have immediate results but will be reviewing results of our fall screening assessments against our student list to identify levels of impact. That data should be available in early October.
MIDDLETON	As a district we provided credit recovery to students in grades 6-12 to address credit deficits for these students. We offered a summer school program and allowed students to attend to recover credits. We also served breakfast and lunch for these students. This ran for six weeks. We measured success of this program through credits earned. We had 70 high school student earn 118 credits this summer. We had 30 middle school students earn 40 credits this summer. We also offered extended school year to our Special Education students. We had five K-4 students participate and two 6-12 students participate. The metric used was the IEP goals. All students who participated made progress towards their IEP goals. This helped close the learning loss gap created for these students in terms of progress on their IEP's.
MOUNTAIN VIEW	The district provided learning loss opportunities throughout the summer. We had jumpstart reading programs at all elementary schools. We provided opportunities for credit recovery, ELA and Math instruction, and for students with excessive absences. The students that participated in summer school were able to recover credits and were promoted to the next grade level. The schools used teacher made assessments to determine learning gains throughout summer school.
MOSCOW	The Moscow School District's Summer Learning Loss program offered intervention to academically at-risk students in grades kindergarten-8th grade. Certified teachers and paraprofessionals provided targeted instruction in reading and math. Students who participated in the Summer Learning Loss program increased their reading and math skills, including motivation and confidence. Additionally, paraprofessionals assisted students in courses they failed, allowing most students to complete the remediation and move on to the next grade level.
FILER	Filer School District hosted a summer credit recovery opportunity for students in grades 7-12 who needed extra time to complete course requirements in order to earn credit. The program ran for two weeks in June after the end of the school year. Filer also hosted a summer program for students in grades 4-6. The program was held four days a week for three weeks -- twelve

	days -- in August prior to the start of a new school year. The focus was on reading and math for students who would benefit from extra help.
VISION CHARTER SCHOOL	Vision offered in person extended year summer school in June and July to all K-12th grade students who were at risk of not being promoted, required credit recovery, or who needed specific English and Math intervention specifically due to Learning Loss experienced due to the pandemic and decreased time in the classroom in person. We used Certified Teachers working with Educational Assistants to offer small group highly targeted tutoring, interventions, and supports.
ST. MARIES JOINT	Credit recovery was offered in four three week summer sessions. Forty-nine students attempted to earn credits. Forty-five students were able to earn credits in core subjects. We used Edgenuity for our online credit recovery platform. The balance of the funds will be used to pay for certified staff to provide learning loss interventions in grades K/12.
LAKELAND JOINT	John Brown Elementary piloted a Jumpstart program supporting at-risk students in the area of reading. At Kinder, we focused on letter names and letter sounds with an emphasis on CVC patterns. Students were assessed using letter sounds, 6 out of 7 students made growth in this area. At first grade, the students were provided intentional explicit instruction in the area of phonics, specifically with CVC, CVCE, vowel teams, and fluency, 7 out of 15 students made gains from their spring ISIP. In second through fifth grade, teachers focused on phonics, vocabulary and word attack skills. 16 out of 31 students made gains in this area as measured by their fall ISIP and oral reading fluency.
BUHL JOINT	Learning loss funds were used to provide credit recovery at the high school level. Students were able to take English or Math in order to helpmstay on track for graduation. Funds were used for staffing summer school. Buhl Middle School held a session of summer school to provide an opportunity for students to pass classes they had previously failed in order to be promoted to the next grade level. Students were given instruction in math and language arts. Money was used to provide certified staff and paraprofessional support to our students.
NOTUS	We provided a summer learning program right after school ended to support any student who had struggled K-6. We also did a book in a bag program, the focus was on those students who did not make the growth we were hoping for during the school year, but we also included students who were on the bubble. They received new books throughout the summer that they could keep as well as working in partnership with the community library. Our math teacher worked one on one with students who needed extra support in math, and 14 of our students were enrolled, and passed, a credit recovery program so they are closer to being on track for graduation.
HERITAGE ACADEMY, INC.	Heritage Academy utilized the Governor's Learning Loss funding to provide individual and small group intervention for students with significant gaps in reading/literacy due to the COVID school building closures. Students were identified using Idaho Reading Indication (IRI) scores, Istation progress monitoring data, Core Phonics Survey data, Curriculum-Based Assessments and teacher referral. Parents of identified students were provided with information about grade level proficiency expectations, current level of performance and options for summer intervention. The approach used to address learning loss was individualized, based upon student need. Two staff members provided options for individual or small group tutoring. Participating students made significant gains over the summer. Unfortunately, very few of the students identified for intervention participated in the program. As a result, the school will continue to implement strategies over the 2021-22 school year to address the significant losses the occurred due to the COVID pandemic school building closures.

FREMONT COUNTY JOINT	We utilized our learning loss funds to provide credit recovery, and remediation/advancement for our students who failed a class or were behind academically. We did this during the month of June, and we will utilize iReady and IStation to measure our students to see if there has been a significant summer slide, or our enhanced summer school did what it was designed to do; stop the summer slide. Our K-5 summer programs were housed at Ashton Elementary School and Henry's Fork Elementary School. Our 6-8 summer programs were housed at South Fremont Junior High School and North Fremont Junior High School.
BONNEVILLE JOINT	Bonneville Joint School District used the K-12 learning loss funds over the summer to fund teacher salaries to run summer school for our middle school and high school students. Two middle schools and four high schools in our district participated in the summer school program. Because of the opportunity provided by these funds, 141 students were able to earn 192 credits. Some of these students were at risk of not being able to advance to the next grade because of lost credits. This allowed many students to stay on track with their courses and remain with their grade level peers this year.
HAGERMAN JOINT	Learning loss funds in the Hagerman School District were used over the summer of 2021 to meet district needs in general content remediation for ELA/Literacy and Math, absenteeism, intervention for grade promotion and credit recovery. General content remediation, absentee recovery and promotion intervention were applicable mostly in grades k-6 while credit recovery was applicable more in grades 7-12 (with content remediation naturally following the learning in credit recovery). Where we are a small rural school district, learning loss funds were also very important for access to our summer school program. Nearly 60% of our summer school students required bussing. Learning loss funds allowed our district to meet needs in student learning that have previously been difficult for our rural school district to meet. Learning loss funds were truly valuable for the academic and social/emotional development of our students.
IDAHO FALLS	All K-4 students in Idaho Falls School District who did not score proficient on the April IStation assessment were invited to participate in the 2021 "Summer Learning Camps" program, which was expanded from previously only addressing K-3 literacy to addressing both ELA and math. Idaho Falls School District had 497 K-4 students enrolled in Summer Learning Camps at three different sites; of these 497 students, 324 students attended 75% or more of the time during the three-week summer program. "Learning Loss" funds were used to fund staff and supplies. The IStation was administered at the end of the program in July to measure student growth in literacy: 63% of kindergarten students made growth; 53% of 1st grade students made growth; 64% of 2nd grade students made growth; 68% of 3rd grade students made growth; and 59% of 4th grade students made growth. Math skills were assessed with classroom-based assessments that addressed differentiated learning needs; there was not a way to aggregate this data because of the various assessments used.
JEFFERSON COUNTY JOINT	We did not use learning loss funds over the summer. We have a plan in place to utilize those funds beginning when students returned to school.
MARSING JOINT	We provided credit recovery to middle and high school students, Migrant credit recovery for our migrant middle and high school students. Jump Start Summer School was also provided for our K-5 elementary students. All of this was already budgeted into our Title 1 program, Title IC and a local grant received from Department of Health and Welfare. We will be spending Blended Learning Loss dollars on additional intervention educational assistants, afterschool tutoring and Friday schools.
CALDWELL	This summer we offered Summer Bridge Academies at all of our schools. Students were invited to attend either a morning or afternoon session. Classes were held throughout the month of June. Our main purpose was to rebuild relationships with students who had spent most of their school year attending either remotely or in a hybrid model. Our academic focus was on improving reading and math skills. In many cases, activities and course work was tied to STEAM.

BUTTE COUNTY JOINT	We paid six teachers to work with students during the summer to make up credits. Most students worked on missing assignments or redid assignments to pass the classes they failed. At the K-4 level, students worked to close learning gaps so they are better prepared to start school in the fall. The district also purchased APEX Learning to use for credit recovery during the school year so we can provide "just in time" interventions to help students recover credits as they go. Due to the lack of electives available in the district, APEX is also used for original credit to personalize student learning.
BASIN	The learning loss funds were used to help students in grades K-6 and 7-12. For elementary most of the funds were used to pay for staffing summer school teachers. For secondary funds were used for staffing and for the cost of Edegnuity credit recovery. Assessment was used in the form of iReady, iStation, and Edgenuity.
ABERDEEN	Aberdeen School District provided summer school for grades K-8 to focus on proficiency skills using various computer programs and curriculum. Students in grades 9-12 were enrolled in credit recovery classes through IDLA and were provided assistance as needed by school personnel. Learning loss was determined by ISAT scores and IRI scores. These tests were also used to determine proficiency levels.
OROFINO JOINT	We were able to use the "learning loss" funds to reach students over the summer to help prevent that gap of leaning that happens over the summer months. Books and supplies were purchased for the children, as well as providing transportation and lunches/snacks for the children that participated in the program. We are in a rural area, and providing the transportation and snacks enabled children to participate that otherwise would not be able to. The books and supplies purchased for the program helped facilitate learning activities specific to strengthening foundational reading skills that were needed.
EMMETT INDEPENDENT	K-4 Learning loss was a targeted summer program based on student IRI data and ISAT data. Students were invited to attend 3 sessions that were 2 weeks in length. The focus of these sessions were focused on individual student learning gaps. The program integrated a number of science and hands on learning projects to engage students in a variety of ways. The secondary learning loss summer funds were used to help 9-12 students that had gaps in learning. The small group instruction and mentoring was conducted by high school teachers in specific content areas of math and ELA. The 6th grade BARK camp was to help 5th grade students and was open to the entire district with their transition from elementary to middle school. Middle school teachers and counselors used this week of instruction to give students a jump start into Middle school but it was not targeted individual instruction as our other two programs were. Visible outcomes from K-4 will be assessed using the Fall IStation data 5-8 students will our district will use Fall Star data.
INSPIRE ACADEMICS, INC.	Inspire has chosen not to expend/accept the funds after all. Requiring additional assessments when students and staff already deal with assessment fatigue is not something Inspire will engage, especially right when students are working to ensure they are on track with course completion before the end of a semester.
CASTLEFORD JOINT	We did not use our learning loss funds over the summer. Instead, we are having an after school tutoring program for students K-12. This fall, we used Istation and interim assessments to help identify and monitor student learning.
NAMPA	Elementary programs - we targeted students with specific ELA or math gaps in their learning as evidenced by IRI and PMA or IMA. Middle School programs - students at risk at not progressing to the next grade were identified (using grades and ISAT) were invited to focus on specific content areas.

	High School - students who needed additional time to demonstrate proficiency in content areas were invited to catch up programs. Other students wishing to earn full credit (replacing F's in previous classes) attended the district main summer school program.
WALLACE	Our funds were used to cover intervention and curriculum programs access, salary and benefits for staff instructing the program as well as that of salary and benefits involved in transporting students to and from the summer activity. Supplies associated with the program and limited snacks were covered by funding also. Students were selected using results from the IStation Reading test in the spring of 2021. Students maintained or slightly dropped in scores using this assessment in the fall.
AMERICAN FALLS JOINT	k-12 funds were used for credit recovery. There were 109 credits earned. k-4 funds were used for k-8 reading and math summer school. At this time we are still analyzing results of outcomes.
GOODING JOINT	Gooding Elementary School was able to provide K-5 students with instruction in math and reading. Students were selected to attend summer school based on ISIP reading and/or math scores that fell below proficiency. Students received up to 5 hours of daily instruction, 4 days per week, for 4 weeks. Gooding Middle School: Number of students ending 2020/2021 under 80% of credits passed requirement: 18 students; out of that 18, 11 students attended summer school to make up failed classes, 6 of the 18 students will need to finish with credit recovery first semester, only 4 students will be retained (out of 352 students).
IDAHO ARTS CHARTER SCHOOL	Our learning loss fund covered the funding of a six week summer program for students at risk for retention, who suffered from absenteeism during remote learning, or who needed credit recovery. We held school 4 days a week from 9-1:00pm and provided both bussing and meals for students. Students were provided strategic instruction in both math and reading from certified teachers. An aide was also placed in almost every grade level to support instruction. Pre and post assessments were given in a power standard taught in both reading and math for each grade level. All grades showed a growth increase in at least one of the reading or math content areas. 100% of students needing credit recovery were able to recover those Middle School credits and advance to the next level. In addition, all students were able to get back into the routine of attending school safely to experience a stint of in person learning while cases were down. Attendance remained between 85 and 100% for the entirety of the program.
VALLIVUE	While Vallivue did submit an application for learning loss funds back in May, we have yet to use any of those monies. We chose to wait until students returned this fall to assess their skills and skill loss to determine where the money would best be spent. Even though our original plan requested the use of both the K-12 and the K-4 funds, we plan to use only the K-4 dollars. Our plan is to used this money on supplemental materials to support instruction and student learning. We plan to spend our K-4 allotment on the following items: Hands on math kits for each classroom, K-4, to enhance our math lessons and to increase student understanding of our mathematical standards. Iready program licenses Istation math licenses This is not an exhaustive list as we are still reviewing and discussing the results of assessments we have given. We plan to purchase these items in the near future and will be able to explain expenditures in detail on the next report.
NORTH STAR CHARTER SCHOOL	North Star invited all students who received a 1 or 2 on the spring ISAT test for ELA or Math and/or a 1 or 2 on the IRI to participate in our summer learning program. This program ran for 6 weeks and students who chose to attend received instruction from

	certified teachers using research based program materials to include Bridges, CPM, Wonders, SIPPS. Students will take the interim ISATs and IRI by the state required date (along with district required benchmarking) to track impact of the program. The unspent dollars will be used in our secondary program (6th-12th) to run an after school program taught be highly qualified staff to support students whose data trends , spring ISAT results and current school performance show learning loss impact. This program will be completed by the December deadline.
NEZPERCE JOINT	Students who showed "learning loss" in reading and math were invited to attend a 4 week summer program. This program featured reading instruction focused on K-3 skills including phonics, sight words, oral reading skills, and comprehension. A daily writing activity was included also at each grade level. Math skills included direct teaching of topics such as number recognition, addition, subtraction, and multiplication. These math skills were reinforced with students using the online math program, Dreambox.
PAYETTE JOINT	We took advantage of the learning loss funds to provide a summer program for students in grades K-5. Students were selected based on data from spring testing, grades and those marked to be retained due to loss of academic achievement. Program selected 'power standards' for all staff to address throughout the four week program. Formative testing was conducted at the beginning and throughout the sessions, but IRI and ISAT will be used as metric for growth.
MARSH VALLEY JOINT	We ran summer programs at three of our elementary schools. Because the needs were different at different schools, the programs that were offered were different. At one school, we offered a summer reading/early literacy program. At the other two schools, we ran "camps" that used activities to remediate ELA and Math.
HANSEN	Hansen School District plans to purchase curriculum for secondary classrooms with the K-12 Learning Loss Funds. K-4 funds will be used to hire support personnel for elementary reading and to purchase curriculum. We didn't use any funds over the summer. Our 21st Century does summer school so that was already paid for K-6. Our plan is to use the funds this fall.
SODA SPRINGS JOINT	Credit recovery was the goal for our high school and middle school students, of the 12 students that arrived all of them completed the necessary work to gain the credit that was lost. Teacher's were paid to assist the students. A local curriculum was used with some purchased programs the district already owned.
CAMBRIDGE JOINT	Our district decided to try a "Jumpstart to School" program. We invited students who were not at benchmark on the IRI at the end of the 2021 school year, students who have special needs with an IEP, and students recommended by the teacher as needing intervention services to be ready for the beginning of the school year. Our staff targeted literacy skills, math skills, and STEM activities that combined literacy and math/science skill practice. 80% of students invited attended. 90% of students who came to our Jumpstart program attended 100% of the time. Also our district used the Governor's Grant to procure the ISIP assessment for math for our elementary students and ISIP reading assessment for 4th grade students. This program includes intervention instruction in reading and math that students can use at home, as well as at school. Our district will use the ISIP reading and math percentile rankings from the assessments given monthly to track growth and to calculate annual growth for all elementary students. This program also allows teachers to determine which students are at benchmark and to target intervention instruction, both in the classroom and in our Title I tier II instruction program.

HOMEDALE JOINT	We were unable to staff a summer school program as we had previously planned. Therefore, our summer learning loss dollars went unspent. We plan to utilize the K-4 and K-12 dollars before December 31, 2021 by providing additional IRI and ISAT remediation. We will target students and provide additional support on designated Friday's throughout the Fall semester as we are on a 4-day school week.
MINIDOKA COUNTY JOINT	During the summer, Minidoka County School District (MCSD) held summer school programs for several groups of students. The summer school migrant program had 142 elementary students enrolled. In addition to enrichment activities specific to the migrant program, these students received small group instruction based on learning deficits. Students used software programs that provided them with instruction at their specific level. Students in the the secondary summer school program attended to recover lost credits due to learning deficits and/or absences. Students either received instruction in small class sizes to better ensure content application and retention or instruction from Edgenuity that allows students to work at their own pace to learn content and demonstrate mastery of content. MCSD uses a model that incorporates software programs that tailors instruction to individual needs in combination with in-person instruction that may be whole-group on one-on one.
PARMA	Parma School District focused efforts on K-4 students who were very close to meeting proficiency targets at the end of the 20-21 school year in hopes that the boost from attending summer school would give them that little bit extra to start the year ready to meet proficiency targets. Teachers worked with students on reading and math daily. Students remained with teachers they finished the 20-21 school year with in order to target specific skills that an unfamiliar teacher would need more time to diagnose. Students and teachers working in that familiarity meant they hit the ground running to improve student outcomes. Parma also had a 5-8th grade program providing high-quality and engaging programming in ELA, Math, Science, and STEM education. Students participated in all 4 subjects everyday. Funding has been used for summer school salaries and benefits. Supplies and needed equipment were also purchased with learning loss funding.
SWAN VALLEY ELEMENTARY	We hired our 1-2 grade teacher to run a summer reading program for students that did not get a 1 spring 2021 IRI.
FUTURE PUBLIC SCHOOL, INC.	We launched three academic summer camps, including a Kinder Readiness Camp and two 1st-6th grade camps (mid-June and mid-July). All camps targeted students based on spring testing or screening, and both camps included instruction in literacy and math. They were staffed by certified teachers and supported by classified staff, all of whom are current staff that can support on-going support in the school year. Transportation and free meals were provided to allow our most vulnerable students to participate. The effectiveness of the program is being evaluated using FY21 spring Istation (IRI) and NWEA Map testing data and FY22 beginning of year fall Istation (IRI) and NWEA Map testing data.
BLACKFOOT CHARTER COMMUNITY LEARNING CENTER	No learning loss funds were used during the summer portion of the school year. Funds have instead been allocated for use during the school year.
JEROME JOINT	Jerome School District used some of the K-4 and K-12 Learning Loss funding for the JSD 2021 Summer School that addressed learning loss due to COVID and credit recovery in the secondary schools. Funds were primarily used to pay transportation services, salaries and benefits. The IRI will be the metric used to determine outcomes for our primary grades and successful credits recovered/earned were the metric used for our secondary grades.

	The balance of the available funds will be used to address COVID learning loss needs in the 21-22 SY.
CASSIA COUNTY JOINT	Cassia Joint School District provided a robust summer learning program. We offered all students K-12 the opportunity to attend summer learning programs in all four of our communities: Burley, Declo, Malta, and Oakley. Every elementary school offered anywhere from 10 to 25 additional days of learning. The focus for learning at the elementary school was on literacy and math skills. In addition, we offered enrichment experiences to all students at the end of each week. At the secondary level, we focused on credit recovery in ELA, math, science, and social studies. Salaries and benefits for instructors, para educators, and child nutrition were all a part of the expenses covered by learning loss funds. In addition, curriculum and resources were also purchased with learning loss funds.
COUNCIL	For Council Jr.-Sr. High School, we concentrated our efforts on credit recovery. Using learning loss funds we had 17 students recover 24 total credits. This allows those students to start the 2021-2022 school year on a positive note and equal to their peers. For Council Elementary School we had dual purpose this last summer. Using learning loss funds we provided remediation for 23 students in both Reading and Math. We also opened up our library and started a bookmobile to provide reading books for our students throughout the community of Council, with 55 students checking out books.
WEST BONNER COUNTY	We were able to offer reading, math and literacy interventions on location at all 3 of our elementary schools. We reached out to all who were below grade level and invited them to this opportunity. We were also able to offer summer school to our secondary students, this was based around credit deficiency and need. Thanks for these opportunities!
NORTH IDAHO STEM CHARTER ACADEMY	We implemented IDLA classes, IXL curriculum, stipends for online teachers and hardware for students to use at home during this time to assist in learning loss.
BLACKFOOT	Blackfoot School District offered a "Jump Start" program for all K-6 students at each elementary school and BHSG in August. MVMS offered interventions for students at rick of not being promoted for grades 7-8 June through July. At the Migrant Outreach Center, we offered time recovery for absenteeism June through August and at Independence Alternative High School, we offered credit recovery through face-to-face learning, ICON, and PLATO for credit accrual.
TWIN FALLS	The TFSD utilized Plato for 8th grade students lacking middle school credits necessary for matriculation to the high school. Students were contacted and 34 students were enrolled into math and/or ELA classes. Of the 34 students who took Plato courses, approximately 17 students successfully completed the course and earned the credit to fully matriculate. The remaining students are finishing courses this year in a Plato lab at the high school.
NORTH VALLEY ACADEMY	We served K - 12. K - 6 focused on reading, math, and ELA learning loss as well as preparing students for the upcoming grade. 7 - 12 focused on credit recovery. We served students at four different locations and had two to three adults at each location to provide the best options for one to one instruction.
KOOTENAI JOINT	We did not use this program.
SHELLEY JOINT	K-4th grades were provided the opportunity to attend summer tutoring where they received direct instruction to help them improve their reading and math skills. Transportation and lunch were provided. 7th-12th grade students were given the opportunity to take asynchronous courses during the summer for credit recovery. IRI and STAR scores will be used as a metric.Total summer credits earned will be used as a metric.

POCATELLO COMMUNITY CHARTER SCHOOL	Our data shows from our summer program reading went from 32% proficient to 42% and in math we went from 29% to 47% proficiency.
SNAKE RIVER	Due to the time when the award was received it was decided that the funds would be used in the fall semester. The elementary schools will use either the Isation or the STAR assessment to determine which students have the most learning loss and those students would receive extra instruction on Fridays throughout the fall semester.The plan is to put together tutoring classes for the secondary level as well
MURTAUGH JOINT	The District did not use learning loss funds over the summer to fund our programs.
BOISE INDEPENDENT	Boise School District established a K-4 summer program to address the needs of unfinished learning from the 2020-2021 school year. During this summer program students participated in high-engaging, skill deficit building activities in the areas of Reading and Math. Students from 33 elementary buildings enrolled into these summer programs that were offered at 5 different locations. A pre-post model of assessment was implemented to determine the levels of improvement in the areas of Reading (iStation) and Math (iReady). The pre-assessment evidence was obtained from the Spring IRI for reading and the Spring iReady in grades K-4. The post-assessment evidence will be obtained following the fall administration of iStation (grades K-5) and iReady (grades K-5).
FORREST M. BIRD CHARTER SCHOOL	We did not use any funds over the summer. We are not planning to use the funds as we cannot find people to work as paraprofessionals. We are buying the program via ESSER II or III funds instead.
ONEIDA COUNTY	I believe the most effective way to address remediation/learning loss is in small groups that can focus on the individual needs of each student. That is why we choose to use the remediation dollars working with the students on Fridays when they would typically not be in school. We will have to use some dollars on technology and programs specifically designed to help individual students. While we may not be able to fund the Friday work sessions on a going basis, we will have the technology and the programs in place to use on an ongoing basis to include summer school.

ROLLING HILLS PUBLIC CHARTER SCHOOL	Learning loss plan is to be implemented after the start of the school year gets started. This summer teachers were burnt out and needed the time to recover from a very intense school year. We are a small school district (250 total students) and the parents also needed time away from the school to be with their kids. Safety of being on campus was a concern. We plan on giving all of our students the Istation (k-8) Reading and Math, additional baseline assessments, and the ISAT interim assessments in the fall. This will allow us to have students in K-4 Math, K-4 ELA, 5-8 Math, 5-8 ELA in an after school program running 4 days a week for students to receive instruction. We will use our Certified Teachers and support staff to run the Learning Loss after school program from Fall 2021 to Winter 2021. We will implement the assessments (Istation Reading and Math, ISAT Interim Math and ELA) to demonstrate progress from baseline in the fall to winter. We are using August and first week of September to establish baselines of students and take the Interim Assessment. We are also looking at their Spring data to identify "Learning Loss" need. On Sept. 7, 2021, students will be invited to our After School Program to address learning loss. The program is to run Monday- Thursday (2:45-3:45pm). Two days dedicated to ELA and two days dedicated to Math. Most students will need help in both area so they can participate in all four day. It is expected from our preliminary numbers that we will serve about 150 students in the area of Math and ELA, grades K-1-2-3-4-5-6-7-8. We will extend supplemental contracts to teachers and staff to support the program of instruction.
WEST ADA	We have utilized some of the learning loss funding through the summer. We did anticipate a larger Summer Program for Special Education than actually occurred - less students requested services than was originally anticipated. Much of the learning loss funding in the plan is being devoted to programs that will start when school begins and will be expanded programs leveraging current literacy funding. Expenditures will be incurred throughout the fall through December.
CAMAS COUNTY	Due to the dynamics of our community, we had only two families who were willing to participate in our summer reading program. Due to this, we are planning our reading intervention for this October/November, thus allowing our teachers to use monthly benchmarks to identify students who are below grade level, and allow for appropriate grouping. Teachers attended professional development this summer, learning how use our new adopted reading and writing intervention curricula. Assessments are included in this curricula that help us to identify students who are below grade level proficiency. Our instructional coach has designed both push in and pull out intervention.
RIRIE JOINT	At the end of the 2020-2021 school year we held our regularly scheduled summer school and paid for it with Title funds. I did not have any other staff that wanted to work through the summer so we did not offer any addition summer programs. Our plan is to utilize the funds during our first semester of school this year.
AMERICAN HERITAGE CHARTER SCHOOL	American Heritage Charter School provided a summer learning opportunity for students in grades K-12. The students were identified and invited to attend the summer school programs. Students in PK - 1 came on Monday and Wednesdays and Students in 2-5 came on Tuesdays and Thursdays. Students in 6-12 were invited to attend M-TH to receive help in reading and mathematics. The library was also opened for students to come and check out books during the summer. We tested students in these levels at the end of the summer school program. The teachers felt they had an impact on the students' learning and parents provided positive feedback to the teachers on how the could see their students improving in these areas.

GARDEN VALLEY	K-4 Seven students in K-4 participated in our Jump Start program. This program is provided annually by one of our Paraprofessionals. Students are selected to participate by teacher recommendation and/or assessment results. In previous years there was less participation. The summer of 2021 the program served seven students. K-12 Seven MS/HS students participated in Credit Recovery during the 2021 summer. Students attended in person during the month of June. Those that did not finish their class worked independently in July and August. Our Summer School Paraprofessional supported them four days a week in June. In July and August the para communicated with them online and by phone. She monitored their progress and kept them motivated and focused on finishing their classes.
IDAHO SCIENCE AND TECHNOLOGY CHARTER SCHOOL	The school hosted a summer reading camp in August to prepare students for a successful 2021-22 school year. Five certified teachers worked with 39 students on reading skills ranging from early phonics to advanced vocabulary and spelling. Students who participated read daily at home and at reading camp. Those 39 students performed better on the September IRI. They also read (as a group) a total of 8500+ pages during the camp. SEL indicators showed student anxiety over attending school in the fall decreased dramatically after participating in the camp.
COTTONWOOD JOINT	We provided summer school for 41 K-7 students and credit recovery for 4 high school students. We had a summer school coordinator along with 5 paraprofessionals. There were 3 elementary groups which were assigned stations throughout the morning. One session was included live interaction with their IDLA teacher focusing on math and reading/literacy. 2nd session was small group work with a paraprofessional and the 3rd session was iStation independent work. Summer school ran every Tuesday and Thursday from 8:30-12:30 starting June 8th and ending July 29th. The credit recovery high school students took their courses via IDLA and worked on their own or with our high school IDLA coordinator.
ARBON ELEMENTARY	We ran a summer reading program every Mon through out the summer. Mrs. Williams also had activities sheets to do with their library books. Mrs. Curry tutored one student 4 days a week in math. After taking the I Ready diagnostic at the beginning of the school year she showed growth in each domain, but is still performing a grade level behind. She did show a 3 grade level improvement in geometry.
SUGAR-SALEM JOINT	We used the extra funding to help students that were struggling with reading and math. We hired teachers and paraprofessionals at each grade level pre-K through 6th grade to come and help the students we had identified for intervention. We had one session of summer school at the end of June and another session at the beginning of August. We used a 1 minute reading test to determine the effectiveness of our program for those students that were struggling in literacy.
MACKAY JOINT	Mackay School District operated a summer school for students in grades 1-8. We utilized Learning Loss K-4 funds for literacy intervention for 8 students and Learning Loss K-12 funds for math intervention for 15 students. Some students were served for both literacy and math. Students were recommended for summer school based on ISAT scores, IRI scores, and teacher recommendations. In addition to Learning Loss funds, Title 1 and Special Education funds were also utilized for additional students. Students served by Learning Loss funds were in grades 4-8. Participating students will complete an ISAT comprehensive interim assessment between December 1 and 10, 2021.
BRUNEAU-GRAND VIEW JOINT	We didn't offer any summer programs in 2021

WILDER	Wilder Elementary has partnered over the summer with the local library to have reading groups each week throughout the summer. Many fun ideas and experiences were had helping to have more students in the library with parents. The program went well, however we had to keep recruiting as there were only a few students who attended. We did have families attend so preschool age kids also benefited. We are looking forward to implement "Read Right" that was in the planning stages as it has taken time to find training for this program. This will provide extra opportunities as well for students who have struggled in the past.
BLAINE COUNTY	Blaine County School District was able to serve over 400 students this summer through a variety of programs. The programs were split into target categories that provided instruction to target early literacy, provide intervention services for ela/math in elementary grades, provide intervention and academic support in middle school, and credit recovery/advancement in high school. High school students recovered over 54 credits as a result of these efforts. Middle School students received intervention instruction in Math and ELA that will benefit their academic progress, and elementary students received targeted intervention/support in literacy and math.
BEAR LAKE COUNTY	We utilized these funds to pay staff to keep our school libraries open specific hours during the summer. We had a great turnout overall for students to come in, check out books, and then read during summer when many students do not spend a lot of time reading.
LAPWAI	K-4 summer reading program, transportation, and salaries/benefits for: Learning Loss Recovery and Leap Ahead Services K-4: Of the 100 students who participated in the summer reading/early literacy program, 65% received content remediation for ELA/Literacy K-12 Credit Recovery Program: Learning Loss Recovery and Leap Ahead Services, Math Interventionist and Intervention Materials Locally selected metrics for all grade level include STAR Reading and Math
PATHWAYS IN EDUCATION - NAMPA, LLC	The plan we have developed for these funds did not include additional summer support above and beyond what is already in place for summer. These funds will be used during the fall semester.
WENDELL	Funds were used to assist with Migrant Pre K-12 and ELL Pre K-12 summer school. Additionally, we had a jump start program at our middle school in August and credit recovery at the high school. Gov Learning Loss monies will benefit all students in the district with purchases of curriculum, remediation program, technology, PD, etc.
FRUITLAND	Learning loss funds were used at the secondary level to address credit recovery in the areas of math and language arts. Some of the students were at risk of not moving to the 9th grade, while upper classmen were doing credit recovery to get back on track for graduation. The elementary had school for the month of June, focusing on literacy. The students were selected based upon Istation scores. 180 of our 500 elementary students attended in the month of June.
TREASURE VALLEY CLASSICAL ACADEMY, INC.	TVCA offered an 8 day reading program for students entering 1st and 2nd grade who scored a 2 or 3 on the IRI. Students reviewed phonogram sounds, decoding, letter formation, rhyming, and read daily from primary phonics readers. The goal was to review and

	help these students retain what they had learned the previous year in school so to be better prepared to enter their new grade level.
MOSAICS PUBLIC SCHOOL, INC.	We provided two 3 hour summer school sessions focused on literacy and math for 3 weeks for students who were behind their grade level peers. We invited 110 students to participate, and the families of 79 students accepted the invitation. During our summer program, we focused on remediation of literacy skills using a combination of HeadSprout, Fundations direct instruction, and targeted math skills aligned to our math skills. We used the CORE Phonics Survey to assess students' skills entering and to help target the Fundations groups. We paid for 4 teachers salaries, 1 administrator, and paid for transportation for students to and from the school. We also purcahed Headsprout and RazKids so students would have access to the intervention materials online as well as books at their level. Even though we requested parents commit to sending their child every day for all 3 weeks (15 days), we saw many students miss multiple days due to trips or other family commitments. The parents were able to continue access to Headsprout throughout the summer with the hopes students would be able to complete the 40 hour intervention. The school offered to provide a Chromebook and Wifi hotspot for parents who needed it so they could access the program. No parents checked out a device and most students did not complete the Headsprout intervention.
UPPER CARMEN PUBLIC CHARTER SCHOOL	Students who had either been home schooled due to Covid, or were at risk of being below their grade level participated in an all subjects summer program. At summers end all students are working at the entry level expected for the start of school. Funds were used to pay the instructor, her mentor and to also provide mileage to the teacher and to two families living in excess of 30 miles one way from the school.
FERN-WATERS PUBLIC CHARTER SCHOOL, INC.	Students participated in a 6-week program, two times per week for 2.5 hours. Students performed math tasks and worked from a math workbook in the first hour. The second hour was a book club, focused on reading and comprehension. The last half was devoted to socio-emotional learning. Students who participated will complete the interim ISAT their first week of school. Fernwaters will also use MAPS testing to measure student growth.
KUNA JOINT	For our k-4 summer learning loss funds were used to catch up all students who had learning gaps in reading and math. All teachers gave the core phonics survey to all students. There was focus on incorporating STEM activities in math and reading. Teachers were focused essential standards at each grade level For k-12 funds for our secondary we used this money to help add extra supports for our 9-12 students before the start of school on August 26th.We had two intervention specialists work with 9-12 students for two weeks. They called parents and students who were in danger of not graduating and offered additional supports once school started. They called over 200 families and they were able to get 175 of the students back to school. Other alternatives were offered to all students also.
MIDVALE	The Midvale School District had a summer school session for the first time in my remembrance. Funds were used to purchase curriculum, training, materials, salaries/pay for two certified teachers and one paraprofessional.
VALLEY	Our learning loss funds were used to hire teachers to run a secondary credit recovery program in the content areas of English and Social Studies, and an intervention/retention program at the ELE level. Secondary students had to demonstrate mastery through end-of-unit assessments. The ELE program was designed to recover missing or failed assignments, with support from (2) ELE certified teachers. Both programs lasted 6 weeks.

KIMBERLY	Kimberly School District #414 did not use any "learning loss" funds over the summer .
COEUR D'ALENE CHARTER ACADEMY	We provided a three-week math instruction opportunity for incoming middle school students and middle school students who struggled in our math classes the previous year. This was not required, but attendance was fairly consistent. Instructors did do informal assessments throughout, but primarily to guide their instruction. We plan to provide a math center during the school year for students who would like help, as well as those referred by teachers.
FALCON RIDGE PUBLIC CHARTER SCHOOL	Falcon Ridge provided a Summer Reading program for 46 students that were able to attend. We did not provide transportation. The "Reading Coaches" reviewed the IRI's and ISAT scores of the students participating and used that as a basis to help each individual student. They all received one on one instruction. No local assessment was taken at the end of the program.
HIGHLAND JOINT	Highland JSD 305 did not use any learning loss funds over the summer of 2021.
IDAHO VIRTUAL ACADEMY	Students participating in the summer learning loss program were enrolled in Mindplay to improve reading from June 21st to August 6th. Mindplay is a personalized reading plan that meets individual student needs. Mindplay focuses on phonics, grammar, silent reading rate, comprehension, and fluency in this order. Students were asked to complete a minimum of 20 hours during the summer. Students were supported by a teacher who helped students to complete a screener, track progress, set goals, provide instruction and assistance, and motivate students. We are planning to compare Spring IRI to Fall IRI for the students involved in our summer program.
KAMIAH JOINT	No use over the summer.
WHITEPINE JOINT	Our secondary students recovered credit. We employed several staff members to regain credits in math, history, english and science. Our elementary students had summer school working on general math and english remediation. The program for both elementary and secondary lasted for 4 weeks.
COSSA	Purchased Odysseyware software to be used for online credit recovery by students who fail regular classes during the school year. No students enrolled in Odysseyware during the June 2021 summer school.
TAYLOR'S CROSSING PUBLIC CHARTER SCHOOL	We did not use the $ for summer school this year as we focused our efforts to provide learning loss supports throughout the school year in 21-22 and potentially the summer of 2022. We did not access any money for this past summer.
LEWISTON INDEPENDENT	The District did not use learning loss grant funding during the summer of 2021. We will use these funds between now and December 30, 2021.
GENESEE JOINT	We are using IRI scores for all students to assess the impact of our summer program. To be bluntfully honest, our kids are so burnt out on the IRI which was part of our summer program, that they didn't do their best nor have any interest in doing iStaiton over the summer. I reviewed student scores and the scores did not show growth after a 6 week program due to students not attempting to show what they know. Our test scores at the end of the program did not show the growth we had hoped for. Hopefully my Sept. data will show an improvement since students will be monitored in a more structured environment.
ELEVATE ACADEMY, INC.	Learning loss money was spent on staff. $21,972.77. An average of 25-30 high school students arrived Monday-Thursday to work on Credit Recovery, and they recovered close to 75 credits altogether. An average of 20-30 middle school students arrived Monday-Thursday to work on Math and ELA intervention from 9-12 each day, and while we didn't test, we focused on reading, writing, and math skills in fun and engaging manners to continue learning into the next school year.

HORSESHOE BEND	We implemented two summer reading programs. One was 2 days/week and was open to all students. The other was 4 days/week was by invitation for students who were lower than 50th % on Spring 2021 NWEA MAP tests and/or May 2021 Istation tests. We will use Fall 2021 MAP and Istation test results to measure effectiveness. Fall testing is not yet complete at this time.
PRESTON JOINT	We utilized learning loss funds for literacy and math content and salaries and benefits of staff for summer intervention programs.
MOUNTAIN HOME	We provided secondary credit recovery summer school that served 107 students who ended up earning a total of 190 credits. At the elementary level, we set up multiple different sessions for students to choose from. Some were week long literacy/math camps and others were spread out over the month of June and took place 2 days a week. Each school focused on what they felt their greatest need was.
NORTH GEM	We provided a summer reading and math program for our K-5 grade students. We had 25 out of 51 students participate in the program and we evaluated their progress using our Monthly I-Station. The math portion will be evaluated using our iReady Assessment that is given in October.
WEST SIDE JOINT	We utilized learning loss funds to pay salaries and benefits of certified and classified staff providing reading intervention to students.
TETON COUNTY	We offered a 5 week summer tutoring program to students in grades K-8 that focused on reading, writing, and math skills. The program ran in 4 locations, Victor Elementary (K-3), Driggs Elementary (K-3), Rendezvous Upper Elementary (4-5), and Teton Middle School (6-8). A total of 8 teachers, 1 cook, and 2 admin oversaw the program. Students increased their foundational reading skills in phonemic awareness (K-1), phonics (K-5), and comprehension (K-8) as evidenced by informal assessments by the teachers. We used a researched based curriculum to support students including the Wilson Fundations curriculum (K-3), and Reading Horizons Elevate (4-8).

SUBJECT

Update on New Idaho Content Standards in Mathematics, English Language Arts and Science

REFERENCE

April 2009	Board approved updated Content Standards in Science
April 2010	Board approved adoption of updated Mathematics and English Language Arts content standards and proposed rule incorporating them by reference
August 2015	Board approved updated Science content standards (rejected by legislature)
August 2016	Board approved updated English Language Arts and Mathematics content standards
December 2016	Board approved updated Science content standards (partially rejected by legislature)
October 2020	Board received an update on the ELA, Math, and Science content standards rewrite process.
January 2021	Board received an update on the first draft of the ELA, Math and Science content standards revisions.

APPLICABLE STATUTE, RULE, OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section IV.B.9
Section 33-1612, Idaho Code
Idaho Administrative code, IDAPA 08.02.03 – Section 4, Rules Governing Thoroughness, Idaho Content Standards

BACKGROUND/DISCUSSION

The Idaho Content Standards reflect statements of what students should know and do in various content disciplines and grades. Content standards are adopted statewide and reviewed every six (6) years by teams of educators and stakeholders for possible revision. These standards provide a consistent foundational level of academic expectation at each grade level in a number of content areas across Idaho's public schools.

Both Mathematics and English Language Arts were due for review by the department this year and approval by the Legislature in the 2022 legislative session for curricular review in 2022-2023.

The Idaho Legislature rejected the Idaho Content Standards for Science in Spring 2016, citing the need for additional public input. The State Department of Education (Department) facilitated rulemaking for the Board, in April 2016, which included solicitation of public comment online and through statewide, face-to-face meetings and meetings of the science standards working committee. The resulting science standards included substantial revisions of structure and organization and revisions to accommodate and address concerns of stakeholders and legislators.

The revised science standards were presented to the 2017 Legislature, and the standards were approved with the exception of five (5) paragraphs dealing with human impacts on the environment. The Department was asked to gather additional public comment and consider revisions to the five (5) paragraphs that address both positive and negative impacts.

After additional rulemaking, public comment and public hearings in 2017, the State Board of Education approved revisions August 10, 2017. The Idaho Content Standards for Science were accepted by the Legislature in the 2018 legislative session as an incorporated by reference document in IDAPA 08.02.03, although they were rejected by the House Education Committee and approved only by the Senate Education Committee.

The updated Idaho Content Standards for English Language Arts, Mathematics, and Science represent the work of dozens of stakeholders and educators who have worked since June of 2020 to address the continued concerns regarding these standards.

IMPACT

These changes to the Idaho Content Standards for English Language Arts, Mathematics, and Science may have a fiscal impact at the state and local levels for professional development. A study to ascertain alignment with the current assessment and curricular review and implementation is needed.

ATTACHMENTS

Attachment 1 – March 9, 2020 House and Senate Education Committee Letter
Attachment 2 – Joint Education Committee Letter
Attachment 3 – SBOE President and SDE Response Letter
Attachment 4 – Revised English Language Arts Content Standards Markup
Attachment 5 – Revised English Language Arts and Literacy Content Standards Clean Version
Attachment 6 – Revised Idaho Mathematics Content Standards Markup
Attachment 7 – Revised Idaho Mathematics Content Standards Clean Version
Attachment 8 – Revised Idaho Science Content Standards Markup
Attachment 9 – Revised Idaho Science Content Standards Clean Version

BOARD STAFF COMMENTS AND RECOMMENDATIONS

Pursuant to Board Policy IV.B.9.a. the Idaho content standards must be reviewed, at a minimum on a six (6) year cycle and the process for reviewing and updating the content standards will include at a minimum:

i. A review committee consisting of Idaho educators with experience in the applicable content area. The committee shall be made up of elementary and secondary instructional staff and at least one postsecondary faculty member from a four-year institution and at least one from a two-year institution, at least one public school administrator, and at least one parent of school-aged children or representative of an organization representing parents with school aged children. Instructional staff and postsecondary faculty members must have experience providing instruction in the applicable content area. Additional members may be included at the discretion of the Department. To the extent possible, representatives shall be chosen from a combination of large and small schools or districts and provide for regional representation.

ii. The review committee will make an initial determination regarding the need to update the standards.

iii. Based on the review, the committee shall meet to develop initial recommendations for the creation of new content standards or amendments to the existing content standards. The Department will provide multiple opportunities for public input on the draft recommendations including but not limited to the Department website and processes that allow for individuals in each region of the state to participate.

iv. Drafts of the recommended amendments will be made available to the public for comment for a period of not less than 20 days. At the close of the comment period, the committee will finalize recommendations for Board consideration.

While Board policy sets out a process for reviewing and updating content standards, it does not require standards be amended during each review cycle.

In addition to these requirements set in Board policy, because the content standards are incorporated by reference into Administrative Code, they must also go through the negotiated rulemaking process before they can be amended and go into effect. This process allows the public to provide input prior to the Board approving the content standards incorporating them by reference into IDAPA 08.02.03. Amendments to the content standards take effect when the administrative rule incorporating them by reference takes effect. As an example, content standards incorporated into a pending rule taking effecting at the end of a legislative session would be in effect for the following school year. This would mean the new content standards would be the minimum standards taught in the school the following year and in the case of ELA, mathematics, and science would need to be assessed on the statewide assessment and used for accountability purposes. The negotiated rulemaking process starts with a notice of intent and the opportunity for the public to participate in negotiations prior to the incorporation into a proposed rule and final consideration as a pending rule.

The Elementary Secondary Education Act as amended by the Every Student Succeeds Act in 2015 requires states to have high academic standards and statewide assessments that measure students' progress toward those academic standards. At a minimum, states are required to have a statewide assessment aligned to the applicable content standards in grades 3 through 8 and once in high school for English language arts and mathematics and an assessment aligned to our science content standards given once in each grade band (elementary, middle school, high school). Significant amendments to the content standards for these three subjects additionally will require review of the alignment between the statewide assessments and the content standards. New or amended assessments would be required if it is determined the content standards are no longer aligned with the statewide assessments. Implementation of any new content standards should be considered in conjunction with discussions around cost of new assessment development and professional development for instructional staff, as well as the impact on the state accountability system and timing for roll out that aligns professional development, student instruction, assessment, and accountability requirements.

Chapter 52, Title 67, Administrative Procedures Act, sets out the requirements for negotiated rulemaking. Pursuant to Section 67-5221, Idaho Code, notices of proposed rules must include any fiscal impact greater than $10,000. As part of the process to request approval to enter into negotiated rulemaking, all agencies are required to submit requests to the state Administrative Rules Coordinator, in the Division of Financial Management. Without the fiscal impact required by the Administrative Procedures Act, a request to promulgate proposed rules cannot move forward. Unlike other content areas, the ELA, mathematics, and science content standards' tie to the statewide assessments. As such, proposed amendments to those standards must be evaluated against alignment with the existing applicable statewide assessments to determine if amendments will trigger the requirement for new assessments to be developed. The development of new assessments can have a significant fiscal impact. Additionally, changes to the assessments are likely to also require a delayed implementation to the standards as the new assessment is developed and professional development is implemented at the school level.

BOARD ACTION

This item is for informational purposes only.

Idaho Content Standards

Supporting Schools and Students to Achieve

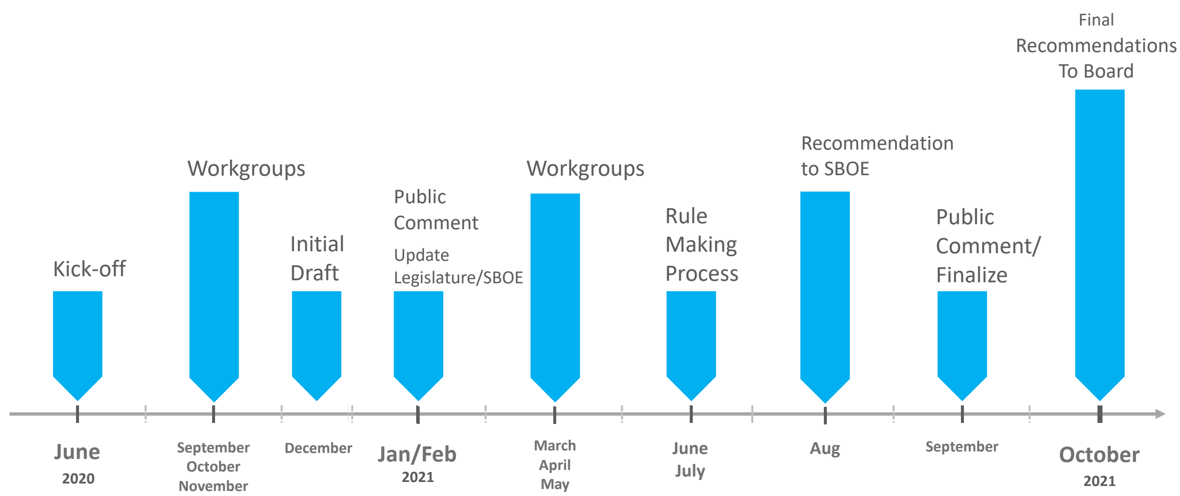
SHERRI YBARRA, ED.S., SUPERINTENDENT OF PUBLIC INSTRUCTION

ELA | Math | Science

Proposed Content Standards Revisions

Negotiated Rule Making | 2

Content Standards Review Timeline



Committee Processes

- Nomination process
- Broad diverse stakeholder representation
- Norms were agreed upon
- Processes were agreed upon
  - Why - high quality standards, not Common Core
  - What - focus of changes grounded in legislative requests
  - How – virtual, all consensus reached in public

Mathematics

Education Committees' Letter: Math Focus

- Explicitly state grade levels at which students should demonstrate mastery of addition, subtraction, multiplication, and division facts. Integrate these basics with critical thinking and real-life problem solving throughout the standards to ensure more connections to science, business, and other related disciplines.

- Reduce the number of standards, use less complex verbiage, and prioritize the more important concepts without marginalizing the accuracy of the standards.

- Ensure the standards are age and grade level-appropriate especially in the early grades, emphasizing the concrete nature of young minds.

- Make certain that standards requiring problem solving are age appropriate and do not exceed the knowledge standards accepted for each grade level.

Math Standards Document Walk Through

REQUEST	SOLUTION
Mastery of Basic Facts	• Mastery Standards identified for each grade level K-6 on Grade Level Overview page
Real-life problem solving	• Examples in blue boxes throughout document • Emphasis on application of concepts • Added Idaho based scenarios
Number of standards	• Fewer standards was not accomplished – this interest conflicted with adding clarity. • Added more subpoints for standards with complex verbiage and syntax • Numbering maintained as much as possible to align to curriculum resources used nationally • Teachers on groups did not feel there were too many standards.

Math Standards Document Walk Through (cont.)

REQUEST	SOLUTION
Complex verbiage	• Vocabulary and sentence structure changed throughout document to be more understandable for all stakeholders. • Much discussion about mathematical vocabulary used when considered essential to the concept. • Examples and clarifications pulled out of standards and put into blue text boxes.
Prioritized concepts	• Mastery standards identified for each grade level • K-8 Coding at Cluster Level – Major Work(☐). Supporting Work(△) , Additional Work (○) • 9-12 Coding - (+) Advanced Standards ★ Modeling Standard • Coding is explained in all grade level or conceptual category introductions.

Math Standards Document Walk Through (cont.)

REQUEST	SOLUTION
Age and grade-level appropriateness	• Standards for Mathematical Practice rewritten for each grade level with age and content of grade in mind. • Learning progressions from multiple sources consulted • Studied standards from other states. • Much discussion in small grade level teams and with whole team. • How a concept flows through the grades was carefully considered

Science

Education Committees' Letter: Science Focus

- Please remove the supporting content (curriculum) from the incorporated by reference document immediately. Local school districts are responsible for curriculum. COMPLETED BY SBOE
- Provide balance in standards that have been politicized. (e.g. include both positive and negative aspects of energy sources).
- Focus on age appropriateness for science, ensuring that these basic concepts are understood before delving deeply into theoretical science. Additionally, please ensure that standards requiring problem solving are age appropriate and do not exceed the knowledge standards accepted for each grade level.
- April 27, 2021 joint letter requested that all supporting content be returned to the document.

Science Standards Document Walk Through

REQUEST	SOLUTION
Supporting content	All supporting content was returned to the standards so that each standard has both a performance expectation and one or more content expectations.
Balance on politicized content	Standards were rewritten to avoid politicized content or to focus on positive aspects rather than negative aspects
Age appropriateness	Standards were moved to ensure age appropriateness, assessment limits and additional information were added, teachers from all grade bands reviewed the standards to ensure that material is appropriately placed.

English Language Arts/Literacy

Education Committees’ Letter: ELA/Literacy Initial Focus

- Ensure that explicit, systematic, and sequential approaches to teaching phonemic awareness, phonics, vocabulary, fluency, and text comprehension are included.
- Prioritize the basics of reading and writing, with less emphasis on analysis, style, and complex writing forms in lower grades.
- Balance fiction and non-fiction reading materials, emphasizing value-rich, historically important, and uplifting literature.
- Reduce the number of standards, lessen complex verbiage, and prioritize the more important concepts.

Education Committees' Letter: ELA/Literacy Additional Focus

- Comprehensive review of the College and Career Readiness Anchor standards.
- Review classifications of literature and informational text and better give a better balance of genres.
- Reevaluate the categories of reading, writing, speaking, listening. Combine some standards in reading, listening, writing, speaking.
- Remove or move the standards for Literacy in History/Social Studies, Science, and Technical Subjects.
- Compare state Comprehensive Literacy Plan with Reading Foundational Skills K-5.
- Ensure adequacy and progression of cursive writing.
- Review of standards for conventions to ensure adequacy.
- Remove or significantly revise suggested reading that illustrates Complexity, Quality, and Range of Student Reading K-5.
- Remove all other reading lists from standards and their appendices.

Proposed ELA Standards

Request	Solution
Ensure that explicit, systematic, and sequential approaches to teaching phonemic awareness, phonics, vocabulary, fluency, and text comprehension	• Aligned foundational reading standards to the state Comprehensive Literacy Plan • Changed phonological awareness to phonemic awareness to align with current research

Prioritize the basics of reading and writing, with less emphasis on analysis, style, and complex writing forms in lower grades.	• Continued the progression of phonemic awareness standards previously ending in grade 1 into grade 2
	• Reduced K-2 writing standards
	  • Kindergarten from 10 to 1
	  • First grade from 10 to 1
	  • Second grade from 10 to 5

Balance fiction and non-fiction reading materials	• Reading lists were removed from standards and all appendices at the direction of the 2021 legislative letter
Reduce the number of standards, lessen complex verbiage, and prioritize the more important concepts	• Reduced total number of standards • Verbiage changes to most all standards • Reorganization of strands (foundational skills to reading comprehension to vocabulary development)

Proposed ELA Standards

Request	Solution
Review classifications of literature and informational text and better give a better balance of genres	• Sub strands were re-named literature and non-fiction
Comprehensive review of the College and Career Readiness Anchor (CCRA) standards	• CCRA were removed
Reevaluate the categories of reading, writing, speaking, listening. Combine some standards in reading, listening, writing, speaking	• New strands and sub strands were developed • See page(s)4-5 of proposed ELA standards
Remove or move the standards for Literacy in History/Social Studies, Science, and Technical Subjects	• Standards for literacy in content areas were removed.
Ensure adequacy and progression of cursive writing	• Cursive standard was carried through grade 6
Review of Standards for Conventions to ensure adequacy	• Grammar and Conventions strand was added • Subs strands K-12 for grammar & usage and mechanics to ensure adequacy

Negotiated Rule Making

Questions

Todd Driver | Director Content & Curriculum

Cathy Beals | Mathematics Coordinator

Sharon Cates | Science Coordinator

Alayna Knop | ELA/Literacy Coordinator

tdriver@sde.Idaho.gov · cbeals@sde.Idaho.gov · scates@sde.Idaho.gov · aknop@sde.Idaho.gov

Idaho State Department of Education
650 W State Street, Boise, ID 83702
208.332.6800
https://www.sde.idaho.gov/

Supporting Schools and Students to Achieve

SHERRI YBARRA, ED.S., SUPERINTENDENT OF PUBLIC INSTRUCTION

Negotiated Rule Making | 18

Idaho House of Representatives

House Education Committee

Idaho Senate

Senate Education Committee

March 9, 2020

Dear Governor Little, State Board of Education and State Superintendent Sherri Ybarra,

We, the undersigned, believe it is time to replace the Idaho Content Standards sometimes referred to as "Common Core Standards". The Idaho House Education Committee voted on February 6, 2020 to reject the English Language Arts, Math, and Science Standards. We want standards which work for students, parents, and educators. We seek compromise and agreement in creating new content standards.

The purpose of this letter is to give direction to the State Board of Education and the State Department regarding what the House and Senate Education committees would like to see happen going forward. These recommendations are based on input from hundreds of parents and educators across the state since Common Core was implemented.

Our concern is that any new standards developed by the State Board of Education and the State Department of Education may not be accepted by parents, educators, administrators, the public, and therefore the legislature. Stating with clarity what the House and Senate Education committees would deem appropriate will avoid wasted time, effort, and manpower of the State Board of Education and the State Department of Education during any standards rewriting process.

Following are specific recommendations of the Education Committees. We would appreciate a written response to address each of these issues.

Content Standards

A. Math
   a. Explicitly state grade levels at which students should demonstrate mastery of addition, subtraction, multiplication, and division facts. Integrate these basics with critical thinking and real-life problem solving throughout the standards to ensure more connections to science, business, and other related disciplines.
   b. Reduce the number of standards, use less complex verbiage, and prioritize the more important concepts without marginalizing the accuracy of the standards.
   c. Ensure the standards are age and grade level-appropriate especially in the early grades, emphasizing the concrete nature of young minds.
   d. Make certain that standards requiring problem solving are age appropriate and do not exceed the knowledge standards accepted for each grade level.

B. English Language Arts
   a. Idaho Standards should have explicit, systematic and sequential approaches to teaching phonemic awareness, phonics, vocabulary, fluency, and text comprehension.
   b. Provide better balance between fiction and non-fiction reading materials, emphasizing value-rich, historically important, and uplifting literature (particularly American and English literature).
   c. Reduce the number of standards, use less complex verbiage, and prioritize the more important concepts.

d. Renew Idaho's focus on content-rich English Language Arts standards by prioritizing the basics of reading and writing, with less emphasis on analysis, style, and complex writing forms in the lower grades.

C. Science
   a. Please remove the supporting content (curriculum) from the incorporated by reference document immediately. Local school districts are responsible for curriculum.
   b. Provide balance in standards that have been politicized. (E.g. Include both positive and negative aspects of energy sources.)
   c. Focus on age appropriateness for science, ensuring that these basic concepts are understood before delving deeply into theoretical science. Additionally, please ensure that standards requiring problem solving are age appropriate and do not exceed the knowledge standards accepted for each grade level.

D. ESSA Assessment
   a. Use some items (questions) on the assessments that have been written or approved by experts in Idaho, and that all items to be used on the new Idaho assessment reviewed by a complement of experts and others in Idaho.
   b. Ensure that this test is not based on Common Core. Please explore assessment options including removing Idaho from the SBAC consortium and cancelling the SBAC contract.

Process

We believe the process of rewriting the content standards should take place beginning immediately and be completed as soon as possible while creating excellent standards. We expect schools will use current standards during the rewrite process.

In reviewing/rewriting the standards, we would like to see the Board and the Department look at nationally recognized quality standards from a variety of sources, including states such as Florida, Massachusetts, Texas and Nebraska, and compare and contrast these standards with Idaho's. From this work, develop what Idaho teachers, parents, and administrators believe to be the best set of standards considering age appropriateness, readability, quality of content, and sequential nature.

Please provide estimated costs such as requirements for a new test, and fulfilling federal accountability requirements. However, the first priority should be the needs of the students, secondly parents and teachers, and third, accountability to the federal government.

When selecting the committees to rewrite the content standards please include people who understand current issues with Common Core, retired teachers who have used previous standards, parents from across the state who have expressed interest, administrators with a variety of perspectives, as well as experts from other states. Bring together experts from across all grade levels to evaluate sequencing of concepts and grade level appropriateness.

Please embed traditional American civics throughout K-12 standards.

We would like you to develop a clear progression of content from one grade to the next that is aligned from early learning to post-secondary education to continue increasing student knowledge and skills over time.

While rewriting the standards, keep in mind the professional development needed to implement them.

Please address financial literacy in all grades at appropriate places in the standards.

Curriculum, Instruction, Student Assignments

While it is not in the Legislature's purview to be involved in curriculum, instruction, and/or student assignments, we do request that the State Department of Education utilize the appropriated resources to provide enough support to schools and teachers so the standards can be implemented in a suitable fashion. Engaging instruction, meaningful assignments, and interaction with parents are each critically important, and hopefully will be accomplished in every classroom across Idaho. Please work with school boards and district administrators to ensure they understand their roles in choosing curriculum, using the best instructional techniques, and giving students meaningful assignments.

Other Issues

During the House Education committee's administrative rules review of the omnibus docket several additional issues were discussed at length. The House Education committee would like to identify four issues that garnered commentary. While the House Education committee believes these issues are on the State Board and Department of Education's radar, there is value to confirm our interest in seeing them addressed.

1. Review the standards for initial certification in order to reduce paperwork and other requirements which cause unnecessary expense, time, and work for the colleges but don't truly improve the quality of graduating teachers. Work with the teacher preparation programs to provide them more flexibility through the streamlining of this process.
2. Remove the senior math requirement while still requiring six math credits for graduation.
3. Consider not requiring veteran teachers to be evaluated on all evaluation standards every year.
4. Evaluate social studies and other endorsement requirements considering the difficulty small and rural schools have in hiring endorsed teachers in some subjects. Please consider a consistent degree of difficulty for the various disciplines.

House Members		Senate Members
Lance Clow, Chairman	Ryan Kerby, Vice Chairman	Dean Mortimer, Chairman
Rep. Paul Shepherd	Rep. Judy Boyle	Steven Thayn, Vice Chairman
Rep. Ron Mendive	Rep. Gayann DeMordaunt	
Rep. Dorothy Moon	Rep. Barbara Ehardt	
Rep. Bill Goesling	Rep. Gary Marshall	
Rep. Jerald Raymond	Rep. Tony Wisniewski	

3

66th Idaho Legislature
House and Senate Education Committees

Dear Governor Brad Little, State Board of Education and State Superintendent Sherri Ybarra,

We have actively reviewed the progress made to replace the Idaho Content Standards, sometimes referred to as "Common Core Standards". The Idaho Constitution Article IX, Section 1 establishes, "The stability of a republic form of government depending mainly upon the intelligence of the people, it shall be the duty of the Legislature of Idaho, to establish and maintain a general, uniform and thorough system of public, free common schools." Uniformity and Thoroughness are included in the Idaho Administrative Rules, as documents by reference. The Idaho Joint Education Committees are expecting that any new standards are not simply modified Common Core standards.

The purpose of this letter is to acknowledge the progress made over the past eleven months to meet the recommendations specified in a letter from the Joint Education Committees dated March 9, 2020. In the following paragraphs we will acknowledge the progress to date, make recommendations for further direction and provide suggestions that can lead to a final approval of new Administrative Rules covering Thoroughness of the Idaho English Language Arts, Math and Science Content Standards.

A. **ELA Standards - Committee comments and suggestions for completing these standards**
   a. We are asking that the process for completing the ELA Standards revision be significantly modified. We ask that a smaller committee of practicing or retired teachers who understand the initial directive to replace Common Core (eight to ten teachers) be assembled this summer and given the opportunity to dedicate sufficient time and energy to the process. We ask that the process not rely on volunteers, but that great teachers be sought out and invited to join the process. We suggest that four to eight weeks be dedicated to the process, and that these teachers be paid for their time so they can give their full energy to the task and feel valued for their professionalism and expertise. We would like to offer the opportunity to continue the process into another year if that is deemed necessary and wise to create the best standards possible.
   b. We would like the revision committee to ask all pertinent questions, to probe deeply, to be comfortable with a different approach, and to make major changes. We are not asking the revision committee to "start over," but we encourage review and comparison of our revised standards with the standards from other states, with related material from major publishers, and with materials from other organizations like the Core Knowledge Sequence in order to glean the best of the best standards available.
   c. We believe that Idaho can truly create exceptional standards that are appropriate for Idaho students, parents, and teachers—standards that will endure, provide clarity and vision, provide a better way forward for student proficiency, and encourage good teaching for years to come. We encourage a focus on necessary, underlying knowledge as well as the processes of reading, writing, and "doing" language arts skills.
   d. It is extremely important that the standards can be evaluated effectively. Committee members should not assume that Idaho must continue to use our current testing models or providers.
   e. Appendix A includes other Suggestions and Thoughts.

B. Science Standards – Committee Comments and Suggestions for Completing these Standards

a. In addition to the "Common-Core-Standards" it was the desire to review and rewrite the Science Standards, modeled after the Next Generation Science Standards, to make them more usable for students, parents, and educators. The journey toward this end has brought together many talented individuals that spent a great deal of time, energy, and cooperation.

b. The resulting revision, although an improvement, still falls short of the original intent of a fresh approach to the standards. A broader vision of a system of enduring value to the teachers, parents, and the long-term needs of our students.

c. When the standards were reviewed in detail, it became apparent that some requests of the House and Senate Education Committees were problematic, such as removing the supporting content. We recommend including the supporting content, with assurance that supporting content and standards are depoliticized.

d. A more focused group of compensated individuals should be assembled to finish this task. When selecting the committees to rewrite the content standards we should include people who understand current issues with the Next Generation Science Standards, both current and retired teachers. Experts from across all grade levels should be brought together to evaluate sequencing of concepts and grade level appropriateness.

e. Appendix B includes other Suggestions and Thoughts.

C. Math Standards – Committee Comments and Suggestions for Completing these Standards

a. Legislators on the State Math Standards Committee have a few standards they would still like to see improved. These suggestions have been taken to the State Math Standards Committee for consideration. Once the content of the standards document has been finalized, the SDE should have a small team of qualified K – 12 practicing or retired teachers who understand the initial directive to replace Common Core go through the standards to check for any mathematical errors, and then hire a professional editor to make sure formatting and verbiage is consistent.

b. Appendix C includes other Suggestions and Thoughts.

The House and Senate Education Committees have established a goal that these content standards be available for the State Board of Education to present to the public for negotiated rulemaking to allow rule changes presented for the 2022 Legislative Session with implementation as soon as possible following approval. This letter and Appendixes A, B & C have been reviewed by the Idaho House and Senate Education Committees and approved for delivery to the Governor, State Board and Department of Education.

Respectfully,

Chairman Lance W. Clow
House Education Committee

Chairman Steve Thayn
Senate Education Committee

Vice Chairman Ryan Kerby
House Education Committee

Vice Chairman Carl Crabtree
Senate Education Committee

APPENDIX A – English Language Arts Content Standards

Structure and Organizational Issues:

1. We would like to see a complete, comprehensive review of the College and Career Readiness Anchor Standards. We believe that the Anchor Standards, if used, could be listed once (not repeated at various places throughout the standards). We are also concerned that the structure imposed by the Anchor Standards results in standards that are developmentally inappropriate at the lower grades, too many standards at all grade levels, and unnecessary duplication and repetition. Said another way, there should not necessarily be ten writing standards at the kindergarten level just because there are ten anchor standards in writing.
2. We are concerned about the use of "literature" and "informational texts" as classifications of reading. Perhaps the more traditional classifications of fiction and non-fiction would be better. We also want the standards to better balance the fiction and non-fiction requirements and give better instruction in the various genres of those two majors categories (e.g. historical fiction, science fiction, romance, poetry, drama, biography, historical narrative, instructional and technical texts, journalism, etc.).
3. We would ask that the categories of "Reading and Writing" and "Listening and Speaking" be reevaluated. In the current standards, there is significant duplication of skills when reading and listening are compared, and when writing and speaking are compared. There may be value in combining some standards for reading, listening, writing, and speaking.
4. We would ask that the reading and writing standards for Literacy in History/Social Studies, and Science, and Technical Subjects be taken out of the ELA Standards and moved to the appropriate content standards in social studies and science, or these standards should be removed altogether.

Content Issues:

1. Please compare the State's Comprehensive Literacy Plan (pp. 9-13) with the Reading Standards for Foundational Skills K-5 and make certain that there are no discrepancies that would make things more difficult for teachers. We believe that the foundational skills for reading should appear first in the standards to give them appropriate emphasis.
2. We feel there is still too much emphasis in the K-5 standards on literary analysis of both literature and informational texts. We feel that the consequence may be to suck the joy out of reading throughout all the grades, but especially in the early years of reading. We want students to read for the joy of entertainment and learning.
3. Please make certain that the cursive writing standards for grades 3 and 4 are adequate, clearly defined, follow a logical progression, and require continued practice in grades 5-8. We want this generation of students to be able to read the written record or our history as well as being efficient in their own writing.
4. We would like a comprehensive review of the Standards for Conventions of Standard English (grammar, punctuation, parts of speech, usage, sentence structures, clauses, phrases, tense, voice, etc.) to make certain that they are adequate. We would like the standards to emphasize the importance of continued instruction for these skills in grades 6-12.
5. We would like a full review of the suggested reading that illustrates the "Complexity, Quality, and Range of Student Reading K-5" on pages 33-35 of the original ELA standards; we feel that this list may need to be removed or significantly revised.
6. We would like all other reading lists removed from the standards and their appendices. We would encourage something like the following statement to be included in the introductory material for the standards: In article IX, section 1, the Idaho State Constitution says, "The stability of a

republican form of government depending mainly upon the intelligence of the people, it shall be the duty of the legislature of Idaho, to establish and maintain a general, uniform and thorough system of public, free common schools." The Idaho Legislature believes that Idaho's public-school system should teach its citizens the background knowledge to maintain a free society and a republican form of government. The texts used in the ELA curriculum must include selections from American history and American literature that promote kindness, generosity, civility, individual responsibility, and socially acceptable behavior.

APPENDIX B – Science Content Standards

Summary - ***The following are more specific areas that require additional scrutiny.***

Proper Assessments of Performance Based Standards

1. There is excessive emphasis in the Science Standards on the performance of tasks which thereby detracts from learning science facts and principles. This is demonstrated by the Standards almost exclusively using terms such as:
    - Gather evidence to support or refute
    - Plan and conduct an investigation
    - Use tools and materials to design and build
    - Use observations to describe
    - Construct an argument supported by evidence
    - Communicate solutions that will
    - Use materials to design a solution
    - Analyze data obtained from testing

    Assessment is a fundamental shortcoming of the Performance Standards as currently written. We request that the Science Standards include clear content (knowledge-based) standards. Since the Standards are performance based, the assessment of these skills is next to impossible in an individual written or computer-based testing environment. A one-on-one evaluation from the teacher may approach this required level of evaluation, but this is neither practical, uniform, objective, or affordable.

2. Certain test questions have multiple interdependent steps where an incorrect answer on one step will necessarily result in incorrect answers on subsequent questions. This cascading effect of a single incorrect answer may give a skewed assessment of a student's aptitude.

Age Appropriateness

We believe many of these performance requirements are above grade level for the early years. Although these skills are necessary for students to learn before they complete their education, the "doing" of science vs. content knowledge in the early grades causes concern.

Use of other Science Based Skills

When reviewing the fifth-grade sample test questions, there was no usage of mathematics on any of the questions. The highest use of mathematical skill needed to answer the ninth and twelfth grade sample test questions was at a third-grade level (addition and subtraction of two-digit numbers). This is entirely inadequate.

Because mathematics is the language of science, the Standards revision should maximize the use of the level of mathematics that is appropriate to the grade level of the assessment.

Content Issues

1. One of the original intent of the Joint Education Committees was to eliminate the politicization of the material being taught. Although much progress has been made on this front, the same issue is evident in some of the testing materials. There is still a heavy emphasis on environmental and ecology related topics. The limited information given the students in the questions forces a desired outcome for the answers. (Examples of Sample Test Questions: Grade 5 Question 1: repair of coastal shoreline; G5 Question 4: breaching of a dam on a river; High

School Question 6: reforestation of South Korea; HS Question: improving blue crab harvesting yields).

2. It's not productive to remove these materials from the Performance Standards only to insert them again in the assessments where they have no visibility to legislators and the public.
3. The fundamental premise of how to understand our physical world is not addressed in the Science Performance Standards. Specifically, the four steps of the scientific method are never even mentioned in the Standards. The Joint Education Committees recommend a focus on teaching fundamental scientific principles.

APPENDIX C – Math Content Standards

We have reviewed the initial recommendation and provide the following comments:

1. The Math Committee switched from Idaho Standards to Massachusetts standards. The standards were similar, but Massachusetts had modified the language in many standards to make them more understandable, added more examples, and put the standards in a format that was easier to read. The committee also used language from Florida's Best standards at times, as well as verbiage from Colorado, Nebraska, and a few other states when their approach to a standard was especially strong.
2. The Committee added "mastery standards" for each grade in elementary school. These standards, prominently displayed at the beginning of each grade, make it clear that Idaho expects students to be extremely proficient in addition, subtraction, multiplication and division facts and algorithms at the appropriate grade levels.
3. The Math Committee took great care in addressing the issue of students using multiple methods of solve problems. Teachers help students learn a variety of approaches to solving problems, but the student is then able to choose the method with which they are most comfortable. Standard algorithms, (the way previous generations solved problems), are included in the standards and students are expected to become proficient in using these approaches.
4. The Math Committee did a lot of work to make sure the standards are easily understood by teachers and other interested parties. In some cases, the Committee modified the verbiage in the standard, in other cases they included examples or clarifications. The examples are highlighted in blue, and the clarifications in light red, making the math standards clean and easy to read. In some cases, Committee members wrote the new language, and sometimes they borrowed from the aforementioned states.
5. The standards are age appropriate. They are carefully constructed so building blocks are in place for concepts learned in successive grades.
6. The Committee thoroughly eliminated all aspects of Common Core in these draft standards.

Idaho State Board of Education

IDAHO
STATE DEPARTMENT OF EDUCATION

LEN B JORDAN OFFICE BUILDING
650 W. STATE STREET
BOISE, ID 83720

March 18, 2020

Dear Idaho Senate and House Education Committees,

Thank you for your letter of March 9th. We are committed to working with you to review Idaho's content standards in a manner that reflects Idaho's needs and values through a collaborative process with the Legislature, educators, parents and the public. We share your goal to seek compromise and agreement on the content standards.

Below are responses to the specific requests in your letter. All information and responses provided are contingent on coordination with the legislative interim committee contemplated by SCR 132 (2020) to avoid duplication of effort.

Content Standards
The process to review content standards includes a review committee consisting of Idaho educators with experience in the content area. At a minimum the committee will include both elementary and secondary instructional staff as well as postsecondary faculty from four-year and two-year institutions, public school administrators, and parents of school-aged children. We also ask that you help us in identifying representatives from the Legislature to serve on each content review committee.

A. Math

a. Explicitly state grade levels at which students should demonstrate mastery of addition, subtraction, multiplication, and division facts. Integrate these basics with critical thinking and real-life problem solving throughout the standards to ensure more connections to science, business, and other related disciplines.
b. Reduce the number of standards, use less complex verbiage, and prioritize the more important concepts without marginalizing the accuracy of the standards.
c. Ensure the standards are age and grade level-appropriate especially in the early grades, emphasizing the concrete nature of young minds.
d. Make certain that standards requiring problem solving are age appropriate and do not exceed the knowledge standards accepted for each grade level.

We will ensure that the review committees have specific instruction to include these considerations in their process and that the resulting work reflects these points.

B. English Language Arts

a. Idaho Standards should have explicit, systematic and sequential approaches to teaching phonemic awareness, phonics, vocabulary, fluency, and text comprehension.

b. Provide better balance between fiction and non-fiction reading materials, emphasizing value-rich, historically important, and uplifting literature (particularly American and English literature).
c. Reduce the number of standards, use less complex verbiage, and prioritize the more important concepts.
d. Renew Idaho's focus on content-rich English Language Arts standards by prioritizing the basics of reading and writing, with less emphasis on analysis, style, and complex writing forms in the lower grades.

We will ensure that the review committees have specific instruction to include these considerations in their process and that the resulting work reflects these points.

C. Science

a. Please remove the supporting content (curriculum) from the incorporated by reference document immediately. Local school districts are responsible for curriculum.

The Superintendent favors removing supporting content, and will recommend such to the State Board of Education, which can be accomplished immediately through a waiver.

b. Provide balance in standards that have been politicized. (e.g. include both positive and negative aspects of energy sources).
c. Focus on age appropriateness for science, ensuring that these basic concepts are understood before delving deeply into theoretical science. Additionally, please ensure that standards requiring problem solving are age appropriate and do not exceed the knowledge standards accepted for each grade level.

We will ensure that the review committees have specific instruction to include these considerations in their process and that the resulting work reflects these points.

D. ESSA Assessment

a. Use some items (questions) on the assessments that have been written or approved by experts in Idaho, and that all items to be used on the new Idaho assessment reviewed by a complement of experts and others in Idaho.

This will be assigned to the Bias and Sensitivity Committee for review. This committee is established in Idaho Code §33-134.

b. Ensure that this test is not based on Common Core. Please explore assessment options including removing Idaho from the SBAC consortium and cancelling the SBAC contract.

The State Board will be discussing the state assessment at its April meeting.

Process

We believe the process of rewriting the content standards should take place beginning immediately and be completed as soon as possible while creating excellent standards. We expect schools will use current standards during the rewrite process.

In reviewing/rewriting the standards, we would like to see the Board and the Department look at nationally recognized quality standards from a variety of sources, including states such as Florida, Massachusetts, Texas and Nebraska, and compare and contrast these standards with Idaho's. From this work, develop what Idaho teachers, parents, and administrators believe to be

the best set of standards considering age appropriateness, readability, quality of content, and sequential nature.
We will ensure that the review committees have specific instruction to review, discuss and consider standards adopted by other states.

Please provide estimated costs such as requirements for a new test, and fulfilling federal accountability requirements. However, the first priority should be the needs of the students, secondly parents and teachers, and third, accountability to the federal government.
The State Department of Education has prepared cost estimates for a new assessment and will provide them to the germane committees and the interim committee.

When selecting the committees to rewrite the content standards please include people who understand current issues with Common Core, retired teachers who have used previous standards, parents from across the state who have expressed interest, administrators with a variety of perspectives, as well as experts from other states. Bring together experts from across all grade levels to evaluate sequencing of concepts and grade level appropriateness.
The review committees will be comprised of a diverse set of educators and stakeholders as described previously.

Please embed traditional American civics throughout K-12 standards.
Pursuant to Idaho Code §33-1602, instruction in citizenship is required to be delivered in all elementary and secondary schools. Citizenship instruction shall include lessons on the role of the citizen in the constitutional republic, how laws are made, how officials are elected, and the importance of voting and of participating in government. The civics and government standards are embedded in the social studies standards for each grade level. As part of the content standards review process, a review committee will evaluate the current civics and government standards at each grade level and make recommendations for improvement.

We would like you to develop a clear progression of content from one grade to the next that is aligned from early learning to post-secondary education to continue increasing student knowledge and skills over time.
The review committees will be asked to consider recommendations on developing a matrix showing the progression of content from one grade to the next. This will help to identify gaps that can be addressed in the recommendations for the content standards review.

While rewriting the standards, keep in mind the professional development needed to implement them. Please address financial literacy in all grades at appropriate places in the standards.
Financial literacy is currently included in the state social studies content standards as part of the economics content. A coordination of what currently exists within subject matters for financial literacy can be reviewed and provided to review committees to avoid duplication. Similar to the civics and government standards, the review committee will be asked to look at the standards for each grade level and make recommendations to the grade and crosswalk with the mathematics content standards with the intent of incorporating financial literacy in mathematics courses.

Curriculum, Instruction, Student Assignments

While it is not in the Legislature's purview to be involved in curriculum, instruction, and/or student assignments, we do request that the State Department of Education utilize the appropriated resources to provide enough support to schools and teachers so the standards can be implemented in a suitable fashion. Engaging instruction, meaningful assignments, and interaction with parents are each critically important, and hopefully will be accomplished in every classroom across Idaho. Please work with school boards and district administrators to ensure they understand their roles in choosing curriculum, using the best instructional techniques, and giving students meaningful assignments.
Passage of S1285 (2020) would require training of all school district and charter school board trustees or directors. Should this bill become law, the State Board will work with the Idaho School Boards Association for the development and delivery of training. In addition, there are existing qualified trainers identified to provide training to school district and charter school leadership in the areas of governance.

Other Issues

During the House Education committee's administrative rules review of the omnibus docket several additional issues were discussed at length. The House Education committee would like to identify four issues that garnered commentary. While the House Education committee believes these issues are on the State Board and Department of Education's radar, there is value to confirm our interest in seeing them addressed.

1. Review the standards for initial certification in order to reduce paperwork and other requirements which cause unnecessary expense, time, and work for the colleges but don't truly improve the quality of graduating teachers. Work with the teacher preparation programs to provide them more flexibility through the streamlining of this process.
   The Superintendent has already committed to convening a broad-based review committee of all the teacher preparation standards over the next 18 months (see letter attached).

2. Remove the senior math requirement while still requiring six math credits for graduation.
   The Superintendent will bring this forward to the Board at its April meeting.

3. Consider not requiring veteran teachers to be evaluated on all evaluation standards every year.
   Idaho Code requires all certificated staff to have an annual evaluation. Additionally, instructional staff and pupil service staff who do not have an evaluation would be impacted in their ability to move on the career ladder or to receive the professional endorsement and the new advanced professional endorsement. School districts currently have the ability to focus on different domains as they are relevant to an

individual's professional practice and level of experience. The Office of the State Board of Education will continue to work with school districts and charter schools on how to document their decisions to not rate a specific component, but rather focus on other domains or components based on a staff person's individualized professional learning plan.

4. Evaluate social studies and other endorsement requirements considering the difficulty small and rural schools have in hiring endorsed teachers in some subjects. Please consider a consistent degree of difficulty for the various disciplines.
   The Superintendent has already committed to convening a broad-based committee to review all the teacher preparation standards over the next 18 months.

D. Critchfield

Debbie Critchfield
President
State Board of Education

Sherri A. Ybarra

Sherri Ybarra
Superintendent of Public Instruction
State Department of Education

February 26, 2020

Dear Senate Education Committee,

I appreciate your support for taking a thoughtful, measured approach to reviewing and revising Idaho's teacher certification standards and want to take this opportunity to share my thoughts about how to proceed.

Rather than bring forward only 20 percent of the certification and endorsement standards next year as the Department typically does, I plan to have a broad-based committee review all the teacher preparation standards over the next 18 months. The review committee would include educators, legislators, parents and others interested in reviewing, streamlining, and simplifying certification standards and endorsements.

The committee will be tasked with reviewing the standards with the goal of reducing requirements that cause unnecessary expense, time, and work for our higher education institutions but have no correlation to improving the quality of teaching. The goal would be to provide our teacher preparation programs with more flexibility and opportunity to innovate.

The work would begin this summer with the intent to bring changes to the Board of Education in Nov. of 2021 for review and approval of the Legislature in 2022.

I look forward to working with you and to having members of your committee participate in this important process.

Sincerely,

Sherri A. Ybarra

Sherri A. Ybarra, Ed.S.
Superintendent of Public Instruction

~~IDAHO CONTENT STANDARDS~~

~~English Language Arts/Literacy~~

~~Literacy in History/Social Studies, Science, Technical Subjects, and Handwriting~~

~~www.sde.idaho.gov/academic/ela-literacy~~

~~Table of Contents~~

~~Idaho Content Standards~~

~~Introduction~~

~~About the Idaho Content Standards in English Language Arts/Literacy & Literacy in History/Social Studies, Science, and Technical Subjects~~

~~Idaho Content Standards describe what Idaho students should know and be able to do at each grade level in certain content areas. Content standards are reviewed by teams of Idaho educators on a rotating basis every six years to ascertain whether changes or revisions are indicated to ensure that the most current and effective standards form the foundational basis for instruction, which is the responsibility of each local public school district. Idaho's Content Standards were revised and adapted in 2015 by Idaho Stakeholders from the Common Core State Standards for English Language Arts/Literacy and Literacy in History/Social Studies, Science, and Technical Subjects. In 2015, Idaho's Content Standards in English Language Arts & Literacy were reviewed through a four-month online review process. In December of 2015, Stake Holders from across Idaho came together to review all comments and suggestions submitted.~~

~~The committee then recommended changes to Idaho's English Language Arts (ELA)/Literacy Standards to best meet the needs of Idaho students and educators. Legislation approved these standards during the 2017 Idaho Session.~~

~~How to Write the Idaho Content Standards for English Language Arts/Literacy & Literacy in History/Social Studies, Science, and Technical Subjects~~

~~Full Name of Standard (Grade Level Indicator)~~	~~Standard Abbreviation~~	~~Grade Level~~	~~Standard Number~~	~~Standard Subcategory Letter (if applicable)~~	~~How to Write as College Career Readiness Anchor (CCRA) Standard (no grade level indicated)~~	~~How to Write for Grade Level Standard~~
~~Reading Literature (K-12)~~	~~RL~~	~~6~~	~~3~~	~~n/a~~	~~CCRA.R.3~~	~~RL.6.3~~
~~Reading Informational Text (K-12)~~	~~RI~~	~~9-10~~	~~9~~	~~n/a~~	~~CCRA.R.9~~	~~RI.9-10.9~~
~~Reading Literacy in History/Social Studies (6-12)~~	~~RH~~	~~9-10~~	~~2~~	~~n/a~~	~~CCRA.R.2~~	~~RH.9-10.2~~
~~Reading Literacy in Science and Technical Subjects (6-12)~~	~~RST~~	~~11-12~~	~~9~~	~~n/a~~	~~CCRA.R.9~~	~~RST.11-12.9~~
~~Reading Foundational Skills (K-5)~~	~~RF~~	~~1~~	~~2~~	~~b~~	~~CCRA.R.2~~	~~RF.1.2.b~~
~~Writing (K-12)~~	~~W~~	~~7~~	~~9~~	~~b~~	~~CCRA.W.9~~	~~W.7.9.b~~
~~Writing Literacy in History/Social Studies, Science, and Technical Subjects (6-12)~~	~~WHST~~	~~11-12~~	~~2~~	~~e~~	~~CCRA.W.2~~	~~WHST.11-12.2.e~~
~~Speaking and Listening (K-12)~~	~~SL~~	~~8~~	~~1~~	~~c~~	~~CCRA.SL.1~~	~~SL.8.1.c~~
~~Language (K-12)~~	~~L~~	~~11-12~~	~~4~~	~~d~~	~~CCRA.L.4~~	~~L.11-12.4.d~~
~~Handwriting (K-6)~~	~~HW~~	~~1~~	~~1~~	~~a~~	~~No anchor standard~~	~~HW.1.1.a~~

~~Write Anchor Standards as: College & Career Readiness Anchor Standard. Standard Strand. Standard Number~~

- ~~College & Career Readiness Anchor. Reading (both Reading Literature and Reading Informational Text are just Reading). Standard **1**: **CCRA.R.1**~~
- ~~College & Career Readiness Anchor. Writing. Standard **9**: **CCRA.W.9**~~

~~Write Grade Level Standards as: Standard. Grade Level. Standard Number. Subcategory letter if applicable~~

- ~~Speaking and Listening. **Eighth** grade. Standard **1**. Subcategory letter **c**: **SL.8.1.c**~~
- ~~Writing in History/Social Studies, Science, and Technical Subjects. **Eleventh-Twelfth** grades. Standard **2**. Subcategory letter **e**: **WHST.11-12.2.e**~~
- ~~Reading Literature. **Sixth** grade. Standard **3**: **RL.6.3**~~
- ~~Reading Informational Text. **Ninth-Tenth** grades. Standard **9**: **RI.9-10.9**~~

~~Key Design Considerations~~

~~CCR and grade-specific standards~~

~~The CCR standards anchor the document and define general, cross-disciplinary literacy expectations that must be met for students to be prepared to enter college and workforce training programs ready to succeed. The K-12 grade-specific standards define end-of-year expectations and a cumulative progression designed to enable students to meet college and career readiness expectations no later than the end of high school. The CCR and high school (grades 9-12) standards work in tandem to define the college and career readiness line—the former providing broad standards, the latter providing additional specificity. Hence, both should be considered when developing college and career readiness assessments.~~

~~Students advancing through the grades are expected to meet each year's grade- specific standards, retain or further develop skills and understandings mastered in preceding grades, and work steadily toward meeting the more general expectations described by the CCR standards.~~

~~Grade levels for K-8; grade bands for 9-10 and 11-12~~

~~The Standards use individual grade levels in kindergarten through grade 8 to provide useful specificity; the Standards use two-year bands in grades 9-12 to allow schools, districts, and states flexibility in high school course design.~~

~~A focus on results rather than means~~

~~By emphasizing required achievements, the Standards leave room for teachers, curriculum developers, and states to determine how those goals should be reached and what additional topics should be addressed. Thus, the Standards do not mandate such things as a particular writing process or the full range of metacognitive strategies that students may need to monitor and direct their thinking and learning. Teachers are thus free to provide students with whatever tools and knowledge their professional judgment and experience identify as most helpful for meeting the goals set out in the Standards.~~

~~An integrated model of literacy~~

~~Although the Standards are divided into Reading, Writing, Speaking and Listening, and Language strands for conceptual clarity, the processes of communication are closely connected, as reflected throughout this document. For example, Writing standard 9 requires that students be able to write about what they read. Likewise, Speaking and Listening standard 4 sets the expectation that students will share findings from their research.~~

~~Research and media skills blended into the Standards as a whole~~

~~To be ready for college, workforce training, and life in a technological society, students need the ability to gather, comprehend, evaluate, synthesize, and report on information and ideas, to conduct original research in order to answer questions or solve problems, and to analyze and create a high volume and extensive range of print and nonprint texts in media forms old and new. The need to conduct research and to produce and consume media is embedded into every aspect of today's curriculum. In like fashion, research and media skills and understandings are embedded throughout the Standards rather than treated in a separate section.~~

~~Shared responsibility for students' literacy development~~

~~The Standards insist that instruction in reading, writing, speaking, listening, and language be a shared responsibility within the school. The K-5 standards include expectations for reading, writing, speaking, listening, and language applicable to a range of subjects, including but not limited to ELA. The grades 6-12 standards are divided into two sections, one for ELA and the other for history/social studies, science, and technical subjects. This division reflects the unique, time-honored place of ELA teachers in developing students' literacy skills while at the same time recognizing that teachers in other areas must have a role in this development as well.~~

~~The Standards are not alone in calling for a special emphasis on informational text. The 2015 reading framework of the National Assessment of Educational Progress (NAEP) requires a high and increasing proportion of informational text on its assessment as students advance through the grades.~~

~~**Distribution of Literary and Informational Passages by Grade in the 2015 NAEP Reading Framework**~~

~~Grade~~	~~Literary~~	~~Informational~~
~~4~~	~~50%~~	~~50%~~
~~8~~	~~45%~~	~~55%~~
~~12~~	~~30%~~	~~70%~~

~~Source: National Assessment Governing Board. (2008). Reading framework for the 2015 National Assessment of Educational Progress. Washington, DC: U.S. Government Printing Office.~~

~~The Standards aim to align instruction with this framework so that many more students than at present can meet the requirements of college and career readiness. In K-5, the Standards follow NAEP's lead in balancing the reading of literature with the reading of informational texts, including texts in history/social studies, science, and technical subjects. In accord with NAEP's growing emphasis on informational texts in the higher grades, the Standards demand that a significant amount of reading of informational texts take place in and outside the ELA classroom. Fulfilling the Standards for 6-12 ELA requires much greater attention to a specific category of informational text—literary nonfiction—than has been traditional. Because the ELA classroom must focus on literature (stories, drama, and poetry) as well as literary nonfiction, a great deal of informational reading in grades 6-12 must take place in other classes if the NAEP assessment framework is to be matched instructionally.[1]~~

~~**Distribution of Communicative Purposes by Grade in the 2011 NAEP Writing Framework**~~

~~Grade~~	~~To Persuade~~	~~To Explain~~	~~To Convey Experience~~
~~4~~	~~30%~~	~~35%~~	~~35%~~
~~8~~	~~35%~~	~~35%~~	~~30%~~
~~12~~	~~40%~~	~~40%~~	~~20%~~

~~Source: National Assessment Governing Board. (2007). Writing framework for the 2011 National Assessment of Educational Progress, pre-publication edition. Iowa City, IA: ACT, Inc.~~

~~NAEP likewise outlines a distribution across the grades of the core purposes and types of student writing. The 2011 NAEP writing framework, like the Standards, cultivates the development of three mutually reinforcing writing capacities: writing to persuade, to explain, and to convey real or imagined experience. Evidence concerning the demands of college and career readiness gathered during development of the Standards concurs with NAEP's shifting emphases: standards for grades 9-12 describe writing in all three forms, but, consistent with NAEP, the overwhelming focus of writing throughout high school should be on arguments and informative/explanatory texts.[2]~~

~~Focus and coherence in instruction and assessment~~

~~While the Standards delineate specific expectations in reading, writing, speaking, listening, and language, each standard need not be a separate focus for instruction and assessment. Often, several standards can be addressed by a single rich task. For example, when editing writing, students address Writing standard 5 ("Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach") as well as Language standards 1-3 (which deal with conventions of standard English and knowledge of language). When drawing evidence from literary and informational texts per Writing standard 9, students are also demonstrating their comprehension skill in relation to specific standards in Reading. When discussing something they have read or written, students are also demonstrating their speaking and listening skills. The CCR anchor standards themselves provide another source of focus and coherence.~~

~~The same ten CCR anchor standards for Reading apply to both literary and informational texts, including texts in history/social studies, science, and technical subjects. The ten CCR anchor standards for Writing cover numerous text types and subject areas. This means that students can develop mutually reinforcing skills and exhibit mastery of standards for reading and writing across a range of texts and classrooms.~~

~~[1] The percentages on the table reflect the sum of student reading, not just reading in ELA settings. Teachers of senior English classes, for example, are not required to devote 70 percent of reading to informational texts. Rather, 70 percent of student reading across the grade should be informational.~~

~~[2] As with reading, the percentages in the table reflect the sum of student writing, not just writing in ELA settings.~~

~~What is Not Covered by the Standards~~

~~The Standards should be recognized for what they are not as well as what they are. The most important intentional design limitations are as follows:~~

~~1. The Standards define what all students are expected to know and be able to do, not how teachers should teach. For instance, the use of play with young children is not specified by the Standards, but it is welcome as a valuable activity in its own right and as a way to help students meet the expectations in this document. Furthermore, while the Standards make references to some particular forms of content, including mythology, foundational U.S. documents, and Shakespeare, they do not—indeed, cannot—enumerate all or even most of the content that students should learn. The Standards must therefore be complemented by a well-developed, content-rich curriculum consistent with the expectations laid out in this document.~~

~~2. While the Standards focus on what is most essential, they do not describe all that can or should be taught. A great deal is left to the discretion of teachers and curriculum developers. The aim of the Standards is to articulate the fundamentals, not to set out an exhaustive list or a set of restrictions that limits what can be taught beyond what is specified herein.~~

~~3. The Standards do not define the nature of advanced work for students who meet the Standards prior to the end of high school. For those students, advanced work in such areas as literature, composition, language, and journalism should be available. This work should provide the next logical step up from the college and career readiness baseline established here.~~

~~4. The Standards set grade-specific standards but do not define the intervention methods or materials necessary to support students who are well below or well above grade-level expectations. No set of grade-specific standards can fully reflect the great variety in abilities, needs, learning rates, and achievement levels of students in any given classroom. However, the Standards do provide clear signposts along the way to the goal of college and career readiness for all students.~~

~~5. It is also beyond the scope of the Standards to define the full range of supports appropriate for English language learners and for students with special needs. At the same time, all students must have the opportunity to learn and meet the same high standards if they are to access the knowledge and skills necessary in their post-high school lives.~~

~~Each grade will include students who are still acquiring English. For those students, it is possible to meet the standards in reading, writing, speaking, and listening without displaying native-like control of conventions and vocabulary. The Standards should also be read as allowing for the widest possible range of students to participate fully from the outset and as permitting appropriate accommodations to ensure maximum participation of students with special education needs. For example, for students with disabilities reading should allow for the use of Braille, screen-reader technology, or other assistive devices, while writing should include the use of a scribe, computer, or speech-to-text technology. In a similar vein, speaking and listening should be interpreted broadly to include sign language.~~

~~6. While the ELA and content area literacy components described herein are critical to college and career readiness, they do not define the whole of such readiness. Students require a wide-ranging, rigorous academic preparation and, particularly in the early grades, attention to such matters as social, emotional, and physical development and approaches to learning. Similarly, the Standards define literacy expectations in history/social studies, science, and technical subjects, but literacy standards in other areas, such as mathematics and health education, modeled on those in this document are strongly encouraged to facilitate a comprehensive, schoolwide literacy program.~~

~~Students who are College and Career Ready in Reading, Writing, Speaking, Listening, and Language~~

~~The descriptions that follow are not standards themselves but instead offer a portrait of students who meet the standards set out in this document. As students advance through the grades and master the standards in reading, writing, speaking, listening, and language, they are able to exhibit with increasing fullness and regularity these capacities of the literate individual.~~

They demonstrate independence.

~~Students can, without significant scaffolding, comprehend and evaluate complex texts across a range of types and disciplines, and they can construct effective arguments and convey intricate or multifaceted information. Likewise, students are able independently to discern a speaker's key points, request clarification, and ask relevant questions. They build on others' ideas, articulate their own ideas, and confirm they have been understood. Without prompting, they demonstrate command of standard English and acquire and use a wide-ranging vocabulary. More broadly, they become self-directed learners, effectively seeking out and using resources to assist them, including teachers, peers, and print and digital reference materials.~~

They build strong content knowledge.

~~Students establish a base of knowledge across a wide range of subject matter by engaging with works of quality and substance. They become proficient in new areas through research and study. They read purposefully and listen attentively to gain both general knowledge and discipline-specific expertise. They refine and share their knowledge through writing and speaking.~~

They respond to the varying demands of audience, task, purpose, and discipline.

~~Students adapt their communication in relation to audience, task, purpose, and discipline. They set and adjust purpose for reading, writing, speaking, listening, and language use as warranted by the task. They appreciate nuances, such as how the composition of an audience should affect tone when speaking and how the connotations of words affect meaning. They also know that different disciplines call for different types of evidence (e.g., documentary evidence in history, experimental evidence in science).~~

They comprehend as well as critique.

~~Students are engaged and open-minded—but discerning—readers and listeners. They work diligently to understand precisely what an author or speaker is saying, but they also question an author's or speaker's assumptions and premises and assess the veracity of claims and the soundness of reasoning.~~

They value evidence.

~~Students cite specific evidence when offering an oral or written interpretation of a text. They use relevant evidence when supporting their own points in writing and speaking, making their reasoning clear to the reader or listener, and they constructively evaluate others' use of evidence.~~

They use technology and digital media strategically and capably.

~~Students employ technology thoughtfully to enhance their reading, writing, speaking, listening, and language use. They tailor their searches online to acquire useful information efficiently, and they integrate what they learn using technology with what they learn offline. They are familiar with the strengths and limitations of various technological tools and mediums and can select and use those best suited to their communication goals.~~

They come to understand other perspectives and cultures.

~~Students appreciate that the twenty-first-century classroom and workplace are settings in which people from often widely divergent cultures and who represent diverse experiences and perspectives must learn and work together. Students actively seek to understand other perspectives and cultures through reading and listening, and they are able to communicate effectively with people of varied backgrounds. They evaluate other points of view critically and constructively. Through reading great classic and contemporary works of literature representative of a variety of periods, cultures, and worldviews, students can vicariously inhabit worlds and have experiences much different than their own.~~

~~How to Read This Document~~

~~Overall Document Organization~~

~~The Standards comprise three main sections: a comprehensive K-5 section and two content area-specific sections for grades 6-12, one for ELA and one for history/social studies, science, and technical subjects. Three appendices accompany the main document:~~

- ~~Appendix A contains supplementary material on reading, writing, speaking and listening, and language as well as a glossary of key terms.~~
- ~~Appendix B consists of text exemplars illustrating the complexity, quality, and range of reading appropriate for various grade levels with accompanying sample performance tasks.~~
- ~~Appendix C includes annotated samples demonstrating at least adequate performance in student writing at various grade levels.~~

~~Each section is divided into strands. K-5 and 6-12 ELA have Reading, Writing, Speaking and Listening, and Language strands; the 6-12 history/social studies, science, and technical subjects section focuses on Reading and Writing. Each strand is headed by a strand-specific set of College and Career Readiness Anchor Standards that is identical across all grades and content areas.~~

~~Standards for each grade within K-8 and for grades 9-10 and 11-12 follow the CCR anchor standards in each strand. Each CCR anchor standard has an accompanying grade-specific standard translating the broader CCR statement into grade-appropriate end-of-year expectations.~~

~~Who is responsible for which portion of the Standards~~

~~A single K-5 section lists standards for reading, writing, speaking, listening, and language across the curriculum, reflecting the fact that most or all of the instruction students in these grades receive comes from one teacher. Grades 6-12 are covered in two content area-specific sections, the first for the English language arts teacher and the second for teachers of history/social studies, science, and technical subjects. Each section uses the same CCR anchor standards but also includes grade-specific standards tuned to the literacy requirements of the particular discipline(s).~~

~~Key Features of the Standards~~

~~Reading: Text complexity and the growth of comprehension~~

~~The Reading standards place equal emphasis on the sophistication of what students read and the skill with which they read. Standard 10 defines a grade-by-grade "staircase" of increasing text complexity that rises from beginning reading to the college and career readiness level. Whatever they are reading, students must also show a steadily growing ability to discern more from and make fuller use of text, including making an increasing number of connections among ideas and between texts, considering a wider range of textual evidence, and becoming more sensitive to inconsistencies, ambiguities, and poor reasoning in texts.~~

~~Writing: Text types, responding to reading, and research~~

~~The Standards acknowledge the fact that whereas some writing skills, such as the ability to plan, revise, edit, and publish, are applicable to many types of writing, other skills are more properly defined in terms of specific writing types: arguments, informative/explanatory texts, and narratives. Standard 9 stresses the importance of the writing-reading connection by requiring students to draw upon and write about evidence from literary and informational texts. Because of the centrality of writing to most forms of inquiry, research standards are prominently included in this strand, though skills important to research are infused throughout the document.~~

~~Speaking and Listening: Flexible communication and collaboration~~

~~Including but not limited to skills necessary for formal presentations, the Speaking and Listening standards require students to develop a range of broadly useful oral communication and interpersonal skills. Students must learn to work together, express and listen carefully to ideas, integrate information from oral, visual, quantitative, and media sources, evaluate what they hear, use media and visual displays strategically to help achieve communicative purposes, and adapt speech to context and task.~~

~~Language: Conventions, effective use, and vocabulary~~

~~The Language standards include the essential "rules" of standard written and spoken English, but they also approach language as a matter of craft and informed choice among alternatives. The vocabulary standards focus on understanding words and phrases, their relationships, and their nuances and on acquiring new vocabulary, particularly general academic and domain-specific words and phrases.~~

~~Idaho Content Standards~~

~~English Language Arts/Literacy~~
~~&~~
~~Literacy in History/Social Studies, Science, and Technical Subjects:~~

~~K-5 Section~~

~~College and Career Readiness Anchor Standards for Reading~~

~~The grades K-5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

Key Ideas and Details

~~**CCRA.R.1** Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.~~

~~**CCRA.R.2** Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.~~

~~**CCRA.R.3** Analyze how and why individuals, events, or ideas develop and interact over the course of a text.~~

Craft and Structure

~~**CCRA.R.4** Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.~~

~~**CCRA.R.5** Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.~~

~~**CCRA.R.6** Assess how point of view or purpose shapes the content and style of a text.~~

Integration of Knowledge and Ideas

~~**CCRA.R.7** Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.*~~

~~**CCRA.R.8** Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.~~

~~**CCRA.R.9** Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.~~

Range of Reading and Level of Text Complexity

~~**CCRA.R.10** Read and comprehend complex literary and informational texts independently and proficiently.~~

~~**Please see "Research to Build and Present Knowledge" in Writing and "Comprehension and Collaboration" in Speaking and Listening for additional standards relevant to gathering, assessing, and applying information from print and digital sources.*~~

~~Note on range and content of student reading~~

~~*To build a foundation for college and career readiness, students must read widely and deeply from among a broad range of high-quality, increasingly challenging literary and informational texts. Through extensive reading of stories, dramas, poems, and myths from diverse cultures and different time periods, students gain literary and cultural knowledge as well as familiarity with various text structures and elements. By reading texts in history/social studies, science, and other disciplines, students build a foundation of knowledge in these fields that will also give them the background to be better readers in all content areas.*~~

~~*Students can only gain this foundation when the curriculum is intentionally and coherently structured to develop rich content knowledge within and across grades. Students also acquire the habits of reading independently and closely, which are essential to their future success.*~~

~~Reading Standards for Literature K-2 RL~~

~~The following standards offer a focus for instruction each year and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*~~

~~Key Ideas and Details~~

~~Kindergarteners:~~	~~Grade 1 Students:~~	~~Grade 2 Students:~~
~~RL.K.1 With prompting and support, a~~Ask and answer questions about key details in a texts heard.	~~RL.1.1~~ Ask and answer questions about key details in ~~a~~ texts heard or read..	~~RL.2.1~~ Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in grade-level ~~a~~ texts heard or read.
~~RL.K.2 With prompting and support, r~~Retell key details of familiar stories, poems, and nursery rhymes heard ~~including key details~~.	~~RL.1.2~~ Retell the beginning, middle, and end of familiar stories with~~, including~~ key details heard or read, ~~, and~~ demonstratinge understanding of their central messages or morals. ~~lesson.~~	~~RL.2.2 Recount stories, including fables and folktales~~ Identify the central message, lesson, or moral of stories (including fables and folktales) from diverse cultures heard or read. ~~, and determine their central message, lesson, or moral.~~
~~RL.K.3 With prompting and support,~~ Describe the connections between ~~identify~~ characters, settings, and major events in stories heard~~a story~~.	~~RL.1.3~~ Describe the connection between characters, settings, and major events in ~~a~~ stories heard ~~,y,~~ using key details.	~~RL.2.3~~ Describe how characters in ~~a~~ stories heard or read ~~y~~ respond to major events and challenges.

~~Craft and Structure~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RL.K.4~~ Ask and answer questions about unknown words in a text.	~~RL.1.4 Identify words and phrases in stories or poems that suggest feelings or appeal to the senses.~~	~~RL.2.4 With guidance and support from adults, identify and describe how words and phrases (e.g., regular beats, alliteration, rhymes, repeated lines) supply rhythm and meaning in a story, poem, or song.~~
~~RL.K.5 Recognize common types of texts (e.g., storybooks, poems).~~	~~RL.1.5 Explain~~ Describe major differences between books that tell stories and books that give information.~~, drawing on a wide reading of a range of text types.~~	~~RL.2.5~~ Describe the overall structure of ~~a~~ stories heard or read~~y~~, including describing how the beginning introduces the story and the ending concludes the action.
~~RL.K.6 With prompting and support, name the author and illustrator of a story and~~ define the role of authors and illustrators ~~each~~ in presenting the ideas or information in stories. ~~telling the story.~~	~~RL.1.6 Identify~~ Describe who is telling ~~the~~ stories heard or read ~~y~~ at various points in ~~a~~ texts.	~~RL.2.6 Acknowledge differences in the points of view of characters, including by speaking in a different voice for each character when reading dialogue aloud.~~

~~Integration of Knowledge and Ideas~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RL.K.7 With prompting and support, describe the relationship between illustrations and the story in which they appear (e.g., what moment in a story an illustration depicts).~~	~~RL.1.7 Use illustrations and details in a story to describe its characters, setting, or events.~~	~~RL.2.7 Use information gained from the illustrations and words in a print or digital text to demonstrate understanding of its characters, setting, or plot.~~
~~RL.K.8 (Not applicable to literature)~~	~~RL.1.8 (Not applicable to literature)~~	~~RL.2.8 (Not applicable to literature)~~
~~RL.K.9~~ With prompting and support, compare and contrast the adventures or ~~and~~ experiences of characters in familiar Stories heard.	~~RL.1.9~~ Compare and contrast the adventures or ~~and~~ experiences of characters in stories heard.	~~RL.2.9~~ Compare and contrast two or more versions of the same story (heard or read)~~e.g., Cinderella stories)~~ by different authors or from different cultures.

~~Range of Reading and Level of~~ Text Complexity

Kindergarteners:	Grade 1 Students:	Grade 2 Students:

~~**RL.K.10** Actively engage in group reading activities with purpose and understanding.~~	~~**RL.1.10** With prompting and support, read prose and poetry of appropriate complexity for grade 1.~~	~~**RL.2.10** By the end of the year,~~ Independently and proficiently read and comprehend texts representing a balance of genres, cultures and perspectives, that exhibit ~~literature, including stories and poetry, in the grades 2-3 text~~ complexity at the lower end of the grades 2-3 band. ~~proficiently, with scaffolding as needed at the high end of the range.~~

~~Reading Standards for Literature 3-5~~ RL

~~Key Ideas and Details~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~RL.3.1~~ Ask and answer questions to demonstrate understanding of a grade-level texts, referring explicitly to the text as the basis for the answers.	~~RL.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.~~	~~RL.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.~~
~~RL.3.2~~ ~~Recount~~ Describe key details from stories, (-including fables, folktales, and tall tales) ~~myths~~ from diverse cultures; and explain how they support ~~determine~~ the central ~~message~~, lesson, ~~, or~~ moral, or theme. ~~and explain how it is conveyed through key details in the text.~~	~~RL.4.2~~ Determine the central ~~a~~ theme ~~of a~~ in stories (including myths and legends) ~~y~~, ~~drama, or~~ poems or plays and explain how they are supported by ~~from~~ key ~~details in the text; summarize the text.~~	~~RL.5.2~~ Summarize a text and ~~D~~determine the central ~~a~~ themes ~~of a~~ stories, ~~y, drama, or~~ plays, or poems ~~from details in the text,~~ including how they are developed using details. ~~characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text.~~
~~RL.3.3 Describe~~ Explain how -characters develop ~~in a story~~ (e.g., their traits, motivations, or feelings) throughout the text. ~~and explain how their actions contribute to the sequence of events~~.	~~RL.4.3 Describe in depth~~ Describe a character, setting, or event in depth in ~~a~~ stories~~y~~ and plays, ~~or drama,~~ drawing on specific details in the texts (e.g., a character's thoughts, words, or actions).	~~RL.5.3~~ Compare and contrast two or more characters, settings, or events in ~~a~~ stories or plays~~y or drama,~~ drawing on specific details in the text. ~~(e.g., how characters interact).~~

~~Craft and Structure~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~RL.3.4 Determine the meaning of words and phrases as they are used in a text, distinguishing literal from nonliteral language.~~	~~RL.4.4 Determine the meaning of words and phrases as they are used in a text, including those that allude to significant characters found in mythology (e.g., Herculean).~~	~~RL.5.4 Determine the meaning of words and phrases as they are used in a text, including figurative language such as metaphors and similes.~~
~~RL.3.5 Refer to parts of stories, dramas, and poems when writing or speaking about a text, using terms such as chapter, scene, and stanza; describe how each successive part builds on earlier sections.~~ Explain major structural differences between poems, plays, and prose.	~~RL.4.5~~ Explain ~~major differences between poems, drama, and prose, and refer to the~~ the overall structures~~al~~ of stories, plays, and ~~elements of~~ poems and how each successive part builds on earlier sections. ~~(e.g., verse, rhythm, meter) and drama (e.g., casts of characters, settings, descriptions, dialogue, stage directions) when writing or speaking about a text.~~	~~RL.5.5~~ Explain how ~~a series of~~ chapters, scenes, or stanzas work~~fits~~ together to provide the overall structure of a ~~particular story, drama, or poem.~~ literacy text.
~~RL.3.6 Distinguish their own~~ Explain the difference between a narrator's point of view and various ~~from that of the narrator or those of the~~ characters' perspectives in stories. ~~.~~	~~RL.4.6~~ Compare and contrast the point of view from which different stories are narrated, including the difference between first- and third-person narrations.	~~RL.5.6 Describe~~ Explain- how a narrator's or speaker's point of view influences how events are described in stories, plays, or poems..

~~Integration of Knowledge and Ideas~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~RL.3.7 Explain how specific aspects of a text's illustrations contribute to what is conveyed by the words in a story (e.g., create mood, emphasize aspects of a character or setting).~~	~~RL.4.7 Make connections between the text of a story or drama and a visual or oral presentation of the text, identifying where each version reflects specific descriptions and directions in the text.~~	~~RL.5.7 Analyze how visual and multimedia elements contribute to the meaning, tone, or beauty of a text (e.g., graphic novel, multimedia presentation of fiction, folktale, myth, poem).~~
~~RL.3.8 (Not applicable to literature)~~	~~RL.4.8 (Not applicable to literature)~~	~~RL.5.8 (Not applicable to literature)~~
~~RL.3.9~~ Compare and contrast the themes, settings, and plots of stories written by the same author about the same or similar characters ~~(e.g., in books from a series)~~.	~~RL.4.9~~ Compare and contrast the treatment of similar themes ~~and topics (e.g., opposition of good and evil)~~ and patterns of events ~~(e.g., the quest)~~ in stories, myths, and traditional literature from different cultures.	~~RL.5.9~~ Compare and contrast stories in the same genre ~~(e.g., mysteries and adventure stories)~~ on their approaches to similar themes and topics.

~~Range of Reading and Level of~~ Text Complexity

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~**RL.3.10** By the end of the year,~~ Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the higher end of the 2-3 band. ~~literature, including stories, dramas, and poetry, at the high end of the grades 2-3 text complexity band independently and proficiently~~.	~~**RL.4.10** By the end of the year,~~ Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the lower end of the grades 4-5 grade band. ~~literature, including stories, dramas, and poetry, in the grades 4-5 text complexity band proficiently, with scaffolding as needed at the high end of the range.~~	~~**RL.5.10** By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 4-5 text complexity band independently and proficiently.~~

~~Reading Standards for Informational Text K-2~~ ~~RI~~

~~Key Ideas and Details~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RI.K.1 With prompting and support, ask and answer questions about~~ Retell ~~-~~key details of ~~in a~~ texts heard.	~~RI.1.1 Ask and answer questions abou~~t Retell key details of texts that demonstrate understanding of the main topics of texts heard or read. ~~in a text.~~	~~RI.2.1 Ask and answer questions as *who, what, where, when, why*, and *how*, to demonstrate understanding of key details in a text.~~
~~RI.K.2 With prompting and support, identify the main topic and retell key details of a text.~~	~~RI.1.2 Identify the main topic and retell key details of a text.~~	~~RI.2.2 Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.~~
~~RI.K.3 With prompting and support,~~ describe the connection between two individuals, events, ideas, or pieces of information in ~~a~~ texts heard.	~~RI.1.3~~ Describe the connection between two individuals, events, ideas, or pieces of information in ~~a~~ texts heard or read .	~~RI.2.3~~ Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

~~Craft and Structure~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RI.K.4 With prompting and support, ask and answer questions about unknown words in a text.~~	~~RI.1.4~~ Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.	~~RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.~~
~~RI.K.5~~ Identify the front cover, back cover, and title page of non-fiction texts. ~~a book.~~	~~RI.1.5~~ Know and use various text features (e.g., tables of contents headings, ~~tables of contents~~, glossaries, ~~electronic menus~~, icons, index) to locate key facts or information in a text.	~~RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.~~
~~RI.K.6 Name the author and illustrator of a text and define the role of each in presenting the ideas or information in a text.~~	~~RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.~~	~~RI.2.6 Identify the main purpose of a text, including what the author wants to answer, explain, or describe.~~

~~Integration of Knowledge and Ideas~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RI.K.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).~~	~~RI.1.7 Use the illustrations and details in a text to describe its key ideas.~~	~~RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.~~
~~RI.K.8 With prompting and support,~~ identify the reasons ~~an~~ authors gives to support points in ~~a~~ texts heard.	~~RI.1.8~~ Identify the reasons ~~an~~ authors give~~s~~ to support points in a text.	~~RI.2.8~~ Describe how authors use facts and reasons to ~~reasons~~ support specific points ~~the author makes~~ in ~~a~~ text.
~~RI.K.9~~ With prompting and support, identify basic similarities in and differences between two texts on the same topic ~~(e.g., in illustrations, descriptions, or procedures).~~	RI.1.9 Identify basic similarities in and differences between two texts heard or read on the same topic. ~~(e.g., in illustrations, descriptions, or procedures).~~	~~RI.2.9~~ Compare and contrast the most important points presented by two texts on the same topic.

~~Range of Reading and Level of Text Complexity~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RI.K.10 Actively engage in group reading activities with purpose and understanding.~~	~~RI.1.10 With prompting and support, read informational texts appropriately complex for grade 1.~~	~~RI.2.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 2-3 text complexity band proficiently, with scaffolding as needed at the high end of the range.~~

~~Reading Standards for Informational Text 3-5~~ ~~RI~~

~~Key Ideas and Details~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.~~	~~RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.~~	~~RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.~~
~~RI.3.2 Determine the main idea of a text;~~ Describe key details from texts and explain ~~recount the key details and explain~~ how they support the main idea.	~~RI.4.2~~ Determine the central ~~main~~ idea of ~~a~~ texts and explain how they are~~it is~~ supported by key details; summarize the texts.	~~RI.5.2 Determine two or more main~~Explain the central ideas of a texts, including ~~and explain~~ how they are developed using ~~supported by key~~ details; summarize ~~the~~ texts.
~~RI.3.3~~ Describe the relationship between a series events, concepts, steps, or procedures in ~~of~~ historical ~~events~~, scientific ~~ideas~~ or ~~concepts~~, ~~or steps in~~ technical ~~procedures in a~~ texts, using words ~~language~~ that pertains to comparison, ~~time~~, sequence, and cause/effect.	~~RI.4.3~~ Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why.~~, based on specific information in the text.~~	~~RI.5.3~~ Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in ~~a~~ historical, scientific, or technical texts.~~ based on specific information in the text.~~

Craft and Structure

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.~~	~~RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.~~	~~RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.~~
~~RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.~~	~~RI.4.5~~ ~~Describe~~ Explain the overall structure (e.g., description, ~~chronology, comparison, cause~~sequence, cause/effect, problem/solution) and how each successive part builds on earlier sections. ~~of events, ideas, concepts, or information in a text or part of a text.~~	~~RI.5.5 Compare and contrast the~~ Explain how series of chapters or overall sections fit together to provide overall structure ~~(e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or~~ of informational ~~in two or more~~ texts (e.g., description, sequence, comparison, problem-solution, cause/effect). .
~~RI.3.6 Distinguish their own point of view from that of the author of a text.~~	~~RI.4.6 Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.~~	~~RI.5.6 Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.~~

~~Integration of Knowledge and Ideas~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).~~	~~RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.~~	~~RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.~~
~~RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).~~	~~RI.4.8~~ Explain how an author uses evidence and reasons ~~and evidence~~ to support specific ~~particular~~ points in a text.	~~RI.5.8~~ Explain how ~~an~~ authors use~~s~~ evidence and reasons ~~and evidence~~ to support specific claims ~~particular points~~ in ~~a~~ texts, identifying which reasons and evidence support which ~~point(s).~~claims.
~~RI.3.9~~ Compare and contrast ~~the most~~ important points and key details presented in two texts on the same topic.	~~RI.4.9~~ ~~Integrate~~ Combine information from two texts on the same topic, noting important similarities and differences in focus and the information provided. ~~in order to write or speak about the subject knowledgeably.~~	~~RI.5.9~~ Integrate information from several texts on the same ~~topic in order to write or speak about the subject knowledgeably~~to demonstrate a coherent understanding of the information.

~~Range of Reading and Level of Text Complexity~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~**RI.3.10** By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2-3 text complexity band independently and proficiently.~~	~~**RI.4.10** By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4-5 text complexity band proficiently, with scaffolding as needed at the high end of the range.~~	~~**RI.5.10** By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4-5 text complexity band independently and proficiently.~~

~~Reading Standards for Foundational Skills K-2 No Anchor Standards for Foundational Skills RF~~

~~These standards are directed toward fostering students' understanding and working knowledge of concepts of print, the alphabetic principle, and other basic conventions of the English writing system. These foundational skills are not an end in and of themselves; rather, they are necessary and important components of an effective, comprehensive reading program designed to develop proficient readers with the capacity to comprehend texts across a range of types and disciplines. Instruction should be differentiated: good readers will need much less practice with these concepts than struggling readers will. The point is to teach students what they need to learn and not what they already know—to discern when particular children or activities warrant more or less attention.~~

~~Note: In kindergarten, children are expected to demonstrate increasing awareness and competence in the areas that follow.~~

Print Concepts

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RF.K.1~~ Demonstrate understanding of the ~~organization and~~ basic features of print. ~~a.~~ Read~~Follow words from~~ left to right, top to bottom, and page by page. ~~b.~~ Recognize that spoken words are represented in written language by specific sequences of letters. ~~c.~~ Understand that words are separated by spaces in print. ~~d.~~ Recognize and name all upper- and lowercase letters of the alphabet.	~~RF.1.1 Demonstrate understanding of the organization and basic features of print.~~ ~~a. Recognize the distinguishing features of a sentence (e.g., first word, capitalization, ending punctuation).~~ In Kindergarten	In Kindergarten and First grade

~~Phonological~~ Phonemic Awareness

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RF.K.2~~ Demonstrate understanding of spoken words, syllables, and sounds ~~(phonemes)~~. ~~a.~~ Identify ~~Recognize~~ and produce rhyming words. ~~b.~~ Count, pronounce, blend, and segment syllables in spoken words. ~~c.~~ Blend and segment onsets and rimes of single- syllable spoken words. ~~d.~~ Isolate and pronounce the initial, medial vowel, and final sounds (phonemes) in three-phoneme (consonant-vowel-consonant, or CVC) words and say the resulting word. (This does not include CVCs ending with /l/, /r/, or /x/.) ~~e.~~ Add or substitute individual sounds (phonemes) in simple, one-syllable words to make new words.	~~RF.1.2~~ Demonstrate understanding of spoken words, syllables, and sounds. ~~(phonemes).~~ ~~a.~~ Distinguish long from short vowel sounds in spoken single-syllable words. ~~b.~~ Orally produce single-syllable words by blending sounds ~~(phonemes)~~, including consonant blends. ~~c.~~ Isolate and pronounce initial, medial vowel, and final sounds ~~(phonemes)~~ in spoken single-syllable words. ~~d.~~ Segment and blend sequences of individual sounds in spoken single-syllable words. ~~into their complete sequence of individual sounds (phonemes).~~	In Kindergarten ~~and F~~irst grade, and second grade

~~Reading Standards for Foundational Skills K-2 No Anchor Standards for Foundational Skills RF~~

~~Note: In kindergarten, children are expected to demonstrate increasing awareness and competence in the areas that follow.~~

Phonics and Decoding~~Word Recognition~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RF.K.3~~ ~~Know and apply~~ Use knowledge of grade-level phonics and word analysis skills in decoding words. ~~a.~~ Demonstrate ~~basic~~ knowledge of one-to-one letter- sound correspondences by producing the ~~primary or many of~~ the most frequent sound for each consonant. ~~b.~~ Associate the long and short sounds ~~with common spellings (graphemes)~~ for the five major vowels. ~~c.~~ Read common high-frequency words with automaticity by sight (e.g., the, of, to, you, she, my, is, are, do, does). ~~d.~~ Distinguish between similarly spelled CVC words by identifying the sounds of the letters that differ.	~~RF.1.3~~ ~~Know and apply~~Use knowledge of ~~-~~grade-level phonics and word analysis skills in decoding words. ~~a.~~ Know the spelling-sound correspondences for common consonant digraphs. ~~(two letters that represent one sound).~~ ~~b.~~ Decode regularly spelled one-syllable words. ~~c.~~ Know final -e and common vowel team conventions for representing long vowel sounds (e.g., ai, ay, ee, ea, oa and oe). ~~d.~~ Use knowledge that every syllable must have a vowel sound to determine the number of syllables in a printed word. ~~e.~~ Decode two-syllable words following basic patterns by breaking the words into syllables. ~~f.~~ ~~Read~~ Decode frequently encountered words with inflectional endings (e.g., -s, -ed, -est). ~~g.~~ Recognize and read grade-appropriate irregularly spelled words (e.g., what, said, have).~~.~~	~~RF.2.3~~ ~~Know and apply~~Use knowledge of grade-level phonics and word analysis skills in decoding words. ~~a. Distinguish long and short vowels when reading regularly spelled one-syllable words.~~ ~~b.~~ Know spelling-sound correspondences for additional common short and long vowel teams (e.g., head, hook, boat, weigh) including diphthongs (e.g., toil, cloud). ~~c.~~ Decode regularly spelled two-syllable words with long vowels. ~~d.~~ Decode words with common prefixes and suffixes (e.g., -un,-dis,-ful,-less). ~~e.~~ Identify words with inconsistent but common spelling-sound correspondences. ~~f.~~ Recognize and read grade-appropriate irregularly spelled words (e.g., was, again, been) including silent letter combinations) .

Reading Fluency

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~RF.K.4~~ Read emergent-reader texts (e.g., rhymes, songs, simple poems) with purpose and understanding.	~~RF.1.4~~ Read grade-level text with accuracy, appropriate rate, and expression ~~with sufficient accuracy and fluency~~ to support comprehension in successive readings. ~~a. Read grade-level text with purpose and understanding.~~ ~~b. Read grade-level text orally with accuracy, appropriate rate, and expression.~~ ~~c.~~a. ~~Use context to confirm or self-correct word recognition and understanding, rereading as necessary.~~	~~RF.2.4~~ Read grade-level text with accuracy, appropriate rate, and expression ~~with sufficient accuracy and fluency~~ to support comprehension in successive readings.~~.~~ ~~a. Read grade-level text with purpose and understanding.~~ ~~b. Read grade-level text orally with accuracy, appropriate rate, and expression on successive readings.~~ ~~c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.~~

~~Reading Standards for~~ Foundational Reading Skills ~~3-5~~ ~~No Anchor Standards for Foundational Skills~~ RF

Print Concepts

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
In Kindergarten ~~and First grade~~	In Kindergarten and First grade	In Kindergarten and First grade

~~Phonological~~ Phonemic ~~-~~Awareness

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
In Kindergarten, ~~and First~~ grade 1, and grade 2.	In Kindergarten and First grade	In Kindergarten and First grade

Phonics and Decoding ~~Word Recognition~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~RF.3.3~~ Use knowledge of ~~Know and apply~~ grade-level phonics and word analysis skills to ~~in~~ decode~~ing~~ words. ~~a.~~ Decode words when known affixes are added to a known word. ~~Identify and know the meaning of the most common prefixes and derivational suffixes.~~ ~~b.~~ Decode words with common Greek and Latin roots (e.g., trans, port, bio).~~suffixes~~. ~~c.~~ Decode multi-syllable words. ~~d.~~ Read grade-appropriate irregularly spelled words (come, friend, today).	~~RF.4.3 Know and apply grade-level phonics and word analysis skills in decoding words.~~ ~~a.~~ Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar grade appropriate multisyllabic words (e.g., depart, beneficial, recycle) in context and out of context.	~~RF.5.3 Know and apply grade-level phonics and word analysis skills in decoding words.~~ ~~a.~~ Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words (e.g., disallow, misinform, transaction) ~~-~~in context and out of context.

Fluency

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
RF.3.4 Read grade-level text with ~~sufficient~~ accuracy, automaticity, appropriate rate, and expression in successive readings ~~-and fluency~~ to support comprehension. ~~a. Read grade-level text with purpose and understanding.~~ ~~b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression.~~ ~~c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.~~	~~RF.4.4~~ Read grade-level text with sufficient accuracy, automaticity, appropriate rate, and expression in successive readings ~~and fluency~~ to support comprehension. ~~a. Read grade-level text with purpose and understanding.~~ ~~b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression.~~ ~~c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.~~	~~RF.5.4~~ Read grade-level text with sufficient accuracy, automaticity, appropriate rate, and expression in successive readings ~~and fluency~~ to support comprehension. ~~a. Read grade-level text with purpose and understanding.~~ ~~b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression.~~ ~~c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.~~

~~College and Career Readiness Anchor Standards for Writing~~

~~The grades K-5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

Text Types and Purposes*

~~**CCRA.W.1** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.~~

~~**CCRA.W.2** Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.~~

~~**CCRA.W.3** Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.~~

Production and Distribution of Writing

~~**CCRA.W.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.~~

~~**CCRA.W.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.~~

~~**CCRA.W.6** Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.~~

Research to Build and Present Knowledge

~~**CCRA.W.7** Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.~~

~~**CCRA.W.8** Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.~~

~~**CCRA.W.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.~~

Range of Writing

~~**CCRA.W.10** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.~~

~~*These broad types of writing include many subgenres. See Appendix A for definitions of key writing types~~.

~~Note on range and content of student writing~~

~~*To build a foundation for college and career readiness, students need to learn to use writing as a way of offering and supporting opinions, demonstrating understanding of the subjects they are studying, and conveying real and imagined experiences and events. They learn to appreciate that a key purpose of writing is to communicate clearly to an external, sometimes unfamiliar audience, and they begin to adapt the form and content of their writing to accomplish a particular task and purpose. They develop the capacity to build knowledge on a subject through research projects and to respond analytically to literary and informational sources. To meet these goals, students must devote significant time and effort to writing, producing numerous pieces over short and extended time frames throughout the year.*~~

Writing Strand ~~Standards K-2~~ W

~~The following standards for K-5 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, from vocabulary and syntax to the development and organization of ideas, and they should address increasingly demanding content and sources. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* The expected growth in student writing ability is reflected both in the standards themselves and in the collection of annotated student writing samples in Appendix C.~~

~~Text Types and Purposes~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~**W.K.1** Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book (e.g., My favorite book is ...).~~	~~**W.1.1** Write opinion pieces in which they introduce the topic or name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure.~~	~~**W.2.1** Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section.~~ Write arguments that express an opinion supported by details and reasons and provide a concluding sentence.
~~**W.K.2** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.~~	~~**W.1.2** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.~~	~~**W.2.2**~~ Write informational ~~ve/explanatory~~ texts that state a focus ~~in which they introduce a topic, use~~ with facts and details~~definitions to develop points,~~ and provide a concluding sentence. ~~statement or section.~~
~~**W.K.3** Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened.~~	~~**W.1.3** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.~~	~~**W.2.3**~~ Write personal or fictional stories that ~~narratives in which they~~ recount a ~~well- elaborated event or~~ short sequence of events, include details to develop the characters or experiences, ~~describe actions, thoughts, and feelings, use temporal words to signal event order,~~ and provide a sense of closure.

~~Production and Distribution of Writing~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~**W.K.4** (Begins in grade 3)~~	~~**W.1.4** (Begins in grade 3)~~	~~**W.2.4** (Begins in grade 3)~~
~~**W.K.5** With guidance and support from adults, respond to questions and suggestions from peers and add details to strengthen writing as needed.~~	~~**W.1.5** With guidance and support from adults, focus on a topic, respond to questions and suggestions from peers, and add details to strengthen writing as needed.~~	~~**W.2.5**~~ With ~~guidance and~~ support from adults and peers, ~~focus on a topic and~~ strengthen writing as needed by revising and editing.
~~**W.K.6** With guidance and support from adults, explore a variety of digital tools to produce and publish writing, including in collaboration with peers.~~	~~**W.1.6** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.~~	~~**W.2.6**~~ With ~~guidance and~~ support ~~from adults,~~ use ~~technology to produce and publish writing, (using~~ keyboarding skills to produce and publish writing.~~) as well as to interact and collaborate with others.~~

~~Research to Build and Present Knowledge~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~**W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).~~	~~**W.1.7** Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).~~	~~**W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).~~
~~**W.K.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.~~	~~**W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.~~	~~**W.2.8** Recall information from experiences or gather information from provided sources to answer a question.~~
W.K.9 (Begins in grade 4)	~~**W.1.9** (Begins in grade 4)~~	~~**W.2.9** (Begins in grade 4)~~

Range of Writing

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~**W.K.10** (Begins in grade 3)~~	~~**W.1.10** (Begins in grade 3)~~	~~**W.2.10** (Begins in grade 3)~~

Writing Standards 3-5

W

~~Text Types and Purposes~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~W.3.1~~ Write arguments that introduce the topic, express an opinion supported with facts, details, and ~~pieces on topics or texts, supporting a point of view with~~ reasons, and provide a concluding statement. ~~a. Introduce the topic or text they are writing about, state an opinion, and create an organizational structure that lists reasons.~~ ~~b. Provide reasons that support the opinion.~~ ~~c. Use linking words and phrases (e.g., because, therefore, since, for example) to connect opinion and reasons.~~ ~~Provide a concluding statement or section.~~	~~W.4.1~~ Write arguments that introduce the topic, express a clear opinion supported with facts, details, and reasons, and provide a concluding statement or section. ~~pieces on topics or texts, supporting a point of view with reasons and information.~~ ~~a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which related ideas are grouped to support the writer's purpose.~~ ~~b. Provide reasons that are supported by facts and details.~~ ~~c. Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition).~~ ~~d. Use precise language and domain-specific vocabulary to support the opinion piece.~~ ~~e.~~a. ~~Provide a concluding statement or section related to the opinion presented.~~	~~W.5.1~~ Write arguments that introduce the topic clearly; express a distinct opinion supported with adequate facts, ideas, and reasons that are logically grouped and provide a concluding sentence. ~~pieces on topics or texts, supporting a point of view with reasons and information.~~ ~~a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which ideas are logically grouped to support the writer's purpose.~~ ~~b. Provide logically ordered reasons that are supported by facts and details.~~ ~~c. Link opinion and reasons using words, phrases, and clauses (e.g., consequently, specifically).~~ ~~d. Use precise language and domain-specific vocabulary to support the opinion piece.~~ ~~e. Provide a concluding statement or section related to the opinion presented.~~
~~W.3.2~~ Write informative~~/explanatory~~ texts that introduce the ~~to examine a~~ topic, develop the focus with facts and details, and provide a concluding statement. ~~and convey ideas and information clearly.~~ ~~a. Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.~~ ~~b. Develop the topic with facts, definitions, and details.~~ ~~c. Use linking words and phrases (e.g., also, another, and, more, but) to connect ideas within categories of information.~~ ~~d.~~a. ~~Provide a concluding statement or section.~~	~~W.4.2~~ Write informational~~ive/explanatory~~ texts ~~to examine a~~that introduce the; develop the focus with facts, details or other information; and provide a concluding statement or section. ~~topic and convey ideas and information clearly.~~ ~~a. Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.~~ ~~b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.~~ ~~c. Link ideas within categories of information using words and phrases (e.g., another, for example, also, because).~~ ~~d. Use precise language and domain-specific vocabulary to inform about or explain the topic.~~ ~~e. Provide a concluding statement or section related to the information or explanation presented.~~	~~W.5.2~~ Write informational texts tht introduce the topic; develop the focus with relevant facts, details, and examples from multiple sources that are logically grouped, including headings to support the purpose; and provide a concluding sentence. ~~ve/explanatory texts to examine a topic and convey ideas and information clearly.~~ ~~a. Introduce a topic clearly, provide a general observation and focus, and group related information logically; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.~~ ~~b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.~~ ~~c. Link ideas within and across categories of information using words, phrases, and clauses (e.g., in contrast, especially).~~ ~~d. Use precise language and domain-specific vocabulary to inform about or explain the topic.~~ ~~e. Provide a concluding statement or section related to the information or explanation presented.~~

Writing Standards 3-5 W

~~Text Types and Purposes (continued)~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~W.3.3~~ Write personal or fictional stories that recount an event or experience, include details to develop the characters or event(s), and provide a sense of closure. ~~narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.~~ ~~W.3.4 Establish a situation and introduce a narrator and/or characters; organize an event sequence that unfolds naturally.~~ ~~W.3.5 Use dialogue and descriptions of actions, thoughts, and feelings to develop experiences and events or show the response of characters to situations.~~ ~~W.3.6 Use temporal words and phrases to signal event order.~~ ~~Provide a sense of closure.~~	~~W.4.3~~ Write personal or fictional narratives that organize the writing around a central problem, conflict, or experience; use descriptions or dialogue to develop the characters or event(s); and provide a sense of closure. ~~to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.~~ ~~a. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.~~ ~~b. Use dialogue and description to develop experiences and events or show the responses of characters to situations.~~ ~~c. Use a variety of transitional words and phrases to manage the sequence of events.~~ ~~d. Use concrete words and phrases and sensory details to convey experiences and events precisely.~~ ~~e. Provide a conclusion that follows from the narrated experiences or events.~~	~~W.5.3~~ Write personal or fictional narratives that establish a situation and narrator; organize around a central problem, conflict, o experience using descriptions, dialogue or pacing to develop the characters, event(s), or experience(s); and provide a conclusion that follows from the narrated events. ~~to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.~~ ~~a. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.~~ ~~b. Use narrative techniques, such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations.~~ ~~c. Use a variety of transitional words, phrases, and clauses to manage the sequence of events.~~ ~~d. Use concrete words and phrases and sensory details to convey experiences and events precisely.~~ ~~e. Provide a conclusion that follows from the narrated experiences or events.~~

~~Production and Distribution of Writing~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~W.3.4 With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1-3.)~~	~~W.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3.)~~	~~W.5.4~~ Produce clear and coherent organizational structures of multiple paragraphs in which facts and details are logically grouped and linking words and phrases connect details and ideas. ~~writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3.)~~
~~W.3.5~~ With ~~guidance and~~ support from adults and peers ~~and adults~~, develop and strengthen writing as needed by planning, revising, and editing. (Editing ~~for conventions~~ should demonstrate command of grade-level Grammar and Conventions~~Language standards 1-3 up to and including grade 3~~.)	~~W.4.5~~ With ~~guidance and~~ support from adults and peers ~~and adults,~~ develop and strengthen writing as needed by planning, revising, and editing. (Editing ~~for conventions~~ should demonstrate command of grade-level Grammar and Conventions) ~~Language standards 1-3 up to and including grade 4.)~~	~~W.5.5 With guidance and~~ support from adults and peers ~~and adults~~, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (Editing ~~for conventions~~ should demonstrate command of grade-level Grammar and Conventions) ~~- Language standards 1-3 up to and including grade 5.)~~
~~W.3.6 With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others; demonstrate sufficient command of~~ Use ~~-~~keyboarding skills to produce and publish writing. ~~type a minimum of one page in a single setting (e.g., 1-3 paragraphs).~~	~~W.4.6 With some guidance and support from adults, use technology, including the Internet,~~Use technology ~~-~~to produce and publish writing ~~as well as to interact and collaborate with others~~; demonstrate sufficient command of keyboarding skills. ~~-to type multi-paragraph text (e.g., 1-2 pages).~~	~~W.5.6 With some guidance and support from adults, use technology, including the Internet,~~ Use technology to produce and publish writing ~~as well as to interact and collaborate with others;~~ demonstratinge sufficient command of keyboarding skills. ~~-to type multi-paragraph text (e.g., 1-3 pages).~~

Writing Standards 3-5 W

~~Research to Build and Present Knowledge~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~W.3.7~~ Conduct short research tasks to take some action or share findings orally or in writing by gathering and recording information on a specific topic from reference texts or through interviews, and using text features and search tools (e.g., (keywords, sidebars, hyperlinks) to locate information efficiently. ~~projects that build knowledge about a topic.~~	~~W.4.7~~ Conduct short research tasks ~~projects~~ to take some action or share findings orally or in writing by identifying what information is needed to answer a research question, using text features and search tools to gather relevant information efficiently; and taking notes, categorizing that information, and providing a list of sources.~~that build knowledge through investigation of different aspects of a topic.~~	~~W.5.7~~ Conduct short research tasks to take some action or share findings orally o in writing by formulating research questions; gathering relevant and reliable information from both primary and secondary sources as appropriate; paraphrasing and quoting ideas and information; and respecting copyright guidelines for use of that information and any images. ~~projects that use several sources to build knowledge through investigation of different aspects of a topic.~~
~~W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.~~	~~W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.~~	~~W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.~~
~~W.3.9 (Begins in grade 4)~~	~~W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.~~ ~~a. Apply grade 4 Reading standards to literature (e.g., "Describe in depth a character, setting, or event in a story or drama, drawing on specific details in the text [e.g., a character's thoughts, words, or actions]").~~ ~~b.~~a. ~~Apply grade 4 Reading standards to informational texts (e.g., "Explain how an author uses reasons and evidence to support particular points in a text").~~	~~W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.~~ ~~a. Apply grade 5 Reading standards to literature (e.g., "Compare and contrast two or more characters, settings, or events in a story or drama, drawing on specific details in the text [e.g., how characters interact]").~~ ~~b. Apply grade 5 Reading standards to informational texts (e.g., "Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point[s]").~~

Range of Writing

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~W.3.10~~ Develop flexibility in w~~W~~riting bye routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others summaries, reflections, descriptions, letters, and poetry, etc.~~over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences~~.	~~W.4.10~~ Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others summaries, reflections, descriptions, letters, and poetry, etc. ~~Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.~~	~~W.5.10~~ Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others summaries, reflections, descriptions, critiques, letters, and poetry, etc.~~Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.~~

~~College and Career Readiness Anchor Standards for Speaking and Listening~~

~~The grades K-5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

~~Comprehension and Collaboration~~

~~**CCRA.SL.1** Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.~~

~~**CCRA.SL.2** Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.~~

~~**CCRA.SL.3** Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.~~

~~Presentation of Knowledge and Ideas~~

~~**CCRA.SL.4** Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.~~

~~**CCRA.SL.5** Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.~~

~~**CCRA.SL.6** Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.~~

~~**Note on range and content of student speaking and listening**~~

~~*To build a foundation for college and career readiness, students must have ample opportunities to take part in a variety of rich, structured conversations—as part of a whole class, in small groups, and with a partner. Being productive members of these conversations requires that students contribute accurate, relevant information; respond to and develop what others have said; make comparisons and contrasts; and analyze and synthesize a multitude of ideas in various domains.*~~

~~Speaking and Listening Standards K-2~~ ~~SL~~

~~The following standards for K-5 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications.~~ ~~*Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*~~

~~Comprehension and Collaboration~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~**SL.K.1**~~ ~~Participate~~ Engage in collaborative conversations about grade level topics and texts with peers by Following agreed-upon rules for discussions; and taking turns speaking through at least two exchanges ~~with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.~~ ~~a. Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking. about the topics and texts under discussion).~~ ~~b. Continue a conversation through multiple exchanges.~~	~~**SL.1.1**~~ ~~Participate~~ Engage in collaborative Engage in collaborative discussions about *grade-level topics and texts* with peers by listening to others closely, taking turns speaking through multiple exchanges, and asking questions to clear up any confusions. ~~conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.~~ ~~a. Follow agreed-upon rules for discussions (e.g., listening to others with care and speaking one at a time about the topics and texts under discussion).~~ ~~b. Build on others' talk in conversations by responding to the comments of others through multiple exchanges.~~ ~~c. Ask questions to clear up any confusion about the topics and texts under discussion.~~	~~**SL.2.1**~~ ~~Participate in~~Engage in collaborative discussions about *grade-level topics and texts* with peers by gaining the floor in respectful ways, listening to others closely and building on others' ideas, and asking for clarification and further explanation to ensure understanding. ~~conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.~~ ~~a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, and speaking one at a time about the topics and texts under discussion).~~ ~~b. Build on others' talk in conversations by linking their comments to the remarks of others.~~ ~~c. Ask for clarification and further explanation as needed about the topics and texts under discussion.~~
~~**SL.K.2**~~ With support, ~~C~~confirm understanding of a text read aloud or information presented orally ~~or through other media~~ by asking and answering questions. ~~about key details and requesting clarification if something is not understood.~~	~~**SL.1.2**~~ Ask and answer questions about key details in a text read aloud or information presented orally or through other media.	~~**SL.2.2**~~ Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.
~~**SL.K.3**~~ With support, ~~A~~ask and answer questions in order to seek help, get information, or clarify something that is not understood.	~~**SL.1.3**~~ Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.	~~**SL.2.3**~~ Ask and answer questions about what a speaker says in order to clarify ~~comprehension,~~by ~~-~~gathering additional ~~information, or~~information, or deepen understanding of a topic or issue.

~~Presentation of Knowledge and Ideas~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~**SL.K.4**~~ Describe familiar people, places, things, and events ~~and,~~ with ~~prompting and~~ support. ~~, provide additional detail.~~	~~**SL.1.4**~~ Describe people, ~~places,~~ things, and events with relevant details, expressing ideas and feelings clearly.	**SL.2.4** Tell a story or recount an experience with ~~appropriate facts and~~ relevant facts and~~,~~ descriptive details, speaking audibly in coherent sentences.
~~**SL.K.5** Add drawings or other visual displays to descriptions as desired to provide additional detail.~~	~~**SL.1.5** Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.~~	~~**SL.2.5** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.~~
~~**SL.K.6** Speak audibly and express thoughts, feelings, and ideas clearly.~~	~~**SL.1.6** Produce complete sentences when appropriate to task and situation. (See grade 1 Language standards 1 and 3 for specific expectations.)~~	~~**SL.2.6** Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 2 Language standards 1 and 3 for specific expectations.)~~

~~Speaking and Listening Standards 3-5~~ ~~SL~~

~~Comprehension and Collaboration~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~SL.3.1~~ Engage in ~~effectively in a range of~~ collaborative discussions about ~~(one-on-one, in groups, and teacher-led) with diverse partners on~~ grade- level~~3~~ -topics and texts, with peers by staying on topic, linking comments to the remarks of others, asking questions to check understanding of information being discussed;, and reviewing ideas ~~building on others' ideas and~~ expressed. ~~ing their own clearly.~~ ~~a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.~~ ~~b. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).~~ ~~c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.~~ ~~d.~~a. ~~Explain their own ideas and understanding in light of the discussion.~~	~~SL.4.1~~ Engage in ~~effectively in a range of~~ collaborative discussions about grade-level topics and texts with peers by carrying out assigned roles; making comments that build on and link to others' remarks; clarifying or following-up on information; and reviewing key ideas expressed and explaining one's understanding. ~~(one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.~~ ~~a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.~~ ~~b. Follow agreed-upon rules for discussions and carry out assigned roles.~~ ~~c. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.~~ ~~d. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.~~	~~SL.5.1~~ Engage in ~~effectively in a range of~~ collaborative discussions about grade-level topics and texts with peers carrying out assigned roles; making comments and posing and responding to questions that contribute to the discussion and elaborate on others' remarks; and reviewing key details expressed and drawing conclusions considering the discussion. ~~(one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.~~ ~~a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.~~ ~~b. Follow agreed-upon rules for discussions and carry out assigned roles.~~ ~~c. Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.~~ ~~d. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.~~
~~SL.3.2~~ Determine the main ideas and supporting details of a text read aloud or information presented in a variety of ~~diverse~~ media ~~and formats, including~~ (audio, visual~~ly~~, and quantitative). ~~ly, and orally.~~	~~SL.4.2~~ Paraphrase portions of a text read aloud or information presented in diverse media (audio, visual, quantitative). ~~and formats, including visually, quantitatively, and orally.~~	~~SL.5.2~~ Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.	~~SL.4.3~~ Identify the reasons and evidence a speaker provides to support particular points being made.	~~SL.5.3~~ Summarize the points a speaker makes and explain how each ~~claim~~ is supported by reasons and evidence.

~~Presentation of Knowledge and Ideas~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~SL.3.4~~ Report orally on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	~~SL.4.4~~ Report orally on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.	~~SL.5.4~~ Report orally on a topic or text or present an argument ~~opinion~~, sequencing ideas logically and using appropriate facts and relevant~~,~~ descriptive details to support main ideas or themes and~~;~~ speaking clearly at an understandable pace.
~~SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.~~	~~SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.~~	~~SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.~~

~~SL.3.6~~ Speak in complete sentences when appropriate to task and situation ~~in order~~ to provide requested detail or clarification. ~~(See grade 3 Language standards 1 and 3 for specific expectations.)~~	~~SL.4.6 Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation. (See grade 4 Language standard 1 for specific expectations.)~~	~~SL.5.6 Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation. (See grade 5 Language standards 1 and 3 for specific expectations.)~~

~~College and Career Readiness Anchor Standards for Language~~

~~The grades K-5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

~~Conventions of Standard English~~

~~**CCRA.L.1** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.~~

~~**CCRA.L.2** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.~~

~~Knowledge of Language~~

~~**CCRA.L.3** Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.~~

~~Vocabulary Acquisition and Use~~

~~**CCRA.L.4** Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.~~

~~**CCRA.L.5** Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.~~

~~**CCRA.L.6** Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.~~

~~Note on range and content of student language use~~

~~*To build a foundation for college and career readiness in language, students must gain control over many conventions of standard English grammar, usage, and mechanics as well as learn other ways to use language to convey meaning effectively. They must also be able to determine or clarify the meaning of grade-appropriate words encountered through listening, reading, and media use; come to appreciate that words have nonliteral meanings, shadings of meaning, and relationships to other words; and expand their vocabulary in the course of studying content. The inclusion of Language standards in their own strand should not be taken as an indication that skills related to conventions, effective language use, and vocabulary are unimportant to reading, writing, speaking, and listening; indeed, they are inseparable from such contexts.*~~

Language Standards K-2 L

~~The following standards for K-5 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* Beginning in grade 3, skills and understandings that are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking are marked with an asterisk (*). See the table on page 32 for a complete list and Appendix A for an example of how these skills develop in sophistication.~~

~~Conventions of Standard English~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~L.K.1~~ Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. ~~a.~~ ~~Print many upper- and lowercase letters.~~ ~~b.~~ ~~Use frequently occurring nouns and verbs.~~ ~~c.~~ Form regular plural nouns orally by adding /s/ or /es/ sound. ~~(e.g., dog, dogs; wish, wishes).~~ ~~d.~~ ~~Understand and~~ Uuse interrogatives to ask questions in full sentences ~~words (interrogatives)~~ (e.g., who, what, where, when, why, how). ~~e.~~ Use the most frequently occurring prepositions (e.g., to, from, in, out, on, off, for, of, by, with). ~~f.~~ Produce and expand complete sentences in shared language activities.	~~L.1.1~~ Demonstrate command of the conventions of ~~standard~~ English grammar and usage when writing and/or speaking. ~~a.~~ ~~Print all upper- and lowercase letters~~. ~~b. Use common, proper, and possessive nouns.~~ ~~c.~~ Match ~~Use~~ singular and plural nouns with matching verbs in simple ~~basic~~ sentences ~~(e.g., He hops; We hop).~~ ~~d.~~ Use personal, possessive, and indefinite pronouns (e.g., I, me, my; they, them, their; anyone, everything). ~~e. Use verbs to convey a sense of past, present, and future (e.g., Yesterday I walked home; Today I walk home; Tomorrow I will walk home).~~ ~~f.~~ Use frequently occurring adjectives. ~~g.~~ Use frequently occurring conjunctions to signal simple relationships. (e.g., and, but, or, so, because). ~~h. Use determiners (e.g., articles, demonstratives).~~ ~~i.~~ Use frequently occurring prepositions (e.g., ~~during, beyond, toward~~to, during, under, in, with, at). ~~j.~~ Produce and expand complete~~.~~ ~~simple and compound declarative, interrogative, imperative, and exclamatory~~ sentences in response to prompts.	~~L.2.1~~ Demonstrate command of the conventions of ~~standard~~ English grammar and usage when writing or speaking. ~~a. Use collective nouns (e.g., group).~~ ~~b.~~ Form and use regular frequently occurring irregular plural nouns (e.g., men, ~~feet, children~~, teeth, ~~mice,~~ fish). ~~c.~~ Use reflexive pronouns (~~e.g.,~~ e.g., yourself, herself)~~myself, ourselves~~). ~~d.~~ Form and use the past tense of frequently occurring irregular verbs (e.g., felt~~sat~~, told, went ~~hid, told~~). ~~e.~~ Use adjectives and adverbs, and choose between them depending on what is to be modified. ~~f.~~ Produce and~~,~~ expand~~, and rearrange~~ complete simple and compound sentences. ~~(e.g., The boy watched the movie; The little boy watched the movie; The action movie was watched by the little boy).~~
~~L.K.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.~~ ~~a. Capitalize the first word in a sentence and the pronoun I.~~ ~~b.~~ Recognize and name end punctuation. ~~c. Write a letter or letters for most consonant and short-vowel sounds (phonemes).~~ ~~d.~~ Spell ~~simple~~ words phonetically, drawing on knowledge of sound-letter relationships.	~~L.1.2~~ Demonstrate command of the conventions of ~~standard~~ English punctuation and capitalization, ~~punctuation, and spelling~~ when writing and reading aloud to create meaning~~.~~ ~~a. Capitalize dates and names of people.~~ ~~b. Use end punctuation for sentences.~~ ~~c.~~ Use commas in dates and to separate single words in a series. ~~d.~~ Use conventional spelling for words with common spelling patterns and for frequently occurring irregular words. ~~e.~~ Spell untaught words phonetically, drawing on phonemic awareness and spelling	**L.2.2** Demonstrate command of the conventions of ~~standard~~ English punctuation and capitalization, ~~punctuation~~, ~~and spelling~~ when writing and reading aloud. a. Capitalize holidays, ~~product~~ names, places.~~and geographic names.~~ ~~b.~~ ~~Use~~ commas in greetings and closings of letters. ~~c.~~ ~~Use an~~ apostrophes to form contractions and frequently occurring possessives. ~~d.~~ Generalize learned spelling patterns when writing words (e.g., cage → badge; boy → boil).

Language Standards K-2	conventions.	~~e.~~ Consult reference materials, including beginning dictionaries, as needed to check and correct spelling. **L**

Language Standards K-2 L

~~Knowledge of Language~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~L.K.3 (Begins in grade 2)~~	~~L.1.3 (Begins in grade 2)~~	~~L.2.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.~~ ~~a. Compare formal and informal uses of English.~~

~~Vocabulary Acquisition and Use~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~L.K.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on kindergarten reading and content. ~~a.~~ Identify new meanings for familiar words and apply them accurately (e.g., discovering the verb roll is also a noun). ~~knowing duck is a bird and learning the verb to duck).~~ ~~b. Use the most frequently occurring inflections and affixes (e.g., -ed, -s, re-, un-, pre-, -ful, -less) as a clue to the meaning of an unknown word.~~	~~L.1.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on ~~grade 1~~grade-level reading and content, choosing flexibly from an array of strategies. ~~a.~~ Use sentence-level context as a clue to the meaning of a word or phrase. ~~b.~~ Use frequently occurring affixes (e.g., re-, un- pre-, -ful, -less) as ~~a~~ clues to the nuance they add to known words. ~~e to the meaning of a word.~~ ~~c.~~ Identify frequently ~~occurring~~ encountered root words (e.g., help~~look~~) and use the roots as clues to the meaning of the full word.~~their inflectional forms~~ (~~e.g.,~~ e.g., helper, helpful) ~~looks, looked, looking~~).	~~L.2.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade-level ~~-2~~ reading and content, choosing flexibly from an array of strategies. ~~a.~~ Use sentence-level context as a clue to the meaning of a word or phrase. ~~b.~~ Determine the meaning of the new word formed when a known prefix is added to a known word (~~e.g.~~e.g. safe/unsafe, like/dislike~~, happy/unhappy, tell/retell~~) and suffixes (e.g., beauty/beautiful, light/lightness) are added to a known word. . ~~c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., addition, additional).~~ ~~d.~~ Use knowledge of the meaning of individual words to predict the meaning of compound words (e.g., ~~birdhouse,~~ backpack, backyard, flashlight, lighthouse, ~~housefly; bookshelf, notebook, bookmark~~). ~~e.~~ Use glossaries and beginning dictionaries, both print and digital, to determine or clarify the meaning of words and phrases.

Language Standards K-2

L

~~L.K.5~~ With ~~guidance and~~ support ~~from adults,~~ explore word relationships and nuances in word meanings. ~~a.~~ Sort common objects into categories (e.g., ~~shapes,~~ foods, sizes) to gain a sense of the concepts the categories represent. ~~b.~~ Demonstrate understanding of frequently occurring verbs and adjectives by relating them to their synonyms and ~~opposites (~~antonyms~~)~~. ~~c.~~ Identify real-life connections between words and their use (e.g., note places at school that are cozy~~olorful~~). ~~d.~~ Distinguish shades of meaning among verbs describing the ~~same~~ general action (e.g., walk, march, strut, prance). ~~by acting out the meanings.~~	~~L.1.5~~ With ~~guidance and~~ support ~~from adults, demonstrate understanding of~~ explore word relationships and nuances in word meanings. ~~a.~~ Sort words into categories (e.g., ~~colors, clothing~~tools, pets) and define those words by one or more key attributes (e.g., a *saw* is a tool that cuts; *a goldfish* is a pet that lives in water).~~to gain a sense of the concepts the categories represent.~~ ~~b. Define words by category and by one or more key attributes (e.g., a duck is a bird that swims; a tiger is a large cat with stripes).~~ ~~c. Identify real-life connections between words and their use (e.g., note places at home that are cozy).~~ ~~d.~~ Distinguish shades of meaning among verbs describing the same general action. ~~differing in manner~~ (e.g., ~~look, peek, glance, stare, glare, scowl~~walk, stroll, strut, prance) by acting out the meanings. ~~and adjectives differing in intensity (e.g., large, gigantic) by defining or choosing them or by acting out the meanings.~~	~~L.2.5~~ Determine how words and phrases provide meaning and nuance to texts ~~Demonstrate understanding of word relationships and nuances in word meanings.~~ ~~a.~~ Identify real-life connections between words and their use (e.g., ~~describe~~ describe weather that is freezing or windy~~foods that are spicy or juicy~~). ~~b.~~ Distinguish shades of meaning among closely related verbs (e.g., toss, throw, hurl) and closely related adjectives (e.g., ~~thin, slender, skinny, scrawny~~hot, sizzling, blazing).

Language Standards K-2 L

~~Vocabulary Acquisition and Use (continued)~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~L.K.6~~ With support, u~~U~~se words and phrases acquired through conversations, reading and listening ~~being read to, and responding~~ to texts.	~~L.1.6 Use words and phrases~~ With support as needed, acquire~~d~~ and use general academic and content-specific words gained through conversations, reading, and listening to texts. ~~through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., because).~~	~~L.2.6~~ Acquire and use general academic and content-specific words gained through conversations, and reading and listening to texts, including using adjectives and adverbs to describe situations with specificity (e.g., *When other kids are acting silly, that makes me feel giddy*). Use these words in discussions and writing. ~~Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using adjectives and adverbs to describe (e.g., When other kids are happy that makes me happy).~~

Language Standards 3-5

L

~~Conventions of Standard English~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~L.3.1~~ Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. ~~a. Explain the function of nouns, pronouns, verbs, adjectives, and adverbs in general and their functions in particular sentences.~~ ~~b.~~ Form and use regular and irregular plural nouns (e.g., fish and teeth). ~~c.~~ Use collective ~~abstract~~ nouns (e.g., family, crew, assembly ~~childhood~~) matched to plural verb forms. ~~d.~~ Form and use progressive and perfect ~~regular and irregular~~ verb tenses.~~s~~. ~~e.~~ Form and use the simple (e.g., I walked; I walk; I will walk) verb tenses. ~~f.~~ Ensure subject-verb and pronoun-antecedent agreement.* ~~g.~~ Form and use comparative and superlative adjectives and adverbs.~~, and choose between them depending on what is to be modified.~~ ~~h.~~ Use coordinating and subordinating conjunctions. ~~i. Produce simple, compound, and complex sentences.~~	~~L.4.1~~ Demonstrate command of the conventions of ~~standard~~ English grammar and usage when writing or speaking. ~~a.~~ Use relative pronouns ~~(who, whose, whom, which, that)~~ and relative adverbs. ~~(where, when, why).~~ ~~b. Form and use the progressive (e.g., I was walking; I am walking; I will be walking) verb tenses.~~ ~~c. Use modal auxiliaries (e.g., can, may, must) to convey various conditions.~~ ~~d.~~ Order adjectives within sentences according to conventional patterns. ~~(e.g., a small red bag rather than a red small bag).~~ ~~e.~~ Form and use prepositional phrases. ~~f.~~ Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.~~*~~ ~~g.~~ Correctly use frequently confused words (e.g., to, too, ~~two; there, their~~).~~*~~	~~L.5.1~~ Demonstrate command of the conventions of ~~standard~~ English grammar and usage when writing or speaking. ~~a. Explain the function of conjunctions, prepositions, and interjections in general and their function in particular sentences.~~ ~~b. Form and use the perfect (e.g., I had walked; I have walked; I will have walked) verb tenses.~~ ~~c. Use verb tense to convey various times, sequences, states, and conditions.~~ ~~d. Recognize and correct inappropriate shifts in verb tense.*~~ ~~e. Use correlative conjunctions (e.g., either/or, neither/nor).~~
~~L.3.2~~ Demonstrate command of the conventions of ~~standard~~ English capitalization and when writing and reading aloud to create meaning. ~~, punctuation, and spelling when writing.~~ ~~a.~~ Capitalize appropriate words in titles. ~~b.~~ ~~Use~~ C~~c~~ommas in addresses and dates. ~~c.~~ ~~Use c~~Commas and quotation marks in dialogue. Forming and us~~e~~ing possessives. ~~d.~~ Use conventional spelling for high-frequency and other studied words ~~and~~ for adding suffixes to base words ~~(e.g., sitting, smiled, cries, happiness)~~. ~~e.~~ Use spelling patterns and generalizations (e.g., word families, position-based spellings, syllable patterns, ending rules, meaningful word parts) ~~in~~ when producing and writing words. ~~f.~~ Consult reference materials~~, including beginning dictionaries, as needed~~ to check and correct spelling.	~~L.4.2~~ Demonstrate command of the conventions of ~~standard~~ English punctuation and capitalization, ~~punctuation, and spelling~~ when writing and reading aloud to create meaning. ~~a.~~ Use correct capitalization. ~~b.~~ ~~Use commas and~~ quotation marks to mark direct speech and quotations from a text. ~~c. Use a~~ C~~c~~ommas in a series ~~before a coordinating conjunction in a compound sentence.~~ ~~d.~~ ~~S~~Spell grade-appropriate words correctly, , including commonly confused words (e.g., there, their, they're). ~~consulting references as needed.~~	~~L.5.2~~ Demonstrate command of the conventions of ~~standard~~ English punctuation and capitalization~~, punctuation, and spelling~~ when writing and reading aloud to crate meaning. ~~a. Use punctuation to separate items in a series.*~~ ~~b.~~ ~~Use a~~ commas to separate an introductory element from the rest of the sentence. ~~c.~~ ~~Use a~~ commas before a coordinating conjunction. ~~to set off the words yes and no (e.g., Yes, thank you), to set off a tag question from the rest of the sentence (e.g., It's true, isn't it?), and to indicate direct address (e.g., Is that you, Steve?).~~ ~~d.~~ ~~Use~~ underlining, quotation marks, or italics to indicate titles of works. ~~e.~~ Spell grade-appropriate words correctly, ~~consulting references as needed.~~including commonly confused words (it's/its, affect/effect).

Language Standards 3-5 L

~~Knowledge of Language~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~L.3.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.~~ ~~a. Choose words and phrases for effect.*~~ ~~b. Recognize and observe differences between the conventions of spoken and written standard English~~.	~~L.4.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.~~ ~~a. Choose words and phrases to convey ideas precisely.*~~ ~~b. Choose punctuation for effect.*~~ ~~c. Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion).~~	~~L.5.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.~~ ~~a. Expand, combine, and reduce sentences for meaning, reader/listener interest, and style.~~ ~~b. Compare and contrast the varieties of English (e.g., dialects, registers) used in stories, dramas, or poems.~~

~~Vocabulary Acquisition and Use~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~L.3.4~~ Determine or clarify the meaning of unknown and multiple-meaning words~~ and phrases~~ based on grade-level ~~3~~ reading and content, choosing flexibly from a range of strategies. ~~a.~~ Use sentence-level context as a clue to the meaning of a word or phrase. ~~b.~~ Determine the meaning of the new word formed when ~~a~~ known affixes are~~is~~ added to a known word (e.g.,~~ ~~ expensive/inexpensive, lock/unlock, help/helpless, care/careless). ~~agreeable/disagreeable, comfortable/uncomfortable, care/careless, heat/preheat~~). ~~c.~~ Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., transport/portable~~company, companion~~). ~~d.~~ Use glossaries or beginning dictionaries, ~~both~~ print or ~~and~~ digital, to ~~determine or~~ clarify the precise meaning of key words and phrases.	~~L.4.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade-~~-4 reading~~level reading and content, choosing flexibly from a range of strategies. ~~a.~~ Use context (e.g., definitions, examples, or restatements in text) as ~~a~~ clues to the meaning of ~~a~~ words or phrase. ~~b.~~ Use ~~common, grade-appropriate Greek~~common Greek and Latin affixes and roots as clues to the meaning of a word (~~e.g.,~~e.g., thermometer, thermos, thermostat).~~ telegraph, photograph, autograph~~). ~~c.~~ Consult reference materials (e.g., dictionaries, glossaries, thesauruses), ~~both~~ print or~~and~~ digital, to find the pronunciation and ~~determine or~~ clarify the precise meaning of key words and phrases.	~~L.5.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade-level~~ 5~~ reading and content, choosing flexibly from a range of strategies. ~~a.~~ Use context (e.g., definitions, examples, or restatements in text) ~~cause/effect relationships and comparisons in text~~) as a clue to the meaning of a word or phrase. ~~b.~~ Use ~~common, grade-appropriate Greek~~common Greek and Latin affixes and roots as clues to the meaning of a word (e.g., biology, biography, biohazard~~photograph, photosynthesis~~). ~~c.~~ Consult reference materials (e.g., dictionaries, glossaries, thesauruses), ~~both~~ print or ~~and~~ digital, to find the pronunciation and ~~determine or~~ clarify the precise meaning of key words and phrases.
~~L.3.5~~ Demonstrate how ~~understanding of~~ words and phrases provide meaning and~~ relationships and~~ nuances to grade-level texts. ~~in word meanings.~~ ~~a.~~ Distinguish the literal and nonliteral meanings of words and phrases in context (e.g., take steps). ~~b. Identify real-life connections between words and their use (e.g., describe people who are friendly or helpful).~~ ~~c.~~ Distinguish shades of meaning among grade-appropriate, related words that describe states of mind or degrees of certainty (e.g., knew,	~~L.4.5~~ Demonstrate how words and phrases provide meaning and ~~understanding of figurative language, word relationships, and nuances~~ nuance to grade-level texts. in word meanings. ~~a. Explain the meaning of simple similes and metaphors (e.g., as pretty as a picture) in context.~~ ~~b. Recognize and explain the meaning of common idioms, adages, and proverbs.~~ ~~c. Demonstrate understanding of words by relating them to their opposites (antonyms) and to words with similar but not identical meanings (synonyms).~~	~~L.5.5~~ Demonstrate how words and phrases provide meaning and nuance to grade-level texts. ~~understanding of figurative language, word relationships, and nuances in word meanings.~~ ~~a.~~ Recognize and explain ~~Interpret~~ figurative language, including similes and metaphors, in context. ~~b.~~ Recognize and explain the meaning of common idioms, adages, and proverbs. ~~c. Use the relationship between particular words (e.g., synonyms, antonyms, homographs) to better understand each of the words.~~

believed, suspected, heard, wondered).		

Language Standards 3-5

L

Language Standards 3-5 L

~~Vocabulary Acquisition and Use (continued)~~

Grade 3 Students:	Grade 4 Students:	Grade 5 Students:
~~L.3.6~~ Acquire and use ~~accurately grade-appropriate conversational,~~ general academic, and content ~~domain~~-specific words and phrases occurring in grade-level reading and content, , including those that signal spatial and temporal relationships (e.g., She stood behind the doo before she entered the room). Use these words in discussion and writing. ~~After dinner that night we went looking for them~~).	~~L.4.6~~ Acquire and use accurately ~~grade-appropriate~~ general academic and ~~domain~~content-specific words and phrases occurring in grade-level reading and content, including those that signal precise actions~~, emotions~~, or states of being (e.g., frustrated, puzzled, ~~quizzed, whined~~, stammered) and vocabulary essential ~~that are basic~~ to a particular topic (e.g., heroes, villains, quest, fate when discussing myths) ~~wildlife, conservation, and endangered when discussing animal preservation~~).Use these words in discussion and writing.	~~L.5.6~~ Acquire and use accurately ~~grade-appropriate~~ general academic and content ~~domain~~-specific words and phrases occurring in grade-level reading and content, including those that signal contrast, addition, connection, and other logical relationships (e.g~~., however, although, nevertheless, similarly, moreover, in addition~~ therefore, meanwhile, on the other hand). Use these word sin discussions and writing.

~~Language Progressive Skills, by Grade~~

~~The following skills, marked with an asterisk (*) in Language standards 1-3, are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking.~~

~~Standards~~	~~Grades~~
~~**L.3.1.f** Ensure subject-verb and pronoun-antecedent agreement.~~	~~3-12~~
~~**L.3.3.a** Choose words and phrases for effect.~~	~~3-12~~
~~**L.4.1.f** Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.~~	~~4-12~~
~~**L.4.1.g** Correctly use frequently confused words (e.g., to, too, two; there, their).~~	~~4-12~~
~~**L.4.3.a** Choose words and phrases to convey ideas precisely.*~~	~~4-6~~
~~**L.4.3.b** Choose punctuation for effect.~~	~~4-12~~
~~**L.5.1.d** Recognize and correct inappropriate shifts in verb tense.~~	~~5-12~~
~~**L.5.2.a** Use punctuation to separate items in a series.†~~	~~5-8~~
~~**L.6.1.c** Recognize and correct inappropriate shifts in pronoun number and person.~~	~~6-12~~
~~**L.6.1.d** Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).~~	~~6-12~~
~~**L.6.1.e** Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.~~	~~6-12~~
~~**L.6.2.a** Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.~~	~~6-12~~
~~**L.6.3.a** Vary sentence patterns for meaning, reader/listener interest, and style.‡~~	~~6-10~~
~~**L.6.3.b** Maintain consistency in style and tone.~~	~~6-12~~
~~**L.7.1.c** Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.~~	~~7-12~~
~~**L.7.3.a** Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.~~	~~7-12~~
~~**L.8.1.d** Recognize and correct inappropriate shifts in verb voice and mood.~~	~~8-12~~
~~**L.9-10.1.a** Use parallel structure.~~	~~9-12~~

~~*Subsumed by L.7.3.a~~
~~†Subsumed by L.9-10.1.a~~
~~‡Subsumed by L.11-12.3.a~~

~~Standard 10: Range, Quality, and Complexity of Student Reading K-5~~

Measuring Text Complexity: Three Factors

~~**Qualitative evaluation of the text:** Levels of meaning, structure, language conventionality and clarity, and knowledge demands~~

~~**Quantitative evaluation of the text:** Readability measures and other scores of text complexity~~

~~**Matching reader to text and task:** Reader variables (such as motivation, knowledge, and experiences) and task variables (such as purpose and the complexity generated by the task assigned and the questions posed)~~

~~**Note:** More detailed information on text complexity and how it is measured is contained in Appendix A.~~

Range of Text Types for K-5

~~Students in K-5 apply the Reading standards to the following range of text types, with texts selected from a broad range of cultures and periods.~~

~~**Literature**~~

- ~~**Stories:** *Includes children's adventure stories, folktales, legends, fables, fantasy, realistic fiction, and myth*~~
- ~~**Dramas:** *Includes staged dialogue and brief familiar scenes*~~
- ~~**Poetry:** *Includes nursery rhymes and the subgenres of the narrative poem, limerick, and free verse poem*~~

~~**Informational Text**~~

- ~~**Literary Nonfiction and Historical, Scientific, and Technical Texts:** *Includes biographies and autobiographies; books about history, social studies, science, and the arts; technical texts, including directions, forms, and information displayed in graphs, charts, or maps; and digital sources on a range of topics*~~

~~Texts Illustrating the Complexity, Quality, and Range of Student Reading K-5~~

~~Grade Level~~	~~Literature: Stories, Drama, Poetry~~	~~Informational Texts: Literary Nonfiction and Historical, Scientific, and Technical~~
~~K*~~	~~*Over in the Meadow* by John Langstaff (traditional) (c1800)‡~~ ~~*A Boy, a Dog, and a Frog* by Mercer Mayer (1967)~~ ~~*Pancakes for Breakfast* by Tomie DePaola (1978)~~ ~~*A Story, a Story* by Gail E. Haley (1970)‡~~ ~~*Kitten's First Full Moon* by Kevin Henkes (2004)‡~~	~~*My Five Senses* by Aliki (1962)‡~~ ~~*Truck* by Donald Crews (1980)~~ ~~*I Read Signs* by Tana Hoban (1987)~~ ~~*What Do You Do With a Tail Like This?* by Steve Jenkins and Robin Page (2003)‡~~ ~~*Amazing Whales!* by Sarah L. Thomson (2005)‡~~
~~1*~~	~~"Mix a Pancake" by Christina G. Rossetti (1893)‡~~ ~~*Mr. Popper's Penguins* by Richard Atwater (1938)‡~~ ~~*Little Bear* by Else Holmelund Minarik, illustrated by Maurice Sendak (1957)‡~~ ~~*Frog and Toad Together* by Arnold Lobel (1971)‡~~ ~~*Hi! Fly Guy* by Tedd Arnold (2006)~~	~~*A Tree Is a Plant* by Clyde Robert Bulla, illustrated by Stacey Schuett (1960)‡~~ ~~*Starfish* by Edith Thacher Hurd (1962)~~ ~~*Follow the Water from Brook to Ocean* by Arthur Dorros (1991)‡~~ ~~*From Seed to Pumpkin* by Wendy Pfeffer, illustrated by James Graham Hale (2004)‡~~ ~~*How People Learned to Fly* by Fran Hodgkins and True Kelley (2007)‡~~
~~2-3~~	~~"Who Has Seen the Wind?" by Christina G. Rossetti (1893)~~ ~~*Charlotte's Web* by E. B. White (1952)‡~~ ~~*Sarah, Plain and Tall* by Patricia MacLachlan (1985)~~ ~~*Tops and Bottoms* by Janet Stevens (1995)~~ ~~*Poppleton in Winter* by Cynthia Rylant, illustrated by Mark Teague (2001)~~	~~*A Medieval Feast* by Aliki (1983)~~ ~~*From Seed to Plant* by Gail Gibbons (1991)~~ ~~*A Drop of Water: A Book of Science and Wonder* by Walter Wick (1997)~~ ~~*Moonshot: The Flight of Apollo 11* by Brian Floca (2009)~~
~~4-5~~	~~*Alice's Adventures in Wonderland* by Lewis Carroll (1865)~~ ~~"Casey at the Bat" by Ernest Lawrence Thayer (1888)~~ ~~*The Black Stallion* by Walter Farley (1941)~~ ~~"Zlateh the Goat" by Isaac Bashevis Singer (1984)~~ ~~*Where the Mountain Meets the Moon* by Grade Lin (2009)~~	~~*Discovering Mars: The Amazing Story of the Red Planet* by Melvin Berger (1992)~~ ~~*Hurricanes: Earth's Mightiest Storms* by Patricia Lauber (1996)~~ ~~*A History of US* by Joy Hakim (2005)~~ ~~*Horses* by Seymour Simon (2006)~~ ~~*Quest for the Tree Kangaroo: An Expedition to the Cloud Forest of New Guinea* by Sy Montgomery (2006)~~

~~**Note:** Given space limitations, the illustrative texts listed above are *meant only to show individual titles that are representative of a wide range of topics and genres.* (See Appendix B for excerpts of these and other texts illustrative of K-5 text complexity, quality, and range.) At a curricular or instructional level, within and across grade levels, texts need to be selected around topics or themes that generate knowledge and allow students to study those topics or themes in depth. On the next page is an example of progressions of texts building knowledge across grade levels.~~

~~*****Children at the kindergarten and grade 1 levels should be expected to read texts independently that have been specifically written to correlate to their reading level and their word knowledge. Many of the titles listed above are meant to supplement carefully structured independent reading with books to read along with a teacher or that are read aloud to students to build knowledge and cultivate a joy in reading.~~

~~‡Read-aloud~~
~~‡Read-along~~

~~Staying on Topic Within a Grade and Across Grades~~

~~How to Build Knowledge Systematically in English Language Arts K-5~~

~~Building knowledge systematically in English language arts is like giving children various pieces of a puzzle in each grade that, over time, will form one big picture. At a curricular or instructional level, texts—within and across grade levels—need to be selected around topics or themes that systematically develop the knowledge base of students. Within a grade level, there should be an adequate number of titles on a single topic that would allow children to study that topic for a sustained period. The knowledge children have learned about particular topics in early grade levels should then be expanded and developed in subsequent grade levels to ensure an increasingly deeper understanding of these topics. Children in the upper elementary grades will generally be expected to read these texts independently and reflect on them in writing. However, children in the early grades (particularly K-2) should participate in rich, structured conversations with an adult in response to the written texts that are read aloud, orally comparing and contrasting as well as analyzing and synthesizing, in the manner called for by the Standards.~~

~~Preparation for reading complex informational texts should begin at the very earliest elementary school grades. *What follows is one example that uses domain-specific nonfiction titles across grade levels to illustrate how curriculum designers and classroom teachers can infuse the English language arts block with rich, age-appropriate content knowledge and vocabulary in history/social studies, science, and the arts.* Having students listen to informational read-alouds in the early grades helps lay the necessary foundation for students' reading and understanding of increasingly complex texts on their own in subsequent grades.~~

~~Exemplar Texts on a Topic~~

~~**Topic**~~	~~**Kindergarten**~~	~~**Grade 1**~~	~~**Grades 2-3**~~	~~**Grades 4-5**~~
~~**The Human Body** Students can begin learning about the human body starting in kindergarten~~ ~~and then review and extend their learning during each subsequent grade.~~	~~**The five senses and associated body parts**~~ • ~~*y Five Senses* by Aliki (1989)~~ • ~~*earing* by Maria Rius (1985)~~ • ~~*ight* by Maria Rius (1985)~~ • ~~*mell* by Maria Rius (1985)~~ • ~~*aste* by Maria Rius (1985)~~ • ~~*ouch* by Maria Rius (1985) **Taking care of your body: Overview (hygiene, diet, exercise, rest)**~~ • ~~*y Amazing Body: A First Look at Health & Fitness* by Pat Thomas (2001)~~ • ~~*et Up and Go!* by Nancy Carlson (2008)~~ • ~~*o Wash Up* by Doering Tourville (2008)~~ • ~~*leep* by Paul Showers (1997)~~ •	~~**Introduction to the systems of the human body and associated body parts**~~ • ~~*nder Your Skin: Your Amazing Body* by Mick Manning (2007)~~ • ~~*e and My Amazing Body* by Joan Sweeney (1999)~~ • ~~*he Human Body* by Gallimard Jeunesse (2007)~~ • ~~*he Busy Body Book* by Lizzy Rockwell (2008)~~ • ~~*irst Encyclopedia of the Human Body* by Fiona Chandler (2004)~~ ~~**Taking care of your body: Germs, diseases, and preventing illness**~~ • ~~*erms Make Me Sick* by Marilyn Berger (1995)~~ • ~~*iny Life on Your Body* by Christine Taylor-Butler (2005)~~ • ~~*erm Stories* by Arthur Kornberg (2007)~~	~~**Digestive and excretory systems**~~ • ~~*hat Happens to a Hamburger* by Paul Showers (1985)~~ • ~~*he Digestive System* by Christine Taylor-Butler (2008)~~ • ~~*he Digestive System* by Rebecca L. Johnson (2006)~~ • ~~*he Digestive System* by Kristin Petrie (2007)~~ ~~**Taking care of your body: Healthy eating and nutrition**~~ • ~~*ood Enough to Eat* by Lizzy Rockwell (1999)~~ • ~~*howdown at the Food Pyramid* by Rex Barron (2004)~~ ~~**Muscular, skeletal, and nervous systems**~~ • ~~*he Mighty Muscular and Skeletal Systems* Crabtree Publishing (2009)~~ • ~~*uscles* by Seymour Simon (1998)~~ •	~~**Circulatory system**~~ • ~~*he Heart* by Seymour Simon (2006)~~ • ~~*he Heart and Circulation* by Carol Ballard (2005)~~ • ~~*he Circulatory System* by Kristin Petrie (2007)~~ • ~~*he Amazing Circulatory System* by John Burstein (2009)~~ ~~**Respiratory system**~~ • ~~*he Lungs* by Seymour Simon (2007)~~ • ~~*he Respiratory System* by Susan Glass (2004)~~ • ~~*he Respiratory System* by Kristin Petrie (2007)~~ • ~~*he Remarkable Respiratory System*~~ ~~by John Burstein (2009)~~ ~~**Endocrine system**~~ •

	~~*uel the Body* by Doering Tourville (2008)~~	~~*ll About Scabs* by Genichiro Yagu (1998)~~	~~*ones* by Seymour Simon (1998)~~ ~~*he Astounding Nervous System*~~ ~~Crabtree Publishing (2009)~~ ~~*he Nervous System* by Joelle Riley (2004)~~	~~*he Endocrine System* by Rebecca Olien (2006)~~ ~~*he Exciting Endocrine System* by John Burstein (2009)~~

Idaho Content Standards

English Language Arts/Literacy Handwriting:

~~K-6~~K-5 Section

~~Handwriting Standards K-6~~ ~~HW~~

~~Writing Components: Acquire Handwriting Skills for Print Handwriting~~

Kindergarteners:	Grade 1 Students:	Grade 2 Students:
~~HW.K.1~~ ~~Write~~ Print all upper and lowercase letters of the alphabet. ~~a.~~ Write left to right, top to bottom, with appropriate spaces between words.	~~HW.1.1~~ Print legibly and space words appropriately when writing ~~.~~ a complete sentence. ~~a. Write a complete sentence with words spaced appropriately.~~	~~HW.2.1~~ ~~Print~~ Form letters correctly with functional speed. Space words and sentences properly so that writing can be read easily by another person. ~~and maintain legibility~~.

~~Writing Components: Acquire Handwriting Skills for Cursive Handwriting~~

Grade 3 Students:	Grade 4 Students:
~~HW.3.1~~ Write legibly in cursive leaving space between letters in a word, in a sentence, and at the edges of the paper. ~~.~~	~~HW.4.1~~ Write legibly and fluently ~~and legibly~~ in cursive by hand, forming letters and words that can be easily read by others. .

~~Writing Components: Acquire Handwriting Skills for Print and Cursive Handwriting~~

Grade 5 Students:	Grade 6 Students:
~~HW.5.1~~ Write in cursive legibly and fluently by hand with a consistent form and recognizable signature. ~~fluently and legibly in print or cursive.~~	~~HW.6.1 Write fluently and legibly in print or cursive.~~

Idaho Content Standards

English Language Arts/Literacy:

6-12 ~~Section~~

~~College and Career Readiness Anchor Standards for Reading~~

~~The grades 6-12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

~~Key Ideas and Details~~

~~**CCRA.R.1** Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.~~

~~**CCRA.R.2** Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.~~

~~**CCRA.R.3** Analyze how and why individuals, events, or ideas develop and interact over the course of a text.~~

~~Craft and Structure~~

~~**CCRA.R.4** Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.~~

~~**CCRA.R.5** Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.~~

~~**CCRA.R.6** Assess how point of view or purpose shapes the content and style of a text.~~

~~Integration of Knowledge and Ideas~~

~~**CCRA.R.7** Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.*~~

~~**CCRA.R.8** Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.~~

~~**CCRA.R.9** Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.~~

~~Range of Reading and Level of Text Complexity~~

~~**CCRA.R.10** Read and comprehend complex literary and informational texts independently and proficiently.~~

~~**Please see "Research to Build and Present Knowledge" in Writing and "Comprehension and Collaboration" in Speaking and Listening for additional standards relevant to gathering, assessing, and applying information from print and digital sources.*~~

~~Note on range and content of student reading~~

~~*To become college and career ready, students must grapple with works of exceptional craft and thought whose range extends across genres, cultures, and centuries. Such works offer profound insights into the human condition and serve as models for students' own thinking and writing. Along with high-quality contemporary works, these texts should be chosen from among seminal U.S. documents, the classics of American literature, and the timeless dramas of Shakespeare. Through wide and deep reading of literature and literary nonfiction of steadily increasing sophistication, students gain a reservoir of literary and cultural knowledge, references, and images; the ability to evaluate intricate arguments; and the capacity to surmount the challenges posed by complex texts.*~~

Reading Standards for Literature 6-8 RL

~~The following standards offer a focus for instruction each year and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*~~

~~Key Ideas and Details~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~RL.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text~~.	~~RL.7.1~~ Cite ~~several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.~~	~~RL.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.~~
~~RL.6.2~~ Explain stated or implied ~~Determine a~~ themes ~~or central idea of a~~ texts, including how they are developed using specific ~~and how it is conveyed through particular~~ details~~;~~ from texts. ~~provide a summary of the text distinct from personal opinions or judgments.~~	~~RL.7.2 Determine a~~ Explain stated or implied themes, ~~or central idea of a text and~~ analyzing their~~e its~~ development over the course of the texts; provide an objective summaries~~y~~ of the literary texts.	~~RL.8.2 Determine a~~ Explain stated or implied themes ~~or central idea of a text and~~ analyzing their ~~e its~~ development over the course of the texts~~, including its~~ and the relationship ~~to the~~ characters, setting, and plot of those themes~~; provide an objective summary of the text.~~
~~RL.6.3~~ Describe how ~~a particular story's or drama's plot unfolds in a series of episodes as well as how the~~ characters respond or change as the plot moves toward a resolution.	~~RL.7.3~~ ~~Analyze~~Explain how particular elements of a stories~~y~~ or dramas interact, ~~(e.g.,~~ including how setting shapes the characters or plot~~)~~.	~~RL.8.3~~ Analyze how characters are revealed through particular lines of dialogue or incidents in literary texts. ~~a story or drama propel the action, reveal aspects of a character, or provoke a decision.~~

~~Craft and Structure~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~RL.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone~~.	~~RL.7.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.~~	~~RL.8.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.~~
~~RL.6.5~~ ~~Analyze~~ Describe how a particular sentence, chapter, scene, or stanza fits into the overall structure of ~~a~~ texts and contributes to the development of the theme, setting, or plot.	~~RL.7.5 Analyze how a drama's or poem's form or structure (e.g., soliloquy, sonnet) contributes to its meaning.~~	~~RL.8.5 Compare and contrast the~~ Analyze how authors structure ~~of two or more~~ texts to advance a plot, explaining how each event gives rise to the next or foreshadows a future event. ~~and analyze how the differing structure of each text contributes to its meaning and style.~~
~~RL.6.6~~ Explain how ~~an~~ authors develops the point of view of the narrator or speaker in a text.	~~RL.7.6 Analyze~~ Explain how ~~an~~ authors develops and contrasts the points of view of different characters or narrators in ~~a~~ texts.	~~RL.8.6~~ Analyze how differences in the points of view of the characters and the audience or reader created with dramatic irony result in ~~(e.g., created through the use of dramatic irony) create such~~ effects as suspense or humor.

~~Integration of Knowledge and Ideas~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~RL.6.7 Compare and contrast the experience of reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text, including contrasting what they "see" and "hear" when reading the text to what they perceive when they listen or watch.~~	~~RL.7.7~~ Compare and contrast structures of two or more stories, poems, and plays and~~a written story, drama, or poem to its audio, filmed, staged, or multimedia version,~~ analyzing how the differing structure of each literary text contributes to meaning and style. ~~the effects of techniques unique to each medium (e.g., lighting, sound, color, or camera focus and angles in a film).~~	~~RL.8.7 Analyze the extent to which a filmed or live production of a story or drama stays faithful to or departs from the text or script, evaluating the choices made by the director or actors.~~

Reading Standards for Literature 6-8 RL

~~RL.6.8 (Not applicable to literature)~~	~~RL.7.8 (Not applicable to literature)~~	~~RL.8.8 (Not applicable to literature)~~
~~RL.6.9~~ Compare and contrast texts in different forms or genres (e.g., stories and poems; historical novels and fantasy stories) in terms of their approaches to similar themes and topics.	~~RL.7.9~~ Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history.	~~RL.8.9~~ Relate ~~Analyze how a modern work of fiction draws on~~ themes, patterns of events, or character types from myths, traditional stories, or religious works to contemporary stories, poems, or dramas. ~~(e.g., the Bible), including describing how the material is rendered new~~.

Reading Standards for Literature 6-8 RL

~~Range of Reading and Level of Text Complexity~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~**RL.6.10** By the end of the year,~~ Independently and proficiently read and comprehend texts representing a balance of genres, cultures, perspectives, and that exhibit complexity at the lower end of the grades 6-8 band. ~~literature, including stories, dramas, and poems, in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.~~	~~**RL.7.10** By the end of the year,~~ Independently and proficiently read and comprehend texts representing a balance of genres, cultures, perspectives, and that exhibit complexity at the midrange of the grades 6-8 band. ~~literature, including stories, dramas, and poems, in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.~~	~~**RL.8.10** By the end of the year,~~ Independently and proficiently read and comprehend texts representing a balance of genres, cultures, perspectives, and that exhibit complexity at the higher end of the grades 6-8 band. ~~literature, including stories, dramas, and poems, at the high end of grades 6-8 text complexity band independently and proficiently.~~

Reading Standards for Informational Text 6-8 RI

~~Key Ideas and Details~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~RI.6.1 Cite textual~~ Draw several pieces of ~~-~~evidence from grade-level texts to support claims and ~~analysis of what the text says explicitly as well as~~ inferences, including quoting and paraphrasing from texts accurately. ~~drawn from the text.~~	~~RI.7.1 Cite~~ Draw several pieces of ~~textual~~ evidence from grade-level texts to support claims and inferences, including quoting or paraphrasing from texts accurately and tracing where in texts relevant evidence is located. ~~analysis of what the text says explicitly as well as inferences drawn from the text.~~	~~RI.8.1 Cite the~~ Draw several pieces of ~~textua~~l evidence from grade-level texts that ~~most~~ strongly supports both what is said~~an analysis of what the text says~~ explicitly and what is implied, including quoting, and paraphrasing from relevant sections and accurately citing textual references. ~~as well as inferences drawn from the text.~~
~~RI.6.2 Determine a~~ Explain stated or implied central ideas from ~~of a~~ texts, including how they are developed using specific details from the text; ~~and how it is conveyed through particular details;~~ provide a summary of the texts distinct from personal opinions. ~~or judgments.~~	~~RI.7.2~~ ~~Determine two or more~~ Explain stated or implied central ideas of ~~in a~~ texts, ~~and~~ analyzing e their development over the course of ~~the~~ texts; provide an objective summary of ~~the~~ texts.	~~RI.8.2 Determine a~~ Explain state or implied central ideas of ~~a~~ texts and analyzinge their ~~its~~ development over the course of ~~the~~ texts, including the ~~its~~ relationship of individuals, ~~to supporting~~ ideas, or events to the central ideas; provide ~~an~~ objective ~~summary of~~summaries of ~~the~~ texts.
~~RI.6.3 Analyze~~ Explain in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a texts ~~(e.g.,~~ through examples or anecdotes~~)~~.	~~RI.7.3~~ Analyze the relationships or interactions between individuals, events, and ideas in ~~a~~ texts (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).	~~RI.8.3~~ Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).

~~Craft and Structure~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.~~	~~RI.7.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.~~	~~RI.8.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.~~
~~RI.6.5 Analyze how a particular~~ Explain how a specific sentence, paragraph, chapter, or section fits into the overall structure of a text and contributes to the development of the ideas.	~~RI.7.5 Analyze~~ Compare and contrast the structure of two or more texts and analyze how the differing structure of each text contributes to its meaning and ~~an author uses to organize a text, including how the major sections contribute to the whole and to the~~ development of the ideas.	~~RI.8.5~~ Analyze ~~in detail~~ the structure elements ~~of a specific paragraph in~~ a text, including the role of specific ~~particular~~ sentences, paragraphs, and text features ~~-~~in developing and refining a key concepts.
~~RI.6.6 Determine an author's point of view or purpose in a text and explain how it is conveyed in the text.~~	~~RI.7.6 Determine an author's point of view or purpose in a text and analyze how the author distinguishes his or her position from that of others.~~	~~RI.8.6 Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.~~

~~Integration of Knowledge and Ideas~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.~~	~~RI.7.7 Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).~~	~~RI.8.7 Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.~~
~~RI.6.8~~ Trace ~~and evaluate~~ the argument and specific claims in ~~a~~ texts, distinguishing claims that are supported by ~~reasons and~~ evidence from claims that are not.	~~RI.7.8~~ Trace ~~and evaluate~~ the argument that ~~and~~ specific claims in ~~a~~ texts~~,~~ and assesses~~ing~~ whether the ~~reasoning is sound and the~~ evidence is ~~relevant and~~ sufficient to support the claims.	~~RI.8.8 Delineate and evaluate~~ Trace the argument and specific claims in ~~a~~ texts ~~,~~and assesses~~ing~~ whether the all ~~reasoning is sound and~~ the evidence is relevant and whether ~~sufficient; recognize when~~ irrelevant evidence was ~~is~~ introduced.

Reading Standards for Informational Text 6-8		RI
~~RI.6.9~~ Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).	~~RI.7.9~~ ~~Analyze~~ Compare and contrast how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.	~~RI.8.9~~ Analyze ~~a~~ cases in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.

Reading Standards for Informational Text 6-8 RI

~~**Range of Reading and Level of Text Complexity**~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~**RI.6.10** By the end of the year, read and comprehend literary nonfiction in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.~~	~~**RI.7.10** By the end of the year, read and comprehend literary nonfiction in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.~~	~~**RI.8.10** By the end of the year, read and comprehend literary nonfiction at the high end of the grades 6-8 text complexity band independently and proficiently.~~

~~College and Career Readiness Anchor Standards for Writing~~

~~The grades 6-12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

Text Types and Purposes*

~~**CCRA.W.1** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.~~

~~**CCRA.W.2** Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.~~

~~**CCRA.W.3** Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.~~

Production and Distribution of Writing

~~**CCRA.W.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.~~

~~**CCRA.W.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.~~

~~**CCRA.W.6** Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.~~

Research to Build and Present Knowledge

~~**CCRA.W.7** Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.~~

~~**CCRA.W.8** Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.~~

~~**CCRA.W.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.~~

Range of Writing

~~**CCRA.W.10** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.~~

~~**These broad types of writing include many subgenres. See Appendix A for definitions of key writing types.*~~

~~Note on range and content of student writing~~

~~*For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college- and career-ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to know how to combine elements of different kinds of writing—for example, to use narrative strategies within argument and explanation within narrative—to produce complex and nuanced writing. They need to be able to use technology strategically when creating, refining, and collaborating on writing. They have to become adept at gathering information, evaluating sources, and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have the flexibility, concentration, and fluency to produce high-quality first-draft text under a tight deadline as well as the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it.*~~

Writing Standards 6-8 W

~~The following standards for grades 6-12 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, from vocabulary and syntax to the development and organization of ideas, and they should address increasingly demanding content and sources.~~ ~~*Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*~~ ~~The expected growth in student writing ability is reflected both in the standards themselves and in the collection of annotated student writing samples in Appendix C.~~

~~Text Types and Purposes~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~W.6.1~~ Write arguments that introduce and support a distinct point of view with relevant claims, evidence and reasoning; demonstrate an understanding of the topic; and provide a concluding section that follows from the argument presented.~~to support claims with clear reasons and relevant evidence.~~ ~~a. Introduce claim(s) and organize the reasons and evidence clearly.~~ ~~b. Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.~~ ~~c. Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons.~~ ~~d. Use precise language and domain-specific vocabulary to support the argument.~~ ~~e. Establish and maintain a formal style. Provide a concluding statement or section that follows from the argument presented.~~	~~W.7.1~~ Write arguments that introduce and support a well-defined point of view with appropriate claims, relevant evidence and clear reasoning, demonstrate a keen understanding of the topic or text, and provide a concluding section that follows from the argument presented.~~to support claims with clear reasons and relevant evidence.~~ ~~a. Introduce claim(s), acknowledge alternate or opposing claims, and organize the reasons and evidence logically.~~ ~~b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.~~ ~~c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence.~~ ~~d. Use precise language and domain-specific vocabulary to support the argument.~~ ~~e. Establish and maintain a formal style.~~ ~~f. Provide a concluding statement or section that follows from and supports the argument presented.~~	~~W.8.1~~ Write arguments or make claims that support well-defined points of view effectively with relevant evidence and clear reasoning in ways that logically advance the claim(s) made; demonstrate a nuanced understanding of the topic; and provide a concluding section that follows from and supports the argument presented. ~~to support claims with clear reasons and relevant evidence.~~ ~~a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.~~ ~~b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.~~ ~~c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.~~ ~~d. Use precise language and domain-specific vocabulary to support the argument.~~ ~~e. Establish and maintain a formal style.~~ ~~f. Provide a concluding statement or section that follows from and supports the argument presented.~~
~~W.6.2~~ Write informational ~~ive/explanatory~~ texts Write informational texts that introduce the topic, develop the focus with relevant facts, definitions, concrete details, quotations, and examples from multiple sources using appropriate strategies, such as description, comparison, and/or cause-effect; and provide a concluding section that follows from the information presented. ~~to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.~~ ~~a. Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and~~	~~W.7.2~~ Write informational ~~ve/explanatory~~ texts that introduce the topic clearly; develop the focus with relevant facts, definitions, concrete details, quotations, or other information and examples from multiple sources using strategies such as description, enumeration, classification, comparison, problem-solution, and/or cause-effect; and provide a concluding section that follows from the information presented. ~~to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.~~ ~~a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics~~	~~W.8.2~~ Write informational ~~ve/explanatory~~ texts that introduce the topic clearly; preview what is to follow by establishing and maintaining a clear focus with relevant, well-chosen facts, definitions, concrete details, quotations, and examples from multiple sources using appropriate strategies, such as description, enumeration, classification, comparison, problem-solution, and/or cause-effect; and provide a concluding section that follows from the information presented. ~~to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.~~ ~~a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader~~

~~multimedia when useful to aiding comprehension.~~ ~~b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.~~ ~~**W.6.3** Use appropriate transitions to clarify the relationships among ideas and concepts.~~ ~~**W.6.4** Use precise language and domain-specific vocabulary to inform about or explain the topic.~~ ~~a. Establish and maintain a formal style.~~ ~~Provide a concluding statement or section that follows from the information or explanation presented.~~	~~(e.g., charts, tables), and multimedia when useful to aiding comprehension.~~ ~~b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.~~ ~~c. Use appropriate transitions to create cohesion and clarify the relationships among ideas and concepts.~~ ~~d. Use precise language and domain-specific vocabulary to inform about or explain the topic.~~ ~~e. Establish and maintain a formal style.~~ ~~f. Provide a concluding statement or section that follows from and supports the information or explanation presented.~~	~~categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.~~ ~~b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.~~ ~~c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.~~ ~~d. Use precise language and domain-specific vocabulary to inform about or explain the topic.~~ ~~e. Establish and maintain a formal style.~~ ~~f. Provide a concluding statement or section that follows from and supports the information or explanation presented.~~

Writing Standards 6-8 W

~~Text Types and Purposes (continued)~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~W.6.3~~ Write personal or fictional narratives that establish a situation and narrator; engage and orient the reader to the context; use narrative techniques such as description, dialogue, pacing, concrete words and sensory details to develop the characters, event(s), or experience(s); and provide a conclusion that follows from the narrated event(s). ~~to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.~~ ~~a. Engage and orient the reader by establishing a context and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.~~ ~~b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters.~~ ~~c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another.~~ ~~d. Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events.~~ ~~e. Provide a conclusion that follows from the narrated experiences or events.~~	~~W.7.3~~ Write personal or fictional narratives that establish a situation and narrator; engage and orient the reader to the context and point of view; use narrative techniques such as description, dialogue, pacing and a variety of precise words and transitional words and phrases to develop the characters, convey sequence, and signal shifts from one timeframe or setting to another; and provide a conclusion that follows from the narrated event(s). ~~to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.~~ ~~a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.~~ ~~b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters.~~ ~~c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another.~~ ~~d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.~~ ~~e. Provide a conclusion that follows from and reflects on the narrated experiences or events.~~	~~W.8.3~~ Write personal or fictional narratives that establish a situation and narrator; engage and orient the reader to the context and one or multiple points of view; use a variety of techniques such as description, dialogue, pacing, and precise words and phrases, sensory language and transition words to develop the characters, capture the action and convey sequence, and signal shifts from one timeframe or setting to another; and provide a conclusion that follows from the narrated event(s). ~~to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.~~ ~~a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.~~ ~~b. Use narrative techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters.~~ ~~c. Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one time frame or setting to another, and show the relationships among experiences and events.~~ ~~d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.~~ ~~e. Provide a conclusion that follows from and reflects on the narrated experiences or events.~~

~~Production and Distribution of Writing~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~W.6.4~~ Produce clear and coherent organizational structures of multiple paragraphs in which facts and ideas are logically grouped; headings, as applicable are included to support ~~writing in which the development, organization, and style are appropriate to task,~~ purpose; and words, phrases, and clauses clarify the relationships between and among ideas and concepts. ~~, and audience. (Grade-specific expectations for writing types are defined in standards 1-3.)~~	~~W.7.4~~ Produce clear and coherent organizational structures in which ideas and other information are logically grouped; headings and other formatting support the purpose; and precise language, content-specific vocabulary, and appropriate transitions create cohesion and clarify the relationships among ideas and concepts. ~~writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3.)~~	**W.8.4** Produce clear and coherent organizational structures in which ideas and other information are logically grouped; headings, other formatting, and graphics (e.g., charts and tables) support the purpose; and precise language, content-specific vocabulary, and varied transitions create cohesion and clarify the relationships between and among ideas and concepts. ~~writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3.)~~

Writing Standards 6-8

W

~~W.6.5~~ With ~~some guidance and~~ support from adults and ~~peers and adults,~~ develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach to audience and purpose. (Editing ~~for conventions~~ should demonstrate command of grade-level Grammar and Conventions ~~Language standards 1-3 up to and including~~ grade 6.)	~~W.7.5~~ With ~~some guidance and~~ support from adults and peers ~~and adults,~~ develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing ~~for conventions~~ should demonstrate command of grade-level Grammar and Conventions). ~~Language standards 1-3 up to and including grade 7.)~~	~~W.8.5~~ With ~~some guidance and~~ support from adults and peers ~~and adults,~~ develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing ~~for conventions~~ should demonstrate command of grade-level Grammar and Conventions). ~~Language standards 1-3 up to and including grade 8.)~~
~~W.6.6~~ Write by hand or with ~~Use~~ technology~~, including the Internet, to~~ produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of ~~three~~ two pages in a single sitting.	~~W.7.6~~ ~~Use~~Write by hand or with technology~~, including the Internet,~~ to produce and publish writing and link to and cite sources as well as to interact and collaborate with others. ~~, including linking to and citing sources.~~	~~W.8.6~~ Write by hand or with ~~Use~~ technology~~, including the Internet,~~ to produce and publish writing, link to and cite sources, ~~and~~ present the relationships between information and ideas efficiently, and ~~as well as to~~ interact and collaborate with others.

Writing Standards 6-8

W

~~Research to Build and Present Knowledge~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~W.6.7~~ Conduct ~~short research projects to answer a~~ brief as well as multi-day research tasks to take some action or share findings orally or in writing by formulating research ~~question, drawing on several sources and~~questions and refocusing the inquiry when appropriate~~.~~ gathering and assessing the relevance and usefulness of information from multiple reliable sources; and, paraphrasing or quoting the data and conclusions of others, providing basic bibliographic information for sources, and respecting copyright guidelines for use of images	~~W.7.7~~ Conduct ~~short~~ brief as well as multi-day research tasks to take some action or share findings orally or in writing by formulating research questions and generating additional questions for further research; gathering and assessing the relevance and usefulness of information from multiple reliable sources; and, summarizing, paraphrasing, or quoting the data and conclusions of others, avoiding plagiarism, and providing basic bibliographic information for sources.~~projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.~~	~~W.8.7~~ Conduct brief as well as multi-day ~~short~~ research ~~projects~~ tasks to take some action or share findings orally or in writing by formulating research questions and generating additional questions that allow for multiple avenues of exploration; gathering and assessing the relevance and credibility of information from multiple sources; and, summarizing, paraphrasing, or quoting the data and conclusions of others while avoiding plagiarism and following a standard format for citations. ~~to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.~~
~~W.6.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.~~	~~W.7.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.~~	~~W.8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.~~
~~W.6.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.~~ ~~a. Apply grade 6 Reading standards to literature (e.g., "Compare and contrast texts in different forms or genres [e.g., stories and poems; historical novels and fantasy stories] in terms of their approaches to similar themes and topics").~~ ~~b. Apply grade 6 Reading standards to literary nonfiction (e.g., "Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not").~~	~~W.7.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.~~ ~~a. Apply grade 7 Reading standards to literature (e.g., "Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history").~~ ~~b. Apply grade 7 Reading standards to literary nonfiction (e.g. "Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims").~~	~~W.8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.~~ ~~a. Apply grade 8 Reading standards to literature (e.g., "Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works [e.g., the Bible], including describing how the material is rendered new").~~ ~~b. Apply grade 8 Reading standards to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced").~~

~~Range of Writing~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~W.6.10 Write~~ Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces ~~over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two)~~ for a range ~~of discipline-specific~~ tasks, purposes, and ~~audiences.~~audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc.	~~W.7.10 Write~~ Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc. ~~over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.~~	~~W.8.10~~ Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc.~~Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.~~

~~College and Career Readiness Anchor Standards for Speaking and Listening~~

~~The grades 6-12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

~~Comprehension and Collaboration~~

~~**CCRA.SL.1** Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.~~

~~**CCRA.SL.2** Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.~~

~~**CCRA.SL.3** Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.~~

~~Presentation of Knowledge and Ideas~~

~~**CCRA.SL.4** Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.~~

~~**CCRA.SL.5** Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.~~

~~**CCRA.SL.6** Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.~~

~~**Note on range and content of student speaking and listening**~~

~~*To become college and career ready, students must have ample opportunities to take part in a variety of rich, structured conversations—as part of a whole class, in small groups, and with a partner—built around important content in various domains. They must be able to contribute appropriately to these conversations, to make comparisons and contrasts, and to analyze and synthesize a multitude of ideas in accordance with the standards of evidence appropriate to a particular discipline. Whatever their intended major or profession, high school graduates will depend heavily on their ability to listen attentively to others so that they are able to build on others' meritorious ideas while expressing their own clearly and persuasively. New technologies have broadened and expanded the role that speaking and listening play in acquiring and sharing knowledge and have tightened their link to other forms of communication. The Internet has accelerated the speed at which connections between speaking, listening, reading, and writing can be made, requiring that students be ready to use these modalities nearly simultaneously. Technology itself is changing quickly, creating a new urgency for students to be adaptable in response to change.*~~

Speaking and Listening Standards 6-8 SL

~~The following standards for grades 6-12 offer a focus for instruction in each year to help ensure that students gain adequate mastery of a range of skills and applications.~~ ~~*Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*~~

~~Comprehension and Collaboration~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~SL.6.1~~ Engage ~~effectively~~ in ~~a range of~~ collaborative discussions about *grade-level topics and texts* with peers by following agreed-upon rules for collegial discussions, setting specific goals, and carrying out assigned roles; making comments and posing and responding to specific questions with elaboration and detail; and demonstrating understanding of various perspectives through reflection and paraphrasing ~~(one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.~~ ~~a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.~~ ~~b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.~~ ~~c. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.~~ ~~d. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.~~	~~SL.7.1~~ Engage ~~effectively~~ in ~~a range of~~ collaborative discussions about grade-level topics and texts with peers by following rules for collegial discussions and decision-making, defining individual roles, and tracking progress on specific goals; propelling conversations forward by posing and responding to questions, relating the current discussion to broader themes, and connecting the ideas of several speakers; and, when warranted, qualifying or justifying one's views considering new evidence heard. ~~(one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.~~ ~~a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.~~ ~~b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.~~ ~~c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.~~ ~~d. Acknowledge new information expressed by others and, when warranted, modify their own views.~~	~~SL.8.1~~ Engage in ~~effectively in a range of~~ collaborative discussions about *grade-level topics and texts* with peers by following rules for collegial discussions and decision-making, defining individual roles, and tracking progress on specific goals; propelling conversations forward by posing and responding to questions, relating the current discussion to broader themes, and connecting the ideas of several speakers; and, when warranted, qualifying or justifying one's views considering new evidence heard.. ~~(one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.~~ ~~a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.~~ ~~b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.~~ ~~c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.~~ ~~d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.~~
~~SL.6.2~~ Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.	~~SL.7.2~~ Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.	~~SL.8.2~~ Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
~~SL.6.3~~ Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.	~~SL.7.3~~ ~~Delineate~~Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.	~~SL.8.3~~ ~~Delineate~~ Analyze a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Speaking and Listening Standards 6-8 SL

~~Presentation of Knowledge and Ideas~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~SL.6.4 Present claims and findings, sequencing ideas logically and~~ Report orally on a topic or text or present an argument, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.	~~SL.7.4 Present claims and findings,~~Report orally on a topic, emphasizing salient points in a focused, coherent manner with ~~pertinent descriptions~~relevant evidence , and well-chosen details; ~~, facts, details, and examples;~~ use appropriate ~~eye contact,~~vocabulary, ~~adequate~~ volume, and clear pronunciation.	~~SL.8.4 Present claims and findings,~~ Report orally on a topic or text or present an argument, emphasizing salient points in a focused, coherent manner with relevant evidence, ~~sound valid reasoning,~~ and well-chosen details; use appropriate vocabulary ~~eye contact, adequate~~ volume, and clear pronunciation.
~~SL.6.5~~ Include ~~multimedia~~ digital components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.	~~SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.~~	~~SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.~~
~~SL.6.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 6 Language standards 1 and 3 for specific expectations.)~~	~~SL.7.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 7 Language standards 1 and 3 for specific expectations.)~~	~~SL.8.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 8 Language standards 1 and 3 for specific expectations.)~~

~~College and Career Readiness Anchor Standards for Language~~

~~The grades 6-12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

~~Conventions of Standard English~~

~~**CCRA.L.1** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.~~

~~**CCRA.L.2** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.~~

~~Knowledge of Language~~

~~**CCRA.L.3** Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.~~

~~Vocabulary Acquisition and Use~~

~~**CCRA.L.4** Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.~~

~~**CCRA.L.5** Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.~~

~~**CCRA.L.6** Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.~~

~~Note on range and content of student language use~~

~~*To be college and career ready in language, students must have firm control over the conventions of standard English. At the same time, they must come to appreciate that language is as at least as much a matter of craft as of rules and be able to choose words, syntax, and punctuation to express themselves and achieve particular functions and rhetorical effects. They must also have extensive vocabularies, built through reading and study, enabling them to comprehend complex texts and engage in purposeful writing about and conversations around content. They need to become skilled in determining or clarifying the meaning of words and phrases they encounter, choosing flexibly from an array of strategies to aid them. They must learn to see an individual word as part of a network of other words—words, for example, that have similar denotations but different connotations. The inclusion of Language standards in their own strand should not be taken as an indication that skills related to conventions, effective language use, and vocabulary are unimportant to reading, writing, speaking, and listening; indeed, they are inseparable from such contexts.*~~

Language Standards 6-8 L

~~The following standards for grades 6-12 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* Beginning in grade 3, skills and understandings that are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking are marked with an asterisk (*). See the table on page 63 for a complete listing and Appendix A for an example of how these skills develop in sophistication.~~

~~Conventions of Standard English~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~L.6.1~~ Demonstrate command of the conventions of ~~standard~~ English ~~grammar and usage~~ when writing or speaking. ~~a.~~ ~~Ensure that~~Use pronouns correctly regarding ~~pronouns are in the proper~~ case number, person, including ~~(subjective, objective, possessive).~~ intensive pronouns (e.g., myself, ourselves). ~~b.~~ ~~Use intensive pronouns (e.g., myself, ourselves).~~ ~~c.~~ Recognize and correct inappropriate shifts in pronoun number and person.* ~~d.~~ Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).* ~~e.~~ Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.*	~~L.7.1~~ Demonstrate command of the conventions of ~~standard~~ English grammar and usage when writing or speaking. ~~a.~~ Explain the function of phrases and clauses in general and their function in specific sentences. ~~b.~~ Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas. ~~c.~~ Place phrases and clauses correctly within a sentence, recognizing and correcting misplaced and dangling modifiers.*	~~L.8.1~~ Demonstrate command of the conventions of ~~standard~~ English grammar and usage when writing or speaking. ~~a.~~ Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences. ~~b.~~ Form and use verbs in the active and passive voice. ~~c.~~ Form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood. ~~d.~~ Recognize and correct inappropriate shifts in verb voice and mood.*
~~L.6.2~~ Demonstrate command of ~~the conventions of standard~~ English ~~capitalization,~~ punctuation and~~,~~ capitalization,~~and spelling~~ when writing and reading aloud to create meaning. ~~a.~~ ~~Use punctuation (~~commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.* ~~b.~~ Spell derivatives correctly by applying knowledge of bases and affixes .	~~L.7.2~~ Demonstrate command of the conventions of ~~standard~~ English ~~capitalization,~~ punctuation and capitalization~~, and spelling~~ when writing and reading aloud to create meaning. ~~.~~ ~~a.~~ Use ~~a~~ commas to separate coordinate adjectives (e.g., It was a fascinating, enjoyable movie). ~~but not He wore an old[,] green shirt).~~ ~~b.~~ Spell derivatives correctly by applying knowledge of bases and ~~-~~affixes.	~~L.8.2~~ Demonstrate command of the conventions of ~~standard~~ English punctuation and ~~capitalization, punctuation, and spelling~~ when writing and reading aloud to create meaning.. ~~a.~~ Use ~~punctuation (~~comma, ellipsis, dash~~)~~ to indicate a pause or break, or omission.. ~~b. Use an ellipsis to indicate an omission.~~ ~~c.~~ Spell derivatives correctly by applying knowledge of bases and affixes..

~~Knowledge of Language~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~L.6.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.~~ ~~a. Vary sentence patterns for meaning, reader/listener interest, and style.*~~ ~~b. Maintain consistency in style and tone.*~~	~~L.7.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.~~ a. ~~Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.*~~	~~L.8.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.~~ ~~a. Use verbs in the active and passive voice and in the conditional and subjunctive mood to achieve particular effects (e.g., emphasizing the actor or the action; expressing uncertainty or describing a state contrary to fact).~~

Language Standards 6-8 L

~~Vocabulary Acquisition and Use~~

Grade 6 Students:	Grade 7 Students:	Grade 8 Students:
~~L.6.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade-level ~~6 reading and~~ content, choosing flexibly from a range of strategies. ~~a.~~ Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. ~~b.~~ Use common, ~~grade-appropriate~~ Greek or Latin affixes and roots as clues to the meaning of a word (e.g., in readings on pioneers of space, determine the meanings of the words *astronaut* and *nautical*).~~(e.g., audience, auditory, audible).~~ ~~c.~~ Consult reference materials (e.g., dictionaries, glossaries, thesauruses), ~~both~~ print or ~~and~~ digital~~,~~ to find the pronunciation of a word and ~~or~~ determine or clarify its precise meaning and~~or~~ its part of speech. ~~d.~~ Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	~~L.7.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade-level ~~7 reading and~~ content, choosing flexibly from a range of strategies. ~~a.~~ Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. ~~b.~~ Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., ~~belligerent, bellicose, rebel).~~in readings about earth sciences, determine the meaning of the words geologist and geophysics). ~~c.~~ Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), ~~both~~ print or ~~and~~ digital, to find the pronunciation of a grade-level ~~a~~ word and~~or~~ determine or clarify its precise meaning and ~~or~~ its part of speech. ~~d.~~ Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	**L.8.4** Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade-level ~~8~~ reading and content, choosing flexibly from a range of strategies. ~~a.~~ Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. ~~b.~~ Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., in readings about mathematics, determine the meanings of the words *percentile* and *perimeter*~~precede, recede, secede~~). ~~c.~~ Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print or ~~and~~ digital, to find the pronunciation of a grade-level word and ~~or~~ determine or clarify its precise meaning and ~~or~~ its part of speech. ~~d.~~ Verify the preliminary determination of the meaning of a word or ~~phrase (e.g., by~~phrase by checking the inferred meaning in context ~~or~~ in a dictionary~~)~~.
~~L.6.5~~ ~~Demonstrate~~Determine -how words and phrases provide ~~understanding of figurative language, word relationships, and nuances in word~~ meaning and nuance to grade-level texts.~~s~~. ~~a.~~ Interpret ~~figures of speech (e.g., personification) in context.~~figurative language (e.g., personification, idioms) in context. ~~b.~~ Use the relationship between particular words (e.g., cause/effect, part/whole, item/category) to better understand each of the words. ~~c.~~ Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., ~~stingy, scrimping, economical, unwasteful, thrifty~~house verses home, cheap verses affordable).	~~L.7.5 Demonstrate understanding of figurative language, word relationships, and nuances in word~~ Determine how words and phrases provide meaning and nuance to grade level-texts. ~~s~~. ~~a.~~ Interpret figurative ~~figures of speech (e.g., literary, biblical, and mythological allusions)~~language e.g., (euphemism, oxymoron) in context. ~~b.~~ Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words. ~~c.~~ Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., ~~refined, respectful, polite, diplomatic, Condescending~~curious verses nosy, assertive verses pushy).	~~L.8.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.~~Determine how words and phrases provide meaning and nuance to grade level-texts. ~~a.~~ Interpret figurative language ~~figures of speech~~ (e.g. verbal irony, puns) in context. ~~b.~~ Use the relationship between particular words (e.g., homonyms, person to location, object to use) to better understand each of the words. ~~c.~~ Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *crowd* versus *mob*, *fired* versus *laid off*).~~bullheaded, willful, firm, persistent, resolute~~).
~~L.6.6~~ Acquire and use accurately grade-appropriate general academic and content ~~domain~~-specific words and phrases; occurring in grade-level reading and content; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these word sin discussion and writing.	~~L.7.6~~ Acquire and use accurately ~~grade-appropriate~~ general academic and ~~domain~~content -specific words and phrases occurring in grade-level reading and content; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these word sin discussion and writing.	~~L.8.6~~ Acquire and use accurately ~~grade-appropriate~~ general academic and ~~domain~~content -specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these word sin discussion and writing.

Reading Comprehension Strand~~Standards for Literature 9-12~~ RL

~~The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.~~

~~Key Ideas and Details~~

Grades 9-10 Students:	Grades 11-12 Students:
~~RL.9-10.1~~ Draw ~~Cite strong and thorough textual~~ ample evidence from grade-level texts to support claims and ~~analysis of what the text says explicitly as well as~~ inferences, attending to the precise details of the authors' descriptions or explanations through quoting, paraphrasing, and citing textual references. ~~drawn from the text.~~	~~RL.11-12.1~~ ~~C~~Draws and cite strong and thorough textual evidence from grade-level texts to support ~~analysis of what the text says explicitly as well as~~ claims and inferences, attending to important distinctions authors make and how those are supported, as well as any gaps or inconsistencies in accounts offered. ~~drawn from the text, including determining where the text leaves matters uncertain.~~
~~RL.9-10.2~~ ~~Determine a~~ Analyze the development of themes ~~or central idea~~ over the course of a text ~~and analyze in detail its development over the course of the text~~, including how themes~~it~~ emerge~~s~~ and are~~is~~ shaped and refined by specific details. ~~; provide an objective summary of the text.~~	~~RL.11-12.2~~ ~~Determine two or more~~ Compare the development of a universal theme~~s or central ideas of a text and analyze their development~~ over the course of two~~the~~ texts, including how it emerges~~they interact~~ and is shaped and refined by specific details in each. ~~build on one another to produce a complex account; provide an objective summary of the text.~~
~~RL.9-10.3~~ Analyze how complex characters ~~(e.g.,~~ those with multiple or conflicting motivations~~)~~ develop over the course of ~~a~~ texts, interact with other characters, and advance the plot. ~~or develop the theme.~~	~~RL.11-12.3~~ ~~Analyze the impact of~~ Evaluate the choices author~~'~~s ~~choices~~ make regarding how to develop and relate several elements of literary texts, ~~a story or drama (e.g., where a story is set, how the action is ordered,~~ including how the characters are introduced and developed and how the action is ordered~~)~~.

~~Craft and Structure~~

Grades 9-10 Students:	Grades 11-12 Students:
~~RL.9-10.4 Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).~~	~~RL.11-12.4 Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or powerful language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.)~~
~~RL.9-10.5~~ Analyze how ~~an~~ author~~'~~s ~~choices concerning how to~~ structure specific parts of a text, including the choice of where to begin and end a scene and explain how they contribute to its overall structure and meaning. ~~order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create such effects as mystery, tension, or surprise~~.	~~RL.11-12.5 Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.~~
~~RL.9-10.6~~ Analyze ~~a particular~~ points of view or cultural experiences that represent diverse voices and perspectives ~~reflected~~ in ~~a~~ works of literature. ~~from outside the United States, drawing on a wide reading of world literature.~~	~~RL.11-12.6~~ ~~Analyze a case in which grasping point of view requires~~ Evaluate how authors structure texts to distinguish~~ing~~ what is directly stated in a text from what is really meant, including ~~(e.g.,~~ satire, sarcasm, irony, and~~or~~ understatement~~)~~.

~~Integration of Knowledge and Ideas~~

Grades 9-10 Students:	Grades 11-12 Students:
~~RL.9-10.7 Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's Landscape with the Fall of Icarus).~~ Compare multiple interpretations of texts (including recorded or live production), evaluating how each version interprets the source text.	~~RL.11-12.7 Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)~~
~~RL.9-10.8 (Not applicable to literature)~~	~~RL.11-12.8 (Not applicable to literature)~~
~~RL.9-10.9 Analyze how an author draws on and transforms source material in a specific work (e.g., how Shakespeare treats a theme or topic from Ovid or the Bible, or how a later author draws on a play by Shakespeare).~~	~~RL.11-12.9~~ ~~Demonstrate knowledge of eighteenth-, nineteenth-, and early-twentieth-century foundational works of American literature, and other~~ Relate literary works and their author's points of view to the political events and seminal ideas of their eras. ~~canons, including how two or more texts from the same period treat similar themes or topics.~~

~~Range of Reading and Level of Text Complexity~~

Reading Comprehension Strand~~Standards for Literature 9-12~~ RL

Grades 9-10 Students:	Grades 11-12 Students:
~~**RL.9-10.10** By the end of grade 9, r~~Independently and proficiently, ~~R~~read grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support~~and~~ comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).~~d literature, including stories, dramas, and poems, in the grades 9-10 text complexity band proficiently, with scaffolding as needed at the high end of the range.~~ ~~By the end of grade 10, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 9-10 text complexity band independently and proficiently.~~	~~**RL.11-12.10** By the end of grade 11, r~~Independently and proficiently, r~~R~~ead grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support~~and~~ comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).~~d literature, including stories, dramas, and poems, in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.~~ ~~By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently.~~

Reading Standards for Informational Text 9-12 RI

~~Key Ideas and Details~~

Grades 9-10 Students:	Grades 11-12 Students:
~~RI.9-10.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.~~	~~RI.11-12.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.~~
~~RI.9-10.2 Determine a~~ Analyze the development of central ideas over the course of a texts ~~and analyze its development over the course of the text~~, including how ~~it~~they emerge~~s~~ and ~~is~~are shaped and refined by specific details; provide ~~an objective~~ accurate summar~~y~~ies of how key events or ideas develop.~~the text.~~	~~RI.11-12.2 Determine two or more central ideas of a~~ Compare texts that express similar central ideas and analyze in detail how their development and treatment of the topic compares over the course of ~~the~~two texts~~, including how they interact and build on one another to provide a complex analysis~~; provide ~~an objective~~accurate summar~~y~~ies of how key events or ideas develop.~~the text.~~
~~RI.9-10.3 Analyze~~Explain how ~~the~~ authors unfolds an analysis or series of ideas or events, including the order in which ~~the~~ points are made, how they are introduced and developed, and the connections that are drawn ~~between~~ among them.	~~RI.11-12.3 Analyze a complex set~~ Evaluate various explanations of concepts and ideas ~~or sequence of events and~~and determine which expla~~i~~nation best accords with textual evidence, noting discrepancies among sources. ~~how specific individuals, ideas, or events interact and develop over the course of the text.~~

~~Craft and Structure~~

Grades 9-10 Students:	Grades 11-12 Students:
~~RI.9-10.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).~~	~~RI.11-12.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).~~
~~RI.9-10.5~~ Analyze ~~in detail~~ how ~~an~~ author~~'~~s use structure to explain relationships among concepts in a text, including how key~~ideas or claims are developed and refined by particular~~ sentences, paragraphs, and sections of texts contribute to the whole.~~or larger portions of a text (e.g., a section or chapter).~~	~~RI.11-12.5 Analyze and e~~Evaluate the effectiveness of the structure(s) and rhetorical devices ~~an~~ authors use~~s~~ in their~~his or her~~ exposition or argument, including whether the structure helps makes points clear, convincing, and engaging.
~~RI.9-10.6 Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose.~~	~~RI.11-12.6 Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.~~

~~Integration of Knowledge and Ideas~~

Grades 9-10 Students:	Grades 11-12 Students:
~~RI.9-10.7 Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.~~	~~RI.11-12.7 Integrate and evaluate multiple~~ Analyze the hypotheses, data, analysis, and conclusions in an argument, verifying the data when possible and corroborating or challenging conclusions with other sources of information.~~presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.~~
~~RI.9-10.8 Delineate and evaluate~~ Assess the argument and specific claims in a text, examining ~~assessing~~ whether the reasoning is valid, ~~and~~ the evidence is relevant, and ~~sufficient; identify~~ whether there are any false statements and unsupported statements.~~fallacious reasoning.~~	~~RI.11-12.8 Delineate and e~~Evaluate ~~the reasoning in seminal U.S. and other texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and~~ the premises~~,~~ and purposes~~, and arguments~~ in works of public advocacy ~~(e.g., The Federalist, presidential addresses)~~.

Reading Standards for Informational Text 9-12	RI
~~RI.9-10.9~~ Analyze seminal ~~U.S.~~ documents of historical and literary significance ~~(e.g., Washington's Farewell Address, the Gettysburg Address, Roosevelt's Four Freedoms speech, King's "Letter from Birmingham Jail")~~, including how they address related themes and concepts of liberty, equality, individual responsibility, and justice.	~~RI.11-12.9 Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) and other documents of similar significance for their themes, purposes, and rhetorical features.~~

Reading Standards for Informational Text 9-12

RI

~~Range of Reading and Level of Text Complexity~~

Grades 9-10 Students:	Grades 11-12 Students:
~~**RI.9-10.10** By the end of grade 9, read and comprehend literary nonfiction in the grades 9-10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9-10 text complexity band independently and proficiently.~~	~~**RI.11-12.10** By the end of grade 11, read and comprehend literary nonfiction in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11-CCR text complexity band independently and proficiently.~~

Writing Standards 9-12 W

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

~~Text Types and Purposes~~

Grades 9-10 Students:	Grades 11-12 Students:
~~W.9-10.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.~~ ~~a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence.~~ ~~b. Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level and concerns.~~ ~~c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.~~ ~~d. Use precise language and domain-specific vocabulary to manage the complexity of the argument.~~ ~~e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.~~ ~~f.~~a. ~~Provide a concluding statement or section that follows from and supports the argument presented.~~	~~W.11-12.1~~ Write arguments ~~to~~that support well defined points of view that~~claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.~~ ~~a. Introduce precise, knowledgeable claim(s),~~ establish the significance of the claim(s)~~,~~ distinguish thosee claim(s) from alternate or opposing claims~~, and create an organization that logically sequences claim(s), counterclaims, reasons, and~~ with persuasive evidence and clear reasoning;~~.~~ ~~b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while~~ pointing out the strengths and limitations of ~~both~~each claim in a manner that anticipates the audience's knowledge level, concerns, values;~~, and possible biases.~~ ~~c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.~~ ~~d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile and analogy to manage the complexity of the argument.~~ ~~e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.~~ ~~f.~~ ~~P~~provide a concluding ~~statement or~~ section that ~~follows from and supports~~ articulates the implications, or the significance of the argument presented.
~~W.9-10.2~~ Write informativeal~~/explanatory~~ texts that introduce the topic ~~to examine and convey complex ideas, concepts, and information~~ clearly by providing needed context, presenting well-defined theses, and previewing what is to follow; ~~accurately through the effective selection, organization, and analysis of content.~~ ~~a. Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.~~ ~~b.~~ ~~D~~develop the topic ~~with well-chosen,~~ through sustained use of the most significant and relevant~~, and sufficient~~ facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic;~~.~~ ~~c. Use appropriate and varied transitions to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.~~ ~~d. Use precise language and domain-specific vocabulary to manage the complexity of the topic.~~ ~~e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.~~ ~~f.~~ ~~P~~provide a concluding ~~statement or~~ section that follows from ~~and supports~~ the information or explanation presented. ~~(e.g., articulating implications or the significance of the topic).~~	~~W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.~~ ~~a. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.~~ ~~b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.~~ ~~c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.~~ ~~d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.~~ ~~e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.~~ ~~f.~~a. ~~Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).~~

Writing Standards 9-12 W

~~Text Types and Purposes (continued)~~

Grades 9-10 Students:	Grades 11-12 Students:
~~W.9-10.3 Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.~~ ~~a. Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.~~ ~~b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters.~~ ~~c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole.~~ ~~d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.~~ ~~e.~~a. ~~Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.~~	~~W.11-12.3 Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.~~ ~~a. Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.~~ ~~b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters.~~ ~~c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution).~~ ~~d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.~~ ~~e.~~a. ~~Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.~~

~~Production and Distribution of Writing~~

Grades 9-10 Students:	Grades 11-12 Students:
~~W.9-10.4~~ Produce clear and coherent ~~writing in which the development,~~ organizational~~, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3.)~~ structures that attend to the norms and conventions of the writing genre and in which ideas, concepts, and other information are logically grouped; include formatting and graphics to support the purpose and create a unified whole; and use precise language, content-specific vocabulary, and varied transitions link major sections of the text, create cohesion and clarify the relationships between and among ideas and concepts.	W.11-12.4 Produce clear and coherent ~~writing in which the development,~~ organizational~~, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3)~~ structures that attend to the norms and conventions of the writing genre and in which ideas, concepts, and other information are logically grouped; include formatting and graphics to support the purpose and create a unified whole; and use precise language, content-specific vocabulary, and varied transitions link major sections of the text, create cohesion and clarify the relationships between and among ideas and concepts.
~~W.9-10.5~~ Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of grade-level Grammar and Conventions~~Language standards 1-3 up to and including grades 9-10~~.)	~~W.11-12.5~~ Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on reframing points to addressing~~ what is most significant for a~~ specific purposes ~~and~~or needs of the audience. (Editing for conventions should demonstrate command of grade-level Grammar and Conventions~~Language standards 1-3 up to and including grades 11-12~~.)
~~W.9-10.6~~ ~~Use~~Write by hand or with technology~~, including the Internet,~~ to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	~~W.11-12.6~~ ~~Use~~Write by hand or with technology~~, including the Internet,~~ to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

~~Research~~ Inquiry Process to Build,~~ and~~ Present, and Use Knowledge

Grades 9-10 Students:	Grades 11-12 Students:
~~W.9-10.7~~ Conduct ~~short~~brief as well as multi-day~~more sustained~~ research projects to take some action or share findings orally or in writing by formulating ~~answer~~ a research question ~~(including a self-generated question) or solve a problem; narrow or broaden the~~ and considering alternative avenues of inquiry~~ when appropriate~~; ~~synthesize multiple~~ gathering relevant information from a variety of authoritative sources and assessing which provide the most reliable and useful information; and, following a standard approved format.~~on the~~	~~W.11-12.7~~ Conduct ~~short~~brief as well as multi-day~~more sustained~~ research projects to take some action or share findings orally or in writing by formulating~~answer a~~ multiple interlocking research questions ~~(including a self-generated question) or solve a problem; narrow or broaden the~~ that span the field of inquiry ~~when appropriate~~in time and scope; ~~synthesize multiple~~gathering relevant information efficiently from a variety of authoritative sources, as well as from direction observation, interviews and surveys; making distrinctions about the

Writing Standards 9-12

W

~~subject, demonstrating understanding of the subject under investigation.~~	strengths and limitations of each source in terms of the task, purpose, and audience, noting any discrepancies among the data; and, following a standard approved format (e.g., APA, MLA, Chicago) for citations and bibliographies.~~on the subject, demonstrating understanding of the subject under investigation.~~
~~**W.9-10.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.~~	~~**W.11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.~~

Writing Standards 9-12 W

~~Research to Build and Present Knowledge (continued)~~

Grades 9-10 Students:	Grades 11-12 Students:
~~W.9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.~~ ~~a. Apply grades 9-10 Reading standards to literature (e.g., "Analyze how an author draws on and transforms source material in a specific work [e.g., how Shakespeare treats a theme or topic from Ovid or the Bible, or how a later author draws on a play by Shakespeare]").~~ ~~b.~~a. ~~Apply grades 9-10 Reading standards to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning").~~	~~W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.~~ ~~a. Apply grades 11-12 Reading standards to literature (e.g., "Demonstrate knowledge of eighteenth-, nineteenth-, and early-twentieth-century foundational works of American literature, and other literary canons, including how two or more texts from the same period treat similar themes or topics").~~ ~~b. Apply grades 11-12 Reading standards to literary nonfiction (e.g., "Delineate and evaluate the reasoning in seminal U.S. and other texts, including the application of constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy [e.g., The Federalist, presidential addresses]").~~

Range of Writing

Grades 9-10 Students:	Grades 11-12 Students:
~~W.9-10.10~~ ~~W~~Develop flexibility in writinge by routinely engaging in the production of shorter and longer pieces ~~over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two)~~ for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc.	~~W.11-12.10~~ ~~W~~Develop flexibility in writinge by routinely engaging in the production of shorter and longer pieces~~over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two)~~ for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc.

~~Speaking and Listening Standards 9-12Oral and Digital Communications Strand~~ SL

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

~~Comprehension and Collaboration~~

Grades 9-10 Students:	Grades 11-12 Students:
~~SL.9-10.1~~ ~~Initiate and participate effectively~~ Engage in ~~a range of~~ collaborative discussions ~~(one-on- one, in groups, and teacher-led) with diverse partners on grades 9-10~~ about *grade-level* topics~~,~~ and texts~~, and issues, building on others' ideas and expressing their own clearly and persuasively.~~ ~~a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.~~ ~~b.~~ ~~Work~~ with peers ~~to~~ by setting rules for collegial discussions and decision-making ~~(e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and~~, defining individual roles, tracking progress on specific goals; ~~as needed.~~ ~~c.~~ ~~Propel conversations by posing and~~ responding to others' questions and comments ~~that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.~~ ~~d.~~ ~~Respond thoughtfully to~~ and diverse perspectives~~, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the~~ with precise evidence, relevant observations, and ideas; making new connections considering the evidence and reasoning presented.	~~SL.11-12.1~~ ~~Initiate and participate effectively~~Engage in ~~a range of~~ collaborative discussions ~~(one-on- one, in groups, and teacher-led) with diverse partners on grades 11-12~~about grade-level topics~~,~~ and texts~~, and issues, building on others' ideas and expressing their own clearly and persuasively.~~ ~~a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.~~ ~~b.~~ ~~Work~~ with peers ~~to~~by promoting~~e~~ civil, democratic discussions and decision-making,~~set clear goals and deadlines, and~~ establishing individual roles, and tracking progress on specific goals;~~as needed.~~ ~~c.~~ ~~P~~propelling conversations forward by synthesizing comments and ideas of several speakers~~posing~~ and responding to ~~questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.~~ ~~d.~~ ~~Respond thoughtfully to~~ diverse perspectives with relevant observations and ideas,~~; synthesize comments, claims, and evidence made on all sides of an issue;~~ resolving~~e~~ contradictions when possible; and determining~~e~~ what additional information ~~or research~~ is required to deepen the investigation or complete the task.
~~SL.9-10.2~~ Integrate multiple sources of information presented in diverse digital media, ~~or formats (e.g., visually, quantitatively, orally)~~ evaluating the credibility and accuracy of each source.	~~SL.11-12.2~~ Integrate multiple sources of information presented in diverse media ~~formats and media (e.g., visually, quantitatively, orally) in order~~ to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
~~SL.9-10.3~~ Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.	~~SL.11-12.3~~ Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

~~Presentation of Knowledge and Ideas~~

Grades 9-10 Students:	Grades 11-12 Students:
~~SL.9-10.4~~ Report orally on a topic or text or ~~P~~present an argument,~~information, findings, and supporting~~ emphasizing salient points in a focuses, coherent manner with relevant evidence, ~~clearly, concisely, and logically such that listeners can follow the line of~~ sound reasoning ~~and the organization, development, substance~~, and well-chosen details in a style ~~are~~ appropriate to purpose, audience, and task.	~~SL.11-12.4~~ Present information, findings, and supporting evidence orally, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning; ensure~~,~~ alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
~~SL.9-10.5~~ Make strategic use of digital media ~~(e.g., textual, graphical, audio, visual, and interactive elements) in~~ presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	~~SL.11-12.5~~ Make strategic use of digital media ~~(e.g., textual, graphical, audio, visual, and interactive elements)~~ in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

~~**SL.9-10.6** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 for specific expectations.)~~	**SL.11-12.6** Adapt speech to a variety of contexts and tasks, using ~~demonstrating a command of~~ formal English when appropriate to task and situation and situations where informal discourse is more appropriate. ~~indicated or appropriate. (See grades 11-12 Language standards 1 and 3 for specific expectations.)~~

Language Standards 9-12 L

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

~~Conventions of Standard English~~~~Grammar and Conventions Strand~~

Grades 9-10 Students:	Grades 11-12 Students:
~~L.9-10.1~~ Demonstrate command of the conventions of ~~standard~~ English grammar and usage when writing or speaking. Use parallel structure.~~*~~ Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) to convey specific meanings and add variety and interest to writing or presentations. ~~and~~ Use various types of clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations. ~~a.~~	~~L.11-12.1~~ Demonstrate command of the conventions of ~~standard~~ English grammar and usage when writing or speaking. ~~a.~~ Apply the understanding that usage is a matter of convention, can change overtime, and is sometimes contested, consulting references (e.g., ~~,~~ *Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage)* as needed ~~b. Resolve issues of complex or contested usage, consulting references (e.g., Merriam- Webster's Dictionary of English Usage, Garner's Modern American Usage) as needed.~~
~~L.9-10.2~~ Demonstrate command of the conventions of ~~standard~~ English punctuation and capitalization~~, punctuation, and spelling~~ when writing and reading aloud to create meaning. ~~a.~~ Use a semicolon (~~and perhaps a~~ or appropriate conjunctive adverb) to link two or more closely related independent clauses. Use a colon to introduce a list or quotation. ~~b.~~ Spell correctly, consulting reference materials to check as needed.	~~L.11-12.2~~ Demonstrate command of the conventions of ~~standard~~ English punctuation and capitalization~~, punctuation, and spelling~~ when writing reading aloud to create meaning. ~~a. Use hyphenation conventions.~~ ~~b.~~ Spell correctly, consulting reference materials as needed.~~.~~

~~Knowledge of Language~~

Grades 9-10 Students:	Grades 11-12 Students:
~~L.9-10.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.~~ ~~a. Write and edit work so that it conforms to the guidelines in a style manual (e.g., MLA Handbook, Turabian's Manual for Writers) appropriate for the discipline and writing type.~~	~~L.11-12.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.~~ ~~a. Vary syntax for effect, consulting references (e.g., Tufte's Artful Sentences) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.~~

~~Vocabulary Acquisition and Use~~

Grades 9-10 Students:	Grades 11-12 Students:
~~L.9-10.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-levels* ~~9-10 reading and~~ *content*, choosing flexibly from a range of strategies. ~~a.~~ Use context (e.g., the overall meaning of a sentence, paragraph, or portion of a text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. ~~b.~~ Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., defend, defense, defendant, defensible ~~analyze, analysis, analytical; advocate, advocacy~~). ~~c.~~ Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), ~~both~~ print or~~and~~ digital, to find the pronunciation of a	~~L.11-12.4~~ Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade-level s ~~11-12~~ reading and content, choosing flexibly from a range of strategies. ~~a.~~ Use context (e.g., the overall meaning of a sentence, paragraph, or portion of text; a word's position or function in a sentence or a sentence within a paragraph) as a clue to the meaning of a word or phrase. ~~b.~~ Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., symbol, symbolism, symbolic, symbolize ~~conceive, conception, conceivable~~). ~~c.~~ Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), ~~both~~ print or~~and~~ digital, to find the pronunciation of grade-level a word ~~o~~rand determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.

Language Standards 9-12 L

grade-level word ~~or~~and determine or clarify its precise meaning, its part of speech, or its etymology. ~~d.~~ Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	~~d.~~ Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

Language Standards 9-12 L

~~Vocabulary Acquisition and Use (continued)~~

Grades 9-10 Students:	Grades 11-12 Students:
~~L.9-10.5 Demonstrate understanding of figurative language,~~ Determine how words and phrases provide meaning ~~relationships,~~ and nuance to texts.~~s in word meanings.~~ ~~a.~~ Interpret figurativees language ~~of speech~~ (e.g., hyperbole, paradox ~~euphemism, oxymoron~~) in context and analyze their role in ~~the~~ texts (e.g., The Party's embrace of the slogans "War is Peace" and "Freedom is Slavery" in Orwell's 1984). ~~b.~~ Analyze nuances in the meaning of words with similar denotations (e.g., shred, clever, cunning, brainy).	~~L.11-12.5 Demonstrate understanding of figurative language, word relationships,~~ Determine haw words and phrases provide meaning and nuances to texts. ~~in word meanings.~~ ~~a. Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text.~~ ~~b.~~ Analyze nuances in the meaning of words with similar denotations (aggressive, assertive, forceful, domineering).
~~L.9-10.6~~ Acquire and use accurately general academic and ~~domain~~content-specific words and phrases *occurring in grade-level reading and content*~~, sufficient for reading, writing, speaking, and listening at the college and career readiness level~~; demonstrate independence when~~in~~ gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these words in discussions and writing.	~~L.11-12.6~~ Acquire and use accurately general academic and content~~domain~~-specific words and phrases occurring in grade-level reading and content, ~~sufficient for reading, writing, speaking, and listening at the college and career readiness level;~~ demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these words inwriting and discussion.

~~Language Progressive Skills, by Grade~~

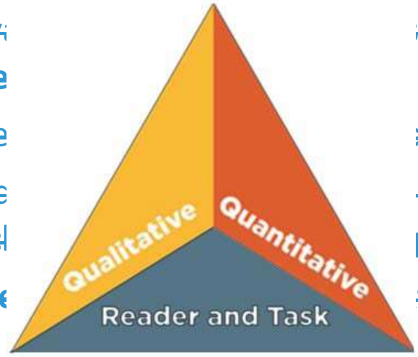
~~The following skills, marked with an asterisk (*) in Language standards 1-3, are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking.~~

~~**Standards**~~	~~**Grades**~~
~~**L.3.1.f** Ensure subject-verb and pronoun-antecedent agreement.~~	~~3-12~~
~~**L.3.3.a** Choose words and phrases for effect.~~	~~3-12~~
~~**L.4.1.f** Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.~~	~~4-12~~
~~**L.4.1.g** Correctly use frequently confused words (e.g., to, too, two; there, their).~~	~~4-12~~
~~**L.4.3.a** Choose words and phrases to convey ideas precisely.*~~	~~4-6~~
~~**L.4.3.b** Choose punctuation for effect.~~	~~4-12~~
~~**L.5.1.d** Recognize and correct inappropriate shifts in verb tense.~~	~~5-12~~
~~**L.5.2.a** Use punctuation to separate items in a series.†~~	~~5-8~~
~~**L.6.1.c** Recognize and correct inappropriate shifts in pronoun number and person.~~	~~6-12~~
~~**L.6.1.d** Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).~~	~~6-12~~
~~**L.6.1.e** Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.~~	~~6-12~~
~~**L.6.2.a** Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.~~	~~6-12~~
~~**L.6.3.a** Vary sentence patterns for meaning, reader/listener interest, and style.‡~~	~~6-10~~
~~**L.6.3.b** Maintain consistency in style and tone.~~	~~6-12~~
~~**L.7.1.c** Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.~~	~~7-12~~
~~**L.7.3.a** Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.~~	~~7-12~~
~~**L.8.1.d** Recognize and correct inappropriate shifts in verb voice and mood.~~	~~8-12~~
~~**L.9-10.1.a** Use parallel structure.~~	~~9-12~~

~~*Subsumed by L.7.3.a~~
~~†Subsumed by L.9-10.1.a~~
~~‡Subsumed by L.11-12.3.a~~

~~Standard 10: Range, Quality, and Complexity of Student Reading 6-12~~

Measuring Text Complexity: Three Factors



~~Qualitative ev~~ ~~of meaning, structure, language conventionality and clarity, and **knowledge de**~~

~~Quantitative e~~ ~~**lability measures and other scores of text complexity**~~

~~Matching reac~~ ~~**r variables (such as motivation, knowledge, and experiences) and task variables (suc**~~ ~~**plexity generated by the task assigned and the questions posed)**~~

~~Note: **More de**~~ ~~**t complexity and how it is measured is contained in Appendix A.**~~

Range of Text Types for 6-12

~~**Students in 6-12 apply the Reading standards to the following range of text types, with texts selected from a broad range of cultures and periods.**~~

~~**Literature**~~

- ~~Stories: ***Includes the subgenres of adventure stories, historical fiction, mysteries, myths, science fiction, realistic fiction, allegories, parodies, satire, and graphic novels***~~
- ~~Dramas: ***Includes one-act and multi-act plays, both in written form and on film***~~
- ~~Poetry: ***Includes the subgenres of narrative poems, lyrical poems, free verse poems, sonnets, odes, ballads, and epics***~~

~~**Informational Text**~~

- ~~Literary Nonfiction and Historical, Scientific, and Technical Texts: ***Includes the subgenres of exposition, argument, and functional text in the form of personal essays, speeches, opinion pieces, essays about art or literature, biographies, memoirs, journalism, and historical, scientific, technical, or economic accounts (including digital sources) written for a broad audience***~~

~~Texts Illustrating the Complexity, Quality, and Range of Student Reading 6-12~~

~~Grade Level~~	~~Literature: Stories, Drama, Poetry~~	~~Informational Texts: Literary Nonfiction and Historical, Scientific, and Technical~~
~~6-8~~	~~***Little Women*** **by Louisa May Alcott (1869)**~~ ~~***The Adventures of Tom Sawyer*** **by Mark Twain (1876) "The Road Not Taken" by Robert Frost (1915)**~~ ~~***The Dark Is Rising*** **by Susan Cooper (1973)**~~ ~~***Dragonwings*** **by Laurence Yep (1975)**~~ ~~***Roll of Thunder, Hear My Cry*** **by Mildred Taylor (1976)**~~	~~**"Letter on Thomas Jefferson" by John Adams(1776)**~~ ~~***Narrative of the Life of Frederick Douglass, an American Slave*** **by Frederick Douglass (1845)**~~ ~~**"Blood, Toil, Tears and Sweat: Address to Parliament on May 13th, 1940" by Winston Churchill (1940)**~~ ~~***Harriet Tubman: Conductor on the Underground Railroad*** **by Ann Petry (1955)**~~ ~~***Travels with Charley: In Search of America*** **by John Steinbeck (1962)**~~
~~9-10~~	~~***The Tragedy of Macbeth*** **by William Shakespeare (1592) "Ozymandias" by Percy Bysshe Shelley (1817)**~~ ~~**"The Raven" by Edgar Allan Poe (1845) "The Gift of the Magi" by O. Henry (1906)**~~ ~~***The Grapes of Wrath*** **by John Steinbeck (1939)**~~ ~~***Fahrenheit 451*** **by Ray Bradbury (1953)**~~ ~~***The Killer Angels*** **by Michael Shaara (1975)**~~	~~**"Speech to the Second Virginia Convention" by Patrick Henry (1775) "Farewell Address" by George Washington (1796)**~~ ~~**"Gettysburg Address" by Abraham Lincoln (1863)**~~ ~~**"State of the Union Address" by Franklin Delano Roosevelt (1941) "Letter from Birmingham Jail" by Martin Luther King, Jr. (1964) "Hope, Despair and Memory" by Elie Wiesel (1997)**~~
~~11-CCR~~	~~**"Ode on a Grecian Urn" by John Keats (1820)**~~ ~~***Jane Eyre*** **by Charlotte Brontë (1848)**~~ ~~**"Because I Could Not Stop for Death" by Emily Dickinson (1890)**~~ ~~***The Great Gatsby*** **by F. Scott Fitzgerald (1925)**~~ ~~***Their Eyes Were Watching God*** **by Zora Neale Hurston (1937)**~~ ~~***A Raisin in the Sun*** **by Lorraine Hansberry (1959)**~~ ~~***The Namesake*** **by Jhumpa Lahiri (2003)**~~	~~***Common Sense*** **by Thomas Paine (1776)**~~ ~~***Walden*** **by Henry David Thoreau (1854)**~~ ~~**"Society and Solitude" by Ralph Waldo Emerson (1857) "The Fallacy of Success" by G. K. Chesterton (1909)** ***Black Boy*** **by Richard Wright (1945)**~~ ~~**"Politics and the English Language" by George Orwell (1946)**~~ ~~**"Take the Tortillas Out of Your Poetry" by Rudolfo Anaya (1995)**~~

~~Note: **Given space limitations, the illustrative texts listed above are** ***meant only to show individual titles that are representative of a wide range of topics and genres.*** **(See Appendix B for excerpts of these and other texts illustrative of 6-12 text complexity, quality, and range.) At a curricular or instructional level, within and across grade levels, texts need to be selected around topics or themes that generate knowledge and allow students to study those topics or themes in depth.**~~

~~Idaho Content Standards~~

~~Literacy in History/Social Studies, Science, and Technical Subjects:~~

~~6-12 Section~~

~~**College and Career Readiness Anchor Standards for Reading**~~

~~**The grades 6-12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.**~~

~~**Key Ideas and Details**~~

~~CCRA.R.1 **Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.**~~

~~CCRA.R.2 **Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.**~~

~~CCRA.R.3 **Analyze how and why individuals, events, or ideas develop and interact over the course of a text.**~~

~~**Craft and Structure**~~

~~CCRA.R.4 **Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.**~~

~~CCRA.R.5 **Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.**~~

~~CCRA.R.6 **Assess how point of view or purpose shapes the content and style of a text.**~~

~~**Integration of Knowledge and Ideas**~~

~~CCRA.R.7 **Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.***~~

~~CCRA.R.8 **Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.**~~

~~CCRA.R.9 **Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.**~~

~~CCRA.R.10 **Read and comprehend complex literary and informational texts**~~

~~independently and proficiently.~~

~~*Please see "Research to Build and Present Knowledge" in Writing and "Comprehension and Collaboration" in Speaking and Listening for additional standards relevant to gathering, assessing, and applying information from print and digital sources.~~

~~Note on range and content of student reading~~

~~*Reading is critical to building knowledge in history/social studies as well as in science and technical subjects. College and career ready reading in these fields requires an appreciation of the norms and conventions of each discipline, such as the kinds of evidence used in history and science; an understanding of domain- specific words and phrases; an attention to precise details; and the capacity to evaluate intricate arguments, synthesize complex information, and follow detailed descriptions of events and concepts. In history/social studies, for example, students need to be able to analyze, evaluate, and differentiate primary and secondary sources. When reading scientific and technical texts, students need to be able to gain knowledge from challenging texts that often make extensive use of elaborate diagrams and data to convey information and illustrate concepts. Students must be able to read complex informational texts in these fields with independence and confidence because the vast majority of reading in college and workforce training programs will be sophisticated nonfiction. It is important to note that these Reading standards are meant to complement the specific content demands of the disciplines, not replace them.*~~

Reading Standards for Literacy in History/Social Studies 6-12 RH

~~The standards below begin at grade 6; standards for K-5 reading in history/social studies, science, and technical subjects are integrated into the K-5 Reading standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.~~

~~Key Ideas and Details~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~RH.6-8.1 **Cite specific textual evidence to support analysis of primary and secondary sources.**~~	~~RH.9-10.1 **Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.**~~	~~RH.11-12.1 **Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.**~~
~~RH.6-8.2 **Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.**~~	~~RH.9-10.2 **Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.**~~	~~RH.11-12.2 **Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.**~~
~~RH.6-8.3 **Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).**~~	~~RH.9-10.3 **Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.**~~	~~RH.11-12.3 **Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.**~~

~~Craft and Structure~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~RH.6-8.4 **Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.**~~	~~RH.9-10.4 **Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social studies.**~~	~~RH.11-12.4 **Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10).**~~
~~RH.6-8.5 **Describe how a text presents information (e.g., sequentially, comparatively, causally).**~~	~~RH.9-10.5 **Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.**~~	~~RH.11-12.5 **Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.**~~
~~RH.6-8.6 **Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).**~~	~~RH.9-10.6 **Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.**~~	~~RH.11-12.6 **Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.**~~

~~Integration of Knowledge and Ideas~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~RH.6-8.7 **Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.**~~	~~RH.9-10.7 **Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.**~~	~~RH.11-12.7 **Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to**~~

Reading Standards for Literacy in History/Social Studies 6-12		~~address~~ ~~a question or solve a problem.~~ RH
~~RH.6-8.8~~ ~~**Distinguish among fact, opinion, and reasoned judgment in a text.**~~	~~RH.9-10.8~~ ~~**Assess the extent to which the reasoning and evidence in a text support the author's claims.**~~	~~RH.11-12.8~~ ~~**Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.**~~
~~RH.6-8.9~~ ~~**Analyze the relationship between a primary and secondary source on the same topic.**~~	~~RH.9-10.9~~ ~~**Compare and contrast treatments of the same topic in several primary and secondary sources.**~~	~~RH.11-12.9~~ ~~**Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.**~~

Reading Standards for Literacy in History/Social Studies 6-12 RH

~~Range of Reading and Level of Text Complexity~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~RH.6-8.10~~ **~~By the end of grade 8, read and comprehend history/social studies texts in the grades 6-8 text complexity band independently and proficiently.~~**	~~RH.9-10.10~~ **~~By the end of grade 10, read and comprehend history/social studies texts in the grades 9-10 text complexity band independently and proficiently.~~**	~~RH.11-12.10~~ **~~By the end of grade 12, read and comprehend history/social studies texts in the grades 11-CCR text complexity band independently and proficiently.~~**

Reading Standards for Literacy in Science and Technical Subjects 6-12 RST

~~Key Ideas and Details~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~RST.6-8.1 **Cite specific textual evidence to support analysis of science and technical texts.**~~	~~RST.9-10.1 **Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.**~~	~~RST.11-12.1 **Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.**~~
~~RST.6-8.2 **Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.**~~	~~RST.9-10.2 **Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.**~~	~~RST.11-12.2 **Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.**~~
~~RST.6-8.3 **Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.**~~	~~RST.9-10.3 **Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.**~~	~~RST.11-12.3 **Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.**~~

~~Craft and Structure~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~RST.6-8.4 **Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.**~~	~~RST.9-10.4 **Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.**~~	~~RST.11-12.4 **Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.**~~
~~RST.6-8.5 **Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.**~~	~~RST.9-10.5 **Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).**~~	~~RST.11-12.5 **Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.**~~
~~RST.6-8.6 **Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.**~~	~~RST.9-10.6 **Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.**~~	~~RST.11-12.6 **Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.**~~

~~Integration of Knowledge and Ideas~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~RST.6-8.7 **Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).**~~	~~RST.9-10.7 **Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.**~~	~~RST.11-12.7 **Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.**~~

Reading Standards for Literacy in Science and Technical Subjects 6-12 RST

~~RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.~~	~~RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.~~	~~RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.~~
~~RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.~~	~~RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.~~	~~RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.~~

Reading Standards for Literacy in Science and Technical Subjects 6-12 RST

~~Range of Reading and Level of Text Complexity~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~RST.6-8.10~~ ~~**By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.**~~	~~RST.9-10.10~~ ~~**By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.**~~	~~RST.11-12.10~~ ~~**By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.**~~

~~College and Career Readiness Anchor Standards for Writing~~

~~The grades 6-12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) Anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.~~

~~Text Types and Purposes*~~

~~CCRA.W.1 **Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.**~~

~~CCRA.W.2 **Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.**~~

~~CCRA.W.3 **Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.**~~

~~Production and Distribution of Writing~~

~~CCRA.W.4 **Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.**~~

~~CCRA.W.5 **Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.**~~

~~CCRA.W.6 **Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.**~~

~~Research to Build and Present Knowledge~~

~~CCRA.W.7 **Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.**~~

~~CCRA.W.8 **Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.**~~

~~CCRA.W.9 **Draw evidence from literary or informational texts to support analysis, reflection, and research.**~~

~~Note on range and content of student writing~~

~~For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college and career ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to be able to use technology strategically when creating, refining, and collaborating on writing.~~

~~They have to become adept at gathering information, evaluating sources, and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have the flexibility, concentration, and fluency to produce high-quality first-draft text under a tight deadline and the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it. To meet these goals, students must devote significant time and effort to writing, producing numerous pieces over short and long time frames throughout the year.~~

~~Range of Writing~~

~~CCRA.W.10~~ **~~Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.~~**

~~*These broad types of writing include many subgenres. See Appendix A for definitions of key writing types.~~

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12 WHST

~~The standards below begin at grade 6; standards for K-5 writing in history/social studies, science, and technical subjects are integrated into the K-5 Writing standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.~~

~~Text Types and Purposes~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~WHST.6-8.1 **Write arguments focused on discipline-specific content.**~~ ~~a. **Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.**~~ ~~b. **Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.**~~ ~~c. **Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.**~~ ~~d. **Use precise language and domain-specific vocabulary to support the argument.**~~ ~~e. **Establish and maintain a formal style.**~~ ~~f. **Provide a concluding statement or section that follows from and supports the argument presented.**~~	~~WHST.9-10.1 **Write arguments focused on discipline-specific content.**~~ ~~a. **Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.**~~ ~~b. **Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.**~~ ~~c. **Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.**~~ ~~d. **Use precise language and domain-specific vocabulary to manage the complexity of the argument and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.**~~ ~~e. **Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.**~~ ~~f. **Provide a concluding statement or section that follows from or supports the argument presented.**~~	~~WHST.11-12.1 **Write arguments focused on discipline-specific content.**~~ ~~a. **Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.**~~ ~~b. **Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.**~~ ~~c. **Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.**~~ ~~d. **Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the argument; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.**~~ ~~e. **Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.**~~ ~~f. **Provide a concluding statement or section that follows from or supports the argument presented.**~~

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12 WHST

~~Text Types and Purposes (continued)~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~WHST.6-8.2 **Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**~~ ~~a. **Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.**~~ ~~b. **Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.**~~ ~~c. **Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.**~~ ~~d. **Use precise language and domain-specific vocabulary to inform about or explain the topic.**~~ ~~e. **Establish and maintain a formal style and objective tone.**~~ ~~f. **Provide a concluding statement or section that follows from and supports the information or explanation presented.**~~	~~WHST.9-10.2 **Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**~~ ~~a. **Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.**~~ ~~b. **Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.**~~ ~~c. **Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.**~~ ~~d. **Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.**~~ ~~e. **Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.**~~ ~~f. **Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications**~~ ~~**or the significance of the topic).**~~	~~WHST.11-12.2 **Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**~~ ~~a. **Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.**~~ ~~b. **Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.**~~ ~~c. **Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.**~~ ~~d. **Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.**~~ ~~e. **Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications**~~ ~~**or the significance of the topic).**~~
~~WHST.6-8.3 **(See note; not applicable as a separate requirement)**~~	~~WHST.9-10.3 **(See note; not applicable as a separate requirement)**~~	~~WHST.11-12.3 **(See note; not applicable as a separate requirement)**~~

~~Note: **Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/ explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.**~~

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12 WHST

~~Production and Distribution of Writing~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~WHST.6-8.4 **Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.**~~	~~WHST.9-10.4 **Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.**~~	~~WHST.11-12.4 **Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.**~~
~~WHST.6-8.5 **With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.**~~	~~WHST.9-10.5 **Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.**~~	~~WHST.11-12.5 **Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.**~~
~~WHST.6-8.6 **Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.**~~	~~WHST.9-10.6 Use **technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.**~~	~~WHST.11-12.6 **Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.**~~

~~Research to Build and Present Knowledge~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~
~~WHST.6-8.7 **Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.**~~	~~WHST.9-10.7 **Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.**~~	~~WHST.11-12.7 **Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.**~~
~~WHST.6-8.8 **Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.**~~	~~WHST.9-10.8 **Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.**~~	~~WHST.11-12.8 **Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.**~~
~~WHST.6-8.9 **Draw evidence from informational texts to support analysis, reflection, and research.**~~	~~WHST.9-10.9 **Draw evidence from informational texts to support analysis, reflection, and research.**~~	~~WHST.11-12.9 **Draw evidence from informational texts to support analysis, reflection, and research.**~~

~~Range of Writing~~

~~Grades 6-8 Students:~~	~~Grades 9-10 Students:~~	~~Grades 11-12 Students:~~

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12 WHST

WHST.6-8.10 ~~Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.~~	WHST.9-10.10 ~~Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.~~	WHST.11-12.10 ~~Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.~~

PRPOSED DRAFT 7/13/2021

Idaho Content Standards English Language Arts/Literacy

IDAHO STATE DEPARTMENT OF EDUCATION
CONTENT AND CURRICULUM | ENGLISH LANGUAGE ARTS/LITERACY

650 W STATE STREET, 2ND FLOOR
BOISE, IDAHO 83702
208 332 6800 OFFICE
WWW.SDE.IDAHO.GOV

CREATED 07/13/2021

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Introduction

Idaho's education system should ensure that students are fully prepared for college and a career in the 21st century upon graduation. Idaho's education system should also ensure that students are prepared to be civically engaged and knowledgeable adults who make positive contributions to their communities. Nothing could be more vital for our state's future.

To reach this goal, Idaho has revised its former English language arts standards. Throughout this year-long process of reviewing, rethinking, and ultimately rewriting our standards, the Idaho Department of Education engaged numerous stakeholders in a multi-layered process. In recent years Idaho teachers, schools, and districts have worked together to improve English language arts education throughout the state. Revisions in this document respond to the practical wisdom gleaned from their efforts and the interests of parents who have a legitimate say in what their children learn.

High-quality academic standards are the foundation of a well-functioning educational system – driving both the instructional materials used in our schools and the assessments we ask students to take. With these new and improved standards, Idaho builds on its past strengths and also learns from a body of experience with college and career-ready standards within Idaho and around the country. We have sought to make our standards the best in the nation and lay the foundation for higher quality textbooks, more streamlined tests, and—ultimately—generations of high school graduates fully capable of discharging the responsibilities associated with United States citizenship.

Idaho's Standards for English Language Arts are built on the following premises:

- Standards should be understandable to all stakeholders, free of jargon and "how to," with wording focused on the learning goal.
- Standards should reflect the fact that English Language Arts is not merely a collection of discrete skills and strategies but a powerful discipline with consequential content to teach and learn.
- Standards in the distinct strands should not serve as isolated areas of instruction; they are designed to be joined purposely for deep and relevant learning.

Idaho's Standards for English Language Arts prioritize the following content:

Foundational Reading Skills

Idaho's standards emphasize explicit, systematic approaches to teaching phonemic awareness, phonics, and fluency as the foundation of literacy in the early grades. Decoding and fluency are essential to creating proficient readers. Findings in multiple studies reinforce the centrality of solid foundational reading skills to students' reading comprehension and broader literacy abilities. The seminal National Reading Panel's review two decades ago is chief among the works testifying to the strength of the evidence for specific early reading practices. When decoding words becomes rapid, automatic, and effortless, a reader's working memory is freed to focus on the meaning of the reading and growing knowledge. The most frequent performance breakdowns for students struggling with reading generally stem from inadequate practice with foundational reading skills or scarce opportunities to gain fluency with grade-level texts – both relatively straightforward to reinforce. Idaho's standards do this by requiring fluency practice through grade 12.

Building Knowledge

Idaho's standards place a premium on students gathering, evaluating, and synthesizing information and data to build their knowledge of the world. Research is emphatic that reading ability and knowledge about the world (and the words used to describe it) are tightly connected. More than a quarter-century of research supports the importance of general knowledge to reading comprehension. Knowledge of the topic has been shown to have a more significant impact on reading comprehension than students' generalized reading ability (Recht & Leslie 1988). We cannot think deeply, productively, or critically about a matter if we have little foundational knowledge of it. Thus, the key to developing critical thinking skills in our students is to increase their knowledge about a breadth of subjects by reading rich and related texts on various topics. In addition to a research standard, and in response to the substantial research base on the importance of knowledge to students' ability to read well and at high levels, there are two standards—one resides in the Reading Comprehension strand and the other in the Research strand— dedicated to students reading a volume of texts on conceptually related topics. Reading comprehension develops as students engage with resonant and rewarding literary and nonfiction text selections where knowledge acquisition is the primary rationale for reading, starting at the earliest grades to allow knowledge to build upon knowledge.

Comprehending Grade-Level Complex Texts

Idaho's standards are specific about the complexity of texts students ought to be reading. Why do college- and career-ready standards include definitions of text complexity? Students encountering appropriately complex texts at each grade level develop the mature language skills and the conceptual knowledge they need for success in school and life. Research shows that rather than the skills or strategies captured in the verbs used in standards, the complexity of the text is the element that most differentiates performance on reading tests (ACT 2006). Therefore, the standards include a definition of quantitative bands of complexity so that teachers and students have clarity about what level of texts students should regularly read in class—that is, which literary and nonfiction texts qualify as "grade-level."

Valuing Text Evidence

Idaho's standards accurately reflect the demand that students draw evidence from texts to support their claims and conclusions – both orally and in writing – about the texts they are reading and what is happening in them. Research shows that reading "thoughtfully and critically and produc[ing] evidence" is one of the most effective ways to lead students to "make connections to related topics" and "synthesize information" (ICAS, 2002, p. 16). Thus, for students to grow their knowledge from what they read and research, text evidence has a central and recurring presence in the standards. Whatever they are reading, students must be able to show a steadily growing ability to discern more from and make fuller use of text. Students must be able to make an increasing number of connections among ideas and between texts, consider a wider range of textual evidence, and become more sensitive to inconsistencies, ambiguities, and flawed reasoning in texts.

Organization and Substance of Key Aspects of the Standards

Idaho's standards are organized into seven strands and written so that reading, writing, and oral communications standards progress together. Students are expected to use the texts they read in their writing and discussions. The strands are:

- Foundational Reading Skills
- Reading Comprehension
- Vocabulary Development
- Research
- Writing
- Oral and Digital Communications
- Grammar and Conventions

Standards under the *Foundational Reading Skills Strand* describe how students become competent readers who can comprehend texts across a wide range of disciplines they will encounter in school and throughout their lives. Each aspect of foundational skills names a slice of the skills and knowledge students need to acquire and are organized under the sub-strands of Print Concepts, Phonemic Awareness, Phonics, and Decoding. Together they constitute what the brain needs to learn and do in order to read proficiently. The standards aim to ensure every Idaho student has an understanding and working knowledge of how spoken English is translated into print. Mastery of these components will culminate in students becoming fluent readers. The standards constitute a research- and evidence-based scope and sequence for phonological awareness and phonics development, and a grounding in print and alphabet awareness, that should guide the development or adoption of an effective reading curriculum.

Standards under the *Reading Comprehension Strand* emphasize the sophistication of what students read and the skill with which they extract and wield evidence from texts. There are four overarching sub-strands—Text Complexity, Volume of Reading, Text Evidence, and Fluency—that work together with the grade-specific standards for Literature and Nonfiction Texts (the other two sub-strands) to promote reading comprehension. The standards for Text Complexity outline a grade-by-grade sequence on increasing text complexity, from grade 2 to the college and career readiness level. The sub-strand of Volume of Reading focuses on growing students' trove of knowledge of the world from reading (or being read to) a volume of texts at a range of complexity levels. The sub-strand for Textual Evidence conveys the belief that students should show a growing ability to discern more from and make fuller use of the ideas and concepts within texts. Whether done aloud or silently, fluent reading is another crucial component of students' reading comprehension and thus constitutes another sub-strand. Because texts increase in complexity across grades and genre, being fluent in one grade does not guarantee fluency in succeeding grades. Thus, as noted above, fluency practice is required through grade 12.

The standards in the *Vocabulary Development Strand* reflect the fact that researchers have closely tied vocabulary to reading comprehension for nearly a century. As Marilyn Adams says, "Words are not just words. They are the nexus—the interface—between communication and thought. When we read, it is through words that we build, refine, and modify our knowledge. What makes vocabulary valuable and important is not the words themselves so much as the understandings they afford" (2009, p. 180). Strong vocabularies allow students to engage and participate in career, civic, and life pursuits more fully. To use language with precision requires, at the most fundamental level, a command of words. The sub-strand of Word Building asks students not merely to master the use of words in context but to familiarize themselves with how word meaning is constructed from roots and affixes. From using resources to research the multiple meanings of words to exploring nuances and shades of meaning, the standards guide students in developing their understanding and skill at deploying the right word to fit the right instance. The other sub-strand, Academic Vocabulary, expects students to grow and expand their vocabulary to incorporate both general academic and content-specific words so they can read with increasing confidence and write and speak with greater force and clarity.

Under the *Research Strand*, students conduct simple research to build their knowledge of the world and communicate their discoveries. The sub-strand of Inquiry Process asks students to generate questions on topics of importance or interest. They gather, evaluate, and synthesize information and data from various sources and communicate that research to suit different audiences and purposes. Within a grade level, the sub-strand of Deep Reading argues that there should be an adequate number of titles on a given topic to allow students to study topics deeply for a sustained period. The knowledge children learn in earlier grade levels should then be expanded and developed in subsequent grade levels. That way, students grow their academic vocabulary and cultivate knowledge over time and with growing maturity levels about the natural and social world. Children in the early grades (particularly K–2) will benefit from participating in rich, structured conversations in response to texts teachers read aloud. Together they can orally compare, contrast, and synthesize information in the manner called for by the standards. Children in the upper elementary grades and beyond will generally be expected to read texts independently and reflect on them in writing.

The standards under the *Writing Strand* and sub-strand of Range of Writing, are designed to ensure students develop the flexibility to write for multiple purposes and audiences. All students can learn how to marshal textual evidence in the service of a skilled interpretation of what a text says directly or inferentially, and learning to do so is essential to students' futures. Researchers note that the task most associated with college-level work across the disciplines is "reading-to-write" (Flower et al., 1990, p. 4). College instructors are unanimous in citing the ability to identify, evaluate, and use evidence to support or challenge a thesis as one of the essential skills expected of incoming college students (Graham & Hebert, 2010; ICAS, 2002). The types of writing described in the standards are versatile and worth learning; mature writing often blends elements of more than one type. For example, an argument may include a reflection, an exposition might consist of a critique, or a short story may explain an idea. In addition, each type of writing is itself a broad category encompassing a balance of genres. For example, narrative writing could include narrative poems, short stories, and memoirs. Since research shows that writing about text(s) is one of the most powerful ways students can improve their reading comprehension and knowledge, writing to sources is a priority. Across all types of writing, students need to be able to reshape and polish pieces of writing and be facile with printing, cursive, and keyboarding, which constitutes the other sub-strand (Handwriting and Keyboarding).

The standards under the *Oral and Digital Communications Strand* include two sub-strands: Oral Communications and Digital Communications. The standards under those two sub-strands reflect the importance of verbal and visual communications in today's society. They illustrate the priority given to working collaboratively in diverse groups and organizational settings and the need to be able to decipher oral and digital communications for their explicit and implicit messages. New technologies have broadened and expanded the role that speaking and listening play in acquiring and sharing knowledge and have elevated the role of digital communications. To fully participate in civic life in our technological society, students need the ability to gather, comprehend, and evaluate information and ideas delivered through oral and digital media. The Oral and Digital Communications standards lay out a progression of competencies in which students develop the ability to listen carefully and express ideas; integrate information from oral, visual, quantitative, and digital sources; and critically evaluate what they hear and see to become more informed, reflective, and engaged participants in society.

The standards under the *Grammar and Conventions Strand* not only identify a steady progression toward student mastery of the rules and conventions of English grammar, but they also communicate that language is a matter of craft and informed choice among alternatives. To convey meaning effectively and build a foundation for writing with precision and clarity, students must learn about the mechanics of the English language and standard expectations for usage. Understanding conventions and grammar is not unimportant for reading; learning how to navigate poetry or prose on the page requires a grasp of how words are strung together and assembled into meaningful sentences. The competent and skillful use of conventions even impacts speaking and listening. They are the mark of an adept user of language. Students should also have a well-developed sense of when discourse calls for standard conventions and when other, more informal modes of communication may be more appropriate.

Coding Scheme

Foundational Reading Skills: FR Print Concepts: PC Phonemic Awareness: PA Phonics and Decoding: PH	**Writing Strand: W** Range of Writing: RW Handwriting and Keyboarding: HWK
Reading Comprehension: RC Text Complexity: TC Volume of Reading to Build Knowledge: V	**Oral and Digital Communications Strand: ODC** Oral Communications : OC Digital Communications : DC

Foundational Reading Skills: FR Print Concepts: PC Phonemic Awareness: PA Phonics and Decoding: PH	**Writing Strand: W** Range of Writing: RW Handwriting and Keyboarding: HWK
Textual Evidence: TE Reading Fluency: RF Literature: L Nonfiction Text: NF	
Vocabulary Development Strand: VD Word Building: WB Academic Vocabulary: AV	**Grammar and Conventions Strand: GC** Grammar and Usage: GU Mechanics: M
Research Strand: RS Inquiry Process to Build, Present, and Use Knowledge: IP Deep Reading on Topics to Build Knowledge: DR	

We express our sincere thanks to all educators and members of the public who contributed to this vital effort. In particular, we thank the many individuals who served on the standards review committees to represent Idaho's teachers and students.

Kindergarten

Foundational Reading Skills Strand

K.FR-

Print Concepts (PC)

1. Demonstrate understanding of the basic features of print.

1a. Locate a printed word on a page.

1b. Recognize that spoken words are represented in written language by specific sequences of letters.

1c. Know that print (not pictures) is what we read, and text holds meaning.

1d. Follow words from left to right with return sweep at the end of each line.

1e. Read left to right, top to bottom, and page by page.

1f. Understand that words are separated by spaces in print.

1g. Recognize the distinguishing features of a sentence (e.g., first word, capitalization, ending punctuation).

1h. Identify and name all upper- and lowercase letters of the alphabet.

Phonemic Awareness (PA)

2. Demonstrate understanding of spoken words, syllables, and sounds.

2a. Identify and produce rhyming words.

2b. Count, pronounce, blend, delete and segment syllables in spoken words.

2c. Blend and segment onsets and rimes of single-syllable spoken words.

2d. Isolate and pronounce the initial, medial vowel, and final sounds (phonemes) in spoken three-phoneme (consonant-vowel-consonant, or CVC) words and say the resulting word (Note: This does not include CVCs ending with /l/, /r/, or /x/.)

2e. Add, substitute, and delete individual sounds (phonemes) in simple, one-syllable words to make new words.

Phonics and Decoding (PH)

3. Use knowledge of grade-level phonics and word analysis skills in decoding words.

3a. Demonstrate knowledge of one-to-one letter-sound correspondences by producing the most frequent sound for each consonant letter.

3b. Associate the long and short sounds for the five major vowel letters.

3c. Read common high-frequency words with automaticity by sight (e.g., *the, of, to, you, she, my, is, are, do, does*).

3d. Distinguish between similarly spelled CVC words by identifying the sounds of the letters that differ.

Reading Comprehension Strand

K.RC-

Text Complexity (TC)

1. *(Text Complexity begins in grade 2.)*

Volume of Reading to Build Knowledge (V)

2. Regularly engage in listening to a series of texts related to the topics and themes being studied to build knowledge and vocabulary.

Textual Evidence (TE)

3. Ask and answer questions about key details in texts heard.

Reading Fluency (RF)

4. Read emergent-reader texts (e.g., rhymes, songs, simple poems) with purpose and understanding.

Literature (L)

5. With support, use evidence from literature read aloud to demonstrate understanding of grade-level texts.

- **5a.** Retell key details of familiar stories, poems, and nursery rhymes heard.
- **5b.** Describe the connection between characters, settings and major events in stories heard.
- **5c.** Identify the front cover, back cover, and title page of stories.
- **5d.** Define the roles of authors and illustrators in presenting the ideas or information in stories.
- **5e.** Compare and contrast the adventures or experiences of characters in familiar stories heard.

Nonfiction Text (NF)

6. With support, use evidence from nonfiction works read aloud to demonstrate of grade-level texts.

- **6a.** Retell key details of texts heard.
- **6b.** Describe the connection between two individuals, events, ideas, or pieces of information in texts heard.
- **6c.** Identify the front cover, back cover, and title page of nonfiction texts.
- **6d.** Identify the reasons authors give to support points in texts heard.
- **6e.** Identify basic similarities in and differences between two texts heard on the same topic.

Vocabulary Development Strand

K.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on kindergarten reading and content.

- **1a.** Ask and answer questions about unknown words in a text.

1b. Identify new meanings for familiar words and apply them accurately (e.g., discovering the verb roll is also a noun). **2.** With support, explore word relationships and nuances in word meanings. **2a.** Sort common objects into categories (e.g., foods, size) to gain a sense of the concepts the categories represent. **2b.** Demonstrate understanding of frequently occurring verbs and adjectives by relating them to their synonyms and antonyms. **2c.** Distinguish shades of meaning among verbs describing the general action (e.g., *walk, march, strut, prance*). **2d.** Identify real-life connections between words and their use (e.g., note places at home that are cozy).
Academic Vocabulary (AV)
3. With support, use words and phrases acquired through conversations, reading, and listening to texts.

Research Strand K.RS-
Inquiry Process to Build, Present, and Use Knowledge (IP)
1. *(Inquiry process begins in grade 1.)*
Deep Reading on Topics to Build Knowledge (DR)
2. Listen to a series of texts organized around a variety of conceptually-related topics to build knowledge about the world.

Writing Strand K.W-
Range of Writing (RW)
1. Routinely write or dictate writing for a range of tasks, purposes, and audiences.
Handwriting and Keyboarding (HWK)
2. Print all uppercase and lowercase letters of the alphabet. Write left to right and top to bottom with appropriate spaces between letters. **3.** *(Keyboarding skills begin in grade 3.)*

Oral and Digital Communications Strand K.ODC-
Oral Communications (OC)

1. Engage in collaborative discussions about *grade-level topics and texts* with peers by following agreed-upon rules for discussions; listening to others and taking turns speaking through at least two exchanges.
2. With support, confirm understanding of a text read aloud or information presented orally by asking and answering questions.
3. With support, ask and answer questions to seek help, get information, or clarify something that is not understood.
4. Describe familiar people, places, things, and events with support.

Digital Communications (DC)

5. *(Digital Communications begin in grade 3.)*

Grammar and Conventions Strand

K.GC-

Grammar and Usage (GU)

1. Demonstrate command of the conventions of English grammar and usage when writing or speaking.

1a. Form regular plural nouns orally by adding 's' or 'es' sound.

1b. Use interrogatives to ask questions in full sentences (e.g., *who, what, where, when, why, how*).

1c. Use frequently occurring prepositions (e.g., *to, from, in, out, on, off, for, of, by, with*).

1d. Produce and expand complete sentences in shared language activities.

Mechanics (M)

2. Recognize and name end punctuation.

3. Spell words phonetically, drawing on knowledge of sound-letter relationships.

Grade 1

**Note: Print concepts, standard 1, is found only in kindergarten. Fluency standards run K-12 and are contained within standard 4, Reading Comprehension.*

Foundational Reading Skills Strand

1.FR-

Phonemic Awareness (PA)

2. Demonstrate understanding of spoken words, syllables, and sounds.

2a. Distinguish long from short vowel sounds in spoken single-syllable words.

2b. Orally produce single-syllable words by blending sounds, including consonant blends.

2c. Isolate and pronounce initial, medial vowel, and final sounds in spoken single-syllable words.

2d. Delete initial and final sounds in spoken single syllable words and say the resulting word.

2e. Segment and blend sequences of individual sounds in spoken single-syllable words.

Phonics and Decoding (PH)

3. Use knowledge of grade-level phonics and word analysis skills in decoding words.

3a. Know the spelling-sound correspondences for common consonant digraphs.

3b. Decode regularly spelled one-syllable words.

3c. Know final -e and common vowel team conventions for representing long vowel sounds (e.g., ai, ay, ee, ea, oa and oe).

3d. Use knowledge that every syllable must have a vowel sound to determine the number of syllables in a printed word.

3e. Learn all the r-controlled vowel patterns (-ar, -er, -ir, -or, -ur) and recognize how they change short vowel recognition and pronunciation.

3f. Decode two-syllable words following basic patterns by breaking the words into syllables.

3g. Decode frequently encountered words with inflectional endings (e.g., -s, ed, -est).

3h. Recognize and read grade-appropriate irregularly spelled words (e.g., *what, said, have*).

Reading Comprehension Strand

1.RC-

Text Complexity (TC)

1. *(Text complexity begins in grade 2.)*

Volume of Reading to Build Knowledge (V)

2. Regularly engage in reading and listening to a series of texts related to the topics and themes being studied to build knowledge and vocabulary.

Textual Evidence (TE)

3. Ask and answer questions about key details in texts heard or read.

Reading Fluency (RF)

4. Read grade-level text with accuracy, appropriate rate, and expression to support comprehension in successive readings (see the 2017 Hasbrouck and Tindal norms listed in the Resource Reference).

Literature (L)

5. Use evidence from literature to demonstrate understanding of grade-level texts.

- **5a.** Retell the beginning, middle and end of familiar stories (including fables, and fairy tales) with key details heard or read, demonstrating understanding of their central messages or morals.
- **5b.** Describe the connection between characters, settings, and major events in stories heard, using key details.
- **5c.** Describe major differences between books that tell stories and books that give information.
- **5d.** Describe who is telling stories heard or read at various points in texts.
- **5e.** Compare and contrast the adventures or experiences of characters in stories heard.

Nonfiction Text (NF)

6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts.

- **6a.** Retell key details of texts that demonstrate understanding of the main topics of texts heard or read.
- **6b.** Describe the connection between two individuals, events, ideas, or pieces of information in texts heard or read.
- **6c.** Know and use various text features (e.g., table of contents, headings, glossaries, icons, index) to locate information in a text.
- **6d.** Identify the reasons authors give to support points in texts heard or read.
- **6e.** Identify basic similarities in and differences between two texts heard or read on the same topic.

Vocabulary Development Strand

1.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-level reading and content*, choosing flexibly from an array of strategies:

- **1a.** Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.
- **1b.** Use sentence-level context as a clue to the meaning of a word or phrase.
- **1c.** Use frequently occurring affixes (e.g., re-, un- pre-, -ful, -less) as clues to the nuance they add to known words.
- **1d.** Recognize and read frequently encountered words with inflectional endings (e.g., -d, -ed, -s, -es).
- **1e.** Identify frequently encountered root words (e.g., *help*) and use the roots as clues to the meaning of the full word (e.g., *helper, helpful*).

1f. Use knowledge of the meaning of individual words to predict the meaning of compound words (e.g., *playpen, penpal*).

2. With support, explore word relationships and nuances in word meanings.

2a. Sort words into categories (e.g., *tools, pets*) and define those words by one or more key attributes (e.g., a *saw* is a tool that cuts; *a goldfish* is a pet that lives in water).

2b. Demonstrate understanding of frequently occurring grade-level verbs and adjectives by relating them to their synonyms and antonyms.

2c. Distinguish shades of meaning among verbs describing the same general action (e.g., *walk, stroll, strut, prance*) by acting out the meanings.

2d. Identify words and phrases in stories or poems that suggest feelings or appeal to the senses.

Academic Vocabulary (AV)

3. With support as needed, acquire, and use general academic and content-specific words gained through conversations, reading, and listening to texts.

Research Strand

1.RS-

Inquiry Process to Build, Present, and Use Knowledge (IP)

1. With support, conduct simple research tasks to take some action or make informal presentations by identifying information from classroom experiences or provided sources (including read alouds) and organizing information, recorded in words or pictures, using graphic organizers or other aids.

Deep Reading on Topics to Build Knowledge (DR)

2. Read or listen to a series of texts organized around a variety of conceptually-related topics to build knowledge about the world.

Writing Strand

1.W-

Range of Writing (RW)

1. Routinely write or dictate writing for a range of tasks, purposes, and audiences (e.g., expressing a view or preference, supplying some information about the topic, stories that recount an event or tell a story).

Handwriting and Keyboarding (HWK)

2. Print legibly and space words appropriately when writing a complete sentence.

3. *(Keyboarding skills begin in grade 3.)*

Oral and Digital Communications Strand

1.ODC-

Oral Communications (OC)

1. Engage in collaborative Engage in collaborative discussions about *grade-level topics and texts* with peers by listening to others closely, taking turns speaking through multiple exchanges, and asking questions to clear up any confusions.

2. Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

3. Ask and answer questions about what a speaker says to gather additional information or clarify something that is not understood.

4. Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.

Digital Communications (DC)

5. *(Digital communications begins in grade 3.)*

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand

1.GC-

Grammar and Usage (GU)

1. Demonstrate command of the conventions English grammar and usage when writing and/or speaking.

1a. Use subject-verb agreement in simple sentences.

1b. Match single and plural nouns with matching verbs in simple sentences. (e.g., *He hops; We hop*).

1c. Form and use the simple verb tenses (past, present, and future) for regular verbs.

1d. Use personal, possessive, and indefinite pronouns (e.g., *I, me, my; they, them, their, anyone, everything*).

1e. Use frequently occurring adjectives.

1f. Use frequently occurring conjunctions to signal simple relationships (e.g., *and, but, or, so, because*).

1g. Use frequently occurring prepositions (e.g., *to, during, under, in, with, at*).

1h. Produce and expand complete sentences in response to prompts.

Mechanics (M)

2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning.

2a. Distinguish among declarative, exclamatory, and interrogative sentences, and use periods, exclamation marks, or question marks at the end of sentences when writing and reading text aloud.

2b. Use commas in dates and to separate single words in a series.

2c. Capitalize the first word in a sentence, the first letter of student's name, and the pronoun I.

3. Use knowledge of spelling in writing.

3a. Use conventional spelling for words with common, taught spelling patterns and frequently occurring irregular words.

3b. Spell untaught words phonetically, drawing on phonemic awareness and spelling conventions.

Grade 2

**Note: Print concepts, standard 1, is found only in kindergarten. Fluency standards run K-12 and are contained within standard 4, Reading Comprehension.*

Foundational Reading Skills Strand

2.FR-

Phonemic Awareness (PA)

2. Demonstrate understanding of spoken words, syllables, and sounds.

2a. Reverse phonemes in spoken one syllable words (e.g., reverse initial and final consonants in the word "pat" and say the resulting word).

2b. Demonstrate automaticity in the deletion and substitution of phonemes in multi-syllable spoken words and naming of resulting words.

Phonics and Decoding (PH)

3. Use knowledge of grade-level phonics and word analysis skills in decoding words.

3a. Know spelling-sound correspondences for common short and long vowel teams (e.g., head, hook, boat, weigh) including diphthongs (e.g., toil, cloud).

3b. Decode regularly spelled two-syllable words with long and short vowels.

3c. Decode words with common prefixes and suffixes (e.g., *un-, dis-, -ful, -less*).

3d. Identify words with inconsistent but common spelling-sound correspondences.

3e. Recognize and read grade-appropriate irregularly spelled words (e.g., *was, again, been*), including silent letter combinations.

Reading Comprehension Strand

2.RC-

Text Complexity (TC)

1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives, that exhibit complexity at the lower end of the grades 2-3 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)

Volume of Reading to Build Knowledge (V)

2. Regularly engage in reading and listening to a series of texts, independently, with peers, or with modest support related to the topics and themes being studied to build knowledge and vocabulary.

Textual Evidence (TE)

3. Ask and answer such questions as *who, what, where, when, why,* and *how* to demonstrate understanding of key details in grade-level texts heard or read.

Reading Fluency (RF)

4. Read grade-level text with accuracy, appropriate rate, and expression to support comprehension in successive readings (see the 2017 Hasbrouck and Tindal norms listed in the Resource Reference).

Literature (L)

5. Use evidence from literature to demonstrate understanding grade-level texts.

5a. Identify the central message, lesson or moral of stories (including fables and folktales) from diverse cultures heard or read.

5b. Describe how characters in stories heard or read respond to major events and challenges.

5c. Describe the overall structure of stories heard or read, including identifying how the beginning introduces the story and the ending concludes the action.

5d. Identify different perspectives of characters in stories heard or read.

5e. Compare and contrast two or more versions of the same story (heard or read) by different authors or from different cultures.

Nonfiction Text (NF)

6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts.

6a. Identify the central idea of texts heard or read.

6b. Describe the connection between a series of historical events, scientific concepts, or steps in technical procedures in texts.

6c. Describe the overall structure of nonfiction texts heard or read, including identifying how the beginning introduces information and the ending sums up the information.

6d. Describe how authors use facts and reasons to support specific points in texts.

6e. Compare and contrast the most important points presented in two texts on the same topic.

Vocabulary Development Strand

2.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade-level reading and content, choosing flexibly from an array of strategies.

1a. Use sentence-level context as clues to the meaning of words or phrases.

1b. Determine the meaning of new words formed when known prefixes (e.g., *safe/unsafe, like/dislike*) and suffixes (e.g., *beauty/beautiful, light/lightness*) are added to a known word.

1c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., *pain/painful, help/helpless*).

1d. Use knowledge of the meaning of individual words to predict the meaning of compound words (e.g., *backpack, backyard; flashlight, lighthouse*).

1e. Use glossaries and beginning dictionaries, print or digital, to clarify the meaning of words and phrases.

2. Determine how words and phrases provide meaning and nuance to texts.

2a. Identify real-life connections between words and use (e.g., describe weather that is *freezing* or *windy*).

2b. Distinguish shades of meaning among closely related verbs (e.g., *toss, throw, hurl*) and closely related adjectives (e.g., *hot, sizzling, blazing*).

2c. Describe how words and phrases (e.g., rhymes, alliteration) supply rhythm and meaning in a story, poem, or song.

Academic Vocabulary (AV)

3. Acquire and use general academic and content-specific words gained through conversations, and reading and listening to texts, including using adjectives and adverbs to describe situations with specificity (e.g., *When other kids are acting silly, that makes me feel giddy*). Use these words in discussions and writing.

Research Strand

2.RS-

Inquiry Process to Build, Present, and Use Knowledge (IP)

1. With support as needed, conduct short research tasks to take some action or make informal presentations by gathering information from experiences and provided sources (including read alouds); and, organizing information using graphic organizers or other aids.

Deep Reading on Topics to Build Knowledge (DR)

2. Read or listen to a series of texts organized around a variety of conceptually-related topics to build knowledge about the world. (These texts should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)

Writing Strand

2.W-

Range of Writing (RW)

1. Develop flexibility in writing by routinely engaging in the production of writing shorter and longer pieces for a range of tasks, purposes, and audiences. This could include reflections, descriptions, letters, and poetry, etc.

2. Write arguments that express an opinion supported by details and reasons and provide a concluding sentence.

3. Write informational texts that state a focus and support the focus with facts and details and provide a concluding sentence.

4. Write personal or fictional stories that recount a short sequence of events, include details to develop the characters or experiences, and provide sense of closure.

5. *(Employing clear and coherent organizational structures begins in grade 3.)*

6. With support from adults and peers, strengthen writing as needed by revising and editing.

Handwriting and Keyboarding (HWK)

7. Form letters correctly with functional speed. Space words and sentences properly so that writing can be read easily by another person.

8. With support, use keyboarding skills to produce and publish writing.

Oral and Digital Communications Strand

2.ODC-

Oral Communications (OC)

1. Engage in collaborative discussions about *grade-level topics and texts* with peers by gaining the floor in respectful ways, listening to others closely and building on others' ideas, and asking for clarification and further explanation to ensure understanding.

2. Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

3. Ask and answer questions about what a speaker says to clarify by gathering additional information or deepen understanding of a topic or issue.

4. Tell a story or retell an experience with relevant facts and descriptive details, speaking audibly in coherent sentences.

Digital Communications (DC)

5. *(Digital Communications begins in grade 3.)*

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand

2.GC-

Grammar and Usage (GU)

1. Demonstrate command of the conventions of English grammar and usage when writing or speaking.

- **1a.** Form and use the past tense of frequently occurring irregular verbs (e.g., *felt, told, went*).
- **1b.** Use adjectives and adverbs and choose between them depending on what is to be modified.
- **1c.** Form and use regular and frequently occurring irregular plural nouns (e.g., *men, teeth, fish*).
- **1d.** Recognize that the names of things can also be the names of actions *(fish, dream, run).*
- **1e.** Use reflexive pronouns (e.g., *yourself, herself*).
- **1f.** Distinguish between complete and incomplete sentences and recognize and use correct word order in written sentences.
- **1g.** Produce and expand, complete simple and compound sentences.

Mechanics (M)

2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning.

2a. Commas in greetings and closing of letters.

2b. Apostrophes to form contractions and frequently occurring possessives.

2c. Capitalize holidays, names, and places.

3. Use knowledge of spelling in writing.

3a. Generalize learned spelling patterns when writing words (e.g., *cage* → *badge; boy* → *boil*).

3b. Consult reference materials, including beginning dictionaries, as needed to check and correct spellings.

Grade 3

**Note: Print concepts (standard 1) is found only in kindergarten; phonological awareness (standard 2) is found only in kindergarten, grade 1, and grade 2. Fluency standards run K-12 and are contained within standard 4, Reading Comprehension.*

Foundational Reading Skills Strand

3.RF-

Phonics and Decoding (PH)

3. Use knowledge of grade-level phonics and word analysis skills to decode words.

3a. Decode words when known affixes are added to a known word (e.g., *visit/revisit, appear/disappear, lead/mislead, care/careful).*

3b. Decode words with common Greek and Latin roots (e.g., *trans, port, bio*).

3c. Decode multisyllable words.

3d. Read grade-appropriate irregularly spelled words (e.g., *come, friend, today*).

Reading Comprehension Strand

3.RC-

Text Complexity (TC)

1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the higher end of the grades 2-3 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)

Volume of Reading to Build Knowledge (V)

2. Regularly engage in a volume of reading (independently, with peers, or with modest support) related to the topics and themes being studied to build knowledge and vocabulary.

Textual Evidence (TE)

3. Ask and answer questions to demonstrate understanding of grade-level texts, referring explicitly to textual evidence as the basis for the answers.

Reading Fluency (RF)

4. Read grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support comprehension (see the 2017 Hasbrouck and Tindal norms listed in the Resource Reference).

Literature (L)

5. Use evidence from literature to demonstrate understanding of grade-level texts.

5a. Describe key details from stories (including folktales, fables, and tall tales) from diverse cultures and explain how they support the central lesson, moral, or theme.

5b. Explain how characters develop (e.g., their traits, motivations, or feelings) throughout the text.

5c. Explain major structural differences between poems, plays, and prose.

5d. Explain the difference between a narrator's point of view and various characters' perspectives in stories.

5e. Compare and contrast the themes, settings, and plots of stories written by the same author about the same or similar characters.

Nonfiction Text (NF)

6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts.

6a. Describe key details from texts and explain how they support the central idea.

6b. Describe the relationship between a series of events, concepts, steps, or procedures in historical, scientific, or technical texts, using words that pertains to comparison, sequence, or cause/effect.

6c. Describe major structural differences between the organization of different informational texts (e.g., description, sequence, comparison, problem-solution, cause-effect).

6d. Explain the logical connection between particular facts and reasons in texts.

6e. Compare and contrast important points and key supporting details presented in two texts on the same topic.

Vocabulary Development Strand

3.VB-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on *grade-level reading and content*, choosing flexibly from a range of strategies.

1a. Use sentence-level context as clues to the meaning of words or phrases.

1b. Determine the meaning of new words formed when known affixes are added to a known word (e.g., *expensive/ inexpensive, lock/unlock, help/helpless, care/ careless*).

1c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., *transport, portable*).

1d. Use glossaries or beginning dictionaries, print or digital, to clarify the precise meaning of key words and phrases.

2. Determine how words and phrases provide meaning and nuance to grade-level texts.

2a. Distinguish the literal and nonliteral meanings of words and phrases in context (e.g., *take steps*).

2b. Distinguish shades of meaning among grade-appropriate, related words that describe states of mind or degrees of certainty (e.g., *knew, believed, suspected, heard, wondered*).

Academic Vocabulary (AV)

3. Acquire and use general academic, and content-specific words and phrases occurring in grade-level reading and content, including those that signal spatial and temporal relationships (e.g., *She stood behind the door before she entered the room*). Use these words in discussions and writing.

Research Strand 3.RS-
Inquiry Process to Build, Present, and Use Knowledge (IP)
1. Conduct short research tasks to take some action or share findings orally or in writing by gathering and recording information on a specific topic from reference texts or through interviews, and using text features and search tools (e.g., *key words, sidebars, hyperlinks*) to locate information efficiently.
Deep Reading on Topics to Build Knowledge (DR)
2. Read a series of texts organized around a variety of conceptually-related topics to build knowledge about the world. (These texts should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)

Writing Strand 3.W-
Range of Writing (R)
1. Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, letters, and poetry, etc. 2. Write arguments that introduce the topic, express an opinion supported with facts, details, and reasons, and provide a concluding statement. 3. Write informational texts that introduce the topic, develop the focus with facts and details, and provide a concluding statement. 4. Write personal or fictional stories that recount an event or experience, include details to develop the characters or event(s), and provide a sense of closure. 5. Group related information within a paragraph, using common linking words and phrases to connect ideas and information. 6. With support from adults and peers, develop and strengthen writing as needed by planning, revising, and editing. (Editing should demonstrate command of grade-level Grammar and Conventions.)
Handwriting and Keyboarding (HWK)
7. Write legibly in cursive leaving space between letters in a word, in a sentence, and at the edges of the paper. 8. Use keyboarding skills to produce and publish writing.

Oral and Digital Communications Strand 3.OD-
Oral Communications (OC)
1. Engage in collaborative discussions about *grade-level topics and texts* with peers by staying on topic; linking comments to the remarks of others; asking questions to check understanding of information being discussed; and, reviewing ideas expressed.

2. Determine the main ideas and supporting details of a text read aloud or information presented in a variety of media (audio, visual and quantitative).

3. Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

4. Report orally on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Digital Communication (DC)

5. With support, evaluate whether a digital source is factual or not by considering its use of evidence.

6. Use information gained digitally to determine where, when, why, and how key events occur.

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand

3.GC-

Grammar and Usage (GU)

1. Demonstrate command of the conventions of English grammar and usage when writing or speaking.

- **1a.** Form and use the progressive and perfect verb tenses.
- **1b.** Form and use comparative and superlative adjectives and adverbs.
- **1c.** Use collective nouns (e.g., *family, crew, assembly*) matched to plural verb forms.
- **1d.** Form and use regular and irregular plural nouns (e.g., *fish*, *teeth*).
- **1e.** Use common, proper, and possessive nouns.
- **1f.** Use coordinating and subordinating conjunctions.
- **1g.** Produce, expand, and rearrange simple and compound sentences.
- **1h.** Speak in complete sentences when appropriate to task and situation to provide requested detail or clarification.

Mechanics (M)

2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning.

- **2a.** Commas in addresses and dates.
- **2b.** Commas and quotation marks in dialogue.
- **2c.** Forming and using possessives.
- **2d.** Capitalize appropriate words in titles.

3. Use knowledge of spelling in writing.

- **3a.** Use conventional spelling for high-frequency and other studied words and for adding suffixes to base words.

3b. Use spelling patterns and generalizations (e.g., word families, position-based spellings, syllable patterns, ending rules, meaningful word parts) when pronouncing and writing words.

3c. Spell high-frequency irregular words correctly (e.g., *who, what, why*).

3d. Consult reference materials to check and correct spelling.

Grade 4

**Note: Print concepts (standard 1) is found only in kindergarten; phonological awareness (standard 2) is found only in kindergarten, grade 1, and grade 2. Fluency standards run K-12 and are contained within standard 4, Reading Comprehension.*

Foundational Reading Skills Strand

4.FR-

Phonics and Decoding (PH)

3. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (roots and affixes) to read accurately unfamiliar grade-appropriate multisyllabic words (e.g., *depart, beneficial, recycle)* in context and out of context.

Reading Comprehension Strand

4.RC-

Text Complexity (TC)

1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the lower end of the grades 4-5 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)

Volume of Reading to Build Knowledge (V)

2. Regularly engage in a volume of reading, independently, with peers, or with modest support related to the topics and themes being studied to build knowledge and vocabulary.

Textual Evidence (TE)

3. Refer to details and examples in grade-level texts when explaining what texts say explicitly and when drawing inferences from texts.

Reading Fluency (RF)

4. Read grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).

Literature (L)

5. Use evidence from literature to demonstrate understanding of grade-level texts.

5a. Determine the central themes in stories (including myths and legends), poems and plays and explain how they are supported by key details.

5b. Describe a character, setting, or event in depth in stories and plays, drawing on specific details in the texts (e.g., a character's thoughts, words, or actions).

5c. Explain the overall structures of stories, plays, and poems and how each successive part builds on earlier sections.

5d. Compare and contrast the point of view from which different stories are narrated, including the difference between first- and third-person narrations.

5e. Compare and contrast the treatment of similar themes and patterns of events in stories, myths, and traditional literature from different cultures.

Nonfiction Text (NF)

6. Use evidence from nonfiction works to demonstrate of grade-level texts.

6a. Determine the central ideas of texts and explain how they are supported by key details; summarize texts.

6b. Explain events, procedures, steps, ideas, or concepts found in historical, scientific, or technical texts, including what happened and why.

6c. Explain the overall structure of informational texts (e.g., description, sequence, comparison, problem-solution, cause-effect) and how each successive part builds on earlier sections.

6d. Explain how authors use evidence and reasons to support specific points in texts.

6e. Combine information from two texts on the same topic, noting important similarities and differences in focus and the information provided.

Vocabulary Development Strand

4.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-level content*, choosing flexibly from a range of strategies:

1a. Use context (e.g., definitions, examples, or restatements in text) as clues to the meaning of words or phrases.

1b. Use common Greek and Latin affixes and roots as clues to the meaning of words (e.g., *thermometer, thermos, thermostat*).

1c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), print or digital, to find the pronunciation and clarify the precise meaning of key words and phrases.

2. Determine how words and phrases provide meaning and nuance to grade-level texts:

2a. Recognize and explain the meaning of idioms, adages, and proverbs in context.

2b. Distinguish shades of meaning among related words that describe subtle differences (e.g., *shook, trembled, wavered, quivered*).

Academic Vocabulary (AV)

3. Acquire and use accurately general academic and content-specific words and phrases *occurring in grade-level* reading and content, including those that signal precise actions or states of being (e.g., *frustrated, puzzled, stammered*) and vocabulary essential to a particular topic (e.g., *heroes, villains, quest, fate* when discussing myths). Use these words in discussions and writing.

Research Strand

4.RS-

Inquiry Process to Build, Present, and Use Knowledge (IP)

1. Conduct short research tasks to take some action or share findings orally or in writing by identifying what information is needed to answer a research question, using text features and search tools to gather relevant information efficiently; and taking notes, categorizing that information, and providing a list of sources.

Deep Reading on Topics to Build Knowledge (DR)

2. Read a series of texts organized around a variety of conceptually-related topics to build knowledge about the world. (These texts should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)

Writing Strand

4.W-

Range of Writing (RW)

1. Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, letters, and poetry, etc.

2. Write arguments that introduce the topic; express a clear opinion supported with facts, details and reasons; and provide a concluding statement or section.

3. Write informational texts that introduce the topic; develop the focus with facts, details or other information; and provide a concluding statement or section.

4. Write personal or fictional narratives that organize the writing around a central problem, conflict, or experience; use descriptions or dialogue to develop the characters or event(s); and provide a sense of closure.

5. Organize related information together in paragraphs using precise language and linking words and phrases to connect details and ideas.

6. With support from adults and peers, develop and strengthen writing as needed by planning, revising, and editing. (Editing should demonstrate command of grade-level Grammar and Conventions.)

Handwriting and Keyboarding (HW)

7. Write legibly and fluently in cursive by hand, forming letters and words that can be easily read by others.

8. Use technology to produce and publish writing, demonstrating sufficient command of keyboarding skills.

Oral and Digital Communications Strand

4.0DC-

Oral Communications (OC)

1. Engage in collaborative discussions about *grade-level topics and texts* with peers by carrying out assigned roles; making comments that build on and link to others' remarks; clarifying or following-up on information; and reviewing key ideas expressed and explaining one's understanding.

2. Paraphrase portions of a text read aloud, or information presented in diverse media (audio, visual and quantitative).

3. Identify the reasons and evidence a speaker provides to support particular points being made.

4. Report orally on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes, speaking clearly at an understandable pace.

Digital Communication (DC)

5. Evaluate whether a digital source is factual or opinion-based by considering its use of evidence and whose point-of-view is represented or missing.

6. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, timelines, or interactive elements) on Web pages.

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand

4.GC-

Grammar and Usage (GU)

1. Demonstrate command of the conventions of English grammar and usage when writing or speaking.

- **1b.** Recognize subject-predicate relationship in sentences.
- **1c.** Use principal modals to convey various conditions (e.g., *can, may, must*).
- **1d.** Order adjectives within sentences according to conventional patterns.
- **1e.** Use relative pronouns and relative adverbs.
- **1f.** Form and use prepositional phrases.
- **1g.** Correctly use frequently confused common words (e.g., *to/too/two*).
- **1h.** Ensure subject-verb agreement.
- **1i.** Produce complete sentences; recognize and correct inappropriate fragments and run-ons.
- **1j.** Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation.

Mechanics (M)

2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning.

- **2a.** Commas in a series.
- **2b.** Quotation marks to mark direct speech and quotations from a text.
- **2c.** Use correct capitalization.

3. Spell grade level words correctly, including commonly confused words (e.g., there/their/they're).

Grade 5

**Note: Print concepts (standard 1) is found only in kindergarten; phonological awareness (standard 2) is found only in kindergarten, grade 1, and grade 2. Fluency standards run K-12 and are contained within standard 4, Reading Comprehension.*

Foundational Reading Skills Strand

5.FR-

Phonics and Decoding (PH)

3. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (roots and affixes) to read accurately unfamiliar grade-level multisyllabic words (e.g., *disallow, misinform, transaction) in* context and out of context.

Reading Comprehension Strand

5.RC-

Text Complexity (TC)

1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the higher end of the grades 4-5 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)

Volume of Reading to Build Knowledge (V)

2. Regularly engage in a volume of reading, independently, with peers, or with modest support related to the topics and themes being studied to build knowledge and vocabulary.

Textual Evidence (TE)

3. Draw evidence from grade-level texts to explain what is said explicitly and when drawing inferences, including quoting from texts accurately.

Reading Fluency (FR)

4. Read grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).

Literature (L)

5. Use evidence from literature to demonstrate understanding of grade-level texts.

- **5a.** Summarize a text and determine the central themes of stories, plays, or poems, including how they are developed using details.
- **5b.** Compare and contrast two or more characters, settings, or events in stories and plays, drawing on specific details in the texts.
- **5c.** Explain how chapters, scenes, or stanzas work together to provide the overall structure of a literary text.
- **5d.** Explain how a narrator's or speaker's point of view influence how events are described in stories, plays, or poems.
- **5e.** Compare and contrast stories in the same genre on their approaches to similar themes.

Nonfiction Text (NF)

6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts.

6a. Explain the central ideas of texts, including how they are developed using details; summarize texts.

6b. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in historical, scientific, or technical texts.

6c. Explain how series of chapters or sections fit together to provide the overall structure of informational texts (e.g., description, sequence, comparison, problem-solution, cause-effect).

6d. Explain how authors use evidence and reasons to support specific claims in texts, identifying which reasons and evidence support which claims.

6e. Integrate information from several texts on the same event or topic to demonstrate a coherent understanding of the information.

Vocabulary Development Strand

5.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-level content*, choosing flexibly from a range of strategies.

1a. Use context (e.g., definitions, examples, or restatements in text) as clues to the meaning of words or phrase.

1b. Use common Greek and Latin affixes and roots as clues to the meaning of words (e.g., *biography, biology, biohazard*).

1c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), print or digital, to find the pronunciation and clarify the precise meaning of key words and phrases.

2. Determine how words and phrases provide meaning and nuance to grade-level texts.

2a. Recognize and explain the meaning of figurative language such as metaphors and similes, in context.

2b. Distinguish shades of meaning among related words that describe different states or subtleties (e.g., *sang, trilled, chirped chorused*).

Academic Vocabulary (AV)

3. Acquire and use accurately general academic and content-specific words and phrases *occurring in grade-level reading and content*, including those that signal contrast, addition, connection, and other logical relationships (e.g., *therefore, for example, meanwhile, on the other hand*). Use these words in discussions and writing.

Research Strand

5.RS-

Inquiry Process to Build, Present, and Use Knowledge (IP)

1. Conduct short research tasks to take some action or share findings orally or in writing by formulating research questions; gathering relevant and reliable information from both primary and secondary sources as

appropriate; paraphrasing and quoting ideas and information; and respecting copyright guidelines for use of that information and any images.

Deep Reading on Topics to Build Knowledge (DR)

2. Read a series of texts organized around a variety of conceptually-related topics to build knowledge about the world. (These texts should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)

Writing Strand

5.W-

Range of Writing (RW)

1. Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc.

2. Write arguments that introduce the topic clearly; express a distinct opinion supported with adequate facts, ideas, and reasons that are logically grouped and provide a concluding section.

3. Write informational texts that introduce the topic; develop the focus with relevant facts, details, and examples from multiple sources that are logically grouped, including headings to support the purpose; and provide a concluding section.

4. Write personal or fictional narratives that establish a situation and narrator; organize around a central problem, conflict, or experience using descriptions, dialogue or pacing to develop the characters, event(s), or experience(s); and provide a conclusion that follows from the narrated events.

5. Produce clear and coherent organizational structures of multiple paragraphs in which facts and details are logically grouped and linking words and phrases connect details and ideas.

6. With support from adults and peers, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (Editing should demonstrate command of grade-level Grammar and Conventions.)

Handwriting and Keyboarding (HWK)

7. Write in cursive legibly and fluently by hand with a consistent form and recognizable signature.

8. Use technology to produce and publish writing demonstrating sufficient command of keyboarding skills.

Oral and Digital Communications Strand

5.ODC-

Oral Communications (OC)

1. Engage in collaborative discussions about *grade-level topics and texts* with peers by carrying out assigned roles; making comments and posing and responding to questions that contribute to the discussion and elaborate on others' remarks; and reviewing key ideas expressed and drawing conclusions considering the discussion.

2. Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

3. Summarize the major points a speaker makes and explain how each is supported by reasons and evidence.

4. Report orally on a topic or text or present an argument, sequencing ideas logically and using appropriate facts and relevant descriptive details to support main ideas or themes and speaking clearly at an understandable pace.

Digital Communication (DC)

5. Consider the source of information gathered digitally through such means as domains (e.g., .gov; .edu vs. .com or .tv).

6. Use information from multiple digital sources, demonstrating the ability to locate an answer to a question or to solve a problem efficiently.

7. Analyze how visual and multimedia elements contribute to the meaning, tone, or beauty of a text presented digitally.

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand

5.GC-

Grammar and Usage (GU)

1. Demonstrate command of the conventions of English grammar and usage when writing or speaking.

1a. Form and use irregular verbs (e.g., *lie/lay, sit/set, rise/raise*) correctly in sentences.

1b. Recognize and correct inappropriate shifts in verb tense and number.

1c. Use nouns, pronouns, verbs, adjectives, adverbs, conjunctions, prepositions, and interjections appropriate to function.

1d. Ensure subject-verb and pronoun-antecedent agreement.

1e. Use coordinating (e.g., *and, but*), subordinating (e.g., *although, because*), and correlative (e.g., *either/or*) conjunctions to join words and phrases in a sentence.

1f. Expand, combine, and reduce sentences for meaning, reader/listener interest, and style.

1g. Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation.

Mechanics (M)

2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning.

2a. Commas before a coordinating conjunction.

2b. Commas to separate an introductory element from the rest of the sentence (e.g., *Yes, thank you, It's true, isn't it?).*

2c. Underlining, quotation marks, or italics to indicate titles of works.

3. Spell grade level words correctly, including commonly confused words (e.g., *its/it's, affect/effect*).

Grade 6

Reading Comprehension Strand 6.RC-
Text Complexity (TC)
1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the lower end of the grades 6-8 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)
Volume of Reading to Build Knowledge (V)
2. Regularly engage in a volume of reading, independently, with peers, or with modest support related to the topics and themes being studied to build knowledge and vocabulary.
Textual Evidence (TE)
3. Draw several pieces of evidence from grade-level texts to support claims and inferences, including quoting and paraphrasing from texts accurately.
Reading Fluency (RF)
4. Read grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).
Literature (L)
5. Use evidence from literature to demonstrate understanding of grade-level texts. 5a. Explain stated or implied themes of texts, including how they are developed using specific details from the texts. 5b. Describe how characters respond or change as the plot moves toward a resolution. 5c. Describe how a particular sentence, chapter, scene, or stanza fits into the overall structure of texts and contributes to the development of the theme, setting, or plot. 5d. Explain how authors develop the point of view of the narrator or speaker in texts. 5e. Compare and contrast texts in different forms or genres (e.g., stories and poems; historical novels and fantasy stories) in terms of their approaches to similar themes and topics.
Nonfiction Text (NF)
6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts. 6a. Explain stated or implied central ideas from texts, including how they are developed using specific details from the texts; provide a summary of texts distinct from personal opinions. 6b. Explain in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in texts through examples or anecdotes. 6c. Explain how a specific sentence, paragraph, chapter, or section fits into the overall structure of texts and contributes to the development of the ideas.

6d. Trace the argument and specific claims in texts, distinguishing claims that are supported by evidence and reasons from claims that are not.

6e. Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).

Vocabulary Development Strand

6.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-level content*, choosing flexibly from a range of strategies.

1a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

1b. Use common Greek or Latin affixes and roots as clues to the meaning of a word (e.g., in readings on pioneers of space, determine the meanings of the words *astronaut* and *nautical*).

1c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), print or digital, to find the pronunciation of a word and determine and clarify its precise meaning and its part of speech.

1d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

2. Determine how words and phrases provide meaning and nuance to grade-level texts.

2a. Interpret figurative language (e.g., personification, idioms) in context.

2b. Use the relationship between particular words (e.g., *cause/effect, part/whole, item/category)* to better understand each of the words.

2c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *house* versus *home*, *cheap* versus *affordable*).

2d. Analyze the impact of a specific word choice on meaning, tone (author's attitude toward the subject), or mood (emotional atmosphere).

Academic Vocabulary (AV)

3. Acquire and use accurately general academic and content-specific words and phrases *occurring in grade-level reading and content*; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these words in discussions and writing.

Research Strand

6.RS-

Inquiry Process to Build, Present, and Use Knowledge (IP)

1. Conduct brief as well as multi-day research tasks to take some action or share findings orally or in writing by formulating research questions and refocusing the inquiry when appropriate; gathering and assessing the relevance and usefulness of information from multiple reliable sources; and, paraphrasing or quoting the data

and conclusions of others, providing basic bibliographic information for sources, and respecting copyright guidelines for use of images.
Deep Reading on Topics to Build Knowledge (DR)
2. Read a series of texts organized around a variety of conceptually-related topics to build knowledge about the world. (These texts should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)

Writing Strand 6.W-
Range of Writing (RW)
1. Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc. 2. Write arguments that introduce and support a distinct point of view with relevant claims, evidence and reasoning; demonstrate an understanding of the topic; and provide a concluding section that follows from the argument presented. 3. Write informational texts that introduce the topic, develop the focus with relevant facts, definitions, concrete details, quotations, and examples from multiple sources using appropriate strategies, such as description, comparison, and/or cause-effect; and provide a concluding section that follows from the information presented. 4. Write personal or fictional narratives that establish a situation and narrator; engage and orient the reader to the context; use narrative techniques such as description, dialogue, pacing, concrete words and sensory details to develop the characters, event(s), or experience(s); and provide a conclusion that follows from the narrated event(s). 5. Produce clear and coherent organizational structures of multiple paragraphs in which facts and ideas are logically grouped; headings, as applicable are included to support the purpose; and words, phrases, and clauses clarify the relationships between and among ideas and concepts. 6. With support from adults and peers, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach appropriate to audience and purpose. (Editing should demonstrate command of grade-level Grammar and Conventions.)
Handwriting and Keyboarding (HWK)
7. Write by hand or with technology to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of two pages in a single sitting.

Oral and Digital Communications Strand 6.ODC-
Oral Communications (OC)
1. Engage in collaborative discussions about *grade-level topics and texts* with peers by following agreed-upon rules for collegial discussions, setting specific goals, and carrying out assigned roles; making comments and

posing and responding to specific questions with elaboration and detail; and demonstrating understanding of various perspectives through reflection and paraphrasing. **2.** Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. **3.** Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not. **4.** Report orally on a topic or text or present an argument, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use adequate volume and clear pronunciation.
Digital Communication (DC)
5. Consider the source of information gathered digitally through such means as domains (e.g., .gov; .edu vs. .com or .tv) and the quality of evidence presented. **6.** Follow safety practices and ethical guidelines when gathering, sharing, and using information. **7.** Compare and contrast a written story to a digital version, contrasting what is "seen and "heard" when reading the text to what is perceived when listened to or watched. **8.** Include digital components (e.g., graphics, images, music, sound) in presentations to clarify information.

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand 6.GC-
Grammar and Usage (GU)
1. Demonstrate command of the conventions of English grammar and usage when writing or speaking. **1a.** Identify the eight basic parts of speech *(noun, pronoun, verb, adverb, adjective, conjunction, preposition, interjection).* **1b.** Recognize that a word performs different functions according to its position in the sentence. **1c.** Use pronouns correctly regarding case, number, and person, including intensive pronouns (e.g., *myself, ourselves*). **1d.** Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents). **1e.** Recognize and correct inappropriate shifts in pronoun number and person. **1f.** Expand, combine, or reduce sentences (e.g., adding or deleting modifiers, combining, or breaking up sentences) for meaning, reader/listener interest, and style. **1g.** Recognize variations from standard English in their own and others' writing and speaking and identify and use strategies to improve expression in conventional language.
Mechanics (M)
2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning.

2a. Commas, parentheses, and dashes to set off nonrestrictive or parenthetical elements.

2b. Colons to separate hours and minutes and to introduce a list.

3. Spell derivatives correctly by applying knowledge of bases and affixes.

Grade 7

Reading Comprehension Strand

7.RC-

Text Complexity (TC)

1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the midrange of the grades 6-8 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)

Volume of Reading to Build Knowledge (V)

2. Regularly engage in a volume of reading, independently, with peers, or with modest support related to the topics and themes being studied to build knowledge and vocabulary.

Textual Evidence (TE)

3. Draw several pieces of evidence from grade-level texts to support claims and inferences, including quoting or paraphrasing from texts accurately and tracing where in texts relevant evidence is located.

Reading Fluency (RF)

4. Read grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).

Literature (L)

5. Use evidence from literature to demonstrate understanding of grade-level texts.

  5a. Explain stated or implied themes, analyzing their development over the course of texts; provide objective summaries of literary texts.

  5b. Explain how particular elements of stories or dramas interact including how setting shapes the characters or plot.

  5c. Compare and contrast the structure of two or more stories, poems, and plays and analyze how the differing structure of each literary text contributes to its meaning and style.

  5d. Explain how authors develop and contrast the point of view of different characters or narrators in texts.

  5e. Compare and contrast fictional portrayals of a time, place, or character and historical accounts of the same period as a means of understanding how authors of fiction use or alter history.

Nonfiction Text (NF)

6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts.

  6a. Explain stated or implied central ideas of texts, analyzing their development over the course of texts; provide objective summaries of texts.

  6b. Analyze the relationships or interactions between individuals, events, and ideas in texts (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).

6c. Compare and contrast the structure of two or more texts and analyze how the differing structure of each text contributes to its meaning and development of ideas.

6d. Trace the argument and specific claims in texts and assess whether the evidence is sufficient to support the claims.

6e. Compare and contrast how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.

Vocabulary Development Strand

7.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-level content*, choosing flexibly from a range of strategies.

1a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

1b. Use common Greek or Latin affixes and roots as clues to the meaning of a word (e.g., in readings about earth sciences, determine the meanings of the words *geologist* and *geophysics*).

1c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), print or digital, to find the pronunciation of a grade-level word and determine or clarify its precise meaning and its part of speech.

1d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

2. Determine how words and phrases provide meaning and nuance to grade-level texts.

2a. Interpret figurative language (e.g., *euphemism, oxymoron*) in context.

2b. Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words.

2c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *curious* versus *nosy*, *assertive* versus *pushy*).

2d. Analyze the impact of a specific word choice on meaning, tone, or mood, including the impact of repeated use of certain images.

Academic Vocabulary (AV)

3. Acquire and use accurately general academic and content-specific words and phrases *occurring in grade-level reading and content*; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these words in discussions and writing.

Research Strand

7.RS-

Inquiry Process to Build, Present, and Use Knowledge (IP)

1. Conduct brief as well as multi-day research tasks to take some action or share findings orally or in writing by formulating research questions and generating additional questions for further research; gathering and assessing the relevance and usefulness of information from multiple reliable sources; and, summarizing, paraphrasing, or quoting the data and conclusions of others, avoiding plagiarism, and providing basic bibliographic information for sources.

Deep Reading on Topics to Build Knowledge (DR)

2. Read a series of texts organized around a variety of conceptually-related topics to build knowledge about the world. (These texts should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)

Writing Strand

7.W-

Range of Writing (RW)

1. Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc.

2. Write arguments that introduce and support a well-defined point of view with appropriate claims, relevant evidence and clear reasoning, demonstrate a keen understanding of the topic or text, and provide a concluding section that follows from the argument presented.

3. Write informational texts that introduce the topic clearly; develop the focus with relevant facts, definitions, concrete details, quotations, or other information and examples from multiple sources using strategies such as description, enumeration, classification, comparison, problem-solution, and/or cause-effect; and provide a concluding section that follows from the information presented.

4. Write personal or fictional narratives that establish a situation and narrator; engage and orient the reader to the context and point of view; use narrative techniques such as description, dialogue, pacing and a variety of precise words and transitional words and phrases to develop the characters, convey sequence, and signal shifts from one timeframe or setting to another; and provide a conclusion that follows from the narrated event(s).

5. Produce clear and coherent organizational structures in which ideas and other information are logically grouped; headings and other formatting support the purpose; and precise language, content-specific vocabulary, and appropriate transitions create cohesion and clarify the relationships among ideas and concepts.

6. With support from adults and peers, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing should demonstrate command of grade-level Grammar and Conventions.)

Handwriting and Keyboarding (HWK)

7. Write by hand or with technology to produce and publish writing and link to and cite sources as well as to interact and collaborate with others.

Oral and Digital Communications Strand 7.ODC-
Oral Communication (OC)
1. Engage in collaborative discussions about *grade-level topics and texts* by following rules for collegial discussions, defining individual roles, and setting specific goals; posing questions that elicit elaboration and responding to others with relevant observations; and, acknowledging new information expressed by others and, when warranted, modifying their own views. **2.** Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. **3.** Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence. **4.** Report orally on a topic or text or present an argument, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate vocabulary volume, and clear pronunciation.
Digital Communication (DC)
5. Engage in positive, safe, legal, and ethical behavior when using information and communication technologies, including social interactions online or when using networked devices. **6.** Consider the reliability of websites and blog posts through such means as determining if they are run by established institutions, have named expertise, link to other reputable websites, and are current. **7.** Compare and contrast a text to an audio, video, or digital version of the text, analyzing each medium's portrayal of the subject. **8.** Include digital components in presentations to clarify claims and findings and emphasize salient points.

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand 7.GC-
Grammar and Usage (GU)
1. Demonstrate command of the conventions of English grammar and usage when writing or speaking. **1a.** Identify the eight basic parts of speech *(noun, pronoun, verb, adverb, adjective, conjunction, preposition, interjection).* **1b.** Explain the function of phrases and clauses in general and their function in specific sentences. **1c.** Place phrases and clauses correctly within a sentence, recognizing and correcting misplaced and dangling modifiers. **1d.** Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas. **1e.** Expand, combine, or reduce sentences (e.g., adding or deleting modifiers, combining, or breaking up sentences) for meaning, reader/listener interest, and style.

1f. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
Mechanics (M)
2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning. 2a. Use commas, parentheses, dashes) set off nonrestrictive/parenthetical elements. 2b. Use commas to separate coordinate adjectives (e.g., *It was a fascinating, enjoyable movie).* 3. Spell derivatives correctly by applying knowledge of bases and affixes.

Grade 8

Reading Comprehension Strand 8.RC-
Text Complexity (TC)
1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the higher end of the grades 6-8 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)
Volume of Reading to Build Knowledge (V)
2. Regularly engage in a volume of reading, independently, with peers, or with modest support related to the topics and themes being studied to build knowledge and vocabulary.
Textual Evidence (TE)
3. Draw several pieces of evidence from grade-level texts that strongly supports both what is said explicitly and what is implied, including quoting, and paraphrasing from relevant sections and accurately and citing textual references.
Reading Fluency (RF)
4. Read grade-level text with accuracy, automaticity appropriate rate, and expression in successive readings to support comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).
Literature (L)
5. Use evidence from literature to demonstrate understanding of grade-level texts. **5a.** Explain stated or implied themes, analyzing their development over the course of texts, and the relationship of characters, setting, and plot to those themes. **5b.** Analyze how characters are revealed through particular lines of dialogue or events in literary texts. **5c.** Analyze how authors structure texts to advance a plot, explaining how each event gives rise to the next or foreshadows a future event. **5d.** Analyze how differences in the points of view of the characters and the audience or reader created with dramatic irony result in such effects as suspense or humor. **5e.** Relate themes, patterns of events, or character types from myths, traditional stories, or religious works to contemporary stories, poems, or drama.
Nonfiction Text (NF)
6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts. **6a.** Explain stated or implied central ideas of texts, analyzing their development over the course of the texts, including the relationship of individuals, ideas, or events to the central ideas; provide objective summaries of texts. **6b.** Analyze how texts make connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).

6c. Analyze the structural elements of a text, including the role of specific sentences, paragraphs, and text features in developing and refining key concepts.

6d. Trace the argument and specific claims in texts and assess whether all the evidence presented is relevant and whether irrelevant evidence was introduced.

6e. Analyze cases in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.

Vocabulary Development Strand

8.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-level content*, choosing flexibly from a range of strategies.

1a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

1b. Use common Greek or Latin affixes and roots as clues to the meaning of a word (e.g., in readings about mathematics, determine the meanings of the words *percentile* and *perimeter*).

1c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), print or digital, to find the pronunciation of a grade-level word and determine or clarify its precise meaning or its part of speech.

1d. Verify the preliminary determination of the meaning of a word or phrase by checking the inferred meaning in context or in a dictionary.

2. Determine how words and phrases provide meaning and nuance to texts.

2a. Interpret figurative language (e.g., verbal irony, puns) in context.

2b. Use the relationship between particular words (e.g., homonyms, person to location, object to use) to better understand each of the words.

2c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *crowd* versus *mob*, *fired* versus *laid off*).

2d. Analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.

Academic Vocabulary (AV)

3. Acquire and use accurately general academic and content-specific words and phrases *occurring in grade-level reading and content*; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these words in discussions and writing.

Research Strand

8.RS-

Inquiry Process to Build, Present, and Use Knowledge (IP)

1. Conduct brief as well as multi-day research tasks to take some action or share findings orally or in writing by formulating research questions and generating additional questions that allow for multiple avenues of

exploration; gathering and assessing the relevance and credibility of information from multiple sources; and, summarizing, paraphrasing, or quoting the data and conclusions of others while avoiding plagiarism and following a standard format for citations.

Deep Reading on Topics to Build Knowledge (DR)

2. Read a series of texts organized around a variety of conceptually-related topics to build knowledge about the world. (These texts should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)

Writing Strand

8.W-

Range of Writing (RW)

1. Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc.

2. Write arguments or make claims that support well-defined points of view effectively with relevant evidence and clear reasoning in ways that logically advance the claim(s) made; demonstrate a nuanced understanding of the topic; and provide a concluding section that follows from and supports the argument presented.

3. Write informational texts that introduce the topic clearly; preview what is to follow by establishing and maintaining a clear focus with relevant, well-chosen facts, definitions, concrete details, quotations, and examples from multiple sources using appropriate strategies, such as description, enumeration, classification, comparison, problem-solution, and/or cause-effect; and provide a concluding section that follows from the information presented.

4. Write personal or fictional narratives that establish a situation and narrator; engage and orient the reader to the context and one or multiple points of view; use a variety of techniques such as description, dialogue, pacing, and precise words and phrases, sensory language and transition words to develop the characters, capture the action and convey sequence, and signal shifts from one timeframe or setting to another; and provide a conclusion that follows from the narrated event(s).

5. Produce clear and coherent organizational structures in which ideas and other information are logically grouped; headings, other formatting, and graphics (e.g., charts and tables) support the purpose; and precise language, content-specific vocabulary, and varied transitions create cohesion and clarify the relationships between and among ideas and concepts.

6. With support from adults and peers, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing should demonstrate command of grade-level Grammar and Conventions.)

Handwriting and Keyboarding (HWK)

7. Write by hand or with technology to produce and publish writing, link to, and cite sources, present the relationships between information and ideas efficiently, and interact and collaborate with others.

Oral and Digital Communications Strand 8.ODC-
Oral Communications (OC)
1. Engage in collaborative discussions about *grade-level topics and texts* with peers by following rules for collegial discussions and decision-making, defining individual roles, and tracking progress on specific goals; propelling conversations forward by posing and responding to questions, relating the current discussion to broader themes, and connecting the ideas of several speakers; and, when warranted, qualifying or justifying one's views considering new evidence heard. **2.** Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the intent (e.g., social, political commercial) behind its presentation. **3.** Analyze a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced. **4.** Report orally on a topic or text or present an argument, emphasizing salient points in a focused, coherent manner with relevant evidence, and well-chosen details; use appropriate vocabulary, volume, and clear pronunciation.
Digital Communication (DC)
5. Demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. **6.** Consider the evidence websites or blog posts use to support their position (e.g., *Are they transparent about their sources? Do they link to peer-reviewed articles?).* **7.** Evaluate the advantages and disadvantages of using different mediums—print or digital text—to present a particular topic or idea. **8.** Integrate digital displays into presentations to clarify information, strengthen claims and evidence, and add interest.

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand 8.GC-
Grammar and Usage (GU)
1. Demonstrate command of the conventions of English grammar and usage when writing or speaking. **1a.** Recognize and correct inappropriate shifts in verb voice and mood. **1b.** Form and use verbs in the indicative, imperative, interrogative, and conditional mood. **1c.** Form and use verbs in the active and passive voice to achieve particular effects. **1d.** Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences. **1e.** Expand, combine, or reduce sentences (e.g., adding or deleting modifiers, combining, or breaking up sentences) for meaning, reader/listener interest, and style.

1f. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
Mechanics (M)
2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning. 2a. Use commas, ellipsis, dashes when writing and reading aloud to indicate a pause, break, or omission. 3. Spell derivatives correctly by applying knowledge of bases and affixes.

Grades 9/10

Reading Comprehension Strand 9/10.RC-
Text Complexity (TC)
1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the higher end of the grades 9-10 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)
Volume of Reading to Build Knowledge (V)
2. Regularly engage in a volume of reading related to the topics and themes being studied to build knowledge and vocabulary. (These texts can include a range of genres and should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)
Textual Evidence (TE)
3. Draw ample evidence from grade-level texts to support claims and inferences, attending to the precise details of the authors' descriptions or explanations through quoting, paraphrasing, and citing textual references.
Reading Fluency (RF)
4. Read grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).
Literature (L)
5. Use evidence from literature to demonstrate understanding of grade-level texts. **5a.** Analyze the development of themes over the course of the text, including how themes emerge and are shaped and refined by specific details. **5b.** Analyze how complex characters—those with multiple or conflicting motivations—develop over the course of texts, interact with other characters, and advance the plot. **5c.** Analyze how authors structure specific parts of a text, including the choice of where to begin and end a scene, and explain how they contribute to its overall structure and meaning. **5d.** Analyze points of view or cultural experiences that represent diverse voices and perspectives in works of literature. **5e.** Compare multiple interpretations of texts (including recorded or live production), evaluating how each version interprets the source text.
Nonfiction Text (NF)
6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts. **6a.** Analyze the development of central ideas over the course of texts, including how they emerge and are shaped and refined by specific details; provide accurate summaries of how key events or ideas develop.

6b. Explain how authors unfold an analysis or series of ideas or events, including the order in which points are made, how they are introduced and developed, and the connections that are drawn among them.

6c. Analyze how authors use structure to explain relationships among concepts in a text, including how key sentences, paragraphs, and sections of texts contribute to the whole.

6d. Assess the argument and specific claims in texts, examining whether the reasoning is valid, the evidence is relevant, and whether there are any false or unsupported statements.

6e. Analyze seminal documents of historical and literary significance, including how they address related themes and concepts of liberty, equality, individual responsibility and justice.

Vocabulary Development Strand

9/10.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-level content*, choosing flexibly from a range of strategies.

1a. Use context (e.g., the overall meaning of a sentence, paragraph, or portion of text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

1b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *defend, defense, defendant, defensible*).

1c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), print or digital, to find the pronunciation of a grade-level word and determine or clarify its precise meaning, its part of speech, or its etymology.

1d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

2. Determine how words and phrases provide meaning and nuance to texts.

2a. Use Greek, Latin, and Norse mythology; and other works often alluded to in American and world literature to understand the meaning of words or phrases (e.g., reference to "Achilles's heel" from Greek mythology).

2b. Interpret figurative language (e.g., hyperbole, paradox) in context and analyze its role in texts (e.g., The Party's embrace of the slogans "War is Peace" and "Freedom is Slavery" in Orwell's 1984).

2c. Analyze nuances in the meaning of words with similar denotations (e.g., *shrewd, clever, cunning, brainy*).

2d. Analyze the cumulative impact of specific word choices on meaning and tone (e.g., how Jonathan Swift uses exaggeration to create his satirical essay "A Modest Proposal").

Academic Vocabulary (AV)

3. Acquire and use accurately general academic and content-specific words and phrases *occurring in grade-level reading and content*; demonstrate independence when gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these words in discussions and writing.

Research Strand

9/10.RS-

Inquiry Process to Build, Present, and Use Knowledge (IP)

1. Conduct brief as well as multi-day research projects to take some action or share findings orally or in writing by formulating a research question and considering alternative avenues of inquiry; gathering relevant information from a variety authoritative sources and assessing which provide the most reliable and useful information; and, following a standard approved format (e.g., APA, MLA, Chicago) for citations and bibliographies.

Deep Reading on Topics to Build Knowledge (DR)

2. Read a series of texts organized around a variety of conceptually-related topics to build knowledge about the world. (These texts should be at a range of complexity levels so students can read the texts independently, with peers, or with modest support.)

**Note: In grades 9/10, the focus is on informational text writing. While all three text types are important, the Idaho standards put particular emphasis on students' ability to convey information accurately in these grade levels. Of course, the standards leave the inclusion of writing arguments and narratives to teacher discretion.*

Writing Strand

9/10.W

Range of Writing (RW)

1. Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc.

2 .*(Argument writing is a priority in grades 11/12; teachers can include argument at their discretion.)*

3. Write informational texts that introduce the topic clearly by providing needed context, presenting well-defined theses, and previewing what is to follow; develop the topic through sustained use of the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples from multiple authoritative sources appropriate to the audience's knowledge of the topic; and provide a concluding section that follows from the information or explanation presented.

4. *(Teachers can include narrative writing at their discretion.)*

5. Produce clear and coherent organizational structures that attend to the norms and conventions of the writing genre and in which ideas, concepts, and other information are logically grouped; include formatting and graphics to support the purpose and create a unified whole; and use precise language, content-specific vocabulary, and varied transitions link major sections of the text, create cohesion and clarify the relationships between and among ideas and concepts.

6. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing should demonstrate command of grade-level Grammar and Conventions.)

Handwriting and Keyboarding (HWK)

7. Write by hand or with technology to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Oral and Digital Communications Strand 9/10.ODC-
Oral Communications (OC)
1. Engage in collaborative discussions about *grade-level topics and texts* with peers by setting rules for collegial discussions and decision-making, defining individual roles, tracking progress on specific goals; responding to others' questions and comments and diverse perspectives with precise evidence, relevant observations, and ideas; and making new connections considering the evidence and reasoning presented. 2. Analyze the effect of text and images on the reader's or viewer's emotions in print journalism, and images, sound, and text in electronic journalism, distinguishing techniques used in each to achieve these effects. 3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. 4. Report orally on a topic or text or present an argument, emphasizing salient points in a focused, coherent manner with relevant evidence, sound reasoning, and well-chosen details in a style appropriate to purpose, audience, and task.
Digital Communication (DC)
5. Manage personal data to maintain digital privacy and security and be conscious and aware of data-collection technology used to track and exploit navigation online. 6. Integrate multiple sources of information presented in diverse digital media, evaluating the credibility and accuracy of each source. 7. Analyze various accounts of a subject told in different media (e.g., a person's life story in print or digitally) determining which details are emphasized in each account. 8. Make strategic use of digital media presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand 9/10.GC-
Grammar and Usage (GU)
1. Demonstrate command of the conventions of English grammar and usage when writing or speaking. 1a. Use verbs in the active and passive voice and in the conditional and subjunctive mood to achieve particular effects (e.g., emphasizing the actor or the action; expressing uncertainty or describing a state contrary to fact). 1b. Use parallel structure.

1c. Place modifiers properly.

1d. Use the subjunctive mood accurately.

1e. Avoid run-on sentences, comma splices, and sentence fragments.

1f. Use subordination, coordination, apposition, and other devices to indicate the relationship between ideas clearly.

1g. Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) to convey specific meanings and add variety and interest to writing or presentations.

1h. Use various types of clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.

1i. Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation.

1j. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.

Mechanics (M)

2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning.

2a. Use a semicolon (or appropriate conjunctive adverb) to link two or more closely related independent clauses.

2b. Use a colon to introduce a list or quotation.

2c. Observe hyphenation conventions.

3. Spell correctly, consulting reference materials to check as needed.

Grades 11/12

Reading Comprehension Strand 11/12.RC-
Text Complexity (TC)
1. Independently and proficiently read and comprehend texts representing a balance of genres, cultures, and perspectives that exhibit complexity at the lower end of the grades 11-12 band. (See the Quantitative Analysis Chart for Determining Text Complexity in the Resource Reference.)
Volume of Reading to Build Knowledge (V)
2. Regularly engage in a volume of reading, texts independently, with peers, or with modest support related to the topics and themes being studied to build knowledge and vocabulary.
Textual Evidence (TE)
3. Draw and cite strong and thorough evidence from grade-level texts to support claims and inferences, attending to important distinctions authors make and how those are supported, as well as any gaps or inconsistencies in accounts offered.
Reading Fluency (RF)
4. Read grade-level text with accuracy, automaticity, appropriate rate, and expression in successive readings to support comprehension (see the 2017 Hasbrouck and Tindal norms listed in Resource Reference).
Literature (L)
5. Use evidence from literature to demonstrate understanding of grade-level texts. **5a.** Compare the development of a universal theme over the course of two texts, including how it emerges and is shaped and refined by specific details in each. **5b.** Evaluate the choices authors make regarding how to develop and relate several elements of literary texts , including how the characters are introduced and developed and how the action is ordered. **5c.** Evaluate how authors structure texts to distinguish what is directly stated in a text from what is really meant, including satire, sarcasm, irony, and understatement. **5d.** Relate literary works and their authors' points of view to the political events and seminal ideas of their eras. **5e.** Compare and contrast how works of literary or cultural significance, including myths and traditional stories, draw on similar themes, patterns of events, or character types.
Nonfiction Text (NF)
6. Use evidence from nonfiction works to demonstrate understanding of grade-level texts. **6a.** Compare texts that express similar central ideas and analyze in detail how their development and treatment of the topic compares over the course of the two texts; provide accurate summaries of how key events or ideas develop.

6b. Evaluate various explanations of concepts and ideas and determine which explanation best accords with textual evidence, noting discrepancies among sources.

6c. Evaluate the effectiveness of the structure(s) and rhetorical devices authors use in their exposition or argument, including whether the structure helps makes points clear, convincing, and engaging.

6d. Analyze the hypotheses, data, analysis, and conclusions in an argument, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

6e. Evaluate the premises and purposes in works of public advocacy.

Vocabulary Development Strand

11/12.VD-

Word Building (WB)

1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade-level content*, choosing flexibly from a range of strategies.

1a. Use context (e.g., the overall meaning of a sentence, paragraph, or portion of text; a word's position or function in a sentence or a sentence within a paragraph) as a clue to the meaning of a word or phrase.

1b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *symbol, symbolism, symbolic, symbolize*).

1c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), print or digital, to find the pronunciation of a grade-level word and determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.

1d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

2. Determine how words and phrases provide meaning and nuance to texts.

2a. Use Greek, Latin, and Norse mythology; and other works often alluded to in American and world literature to understand the meaning of words or phrases (e.g., "narcissistic" from the myth of Narcissus and Echo).

2b. Analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how FDR explored different ideas regarding freedom in his "Four Freedoms" speech).

2c. Analyze nuances in the meaning of words with similar denotations (e.g., *aggressive, assertive, forceful, domineering).*

2d. Analyze the impact of specific word choices on the effectiveness of the message meaning and the tone of the text.

Academic Vocabulary (AV)

3. Acquire and use accurately general academic and content-specific words and phrases *occurring in grade-level reading and content*; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. Use these words in discussions and writing.

Research Strand 11/12.RS-
Inquiry Process to Build, Present, and Use Knowledge (IP)
1. Conduct brief as well as multi-day research projects to take some action or share findings orally or in writing by formulating multiple interlocking research questions that span the field of inquiry in time and scope; gathering relevant information efficiently from a variety of authoritative sources, as well as from direct observation, interviews, and surveys; making distinctions about the strengths and limitations of each source in terms of the task, purpose, and audience, noting any discrepancies among the data; and, following a standard approved format (e.g., APA, MLA, Chicago) for citations and bibliographies.
Deep Reading on Topics to Build Knowledge (DR)
2. Read a series of texts, independently, with peers, or with modest support, organized around a variety of conceptually-related topics to build knowledge about the world.

**Note: In grades 11/12, the focus is on writing arguments. While all three text types are important, the Idaho standards put particular emphasis on students' ability to write sound arguments on substantive topics, as this ability is critical to college and career readiness. Of course, the standards leave the inclusion of writing informational texts and narratives to teacher discretion.*

Writing Strand 11/12.W-
Range of Writing (RW)
1. Develop flexibility in writing by routinely engaging in the production of shorter and longer pieces for a range of tasks, purposes, and audiences. This could include among others, summaries, reflections, descriptions, critiques, letters, and poetry, etc. **2.** Write arguments that support well-defined points of view that establish the significance of the claim(s) and distinguish those claim(s) from alternate or opposing claims with persuasive evidence and clear reasoning; point out the strengths and limitations of each claim in a manner that anticipates the audience's knowledge level, concerns, and values; and provide a concluding section that articulates the implications, or the significance of the argument presented. **3&4.** *(Teachers can include informational and narrative writing at their discretion.)* **5.** Produce clear and coherent organizational structures that attend to the norms and conventions of the writing genre, and in which ideas, concepts, and other information build on one another; include formatting and graphics to support the purpose, aid in comprehension, and create a unified whole; and use precise language, content-specific vocabulary, and varied transitions to link major sections of the text, create cohesion and clarify the relationships between and among ideas and concepts. **6.** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on reframing points to address specific purposes or needs of the audience. (Editing should demonstrate command of grade-level Grammar and Conventions.)
Handwriting and Keyboarding (HWK)
7. Write by hand or with technology to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Oral and Digital Communications Strand 11/12.ODC-
Oral Communications (OC)
1. Engage in collaborative discussions about *grade-level topics and texts* with peers by promoting civil, democratic discussions and decision-making, establishing individual roles, and tracking progress on specific goals; propelling conversations forward by synthesizing comments and ideas of several speakers and responding to diverse perspectives with relevant observations and ideas, resolving contradictions when possible; and, determining what additional information is required to deepen the investigation or complete the task. 2. Analyze how visual and sound techniques or design (such as special effects, camera angles, and music) carry or influence messages in various media. 3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. 4. Present information, findings, and supporting evidence orally, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning; ensure alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
Digital Communication (DC)
5. Demonstrate the responsible and ethical use of information and communication technologies by distinguishing between kinds of information that should and should not be publicly shared and describing the consequences of a poor decision. 6. Integrate multiple sources of information presented in diverse digital media to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 7. Analyze multiple interpretations of a text (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. 8. Make strategic use of digital media in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

**Note: Students advancing through the grades are expected to meet each year's grade-specific Grammar and Conventions standards and retain or further develop skills and understandings mastered in preceding grades.*

Grammar and Conventions Strand 11/12.GC-
Grammar and Usage (GU)
1. Demonstrate command of the conventions of English grammar and usage when writing or speaking. 1a. Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested, consulting references (e.g., *Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage)* as needed.

1b. Use a variety of sentence structures, including compound and compound-complex sentences with effective coordination and subordination of ideas and parallel, repetitive, and analogous sentence structures. 1c. Write and edit work so that it conforms to the guidelines in a style manual (e.g., *MLA Handbook*, Turabian's *Manual for Writers*) appropriate for the writing type. 1d. Vary syntax for effect, consulting references (e.g., Tufte's *Artful Sentences*) for guidance as needed. 1e. Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation and situations where informal discourse is more appropriate.
Mechanics (M)
2. Demonstrate command of the conventions of English punctuation and capitalization when writing and reading aloud to create meaning. 2a. Reflect appropriate manuscript requirements in writing, including correct use of seriation (headings and subheadings). 3. Spell correctly, consulting reference materials to check as needed.

References

ACT. Reading Between the Lines: What the ACT Reveals About College Readiness in Reading. Iowa City, IA, 2006.

Adams, M. J. (2009). The challenge of advanced texts: The interdependence of reading and learning. In E. H. Hiebert (Ed.), *Reading more, reading better: Are American students reading enough of the right stuff*? (pp. 163–189). New York, NY: Guilford.

Flower, L., Stein, V., Ackerman, J., Kantz, M. J., McCormick, K., & Peck, W. C. (1990). *Reading to write: Exploring a cognitive & social process*. New York: Oxford University Press.

Graham, S., & Hebert, M. (2010). Writing to Read: Evidence for How Writing Can Improve Reading. *Carnegie Corporation Time to Act Report. Washington, DC: Alliance for Excellent Education. https://www.carnegie.org/publications/writing-to-read-evidence-for-how-writing-can-improve-reading/*

Intersegmental Committee of the Academic Senates (ICAS) of the California Community Colleges, the California State University, and the University of California. (2002). *Academic Literacy: A Statement of Competencies Expected of Students Entering California's Public Colleges and Universities*. Sacramento, CA: ICAS. http://icas-ca.org/Websites/icasca/images/Competency/AcademicLiteracy2002.pdf.

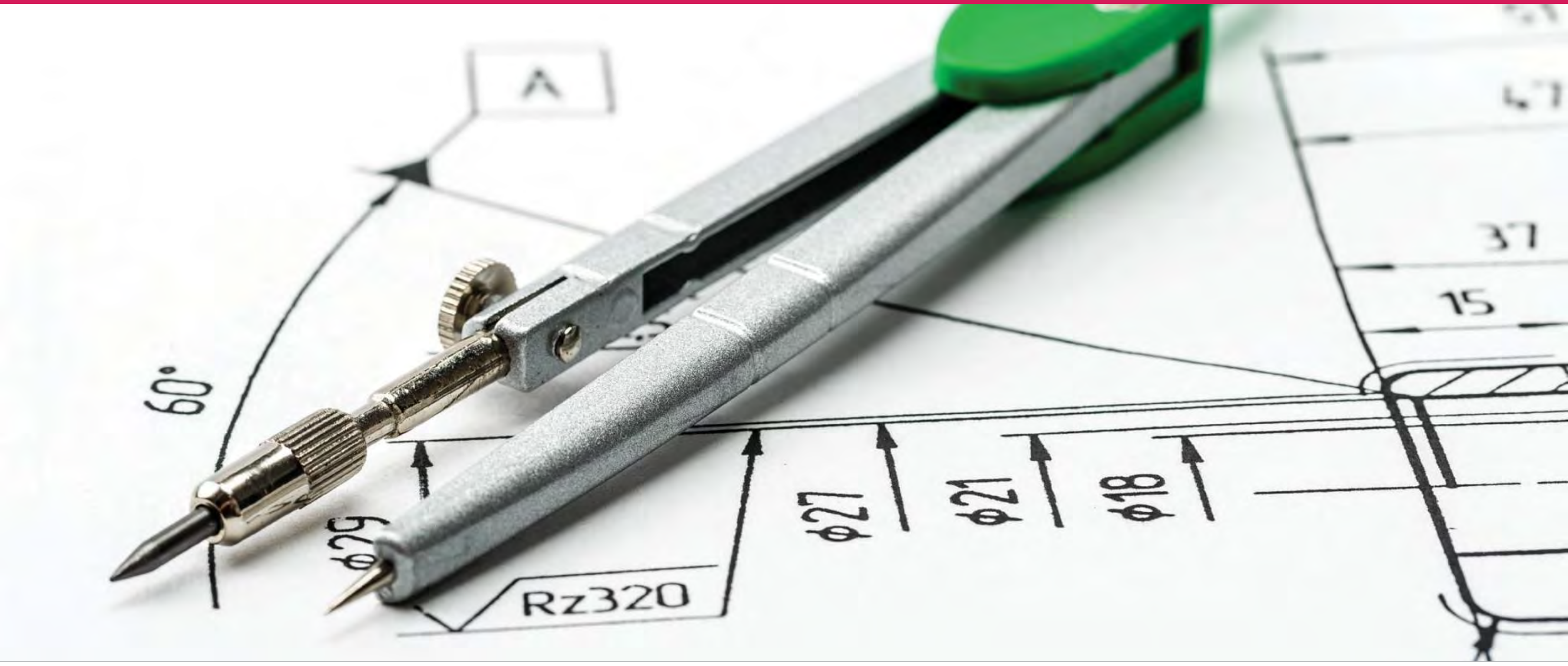
National Reading Panel (US), National Institute of Child Health, & Human Development (US). (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction: Reports of the subgroups*. National Institute of Child Health and Human Development, National Institutes of Health.

Recht, D. R., & Leslie, L. (1988). Effect of prior knowledge on good and poor readers' memory of text. *Journal of Educational Psychology*, *80*(1), 16.

IDAHO CONTENT STANDARDS

MATHEMATICS

2017 to 2021 Revisions with Tracked Changes



STATE SUPERINTENDENT OF PUBLIC INSTRUCTION
SHERRI YBARRA
STATE DEPARTMENT OF EDUCATION
PO BOX 83720
BOISE, ID 83720-0027

In March of 2020, the Idaho Legislature directed the State Board of Education to replace the present Idaho Content Standards in Mathematics. They wanted standards which work for students, parents, and educators. Specifically, the legislators asked that new standards address the following issues in mathematics:

a. Explicitly state grade levels at which students should demonstrate mastery of addition, subtraction, multiplication, and division facts. Integrate these basics with critical thinking and real-life problem solving throughout the standards to ensure more connections to science, business, and other related disciplines.
b. Reduce the number of standards, use less complex verbiage, and prioritize the more important concepts without marginalizing the accuracy of the standards.
c. Ensure the standards are age and grade level-appropriate especially in the early grades, emphasizing the concrete nature of young minds.
d. Make certain that standards requiring problem solving are age appropriate and do not exceed the knowledge standards accepted for each grade level.

The Superintendent's Office of Public Instruction worked with a variety of stakeholders to accept nominations for working group members. The working group was comprised of twenty-four members representing a cross-section of grade levels and roles. These committees included community members, mathematics consultants, and mathematics educators across all grade levels from Kindergarten to four-year colleges. The time and effort they put into this revision was invaluable. Throughout the process of the revision of the standards, the working group received public comments that the revision committees took into consideration. The working group appreciates those who took time to share their thoughts on the revisions. We hope that the changes to these standards allow them to be useful for all stakeholders, including educators, families, students, and community members. We hope that they bring Idaho into a new chapter of statewide success in mathematics.

Respectfully Submitted by,
The Mathematics Standards Working Group Members

Adam Uptmor, Administrator
Corey Friis, Teacher
Jordan Hagen, Teacher
Kacey Diemert, Higher Education
Melanie Blad, Teacher
Sen. David Lent, Legislator
Brandi Griggs, Community Member
Erin Corwine, Teacher
Justin Pickens, Teacher
Kelli Rich, Teacher
Kathryn Atkinson, Teacher
Kenn Roberts, Community Member
Katie Bösch-Wilson, Teacher
Michele Carney, Higher Education
Rep. Ryan Kerby, Legislator
Ann Abbott, Higher Education
Hem Acharya, Teacher
Shannon Murray, Higher Education
Sen. Janie Ward-Engelking, Legislator
Levi Jaynes, Administrator
Cathy Carson, Higher Education

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~~Introduction~~

~~Toward greater focus and coherence~~

> *~~Mathematics experiences in early childhood settings should concentrate on (1) number (which includes whole number, operations, and relations) and (2) geometry, spatial relations, and measurement, with more mathematics learning time devoted to number than to other topics. Mathematical process goals should be integrated in these content areas.~~*
>
> ~~— Mathematics Learning in Early Childhood, National Research Council, 2009~~

> *~~The composite standards [of Hong Kong, Korea and Singapore] have a number of features that can inform an international benchmarking process for the development of K–6 mathematics standards in the U.S. First, the composite standards concentrate the early learning of mathematics on the number, measurement, and geometry strands with less emphasis on data analysis and little exposure to algebra. The Hong Kong standards for grades 1–3 devote approximately half the targeted time to numbers and almost all the time remaining to geometry and measurement.~~*
>
> ~~— Ginsburg, Leinwand and Decker, 2009~~

> *~~Because the mathematics concepts in [U.S.] textbooks are often weak, the presentation becomes more mechanical than is ideal. We looked at both traditional and non-traditional textbooks used in the US and found this conceptual weakness in both.~~*
>
> ~~— Ginsburg et al., 2005~~

> *~~There are many ways to organize curricula. The challenge, now rarely met, is to avoid those that distort mathematics and turn off students.~~*
>
> ~~— Steen, 2007~~

~~For over a decade, research studies of mathematics education in high-performing countries have pointed to the conclusion that the mathematics curriculum in the United States must become substantially more focused and coherent in order to improve mathematics achievement in this country. To deliver on the promise of common standards, the standards must address the problem of a curriculum that is "a mile wide and an inch deep." These Standards are a substantial answer to that challenge.~~

~~It is important to recognize that "fewer standards" are no substitute for focused standards. Achieving "fewer standards" would be easy to do by resorting to broad, general statements. Instead, these Standards aim for clarity and specificity.~~

~~Assessing the coherence of a set of standards is more difficult than assessing their focus. William Schmidt and Richard Houang (2002) have said that content standards and curricula are coherent if they are:~~

> *~~articulated over time as a sequence of topics and performances that are logical and reflect, where appropriate, the sequential or hierarchical nature of the disciplinary content from which the subject matter derives. That is, what and how students are taught should reflect not only the topics that fall within a certain academic discipline, but also the key ideas that determine how knowledge is organized and generated within that discipline. This implies~~*

> ~~*that to be coherent, a set of content standards must evolve from particulars (e.g., the meaning and operations of whole numbers, including simple math facts and routine computational procedures associated with whole numbers and fractions) to deeper structures inherent in the discipline. These deeper structures then serve as a means for connecting the particulars (such as an understanding of the rational number system and its properties).* (emphasis added)~~

~~These Standards endeavor to follow such a design, not only by stressing conceptual understanding of key ideas, but also by continually returning to organizing principles such as place value or the properties of operations to structure those ideas.~~

~~In addition, the "sequence of topics and performances" that is outlined in a body of mathematics standards must also respect what is known about how students learn. As Confrey (2007) points out, developing "sequenced obstacles and challenges for students…absent the insights about meaning that derive from careful study of learning, would be unfortunate and unwise." In recognition of this, the development of these Standards began with research-based learning progressions detailing what is known today about how students' mathematical knowledge, skill, and understanding develop over time.~~

~~Understanding mathematics~~

~~These Standards define what students should understand and be able to do in their study of mathematics. Asking a student to understand something means asking a teacher to assess whether the student has understood it. But what does mathematical understanding look like? One hallmark of mathematical understanding is the ability to justify, in a way appropriate to the student's mathematical maturity, *why* a particular mathematical statement is true or where a mathematical rule comes from. There is a world of difference between a student who can summon a mnemonic device to expand a product such as $(a + b)(x + y)$ and a student who can explain where the mnemonic comes from. The student who can explain the rule understands the mathematics, and may have a better chance to succeed at a less familiar task such as expanding $(a + b + c)(x + y)$. Mathematical understanding and procedural skill are equally important, and both are assessable using mathematical tasks of sufficient richness.~~

~~The Standards set grade-specific standards but do not define the intervention methods or materials necessary to support students who are well below or well above grade-level expectations. It is also beyond the scope of the Standards to define the full range of supports appropriate for English language learners and for students with special needs. At the same time, all students must have the opportunity to learn and meet the same high standards if they are to access the knowledge and skills necessary in their post-school lives. The Standards should be read as allowing for the widest possible range of students to participate fully from the outset, along with appropriate accommodations to ensure maximum participaton of students with special education needs. For example, for students with disabilities reading should allow for use of Braille, screen reader technology, or other assistive devices, while writing should include the use of a scribe, computer, or speech-to-text technology. In a similar vein, speaking and listening should be interpreted broadly to include sign language. No set of grade-specific standards can fully reflect the great variety in abilities, needs, learning rates, and achievement levels of students in any given classroom. However, the Standards do provide clear signposts along the way to the goal of college and career readiness for all students.~~

~~The Standards begin on page 6 with eight Standards for Mathematical Practice.~~

PREAMBLE

Focus

In the past, mathematics standards and curricula were often criticized for covering too much content in each grade level. This created a "shallow" understanding of important math concepts as students moved through the grade levels. The Idaho Content Standards for Mathematics address this by concentrating on major and age-appropriate topics in each grade to allow students to focus their learning at a greater depth.

Coherence

Explicit connections of mathematics topics within each grade level and across grade levels results in coherence. Most of these connections happen across grade level, as the standards support a progression of increasing knowledge and skills.

Thinking across grades: The design of the Idaho Content Standards for Mathematics allows administrators and teachers to connect learning within and across grades. For example, the standards develop fractions and multiplication across elementary grade levels, so that students can build new understanding on foundations that were established in previous years. These topics directly connect to learning in the middle and high school grades as students deepen their knowledge of rational numbers and algebra concepts. Therefore, each standard builds on previous learning and is not a completely new topic.

Linking to major topics: Topics within a grade level are identified as major, additional, or supporting. This can be seen in each grade level overview. This identification allows for teachers to make connections between the additional and supporting topics and the major topics. For example, in grade three, bar graphs are not taught in isolation from other topics. Rather, students use information presented in bar graphs to solve problems using the four operations of arithmetic. Each grade level overview shows the major, supporting, and additional topics.

Rigor

Rigorous teaching in mathematics is more than increasing the difficulty or complexity of tasks. Incorporating rigor into classroom instruction and student learning means exploring at a greater depth the standards and ideas with which students are grappling. There are three components of rigor and each is equally important to student mastery: Conceptual Understanding, Procedural Skill and Fluency, and Application.

Conceptual Understanding refers to understanding mathematical concepts, operations, and relations. It is more than knowing isolated facts and methods. Students should be able to understand why a mathematical idea is important and the contexts in which it is useful. Conceptual understanding allows students to connect prior knowledge to new ideas and concepts.

Procedural Skill and Fluency is the ability to apply procedures accurately, efficiently, and flexibly while giving students opportunities to practice basic skills. Students' ability to solve more complex application tasks is dependent on procedural skill and fluency.

Application provides valuable context for learning and the opportunity to solve problems in a relevant and a meaningful way. Through real-world application, students learn to select an efficient method to find a solution, determine whether the solution makes sense by reasoning, and develop critical thinking skills. This may take the form of a word problem or other contextually related problem.

A Special Note about Procedural Skill and Fluency

Number sense is a fundamental bridge to algebraic thinking for middle and high school mathematics. As students increase their number sense, they see relationships between numbers, think flexibly, and recognize emerging patterns. They make reasonable estimates, compute fluently, and use visual models to apply procedures for solving problems based on the particular numbers involved. In short, "number sense reflects a deep understanding of mathematics, but it comes about through a mathematical mindset that is focused on making sense of numbers and quantities" (Boaler, 2016, p. 36). While speed is a component of fluency, it is not the only indicator that a student is fluent; rather, fluency can be observed by watching how the student engages with a particular problem. Furthermore, fluency does not require the most efficient strategy. The standards specify grade-level appropriate strategies or types of strategies with which students should demonstrate fluency (e.g., 1.OA.C.6 allows for students to use counting on, making ten, creating equivalent but easier or known sums, etc.). It should also be noted that teachers should expect some procedures to take longer than others (e.g., fluency with the standard algorithm for division, 6.NS.B.2, as compared to fluently adding and subtracting within 10, 1.OA.C.6). Students with a strong number sense develop foundational skills which transfer to nearly all mathematical domains, from measurement and geometry to data and equations. Students continue to strengthen their number sense when they communicate ideas, explain their reasoning, and discuss the thinking of others. Discussing mathematical thinking with peers gives each student the opportunity to internalize a cohesive structure for numbers.

What the Idaho Content Standards in Mathematics Do

The standards define what all students are expected to know and be able to do, not how teachers should teach. While the standards focus on what is most essential, they do not describe all that can or should be taught. A great deal is left to the discretion of local school districts, teachers, and curriculum developers. No set of grade-level standards can reflect the great variety of abilities, needs, learning rates, and achievement levels in any given classroom. The standards define neither the support materials that some students may need, nor the advanced materials that others may need access to. It is also beyond the scope of the standards to define the full range of support appropriate for English learners and for students with disabilities. All students must have the opportunity to learn rigorous grade level standards if they are to access the knowledge and skills that will be necessary in their post-high-school lives.

Standards vs. Curriculum

No specific curriculum or strategies are required by the State of Idaho to be used to teach the Idaho Content Standards in Mathematics. Local schools and districts make decisions about what resources will be used to teach the standards.

~~How to read the grade level standards~~

~~Standards define what students should understand and be able to do.~~

~~Clusters are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.~~

~~domains are larger groups of related standards. Standards from different domains may sometimes be closely related.~~

~~domain~~

~~number and operations in Base ten 3.nBt~~

~~**Use place value understanding and properties of operations to perform multi-digit arithmetic.**~~

~~Standard~~

1. ~~Use place value understanding to round whole numbers to the nearest 10 or 100.~~
2. ~~Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.~~
3. ~~Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.~~

Clust~~er~~

~~These Standards do not dictate curriculum or teaching methods. For example, just because topic A appears before topic B in the standards for a given grade, it does not necessarily mean that topic A must be taught before topic B. A teacher might prefer to teach topic B before topic A, or might choose to highlight connections by teaching topic A and topic B at the same time. Or, a teacher might prefer to teach a topic of his or her own choosing that leads, as a byproduct, to students reaching the standards for topics A and B.~~

~~What students can learn at any particular grade level depends upon what they have learned before. Ideally then, each standard in this document might have been phrased in the form, "Students who already know ... should next come to learn ...." But at present this approach is unrealistic—not least because existing education research cannot specify all such learning pathways. Of necessity therefore, grade placements for specific topics have been made on the basis of state and international comparisons and the collective experience and collective professional judgment of educators, researchers and mathematicians. One promise of common state standards is that over time they will allow research on learning progressions to inform and improve the design of standards to a much greater extent than is possible today. Learning opportunities will continue to vary across schools and school systems, and educators should make every effort to meet the needs of individual students based on their current understanding.~~

~~These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms. It is time to recognize that standards are not just promises to our children, but promises we~~ intend to keep.

ORGANIZATION OF THE KINDERGARTEN TO GRADE 8 CONTENT STANDARDS

The Kindergarten through grade 8 content standards in this Framework are organized by **grade level**. Within each grade level, standards are grouped first by **domain**. Each domain is further subdivided into **clusters** of related standards.

-

- **Standards** define what students should understand and be able to do.
- **Clusters** are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.
- **Domains** are larger groups of related standards. Standards from different domains may sometimes be closely related.

The table below shows which domains are addressed at each grade level:

Progression of K–8 Domains									
Domain	**Grade Level**								
	K	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Counting and Cardinality	-	-	-	-	-	-	-	-	-
Operations and Algebraic Thinking	-	-	-	-	-	-	-	-	-
Number and Operations in Base Ten	-	-	-	-	-	-	-	-	-
Number and Operations – Fractions	-	-	-	-	-	-	-	-	-
The Number System	-	-	-	-	-		-	-	-
Ratios and Proportional Relationships	-	-	-	-	-	-	-	-	-
Expressions and Equations	-	-	-	-	-	-	-	-	-
Functions	-	-	-	-	-	-	-	-	-
Measurement and Data	-	-	-	-	-	-	-	-	-
Geometry	-	-	-	-	-	-	-	-	-
Statistics and Probability	-	-	-	-	-	-	-	-	-

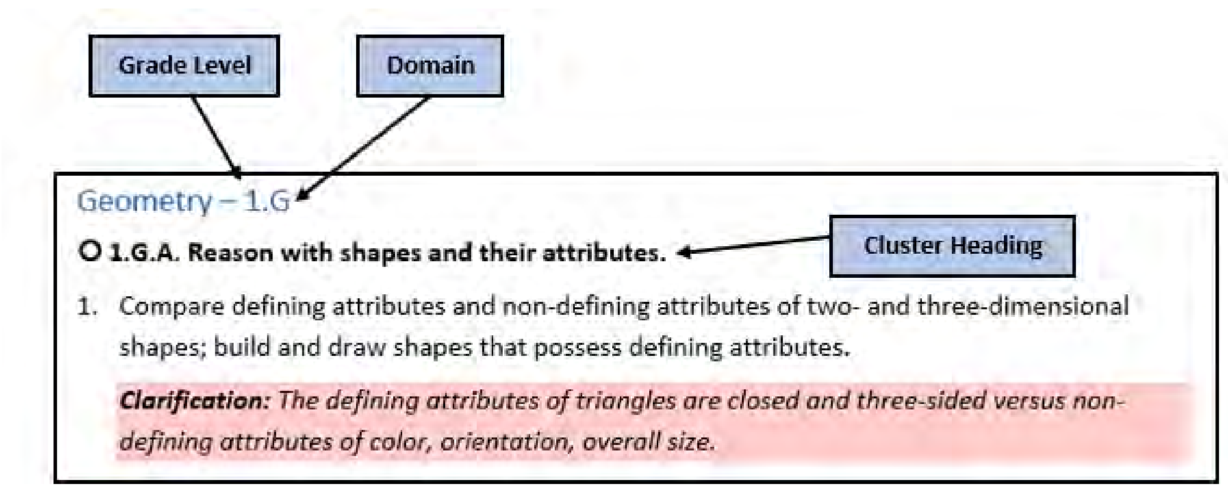
Format for Each Grade Level

Each grade level is presented in the same format:

- An introduction and description of the focus areas for learning at that grade.
- An overview of that grade's domains and clusters.
- The grade-level Standards for Mathematical Practice.
- The content standards for that grade (presented by domain, cluster heading, and individual standard).

Standards Identifiers/Coding

Each standard has a unique identifier that consists of the grade level (K, 1, 2, 3, 4, 5, 6, 7, or 8), the domain code, cluster code, and the standard number, as shown in the example below. The cluster heading also includes a shape (○) to describe its focus in relation to the other clusters within the grade level.



The standard highlighted above is identified as 1.G.A.1, identifying it as a grade 1 (1.) standard in the Geometry domain (G.), and as the first standard in that cluster (A.1). All of the standards use a common coding system.

THIS SECTION WAS REWRITTEN FOR EACH GRADE LEVEL TO SHOW SPECIFICALLY WHAT THE MATHEMATICAL PRACTICES LOOK LIKE AT THAT GRADE LEVEL.

~~Mathematics | Standards for Mathematical Practice~~

~~The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).~~

~~1 Make sense of problems and persevere in solving them.~~

~~Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.~~

~~2 Reason abstractly and quantitatively.~~

~~Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.~~

~~3 Construct viable arguments and critique the reasoning of others.~~

~~Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions,communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.~~

~~4 Model with mathematics.~~

~~Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.~~

~~5 Use appropriate tools strategically.~~

~~Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.~~

~~6 Attend to precision.~~

~~**Mathematically proficient students try to communicate precisely to others. They try to use**~~

~~clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitionsLook for and make use of structure.~~

~~Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression~~ $x^2 + 9x + 14$, ~~older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see~~ $5 - 3(x - y)^2$ ~~as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers~~ x ~~and~~ y.

~~**7 Look for and express regularity in repeated reasoning.**~~

~~Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation~~ $(y - 2)/(x - 1) = 3$. ~~Noticing the regularity in the way terms cancel when expanding~~ $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, ~~and~~ $(x - 1)(x^3 + x^2 + x + 1)$ ~~might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.~~

~~Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content~~

~~The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.~~

~~The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.~~

~~In this respect, those content standards which set an expectation of understanding are potential "points of intersection" between the Standards for Mathematical~~

~~Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.~~

~~Mathematics |~~ Kindergarten

In Kindergarten, instruction~~al time~~ should focus on the following ~~two critical areas:~~ (1) representing, relating, and operating on whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to number than to other topics.

(1) Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 – 2 = 5. (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

(2) Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

~~Grade~~ Kindergarten Overview

Counting and Cardinality

- ☐ A. Know number names and the count sequence.
- ☐ B. Count to tell the number of objects.
- ☐ C. Compare numbers.

Operations and Algebraic Thinking

- ☐ A. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten

- ☐ A. Work with numbers 11–19 to gain foundations for place value.

Measurement and Data

- ○ A Describe and compare measurable attributes.
- ☐ B. Classify objects and count the number of objects in categories.

Geometry

- ○ A Identify and describe shapes.

△ B. Analyze, compare, create, and compose shapes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Kindergarten Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In kindergarten, students begin to build the understanding that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Real-life experiences should be used to support students' ability to connect mathematics to the world. To help students connect the language of mathematics to everyday life, ask students questions such as "How many students are absent?" or have them gather enough blocks for the students at their table. Younger students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" or they may try another strategy.

MP.2 Reason abstractly and quantitatively.
Younger students begin to recognize that a number represents a specific quantity. Then, they connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. For example, a student may write the numeral 11 to represent an amount of objects counted, select the correct number card 17 to follow 16 on a calendar, or build two piles of counters to compare the numbers 5 and 8. In addition, kindergarten students begin to draw pictures, manipulate objects, or use diagrams or charts to express quantitative ideas. Students need to be encouraged to answer questions such as "How do you know?", which reinforces their reasoning and understanding and helps student develop mathematical language.

MP.3 Construct viable arguments and critique the reasoning of others.
Younger students construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They also begin to develop their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking. They begin to develop the ability to reason and analyze situations as they consider questions such as "Are you sure that ____?", "Do you think that would happen all the time?", and "I wonder why ____?"

MP.4 Model with mathematics.

In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. For example, a student may use cubes or tiles to show the different number pairs for 5, or place three objects on a 10-frame and then determine how many more are needed to "make a ten." Students rely on manipulatives (or other visual and concrete representations) while solving tasks and record an answer with a drawing or equation.

MP.5 Use appropriate tools strategically.
Younger students begin to consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, kindergarteners may decide that it might be advantageous to use linking cubes to represent two quantities and then compare the two representations side-by-side or later, make math drawings of the quantities. Students decide which tools may be helpful to use depending on the problem or task and explain why they use particular mathematical tools.

MP.6 Attend to precision.
Kindergarten students begin to develop precise communication skills, calculations, and measurements. Students describe their own actions, strategies, and reasoning using grade level appropriate vocabulary. Opportunities to work with pictorial representations and concrete objects can help students develop understanding and descriptive vocabulary. For example, students describe and compare two- and three-dimensional shapes and sort objects based on appearance. While measuring objects iteratively (repetitively), students check to make sure that there are no gaps or overlaps. During tasks involving number sense, students check their work to ensure the accuracy and reasonableness of solutions. Students should be encouraged to answer questions such as, "How do you know your answer is reasonable?"

MP.7 Look for and make use of structure.
Younger students begin to discern a pattern or structure in the number system. For instance, students recognize that $3 + 2 = 5$ and $2 + 3 = 5$. Students use counting strategies, such as counting on, counting all, or taking away, to build fluency with facts to 5. Students notice the written pattern in the "teen" numbers—that the numbers start with 1 (representing 1 ten) and end with the number of additional ones. Teachers might ask, "What do you notice when ___?"

MP.8 Look for and express regularity in repeated reasoning.
In the early grades, students notice repetitive actions in counting, computations, and mathematical tasks. For example, the next number in a counting sequence is 1 more

when counting by ones and 10 more when counting by tens (or 1 more group of 10). Students should be encouraged to answer questions such as, "What would happen if ___?" and "There are 8 crayons in the box. Some are red and some are blue. How many of each could there be?" Kindergarten students realize 8 crayons could include 4 of each color ($8 = 4 + 4$), 5 of one color and 3 of another ($8 = 5 + 3$), and so on. For each solution, students repeatedly engage in the process of finding two numbers to join together to equal 8.

Counting and Cardinality	K.CC

☐ K.CC.A. Know number names and the count sequence.

1. Count to 100 by ones and by tens.
2. Starting at a given number, ~~C~~count forward within 100 and backward within 20. ~~beginning from a given number within the known sequence (instead of having to begin at 1).~~
3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

☐ K.CC.B. Count to tell the number of objects.

4. Understand the relationship between numbers and quantities; connect counting to cardinality.
   a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
   b. Understand that the last number name said tells the number of objects counted. The number of objects~~s~~ is the same regardless of their arrangement or the order in which they were counted.
   c. Understand that each successive number name refers to a quantity that is one larger. Recognize the one more pattern of counting using objects.

~~5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.~~

5. Given a group of up to 20 objects, count the number of objects in that group and state the number of objects in a rearrangement of that group without recounting given a verbal or written number from 0–20, count out that many objects.

Clarification: Objects can be arranged in a line, a rectangular array, or a circle. For as many as 10 objects, they may be arranged in a scattered configuration.

☐ K.CC.C. Compare numbers.

6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group for groups with up to 10 objects. , ~~e.g., by using matching and counting strategies.~~[1]
7. Compare two numbers between 1 and 10 presented as written numerals.

Operations and Algebraic Thinking	K.OA

☐ K.OA.A Understand addition as putting together and adding to, and under- stand subtraction as taking apart and taking from.

1. Represent addition and subtraction of two whole numbers within 10. Use ~~with~~ objects, fingers, mental images, drawings[2], sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
2. Solve addition and subtraction word problems, and add and subtract within 10, ~~e.g.,~~ by using physical, visual, and symbolic representations. ~~objects or drawings to represent the problem.~~

~~2.~~ ***Clarification:** Students are not expected to independently read word problems.*

~~3.~~ 3. Decompose whole numbers from 1 to 10 into pairs in more than one way by using physical visual or symbolic representations. ~~less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).~~

Example: *Decomposing* 5 *may include* $5 = 2 + 3$ *and* $5 = 4 + 1$.

~~4.~~ 4. For any given whole number from 1 to 9, find the number that makes 10 when added to the ~~given~~ number, ~~e.g.,~~ by using physical, visual, or symbolic representations~~objects or drawings, and record the answer with a drawing or equation.~~

5. Fluently add and subtract within five, including zero~~5~~.

~~5.~~ ***Clarification:*** *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility*

~~[1]Include groups with up to ten objects.~~
~~[2]Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the Standards.)~~

Number and Operations in Base Ten	K.NBT

☐ **K.NBT.A. Work with numbers 11–19 to gain foundations for place value.**

1. Compose (put together) and d~~e~~compose (break apart) numbers from 11 to 19 into ten ones and some further ones and record ~~, e.g., by using objects or drawings, and record~~ each composition or decomposition by physical, visual, or symbolic representations~~a drawing or equation (e.g., 18 = 10 + 8);~~ understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones

***Example**: Recording the decomposition of* 18 *may look like* $18 = 10 + 8$.

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Measurement and Data	K.MD

○ **K.MD.A. Describe and compare measurable attributes.**

1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

△ K.MD.B. **Classify objects and count the number of objects in each category.**

3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.[3]

Geometry	K.G

○ **K.G.A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).**

1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.
2. Correctly name shapes regardless of their orientations or overall size.
3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").

△ K.G.B **Analyze, compare, create, and compose shapes.**

4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, ~~parts (e.g., number of sides and vertices/"corners")~~ and other attributes (~~e.g., having sides of equal length).~~

Examples:

1) Number of sides and vertices/ "corners"

~~4.~~ *2) Having sides of equal length*

5. Model shapes in the world by building shapes from ~~components (e.g., sticks and clay balls)~~ and drawing shapes.

Clarification: *Components/materials may include: sticks, clay balls, marshmallows and/or spaghetti.*

6. Compose simple shapes to form larger two-dimensional shapes.

~~6.~~ *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*

~~[3]Limit category counts to be less than or equal to 10.~~

~~Mathematics | Grade 1~~FIRST GRADE

In first grade~~Grade 1~~, instruction~~al time~~ should focus on the following ~~four critical areas:~~ (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

(1) Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers. They use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., “making tens”) to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.

(2) Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build number sense, they understand the order of the counting numbers and their relative magnitudes.

(3) Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.[1]

(4) Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine shapes, they recognize them from different perspectives and orientations, describe their geometric attributes, and determine how they are alike and different, to develop the background for measurement and for initial understandings of properties such as congruence and symmetry.

~~[4]Students should apply the principle of transitivity of measurement to make indirect comparisons, but they need not use this technical term.~~

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

First Grade~~Grade 1~~ Overview

Operations and Algebraic Thinking

- ☐ A. Represent and solve problems involving addition and subtraction.
- ☐ B. Understand and apply properties of operations and the relationship between addition and subtraction.
- ☐ C. Add and subtract within 20.
- ☐ D. Work with addition and subtraction equations.

Number and Operations in Base Ten

- ☐ A. Extend the counting sequence.
- ☐ B. Understand place value.
- ☐ C. Use place value understanding and properties of operations to add and subtract.

Measurement and Data

☐ A. Measure lengths indirectly and by iterating length units.
○ B. Tell and write time.
△ C. Represent and interpret data.
△ D. Work with money.

Geometry

- ○ A. Reason with shapes and their attributes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For first grade this standard is:

- 1.OA.C.6 Demonstrate fluency for addition and subtraction within 10, use strategies to add and subtract within 20.

First Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In first grade, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Younger students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They are willing to try other approaches.

MP.2 Reason abstractly and quantitatively.
Younger students recognize that a number represents a specific quantity. They connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. In first grade students make sense of quantities and relationships while solving tasks. They represent situations by decontextualizing tasks into numbers and symbols. For example, "There are 60 children on the playground and some children go line up. If there are 20 children still playing, how many children lined up?" Students translate the situation into the equation: $60 - 20 = \boxed{}$ and then solve the task. Students also contextualize situations during the problem-solving process. For example, students refer to the context of the task to determine they need to subtract 20 from 60 because the total number of children on the playground is the 20 less than the original number of children playing. Students might also reason about ways to partition two-dimensional geometric figures into halves and fourths.

MP.3 Construct viable arguments and critique the reasoning of others.
First graders construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They also practice their mathematical communication skills as they

participate in mathematical discussions involving questions like “How did you get that?”, “Explain your thinking.”, and “Why is that true?” They not only explain their own thinking, but listen to others’ explanations. They decide if the explanations make sense and ask questions. For example, “There are 15 books on the shelf. If you take some books off the shelf and there are now 7 left, how many books did you take off the shelf?” Students might use a variety of strategies to solve the task and then share and discuss their problem-solving strategies with their classmates.

MP.4 Model with mathematics.

In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. First grade students model real-life mathematical situations with a number sentence or an equation and check to make sure equations accurately match the problem context. Students use concrete models and pictorial representations while solving tasks and also write an equation to model problem situations. For example, to solve the problem, “There are 11 bananas on the counter. If you eat 4 bananas, how many are left?” students could write the equation $11 - 4 = 7$. Students also create a story context for an equation such as $13 - 7 = 6$.

MP.5 Use appropriate tools strategically.

In first grade, students begin to consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, first graders decide it might be best to use colored chips to model an addition problem. In first grade students use tools such as counters, place value (base ten) blocks, hundreds number boards, number lines, concrete geometric shapes (e.g., pattern blocks, 3-dimensional solids), and virtual representations to support conceptual understanding and mathematical thinking. Students determine which tools are the most appropriate to use. For example, when solving $12 + 8 = \boxed{}$, students explain why place value blocks are more appropriate than counters.

MP.6 Attend to precision.

As young children begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and when they explain their own reasoning. In grade one, students use precise communication, calculation, and measurement skills. Students are able to describe their solution strategies to mathematical tasks using grade-level appropriate vocabulary, precise explanations, and mathematical reasoning. When students measure objects iteratively (repetitively), they check to make sure there are no gaps or overlaps. Students regularly check their work to ensure the accuracy and reasonableness of solutions.

MP.7 Look for and make use of structure.

First graders begin to discern a pattern or structure. For instance, if students recognize $12 + 3 = 15$, then they also know $3 + 12 = 15$. (Commutative property of addition.) To add $4 + 6 + 4$, the first two numbers can be added to make a ten, so $4 + 6 + 4 = 10 + 4 = 14$. While solving addition problems, students begin to recognize the commutative property, for example $7 + 4 = 11$, and $4 + 7 = 11$. While decomposing two-digit numbers, students realize that any two-digit number can be broken up into tens and ones, e.g. $35 = 30 + 5$, $76 = 70 + 6$. Grade one students make use of structure when they work with subtraction as a missing addend problem, such as $13 - 7 = \square$ can be written as $7 + \square = 13$ and can be thought of as how much more do I need to add to 7 to get to 13?

MP.8 Look for and express regularity in repeated reasoning.

First grade students begin to look for regularity in problem structures when solving mathematical tasks. For example, students add three one-digit numbers by using strategies such as "make a ten" or doubles. Students recognize when and how to use strategies to solve similar problems. For example, when evaluating $8 + 7 + 2$, a student may say, "I know that 8 and 2 equals 10, then I add 7 to get to 17. It helps if I can make a 10 out of two numbers when I start." Students use repeated reasoning while solving a task with multiple correct answers. For example, students might solve the problem, "There are 12 crayons in the box. Some are red and some are blue. How many of each could there be?" Students use repeated reasoning to find pairs of numbers that add up to 12 (e.g., the 12 crayons could include 6 of each color ($6 + 6 = 12$), 7 of one color and 5 of another ($7 + 5 = 12$), etc.)

Operations and Algebraic Thinking	1.OA

☐ 1.OA.A. Represent and solve problems involving addition and subtraction.

~~1.~~ Solve ~~Use~~ addition and subtraction within 20 ~~to solve word problems~~ involving situations of adding to, taking from, putting together, taking apart, aand comparing, with unknowns in all positions, ~~e.g.,~~ by using physical, visual, and symbolic representations. ~~objects, drawings, and equations with a symbol for the unknown number to represent the problem.[2]~~

Clarification: *Students are not expected to independently read word problems.*

2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20 by using physical, visual, and symbolic representations.~~, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.~~

~~2.~~ ***Clarification:*** *Students are not expected to independently read word problems.*

☐ 1.OA.B. Understand and apply properties of operations and the relationship between addition and subtraction.

3. Apply properties of operations as strategies to add. ~~and subtract.[3]~~ *Examples: 1) If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) 2) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)*

~~3.~~ **Clarification:** Students need not use formal terms for these properties.

~~4. Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.*~~

4. Restate a subtraction problem as a missing addend problem using the relationship between addition and subtraction.

Example: *The equation* $12-7=?$ *can be restated as* $7+?=12$ *to determine the difference is* 5.

☐ 1.OA.C. Add and subtract within 20.

5. Relate counting to addition and subtraction ~~(e.g., by counting on 2 to add 2).~~

Example: *When students count on* 3 *from* 4*, they should write this as* $4+3=7$*. When students count on for subtraction,* 3 *from* 7*, they should connect this to* $7-3=4$*. Students write "*$7-3=?$*" and think "I count on* $3+?=7$*."*

~~5.~~

~~6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).~~

6. Demonstrate fluency for addition and subtraction within 10, use strategies to add and subtract within 20.

Clarification: *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

Students may use mental strategies such as counting on; making 10, decomposing a number leading to a 10, using the relationship between addition and subtraction; and creating equivalent but easier or known sums.

☐ 1.OA.D. **Work with addition and subtraction equations.**

~~7.~~1. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. *For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.*

2. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers, with the unknown in any position. .
For example, determine the unknown number that makes the equation true in each of the equations 8 +? = 11, 5 = �– 3, 6 + 6 = �.

Number and Operations in Base Ten	1.NBT

☐ **1.NBT.A.** **Extend the counting sequence.**

~~1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.~~

1. Starting at a given number, count forward and backwards within 120 by ones. Skip count by twos to 20, by fives to 100, and by tens to 120. In this range, read and write numerals and represent a number of objects with a written numeral.

☐ 1.NBT.B. **Understand place value.**

2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand ~~the following as special cases~~:

   a. 10 can be thought of as a bundle of ten ones — called a “ten.”

   b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.

   c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

~~[2]See Glossary, Table 1.~~
~~[3]Students need not use formal terms for these properties.~~

3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

☐ 1.NBT.C. **Use place value understanding and properties of operations to add and subtract.**

4. Add whole numbers within 100 by using physical, visual and symbolic representations, with and emphasis on ~~, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on~~ place value, properties of operations, and/or the relationship between addition and subtraction;
~~relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.~~
a. Add a two-digit number and a one-digit number.
b. Add a two-digit number and a multiple of 10.
c. Understand that when adding two-digit numbers, combine like base-ten units such as tens and tens, one and ones, and sometimes it is necessary to compose a ten.

5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

6. Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 ~~(positive or zero differences), using concrete models or drawings and strategies based~~ by using physical, visual, and symbolic representations, with an emphasis, on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Measurement and Data	1.MD

☐ **1.MD.A Measure lengths indirectly and by iterating length units.**

1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.

2. Express the length of an object as a whole number of length units~~,~~ by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. ~~*Limit to*~~

Clarification: *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps. Include use of standard units such as inch-tiles or centimeter tiles.*

○ 1.MD.B. **Tell and write time.**

3. Tell and write time in hours and half-hours using analog and digital clocks.

△ 1.MD.C. **Represent and interpret data.**

4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

△ 1.MD.D. Work with money.

5. Identify quarters, dimes, and nickels and relate their values to pennies. Find equivalent values (e.g., a nickel is equivalent to five pennies).

~~4.~~

Geometry	1.G

O 1.G.A. Reason with shapes and their attributes.

1. ~~Distinguish between~~ Compare defining attributes ~~(e.g., triangles are closed and three-sided) versus~~ and non-defining attributes of two- and three-dimensional shapes; ~~(e.g., color, orientation, overall size~~); build and draw shapes to possess defining attributes.

~~1.~~ ***Clarification:*** *The defining attributes of triangles are closed and three-sided versus non-defining attributes of color, orientation, overall size.*

2. Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.[4]

Clarification: *Students do not need to learn formal names such as "right rectangular prism."*

3. Partition circles and rectangles into two and four equal shares. ~~,~~ Understand for these examples that decomposing into more equal shares creates smaller shares.

3. a ~~d~~ escribe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*.

~~3.~~ B. Describe the whole as two of, or four of the shares. ~~Understand for these examples that decomposing into more equal shares creates smaller shares.~~ (moved to #3 above)

~~[4]Students do not need to learn formal names such as "right rectangular prism."~~

~~Mathematics | Grade 2~~ Second Grade

In second g~~G~~rade 2, instruction~~al time~~ should focus on the following: ~~four critical areas:~~ (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

(1) Students extend their understanding of the base-ten system. This includes ideas of counting in fives, tens, and multiples of hundreds, tens, and ones, as well as number relationships involving these units, including comparing. Students understand multi-digit numbers (up to 1000) written in base-ten notation, recognizing that the digits in each place represent amounts of thousands, hundreds, tens, or ones (e.g., 853 is 8 hundreds + 5 tens + 3 ones).

(2) Students use their understanding of addition to develop fluency with addition and subtraction within 100. They solve problems within 1000 by applying their understanding of models for addition and subtraction, and they develop, discuss, and use efficient, accurate, and generalizable methods to compute sums and differences of whole numbers in base-ten notation, using their understanding of place value and the properties of operations. They select and accurately apply methods that are appropriate for the context and the numbers involved to mentally calculate sums and differences for numbers with only tens or only hundreds.

(3) Students recognize the need for standard units of measure (centimeter and inch) and they use rulers and other measurement tools with the understanding that linear measure involves an iteration of units. They recognize that the smaller the unit, the more iterations they need to cover a given length.

(4) Students describe and analyze shapes by examining their sides and angles. Students investigate, describe, and reason about decomposing and combining shapes to make other shapes. Through building, drawing, and analyzing two- and three-dimensional shapes, students develop a foundation for understanding area, volume, congruence, similarity, and symmetry in later grades.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Second Grade ~~2~~ Overview

Operations and Algebraic Thinking

- ☐ A. Represent and solve problems involving addition and subtraction.
- ☐ B. Add and subtract within 20.
- △ C. Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten

- ☐ A. Understand place value.
- ☐ B. Use place value understanding and properties of operations to add and subtract.

Measurement and Data

- ☐ A. Measure and estimate lengths in standard units.
- ☐ B Relate addition and subtraction to length.
- △ C. Work with time and money.
- △ D. Represent and interpret data.

Geometry

- ○ A. Reason with shapes and their attributes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For second grade these standards are:

- 2.OA.B.2 Demonstrate fluency for addition and subtraction within 20 using mental strategies. By the end of Grade 2, recall basic facts to add and subtract within 20 with automaticity.

2.NBT.5 Fluently add and subtract whole numbers within 100 using understanding of place value and properties of operations.

Second Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In second grade, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. They may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They make conjectures about the solution and plan out a problem-solving approach. An example for this might be giving a student an equation and having him/her write a story to match.

MP.2 Reason abstractly and quantitatively.
Younger students recognize that a number represents a specific quantity. They connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. Second graders begin to know and use different properties of operations and relate addition and subtraction to length. In second grade students represent situations by decontextualizing tasks into numbers and symbols. For example, in the task, "There are 25 children in the cafeteria, and they are joined by 17 more children. How many students are in the cafeteria?" Students translate the situation into an equation, such as: $25 + 17 = \boxed{}$ and then solve the problem. Students also contextualize situations during the problem-solving process. For example, while solving the task above, students might refer to the context of the task to determine that they need to subtract 19 if 19 children leave.

MP.3 Construct viable arguments and critique the reasoning of others.
Second graders may construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They practice their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?", "Explain your thinking.", and "Why is that true?" They not only explain their own thinking, but listen to others' explanations. They decide if the explanations make sense and ask appropriate questions. Students critique the strategies and reasoning of their classmates. For example, to solve $74 - 18$, students may use a variety of strategies, and after working on the task, they might discuss and critique each other's' reasoning and strategies, citing similarities and differences between various problem-solving approaches.

MP.4 Model with mathematics.

In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. In grade two students model real-life mathematical situations with a number sentence or an equation and check to make sure that their equation accurately matches the problem context. They use concrete manipulatives and pictorial representations to explain the equation. They create an appropriate problem situation from an equation. For example, students create a story problem for the equation $43 + 17 = \square$ such as "There were 43 gumballs in the machine. Tom poured in 17 more gumballs. How many gumballs are now in the machine?"

MP.5 Use appropriate tools strategically.

In second grade, students consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be better suited. For instance, second graders may decide to solve a problem by drawing a picture rather than writing an equation. Students may use tools such as snap cubes, place value (base ten) blocks, hundreds number boards, number lines, rulers, virtual manipulatives, and concrete geometric shapes (e.g., pattern blocks, three-dimensional solids). Students understand which tools are the most appropriate to use. For example, while measuring the length of the hallway, students can explain why a yardstick is more appropriate to use than a ruler.

MP.6 Attend to precision.

As children begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and when they explain their own reasoning. Second grade students communicate clearly, using grade-level appropriate vocabulary accurately and precise explanations and reasoning to explain their process and solutions. For example, while measuring an object, students carefully line up the tool correctly to get an accurate measurement. During tasks involving number sense, students consider if their answer is reasonable and check their work to ensure the accuracy of solutions.

MP.7 Look for and make use of structure.

Second grade students look for patterns and structures in the number system. For example, students notice number patterns within the tens place as they connect skip counting by 10s to corresponding numbers on a 100s chart. Students see structure in the base-ten number system as they understand that 10 ones equal a ten, and 10 tens equal a hundred. Students adopt mental math strategies based on patterns (making ten, fact families, doubles). They use structure to understand subtraction as missing addend problems (e.g., $50 - 33 = \square$ can be written as $33 + \square = 50$ and can be thought of as "How much more do I need to add to 33 to get to 50?")

MP.8 Look for and express regularity in repeated reasoning.

Second grade students notice repetitive actions in counting and computation (e.g., number patterns to skip count). When children have multiple opportunities to add and subtract, they look for shortcuts, such as using estimation strategies and then adjust the answer to compensate. Students continually check for the reasonableness of their solutions during and after completing a task by asking themselves, "Does this make sense?"

Operations and Algebraic Thinking	2.OA

☐ 2.OA.A. Represent and solve problems involving addition and subtraction.

1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions by using physical, visual, and symbolic representations. ~~, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.[1]~~

☐ 2.OA.B. Add and subtract within 20.

2. Demonstrate ~~F~~fluen~~tl~~cy for addition and subtraction within 20 using mental strategies.~~[2]~~ By end of Grade 2, recal basic facts to add and subtract within 20 with automaticity. ~~know from memory all sums of two one-digit numbers.~~

Clarification: *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

Students may use mental strategies such as counting on; making 10; decomposing a number leading to a 10; using the relationship between addition and subtraction; and creating equivalent but easier or known sums.

~~2.~~

△ 2.OA.C. Work with equal groups of objects to gain foundations for multiplication.

~~3.~~ 3. Determine whether a group of objects (up to 20) has an odd or even number of members and ~~, e.g., by pairing objects or counting them by 2s;~~ write an equation to express an even number as a sum of two equal addends.

Clarification: *Students may pair objects or count them by twos.*

3. 4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

Example: *The total number of objects arranged in a* 2×5 *rectangular array can be found by adding* $2 + 2 + 2 + 2 + 2$.

~~4.~~

Number and Operations in Base Ten	2.NBT

☐ 2.NBT.A Understand place value.

1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones. Understand:

~~1. ; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:~~

a. 100 can be thought of as a bundle of ten tens — called a "hundred."

b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

***Example**: The number* 241 *can be expressed as* 2 *hundreds +* 4 *tens +* 1 *one or as* 24 *tens +* 1 *one or as* 241 *ones.*

2. Count within 1000; skip-count by 5s, 10s, and 100s. Identify patterns in skip counting starting at any number.

~~2.~~

~~3.~~ 3. Read and write numbers to 1000 using standard form, expanded form, and word form. ~~base-ten numerals, number names, and expanded form.~~

***Example**: The number two-hundred forty-one written in standard form is* 241 *and in expanded form is* $200 + 40 + 1$.

~~4.~~ 4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, recording the results of comparisons with the symbols ~~using~~ >, =, and < symbols ~~to record the results of comparisons.~~

☐ 2.NBT.B. **Use place value understanding and properties of operations to add and subtract.**

5. Fluently add and subtract whole numbers within 100 using understanding of ~~strategies based on~~ place value and, properties of operations. ~~,~~

~~and/or the relationship between addition and subtraction.~~

~~5.~~ ***Clarification:** Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

6. Add up to four two-digit numbers using strategies based on place value and properties of operations.

7. Add and subtract whole numbers within 1000, using physical, visual and symbolic representations, which an emphasis ~~concrete models or drawings and strategies based~~ on place value, properties of operations, and/or the relationships between addition and subtraction~~; relate the strategy to a written method~~.
a. Understand that in adding or subtracting three- digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones;
b. Understand that ~~and~~ sometimes it is necessary to compose or decompose tens or hundreds.
~~7.~~

***Example:** Students may use equations to represent their strategies based on place value such as:* $324 + 515 = (300 + 500) + (20 + 10) + (4 + 5) = 839$.

8. Use mental strategies to add or subtract a number that is ten more, ten less, one hundred more and one hundred less than a given three-digit number.

~~8. Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.~~

~~9.~~ 9. Explain why addition and subtraction strategies work, using place value and the properties of operations.~~[3]~~

~~[1]See Glossary, Table 1.~~
~~[2]See standard 1.OA.6 for a list of mental strategies.~~
~~[3]Explanations may be supported by drawings or objects.~~

Measurement and Data	2.MD

☐ 2.MD.A. Measure and estimate lengths in standard units.

1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
2. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
3. Estimate lengths using units of inches, feet, centimeters, and meters.
4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

☐ 2.MD.B. **Relate addition and subtraction to length.**

5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units. ~~, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.~~

~~5.~~ ***Clarification:*** *Students may use drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.*

6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

△ 2.MD.C. **Work with time and money.**

7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.
8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies (up to $10), , using $ and ¢ symbols appropriately and whole dollar amounts

~~8.~~ ~~.~~*Example: A sample question could be, " If you have 2 dimes and 3 pennies, how many cents do you have? If you have $3 and 4 quarters, how many dollars or cents do you have?"*

△ 2.MD.D **Represent and interpret data.**

9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. ~~Show the measurements by making~~ Organize and record data on a line plot (dot plot) ~~a line plot,~~ where the horizontal scale is marked off in whole-number units.
10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems[4] using information presented in the ~~a bar~~ graph.

Geometry	2.G

○ 2.G.A. Reason with shapes and their attributes.

1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.[5] Identify triangles, squares, rectangles, rhombi, trapezoids, ~~quadrilaterals,~~ pentagons, hexagons, octagons and cubes.
2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.
3. Partition circles and rectangles into two, three, or four equal shares. Understand for these examples that decomposing into more or

equal shares creates smaller shares.
a.~~,~~ D~~d~~escribe the shares using the words *halves*, *thirds*, fourths and quarter, and use the phrases *half of*, *a third of*, a fourth of and a quarter of. ~~etc., and~~
b. ~~d~~Describe the whole as two of, three of, or four of the shares. ~~halves, three thirds, four fourths.~~
~~3.~~ c. Recognize that equal shares of identical wholes need not have the same shape.

~~[4]See Glossary, Table 1.~~
~~[5]Sizes are compared directly or visually, not compared by measuring.~~

Third ~~Mathematics |~~ Grade ~~3~~

In third g~~G~~rade ~~3~~, instruction~~al time~~ should focus on the following: ~~four critical areas~~: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

(1) Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

(2) Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

(3) Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

(4) Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Third Grade ~~3~~ Overview

Operations and Algebraic Thinking

- □ A. Represent and solve problems involving multiplication and division.
- □ B. Understand properties of multiplication and the relationship between multiplication and division.
- □ C. Multiply and Divide Within 100.
- □ D. Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Number and Operations in Base Ten

- ○ A. Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

- □ A. Develop understanding of fractions as numbers.

Measurement and Data

- □ A. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

△ B. Represent and Interpret Data.

- □ C. Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
- ○ D. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry

- △ A. Reason with shapes and their attributes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For third grade these standards are:

- 3.OA.C.7.b Demonstrate fluency for multiplication within 100. Know from memory all products of two single-digit numbers and related division facts.
- 3.NBT.A.2* Fluently add and subtract whole numbers within 1000 using understanding of place value and properties of operations.

**Designated as a mastery standard because students in third grade fluently add and subtract within 1000 using methods based on place value, properties of operations, and/or the relationship between addition and subtraction. They focus on methods that generalize readily to larger numbers so the relationship between addition and subtraction that these methods can be extended to 1,000,000 in fourth grade and fluency can be reached with such larger numbers.*

Third Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In third grade, mathematically proficient students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Students may use concrete objects, pictures, or drawings to help them conceptualize and solve problems, such as "Jim purchased 5 packages of muffins. Each package contained 3 muffins. How many muffins did Jim purchase?" or "Describe another situation where there would be 5 groups of 3 or 5×3." Students may check their thinking by asking themselves, "Does this make sense?" Students listen to other students' strategies and are able to make connections between various methods for a given problem.

MP.2 Reason abstractly and quantitatively.
Third graders should recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. For example: students apply their understanding of the meaning of the equal sign as "the same as" to interpret an equation with an unknown. When given $4 \times \square = 40$, they might think:

- 4 groups of some number is the same as 40
- 4 times some number is the same as 40
- I know that 4 groups of 10 is 40 so the unknown number is 10
- The missing factor is 10 because 4 times 10 equals 40.

Teachers might ask, "How do you know" or "What is the relationship between the quantities?" to reinforce students' reasoning and understanding.

MP.3 Construct viable arguments and critique the reasoning of others.
Students may construct arguments using concrete referents, such as objects, pictures, and drawings. They refine their mathematical communication skills as they participate in mathematical discussions that the teacher facilities by asking questions such as "How did you get that?" and "Why is that true?" Students explain their thinking to others and respond to others' thinking. For example, after investigating patterns on the 100s chart, students might explain why the pattern makes sense.

MP.4 Model with mathematics.

Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Third graders should evaluate their results in the context of the situation and reflect on whether the results make sense. For example, students use various contexts and a variety of models (e.g., circles, squares, rectangles, fraction bars, and number lines) to represent and develop understanding of fractions. Students use models to represent both equations and story problems and can explain their thinking. They evaluate their results in the context of the situation and reflect on whether the results make sense. Students should be encouraged to answer questions, such as "What math drawing or diagram could you make and label to represent the problem?" or "What are some ways to represent the quantities?"

MP.5 Use appropriate tools strategically.
Third graders consider the available tools (including drawings and estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper to find all the possible rectangles that have a given perimeter. They compile the possibilities into an organized list or a table and determine whether they have all the possible rectangles. Students should be encouraged to answer questions such as, "Why was it helpful to use ___?"

MP.6 Attend to precision.
As third graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the area of a rectangle they record their answers in square units.

MP.7 Look for and make use of structure.
Students look closely to discover a pattern or structure. For instance, students use properties of operations (e.g., commutative and distributive properties) as strategies to multiply and divide. Teachers might ask, "What do you notice when ___?" or "How do you know if something is a pattern?"

MP.8 Look for and express regularity in repeated reasoning.
Students in third grade should notice repetitive actions in computation and look for more shortcut methods. For example, students use the distributive property as a strategy for using products they know to solve products that they do not know. For example, if students are asked to find the product of 7×8, they might decompose 7 into 5 and 2 and then multiply 5×8 and 2×8 to arrive at $40 + 16$ or 56. In addition, third graders continually

evaluate their work by asking themselves, "Does this make sense? Students should be encouraged to answer questions, such as, "What is happening in this situation?" or "What predictions or generalizations can this pattern support?"

Operations and Algebraic Thinking	3.OA

☐ 3.OA.A. Represent and solve problems involving multiplication and division.

1. Interpret products of whole numbers as grouping of sets, , e.g., interpret 5 × 7 ~~as the total number of objects in~~ 5 groups of 7 objects each. ~~*For example, describe a context in which a total number of objects can be expressed as 5 × 7.*~~

~~2.~~ 2. Interpret a quotient of whole numbers as equal sharing, e.g., 56 ÷ 8 as the number in each share when 56 objects are split into 8 equal shares, or as the number of shares when 56 objects are split into equal shares of 8 objects each. ~~whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*~~

~~3.~~ 3. Use multiplication and division within 100 to solve word ~~problems in situations~~ involving equal groups, arrays, and measurements by using visual and symbolic representations ~~quantities, e.g., by using drawings and equations~~ with a symbol for an~~the~~ unknown number. ~~to represent the problem.~~[1]

4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

~~4.~~ *E~~For e~~xample, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = � ÷ 3, 6 × 6 = ?.*

☐ 3.OA.B. Understand properties of multiplication and the relationship between multiplication and division.

5. Apply properties of operations as strategies to multiply and divide.

~~5.~~ ~~[2] *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*~~

Clarification: *Students need not use formal terms for these properties (identity, communicative, associative, distributive).*

~~6.~~2. Understand division as determining an unknown-factor in a multiplication problem. ~~*For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*~~

☐ 3.OA.C. Multiply and divide within 100.

~~7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.~~

7. Demonstrate fluency for multiplication within 100.

a. Demonstrate understanding of strategies that make use of the relationship between multiplication and division or properties of operations.

b. Know from memory all products of two single-digit numbers and related division facts.

Clarification: *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

☐ 3.OA.D. **Solve problems involving the four operations, and identify and explain patterns in arithmetic.**

8. Solve two-step word problems involving whole numbers using the four operations.

a. Represent these problems using equations with a letter standing for the unknown quantity.

~~8.~~ b. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.[3]

9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. ~~For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.~~

Example*: Arithmetic patterns are patterns that change by the same rate, such as adding the same number the series* $2, 4, 6, 8, 10$ *is an arithmetic pattern that increases by* 2 *between each term.*

~~9.~~

~~[1]See Glossary, Table 2.~~
~~[2]Students need not use formal terms for these properties.~~
~~[3]This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).~~

Number and Operations in Base Ten	3.NBT

3.NBT.A. Use place value understanding and properties of operations to perform multi-digit arithmetic.[4]

1. ~~Use place value understanding to round whole numbers to the nearest 10 or 100.~~ Round a whole number to the tens or hundreds place, using place value understanding or a visual representation.

2. Fluently add and subtract whole numbers within 1000 ~~using strategies and algorithms based on~~ understanding of place value, properties of operations~~, and/or the relationship between addition and subtraction.~~

Clarification: Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.

~~2.~~

~~3.~~ 3. Multiply one-digit whole numbers by multiples of 10 in the range 10– 90 using understanding ~~(e.g., 9 × 80, 5 × 60) using strategies based on~~ place value and properties of operations.

Number and Operations—Fractions[5]	3.NF

3.NF.A Develop understanding of fractions as numbers.

1. Understand a fraction 1/*b* as the quantity formed by 1 part when a whole (a single unit) is partitioned into *b* equal parts; understand ~~a fraction~~ *a*/*b* as the quantity formed by *a* parts of size 1/*b*.
2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.
   a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the fraction 1/b is ~~endpoint of the part based at 0~~ locate~~s the number~~d 1/*b* *of a whole unit from 0* on the number line.
   b. Represent a fraction *a*/*b* on a number line diagram by marking off *a* length~~s~~ 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line.
3. Explain equivalence of fractions ~~in special cases,~~ and compare fractions by reasoning about their size, in limited cases.
   a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
   b. Recognize and generate simple equivalent fractions, ~~e.g., 1/2 = 2/4, 4/6 = 2/3.~~ and ~~E~~explain why the fractions are equivalent, such as ~~e.g.,~~ by using a visual fraction model.

Example: $\frac{1}{2} = \frac{2}{4}, \frac{4}{6} = \frac{2}{3}$

~~b.~~

   c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

~~c.~~ *~~E~~xample~~s~~: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.*

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize th~~eat~~ comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions~~, e.g., by~~ using ~~a~~ visual representations and/or verbal reasoning.~~fraction model.~~

Measurement and Data	3.MD

☐ 3.MD.A. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

~~1.~~ Tell and write time to the nearest minute within the same hour and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes. , ~~e.g., by representing the problem on a number line diagram.~~

1.

***Clarification:** Students may use tools such as clocks, number line diagrams, and tables to solve problems involving time intervals.*

2. Identify and use the appropriate tools and units of measurement, both customary and metric, to solve one-step word problems using the four operations involving weight, mass, liquid volume, and capacity (within the same system and unit).

***Clarification:** Students may use drawings (such as a beaker with a measurement scale) to represent the problem.*

This standard does not include conversions between units. The focus is on measuring and reasonable estimates, use benchmarks to measure weight, and capacity.

~~[4]A range of algorithms may be used.~~
~~[5]Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8.~~

~~2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).[6] Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.[7]~~

△ 3.MD.B. **Represent and interpret data.**

3. Draw a scaled picture graph and ~~a~~ scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

~~3.~~ *~~For e~~Example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Record and ~~S~~show the data by making a line plot (dot plot), where the horizontal scale is marked off in appropriate units—whole numbers, halves, or fourths~~quarters~~.

☐ 3.MD.C **Geometric measurement: understand concepts of area and relate area to multiplication and to addition.**

5. Recognize area as an attribute of plane figures and understand concepts of area measurement.
   a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.
   b. A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.
6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard ~~improvised~~ units).
7. Relate area to the operations of multiplication and addition.
   a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
   b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
   c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.

Example: *Using the distributive property, the area of a shape that is 6 by 7 can be determined by finding the area of the 6×5 section and the 6×2 section and then adding the two products together.*

   d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

Example: *A pool is comprised of two non-overlapping rectangles in the shape of an "L". The area for a cover of a pool can be found by adding the areas of the two non-overlapping rectangles.*

~~d.~~

○ 3.MD.D. **Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.**

8. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

~~[6]Excludes compound units such as cm^3 and finding the geometric volume of a container.~~
~~[7]Excludes multiplicative comparison problems (problems involving notions of "times as much"; see Glossary, Table 2).~~

Geometry	3.G

△ 3.G.A. Reason with shapes and their attributes.

1. Understand that shapes in different categories ~~(e.g., rhombuses, rectangles, and others)~~ may share attributes, ~~(e.g., having four sides),~~ and that the shared attributes can define a larger category. ~~(e.g., quadrilaterals).~~ Recognize rhombi~~uses~~, rectangles, ~~and~~ squares, and trapezoids as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
2. Partition two-diminsional figures ~~shapes into parts with~~ equal areas, and~~. E~~express the area of each part as a unit fraction of the whole.
3.

~~2.~~ *~~For e~~Example: Draw lines to separate ~~, partition~~ a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

~~Mathematics | Fourth~~Fourth Grade ~~4~~

In ~~fourth grade~~fourth gradeGrade 4~~, instructional time~~ should focus on the followingthree ~~critical areas:~~ (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) and understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

(1) Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

(2) Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

(3) Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Fourth Grade 4 Overview

Operations and Algebraic Thinking

- ☐ A. Use the four operations with whole numbers to solve problems.
- △ B. Gain familiarity with factors and multiples.
- ○ C. Generate and analyze patterns.

Number and Operations in Base Ten

- ☐ A. Generalize place value understanding for multi- digit whole numbers.
- ☐ B. Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

- ☐ A. Extend understanding of fraction equivalence and ordering.
- ☐ B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
- ☐ C. Understand decimal notation for fractions, and compare decimal fractions.

Measurement and Data

- △ A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- △ B. Represent and interpret data.
- ○ C. Geometric measurement: understand concepts of angle and measure angles.

Geometry

- ○ A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For fourth grade this standard is:

4.NBT.B.4 Fluently use the standard algorithm for multi-digit whole number addition and subtraction.

Fourth Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.

In fourth grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Fourth graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They listen to the strategies of others and will try different approaches. They often will use another method to check their answers. Students might use an equation strategy to solve the word problem. For example, students could solve the problem "Chris bought clothes for school. She bought 3 shirts for $\$12$ each and a skirt for $\$15$. How much money did Chris spend on her new school clothes?" with the equation $3 \times \$12 + \$15 = a$. Fourth graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They listen to the strategies of others and will try different approaches. They often will use another method to check their answers.

MP.2 Reason abstractly and quantitatively.

Fourth graders should recognize that a number represents a specific quantity. They connect the quality to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions, record calculations with numbers, and represent or round numbers using place value concepts. Students might use base 10 blocks or drawings to demonstrate 154×6, as 154 added six times, and develop an understanding of the distributive property. For example: 154×6

$$= (100 + 50 + 4) \times 6$$

$$= (100 \times 6) + (50 \times 6) + (4 \times 6)$$

$$= 600 + 300 + 24 = 924$$

MP.3 Construct viable arguments and critique the reasoning of others.

In fourth grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like “How did you get that?”, “Explain your thinking,” and “Why is that true?” They not only explain their own thinking, but listen to others’ explanations. Students explain and defend their answers and solution strategies as they answer question that require an explanation. For example, “Vincent cuts 2 meters of string into 4 centimeter pieces for a craft. How many pieces of string does Vincent have? Explain your reasoning.” Students ask appropriate questions, and they decide if explanations make sense. Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fourth graders should evaluate their results in the context of the situation and reflect on whether the results make sense. For example, students may use money (i.e. dollars and coins) or base 10 blocks to solve the following problem: Elsie buys a drink for $\$1.39$ and a granola bar for $\$0.89$. How much change will she receive if she pays with a $\$5$ bill?

MP.5 Use appropriate tools strategically.
Fourth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper, a number line, or base 10 blocks to represent, compare, add, and subtract decimals to the hundredths. Students in fourth grade use protractors to measure angles. They use other measurement tools to understand the relative size of units within a given system and express measurements given in larger units in terms of smaller units.

MP.6 Attend to precision.
As fourth graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. For instance, they may use graph paper or a number line to represent, compare, add, and subtract decimals to the hundredths. Students in fourth grade use protractors to measure angles. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, they use appropriate labels when creating a line plot.

MP.7 Look for and make use of structure.
In fourth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations to explain calculations (partial products model). They relate representations of counting problems such as arrays and area models to the

multiplication principal of counting. They generate number or shape patterns that follow a given rule using two-column tables.

MP.8 Look for and express regularity in repeated reasoning.

Students in fourth grade should notice repetitive actions in computation to make generalizations. Students use models to explain calculations and understand how algorithms work. They also use models to examine patterns and generate their own algorithms. For example, students use visual fraction models to write equivalent fractions.

Operations and Algebraic Thinking	4.OA

☐ 4.OA.A. Use the four operations with whole numbers to solve problems.

1. Interpret a multiplication equation as a comparison, e.g., ~~interpret~~ 35 = 5 × 7 as ~~a statement that~~ 35 is 5 times as many as ~~7 and 7 times as many as 5.~~ Represent verbal ~~statements of~~ multiplicative comparisons as multiplication equations.

2. Multiply or divide to solve word problems involving multiplicative comparison.~~, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.[1]~~

***Example**: If the cost of a red hat is three times more than a blue hat that costs $5 then a red hat cost $15.*

***Clarification:** Students may use drawings and equations with a symbol for the unknown number to represent the problem.*
Distinguish between multiplicative comparison from additive comparison.

~~2.~~

3. Solve multistep whole number word problems ~~using the posed with whole numbers and having whole-number answers using the~~ four operations, including problems in which remainders must be interpreted.
   a. Represent these problems using equations with a letter standing for the unknown quantity.
   ~~3.~~ b. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

△ 4.OA.B. Gain familiarity with factors and multiples.

4. Find all factor pairs for a whole number in the range 1–100.
   a. Recognize that a whole number is a multiple of each of its factors.
   b. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number.
   ~~4.~~ c. Determine whether a given whole number in the range 1–100 is prime or composite.

○ 4.OA.C. Generate and analyze patterns.

5. Generate a number or shape pattern that follows a given rule. Identify and explain ~~apparent~~ features of the pattern that were not explicit in the rule itself.

~~For~~ E~~e~~xample: ~~, g~~Given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

~~5.~~

Number and Operations in Base Ten[2]	4.NBT

☐ 4.NBT.A. Generalize place value understanding for multi-digit whole numbers.

~~1.~~ 1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. ~~*For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*~~

~~2.~~ 2. Read and write multi-digit whole numbers using standard form, ~~base-ten numerals, number names, and~~ expanded form, and word form~~.~~ Compare two multi-digit numbers based on meanings of the digits and~~in~~ each place, recording the results of comparisons with the symbols using >, =, and <~~ symbols to record the results of comparisons~~.

Example: *the number two hundred seventy-five thousand eight hundred two written in standard form is* $275{,}802$ *and in expanded form is* $200{,}000 + 70{,}000 + 5{,}000 + 800 + 2$ *or* $(2 \times 100{,}000) + (7 \times 10{,}000) + (5 \times 1{,}000) + (8 \times 100) + (2 \times 1)$.

~~3.~~ 3. Use place value understanding or visual representation to round multi-digit whole numbers to any place.

☐ 4.NBT.B **Use place value understanding and properties of operations to perform multi-digit arithmetic.**

4. Fluently use the standard algorigthm for ~~add and subtract~~ multi-digit whole number addition and subtraction. ~~s~~ ~~using the standard algorithm.~~

Example: *What is the difference between* 634 *and* 328 *using the standard algorithm?*

$$\begin{array}{r} 6\,{}^{2}\cancel{3}\,{}^{1}4 \\ -\,3\;\;2\;\;8 \\ \hline 3\;\;0\;\;6 \end{array}$$

~~4.~~ ***Clarification****: Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers.
a. U~~, using~~se strategies based on place value and the properties of operations.
~~5.~~ b. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

~~[1]See Glossary, Table 2.~~
~~[2]Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.~~

6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors

a. , ~~U~~u~~s~~ing strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.

~~6.~~ b. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Clarification for 4.NBT.B.5 and 4.NBT.B.6: *Students should be familiar with multiple strategies but should be able to select and use the strategy with which they most closely connect and understand, with the ultimate goal of supporting students to use more efficient strategies.*

Number and Operations—Fractions[3]	4.NF

☐ **4.NF.A. Extend understanding of fraction equivalence and ordering.**

1. Explain why a fraction *a*/*b* is equivalent to a fraction ($n \times a$)/($n \times b$) by using visual fraction models, with attention to how the numbers and sizes of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions, including fractions greater than 1.~~.~~

Example*: When a horizontal line is drawn through the center of the model, the number of equal parts doubles and the size of the parts is*

2. Compare two fractions with different numerators and different denominators~~, e.g.~~, by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2.
a. Recognize that comparisons are valid only when the two fractions refer to the same whole.
~~2.~~ b. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model and/or verbal reasoning.

☐ 4.NF.B. **Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.**

3. Understand a fraction *a*/*b* with $a > 1$ as a sum of fractions 1/*b*.

   a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

   b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify the conclusions by using a v~~decompositions, e.g., by using a~~ visual fraction model or verbal reasoning.

Example~~s~~: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.

   c. Add and subtract mixed numbers with like denominators~~, e.g.,~~ by replacing ~~each~~ mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

   ~~d.~~ Solve word problems involving addition and subtraction of fractions, including mixed numbers, with the same denominator ~~referring to the same whole and having like~~

~~denominators, e.g., by~~Justify the conclusions using visual fraction models and/or verbal reasoning. ~~equations to represent the problem.~~

4. ~~A~~Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

a. Understand a fraction *a*/*b* as a multiple of 1/*b*.

~~a.~~ *E~~For e~~xample~~,~~: use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*

b. Understand a multiple of *a*/*b* as a multiple of 1/*b*, and use this understanding to multiply a fraction by a whole number.

~~b.~~ *~~For e~~Example:~~,~~ use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and/or equations to represent the problem.

~~c.~~ *~~For e~~Example:~~,~~ I~~i~~f each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

~~[3]Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.~~

☐ 4.NF.C. **Understand decimal notation for fractions, and compare decimal fractions.**

5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.~~4~~

~~5.~~ *~~For e~~Example:~~,~~ express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*

6. Use decimal notation for fractions with denominators 10 or 100.

~~6.~~ *~~For e~~Example:~~,~~ rewrite 0.62 as 62/100; describe a length as 0.62 meters; locat~~e~~ 0.62 on a number line diagram.*

7. Compare two decimals to hundredths by reasoning about their size.
a. Recognize that comparisons are valid only when the two decimals refer to the same whole.
b. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, ~~e.g., by~~ using a visual representations and/or verbal reasoning.~~model.~~

Measurement and Data	4.MD

△ **4.MD.A.** **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.**

1. Know relative sizes of measurement units within one system of units. ~~including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec.~~ a. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit.
b. Record measurement equivalents in a two- column table.

~~1.~~ *~~For e~~Example: ~~, k~~Know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

2. Use the four operations to solve word problems involving measurements. ~~distances, intervals of time, liquid volumes, masses of objects, and money,~~
a. ~~i~~Includ~~ing~~e problems involving simple fractions or decimals.
b. Include, and problems that require expressing measurements given in a larger unit in terms of a smaller unit.
c. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

***Clarification**: Measurement may include, but not limited to, length, area, volume, capacity, mass, weight, and money.*

~~2.~~

3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

~~3.~~ *~~For e~~Example: ~~, f~~Find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

Clarification: *Students should express their answers in linear (perimeter) and square (area) units. Students are not expected to use the* $1\,cm^2$ *notation.*

△ 4.MD.B. **Represent and interpret data.**

4. Make a line plot (dot plot) to show ~~display~~ a ~~data~~ set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems ~~involving~~ using addition and subtraction of fractions by using information presented in line plots (dot plots).

~~4.~~ *E~~For e~~xample:~~,~~ from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

○ 4.MD.C. **Geometric measurement: understand concepts of angle and measure angles.**

5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

   a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle.

~~a.~~ *Example: An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.*

   b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.

~~[4]Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.~~

6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

7. ~~Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts.~~ Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems,
   a. ~~e.g., by u~~Useing an equation with a symbol for the unknown angle measure.
   b. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts.
   ~~7.~~

Geometry	4.G

○ 4.G.A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

~~Mathematics |~~ Fifth Grade ~~5~~

In fifth grade~~Grade 5~~, instruction~~al time~~ should focus on the following: ~~ree critical areas:~~ (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of measurement systems and determining volumes to solve problems; and (4) solving problems using the coordinate plane.
~~volume.~~

(1) Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

(2) Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit ~~addition, subtraction,~~ multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

(3) Students convert among different-sized measurement units within a given measurement system allowing for efficient and accurate problem solving with multi-step real-world problems as they progress in their understanding of scientific concepts and calculations. Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube
is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems.

4. Students learn to interpret the components of a rectangular coordinate system as lines and understand the precision of location that these lines require. Students learn to apply their knowledge of number and length to the order and distance relationships of a coordinate grid and to coordinate this across two dimensions. Students solve mathematical and real-world problems using coordinates.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Fifth Grade ~~5~~ Overview

Operations and Algebraic Thinking

- ○ A. Write and interpret numerical expressions.
- ○ B. Analyze patterns and relationships.

Number and Operations in Base Ten

- ☐ A. Understand the place value system.
- ☐ B. Perform operations with multi-digit whole numbers and with decimals to hundredths.

Number and Operations—Fractions

- ☐ A. Use equivalent fractions as a strategy to add and subtract fractions.
- ☐ B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Measurement and Data

- △ A. Convert like measurement units within a given measurement system.
- △ B Represent and interpret data.
- ☐ C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Geometry

- ○ A. Graph points on the coordinate plane to solve real-world and mathematical problems.
- ○ B. Classify two-dimensional figures into categories based on their properties.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For fifth grade this standard is:

5.NBT.B.5 Demonstrate fluency for multiplication of multi-digit whole numbers using the standard algorithm. Include two-digit × four-digit numbers and, three-digit × three-digit numbers.

Fifth Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
Students solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. For example, Sonia had $2\frac{1}{3}$ candy bars. She promised her brother that she would give him $\frac{1}{2}$ of a candy bar. How much will she have left after she gives her brother the amount she promised? They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?".

MP.2 Reason abstractly and quantitatively.
Fifth graders should recognize that a number represents a specific quantity. They connect quantities to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions that record calculations with numbers and represent or round numbers using place value concepts. For example, students use abstract and quantitative thinking to recognize that $0.5 \times (300 \div 15)$ is $\frac{1}{2}$ of $(300 \div 15)$ without calculating the quotient.

MP.3 Construct viable arguments and critique the reasoning of others.
In fifth grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking. Students use various strategies to solve problems and they defend and justify their work with others. For example, two afterschool clubs are having pizza parties. The teacher will order 3 pizzas for every 5 students in the math club; and 5 pizzas for every 8 students in the student council. If a student is in both groups, decide which party they

should attend. How much pizza will each student get at each party? If a student wants to have the most pizza, which party should they attend?

MP.4 Model with mathematics.
Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fifth graders should evaluate their results in the context of the situation and whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems.

MP.5 Use appropriate tools strategically.
Fifth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems or make predictions from real-world data.

MP.6 Attend to precision.
Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units.

MP.7 Look for and make use of structure.
In fifth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation.

MP.8 Look for and express regularity in repeated reasoning.
Fifth graders use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations.

Operations and Algebraic Thinking	5.OA

○ 5.OA.A. Write and interpret numerical expressions.

1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

Example: *$4.5 + (3 \times 2)$ in word form is, four and five tenths plus the quantity 3 times 2.*

~~1.~~

2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

~~2.~~ ~~For e~~Example: ~~,~~ Eexpress the calculation “add 8 and 7, then multiply by 2” as $2 \times (8 + 7)$.

Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product.

○ 5.OA.B Analyze patterns and relationships.

3. Generate two numerical patterns using two given rules.
4. a. Identify apparent relationships between corresponding terms.
5. b. Form ordered pairs consisting of corresponding terms from the two patterns
6. c. G~~, and g~~raph the ordered pairs on a coordinate plane.

~~3.~~7. *~~For e~~Example: ~~,~~ given the rule “Add 3” and the starting number 0, and given the rule “Add 6” and the starting number 0, generate terms in the resulting sequences~~,~~ and O~~o~~bserve that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*

Number and Operations in Base Ten	5.NBT

□ 5.NBT.A. Understand the place value system.

1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

Example: *In the number 55.55, each digit is 5, but the value of the digits is different because of the placement.*

~~1.~~

2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

Example: 10^2 *which is* $10 \times 10 = 100$, *and* 10^3 *which is* $10 \times 10 \times 10 = 1{,}000$

~~2.~~

3. Read, write, and compare decimals to thousandths.

   a. Read and write decimals to thousandths using standard form, ~~base-ten numerals, number names, and~~ expanded form, and word form.

~~a.~~ *Example: ~~e.g.,~~ 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000).*

b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

4. Use place value understanding to round decimals to any place.

☐ 5.NBT.B. **Perform operations with multi-digit whole numbers and with decimals to hundredths.**

5. Demonstrate fluency for multiplication of ~~Fluently multiply~~ multi-digit whole numbers using the standard algorithm. Include two-digit × four-digit numbers and, three-digit × three-digit numbers.

Example: *What is the product of* 304 *and* 23 *using the standard algorithm?*

$$\begin{array}{r} 3\,{}^{1}0\,4 \\ \times\quad 2\,3 \\ \hline 9\,1\,2 \\ +6\,0\,8\,0 \\ \hline 6\,9\,9\,2 \end{array}$$

Clarification*: Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

~~5.~~

6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.
a. ~~, using~~Use strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.
~~6.~~ b. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

7. Add, subtract, multiply, and divide decimals to hundredths.
a. Use~~, using~~ concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.~~;~~
~~7.~~ b. ~~r~~Relate the strategy to a written method and explain the reasoning used.

Clarification for 5.NBT.B.6 and 5.NBT.B.7: *Students should be familiar with multiple strategies but should be able to select and use the strategy with which they most closely connect and understand, with the ultimate goal of supporting students to use more efficient strategies.*

Number and Operations—Fractions 5.NF

☐ 5.NF.A. Use equivalent fractions as a strategy to add and subtract fractions.

1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in ~~such a way as~~ to produce an equivalent sum or difference of fractions with like denominators.

~~1.~~ *E~~For e~~xample: ~~,~~ 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

2. Solve word problems involving addition and subtraction of fractions referring to the same whole (the whole can be a set of objects), including cases of unlike denominators,
3.
4. ~~e.g.,~~ a. Justify the conclusions by using visual fraction models and/or equations to represent the problem.
~~2.~~5. b. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

E~~For e~~xample: ~~,~~ R~~r~~ecognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.

☐ 5.NF.B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

3. Interpret a fraction as division of the numerator by the denominator (*a*/*b* = *a* ÷ *b*). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers~~, e.g.,~~ by using visual fraction models and/~~-~~or equations to represent the problem.

~~3.~~ *E~~For e~~xample: ~~, i~~Interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

   a. Interpret the product (*a*/*b*) × *q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a* × *q* ÷ *b*.

   ~~a.~~ *E~~For e~~xample: ~~,~~ U~~u~~se a visual ~~fraction~~ model and/or area model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*

   b. Find the area of a rectangle with fractional side lengths.

   i. ~~by t~~Til~~e~~ing it with unit squares of the appropriate unit fraction side lengths

   ~~, and s~~ii. Show that the area is the same as would be found by multiplying the side lengths.

   ~~b.~~ iii. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5. Interpret multiplication as scaling (resizing), by:

   a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n\times a)/(n\times b)$ to the effect of multiplying a/b by 1.

~~6.~~ 6. Solve real world problems involving multiplication of fractions and mixed numbers~~, e.g.,~~ by using visual fraction models and/or equations to represent the problem~~.~~

Example: *Evan bought 6 roses for his mother, $\frac{2}{3}$ of them were red. How many red roses were there?*

7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.[1]

a. Interpret division of a unit fraction by a non-zero whole number,

~~[1]Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.~~

and compute such quotients using a visual fraction model. Use the relationship between multiplication and division to explain that $\frac{1}{b} \div c = \frac{1}{bc}$ because $\frac{1}{bc} \times c = \frac{1}{b}$.

E~~For ex~~ample:~~,~~ ~~c~~Create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. ~~*Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.*~~

b. Represent ~~Interpret~~ division of a whole number by a unit fraction, and compute such quotients using. ~~*For example, create a story context for 4 ÷ (1/5), and use*~~ a visual fraction model ~~*to show the quotient*~~. *Use the relationship between multiplication and division to explain that* $a \times \frac{1}{b} = ab$ because $ab \times \frac{1}{b} = a$. ~~*4 ÷ (1/5) = 20 because 20 × (1/5) = 4.*~~

Example: *Create a story context to explain $4 \div \frac{1}{5}$, and use a visual fraction model to show the quotient.*

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions~~, e.g.,~~ by using visual fraction models and/or equations to represent the problem.

~~b.~~ *E~~For e~~xample:~~,~~ H~~h~~ow much chocolate will each person get if three~~3~~ people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*

Measurement and Data	5.MD

△ **5.MD.A. Convert like measurement units within a given measurement system.**

1. Convert among different-sized standard measurement units within a given measurement system. ~~(e.g., convert 5 cm to 0.05 m), and use~~ Use ~~these~~ conversions in solving multi-step, real world problems.

~~1.~~ ***Example:*** *Convert 5 cm to 0.05 m.*

△ 5.MD.B. **Represent and interpret data.**

2. Collect, represent, and interpret numerical data, including whole numbers, fractional and decimal values.
   a. Interpret numerical data, with whole-number values, represented with tables or line plots.
   b. Use graphic displays of data (line plots (dot plots), tables, etc.) to solve real world problems using fractional data.

2. ~~Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.~~ ~~*For e*~~

~~2.~~ *Example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

☐ 5.MD.C. **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**

3. Recognize volume as an attribute of solid figures and understand ~~concepts of~~ volume measurement in terms of cubic units.
   a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.
   b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.
4. Use concrete and/or visual models to Measure volume of rectangular prisms in cubic units~~s~~ by counting ~~unit cubes, using~~ cubic cm, cubic in, cubic ft, and ~~improvise~~nonstandard~~d~~ units.
5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
   a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base.

Example: To ~~R~~represent ~~threefold whole-number products as volumes, e.g., to represent~~ the associative property of multiplication ~~.~~, $(l \times w) \times h = l \times (w \times h)$.

~~a.~~

   b. Apply the formulas $V = l \times w \times h$ and $V = B\cancel{b} \times h$ (where B stands for the area of the base) for rectangular prisms to find volumes of right rectangular prisms with whole- number edge lengths in the context of solving real world and mathematical problems.
   c. Recognize volume as additive.
   ~~c.~~d. i. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

      ii. Apply this technique to solve real world problems.

Geometry 5.G

○ 5.G.A. Graph points on the coordinate plane to solve real-world and mathematical problems.

1. Describe and understand the key attributes of the coordinate plane.

a. Use a pair of perpendicular number lines~~, called~~ (axes), ~~to define a coordinate system,~~ with the intersection of the lines (the origin (0,0)) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates.

~~1.~~ b. Understand that the x-coordinate, the first number in an ordered pair, indicates movement parallel to the x-axis starting at the origin; and the y-coordinate, the second number, indicates movement parallel to the y-axis starting at the origin. ~~how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).~~

2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, (x and y both have positive values) and interpret coordinate values of points in the context of the situation.

○ 5.G.B. Classify two-dimensional figures into categories based on their properties.

3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

~~3.~~ *~~For e~~Example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*

~~4.~~ Classify two-dimensional figures in a hierarchy based on properties.

Example: *All rectangles are parallelograms because they are all quadrilaterals with two pairs of opposite sides parallel.*

~~Mathematics |~~ Sixth Grade ~~6~~

In sixth grade, instruction should ~~Grade 6, instructional time should~~ focus on the following ~~four critical~~ areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers;
(3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking~~.~~ (5) reasoning about geometric shapes and their measurements.

(1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. . As students solve a wide variety of problems involving ratios and rates, they create a foundation for proportional reasoning and future work in Algebra and Geometry.
~~Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.~~

~~(2)~~ 2. Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems as well as demonstrating fluency in operations with whole numbers and the ordering of whole numbers to the full system of rational numbers, which . ~~Students extend their previous understandings of number and the ordering of numbers~~
(2) ~~to the full system of rational numbers, which~~ includes negative rational numbers, and in particular, negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

(3) Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students build on their understanding of an unknown quantity from previous grades to know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of
an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between

quantities.

(4) Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range) ~~or mean absolute deviation~~) can also be useful for summarizing data because two very different sets of data can have the same mean and

median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

5) Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. ~~They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.~~

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Sixth Grade ~~6~~ Overview

Ratios and Proportional Relationships

- ☐ A. Understand ratio concepts and use ratio reasoning to solve problems.

The Number System

- ☐ A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- ○ B. Compute fluently with multi-digit numbers and find common factors and multiples.
- ☐ C. Apply and extend previous understandings of numbers to the system of rational numbers.

Expressions and Equations

- ☐ A. Apply and extend previous understandings of arithmetic to algebraic expressions.
- ☐ B. Reason about and solve one-variable equations and inequalities.
- ☐ C Represent and analyze quantitative relationships between dependent and independent variables.

Geometry

- △ A. Solve real-world and mathematical problems involving area, surface area, and volume.

Statistics and Probability

- ○ A. Develop understanding of statistical variability.
- ○ B Summarize and describe distributions.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For sixth grade these standards are:

- 6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.
- 6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Sixth Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In grade 6, students solve problems involving ratios and rates and discuss how they solved them. Students solve real-world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?". Students can explain the relationships between equations, verbal descriptions, and tables and graphs. Mathematically proficient students check their answers to problems using a different method.

MP.2 Reason abstractly and quantitatively.
In grade 6, students represent a wide variety of real-world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations or other meaningful moves. To reinforce students' reasoning and understanding, teachers might ask, "How do you know?" or "What is the relationship of the quantities?".

MP.3 Construct viable arguments and critique the reasoning of others.
In grade 6, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" and "Does that always work?". They explain their thinking to others and respond to others' thinking.

MP.4 Model with mathematics.
In grade 6, students model problem situations symbolically, graphically, in tables, contextually and visually. Students form expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. Students begin to

represent two quantities simultaneously. Students use number lines to compare numbers and represent inequalities. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences about and make comparisons between data sets. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate and apply them to a problem context. Students should be encouraged to answer questions such as "What are some ways to represent the quantities?" or "What formula might apply in this situation?"

MP.5 Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 6 may decide to represent figures on the coordinate plane to calculate area. Number lines are used to create dot plots, histograms, and box plots to visually compare the center and variability of the data. Visual fraction models can be used to represent situations involving division of fractions. Additionally, students might use physical objects or applets to construct nets and calculate the surface area of three-dimensional figures. Students should be encouraged to answer questions such as "What approach did you try first?" or "Why was it helpful to use?"

MP.6 Attend to precision.
In grade 6, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations, or inequalities. When using ratio reasoning in solving problems, students are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. Students also learn to express numerical answers with an appropriate degree of precision when working with rational numbers in a situational problem. Teachers might ask, "What mathematical language, definitions, or properties can you use to explain ___?"

MP.7 Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables recognizing both the additive and multiplicative properties. Students apply properties to generate equivalent expressions (i.e. $6 + 2n = 2(3 + n)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality; $c = 6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real-world problems

involving area and volume. Teachers might ask, "What do you notice when ___?" or "What parts of the problem might you eliminate, simplify, or ___?"

MP.8 Look for and express regularity in repeated reasoning.

In grade 6, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $\frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc}$ and construct other examples and models that confirm their generalization. Students connect place value and their prior work with operations to understand algorithms to fluently divide multi-digit numbers and perform all operations with multi-digit decimals. Students informally begin to make connections between rates and representations showing the relationships between quantities. Students should be encouraged to answer questions such as, "How would we prove that ___?" or "How is this situation like and different from other situations?"

Ratios and Proportional Relationships	6.RP

6.RP.A. Understand ratio concepts and use ratio reasoning to solve problems.

1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

~~1.~~ *E~~For e~~xample: 1) ~~, "~~The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak. ~~every 2 wings there was 1 beak."~~ 2) ~~"~~For every vote candidate A received, candidate C received nearly three votes.~~"~~*

2. Understand the concept of a unit rate *a*/*b* associated with a ratio *a*:*b* with $b \neq 0$, and use rate language in the context of a ratio relationship. *E~~For e~~xample:~~,~~ "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."~~1~~*

3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
   a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
   b. Solve unit rate problems including those involving unit pricing and constant speed.

~~b.~~ *E~~For e~~xample:~~, I~~ if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

   c. Find a percent of a quantity as a rate per 100 ~~(e.g., 30% of a quantity means 30/100 times the quantity);~~ solve problems involving finding the whole, given a part and the percent.

~~c.~~ *Example: 30% of a quantity means 30/100 times the quantity;*

   d. Use ratio reasoning to convert measurement units within and between measurement systems; ~~;~~ manipulate and transform units appropriately when multiplying or dividing quantities.

Examples:

1) Malik is making a recipe, but he cannot find his measuring cups! He has, however, found a tablespoon. His cookbook says that 1 cup = 16 tablespoons. Explain how he could use the tablespoon to measure out the following ingredients: two cups of flour, $\frac{1}{2}$ cup sunflower seed, and $1\frac{1}{4}$ cup of oatmeal.

~~d.~~ *2) Jessica is building a doghouse out of wooden planks. If the instructions say the house is 30 inches long, how long would the doghouse be using metric measurements (1 in = 2.54 cm)?*

The Number System	6.NS

☐ 6.NS.A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

E~~For e~~xamples

1) ~~, c~~Create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient.

2) ~~; u~~Use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.)

3) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally?

4) How many 3/4-cup servings are in 2/3 of a cup of yogurt?

~~1.~~ *5) How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*

○ 6.NS.B Compute fluently with multi-digit numbers and find common factors and multiples.

2. Fluently divide multi-digit numbers using the standard algorithm.

Example: *What is the quotient of 657 and 3 using the standard algorithm?*

$$\begin{array}{r} 219 \\ 3\overline{)657} \\ \underline{-6} \\ 05 \\ \underline{-3} \\ 27 \\ \underline{-27} \\ 0 \end{array}$$

~~2.~~

3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Example: *What is the difference of 1.82 and 0.06 using the standard algorithm?*

$$\begin{array}{r} 1.\,{}^{7}\cancel{8}\,{}^{1}2 \\ \underline{-0.\;0\;\;6} \\ 1.\;7\;\;6 \end{array}$$

~~3.~~

4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

~~4.~~ *~~For e~~Example, express 36 + 8 as 4 (9 + 2).*

~~[1]Expectations for unit rates in this grade are limited to non-complex fractions.~~

☐ 6.NS.C. Apply and extend previous understandings of numbers to the system of rational numbers.

5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or valuesX ~~(e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge);~~ ~~u~~Use positive and negative numbers (including fractions and decimals) to represent quantities in real-world contexts, explaining the meaning of zero~~0~~ in each situation.

~~5.~~ ***Examples**: Temperature above/below zero, elevation above/below sea level, credits/debits, and positive/negative electric charge*

6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

   a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.

   b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

   c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

7. Understand ordering and absolute value of rational numbers.

   a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.

~~a.~~ *E~~For e~~xample:~~; i~~Interpret –3 > –7½ as a statement that –3 is located to the right of –7 ½ on a number line oriented from left to right.*

   b. Write, interpret, and explain statements of order for rational numbers in real-world contexts.

~~b.~~ *~~For e~~Example: ~~, w~~Write –3 ◦C > –7 ◦C to express the fact that –3 ◦C is warmer than –7 ◦C.*

   c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.

~~c.~~ *E~~For e~~xample:~~; F~~for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.*

   d. Distinguish comparisons of absolute value from statements about order.

~~d.~~ *E~~For e~~xample: ~~, R~~recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.*

8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first

coordinate or the same second coordinate.

~~8.~~ ***Example**: Samuel draws a coordinate plane on a map of his neighborhood. He found that the distance between two consecutive whole number points is one block. His house is located at* $(-4, 6)$*, and his school is located at* $(-4, -3)$*. How many blocks are between Samuel's house and school?*

Expressions and Equations	6.EE

☐ 6.EE.A Apply and extend previous understandings of arithmetic to algebraic expressions.

1. Write and evaluate numerical expressions involving whole-number exponents.
2. Write, read, and evaluate expressions in which letters stand for numbers.
   a. Write expressions that record operations with numbers and with letters standing for numbers.

      ~~a.~~ *~~For e~~Example, express the calculation "Subtract y from 5" as 5 – y.*

b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

~~b.~~ *E~~For e~~xample: ~~,~~ D~~d~~escribe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*

c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

E~~For e~~xamples:

1) , U~~u~~se the formulas $V = s^3$ and $A = 6\, s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.

2) The formula for finding the perimeter of a rectangle is $P = 2l + 2w$. Find the perimeter of a rug that measures 7.5 ft by 9.5 ft.

~~c.~~

3. Apply the properties of operations to generate equivalent expressions.

E~~For e~~xamples:

~~,~~1) ~~-~~A~~a~~pply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x;

2) A~~a~~pply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y);

~~6 (4x + 3y);~~ 3) ~~a~~Apply properties of operations to y + y + y to produce the equivalent expression 3y.

4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

~~4.~~ *~~For e~~Example: ~~, t~~The expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*

☐ 6.EE.B **Reason about and solve one-variable equations and inequalities.**

5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

8. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem.
a. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions;
~~8.~~ b. ~~r~~Represent solutions of such inequalities on number line diagrams.

☐ 6.EE.B Represent and analyze quantitative relationships between dependent and independent variables.

9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write ~~an~~ equations to represent ~~express~~ the relationship between the two quantities. ~~one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable.~~ Analyze the relationship ~~between the dependent and independent variables~~ using graphs and tables, and relate these to the equations. Include an understanding of independent and dependent variables.

~~*For example*~~

~~*, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*~~

Examples:

1) In a problem involving mixing water (W) and orange concentrate (C) to make a consistent flavor of orange juice, list and graph ordered pairs of cups of water and orange concentrate, and write the equations (e.g., $C = \frac{1}{2} \cdot W$ or $W = 2 \cdot C$) to represent the relationship between water (W) and orange concentrate (C).

2) When examining the relationship between time and the growth of a plant. Time tends to be thought of as the independent variable and the height of the plant tends to be thought of as the dependent variable.

Geometry 6.G

△ 6.G.A. Solve real-world and mathematical problems involving area, surface area, and volume.

1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas *V = l w h* and *V = b h* to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side and area by joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Example: *Explain how you could find the surface area of a rectangular prism given a three-dimensional representation (Fig. A) or a net (Fig. B).*

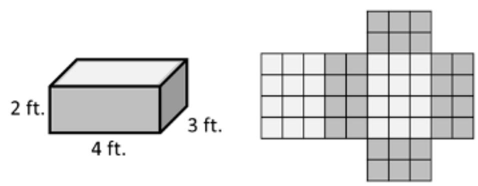


Fig. A Fig. B

~~4.~~

Statistics and Probability	6.SP

○ 6.SP.A. Develop understanding of statistical variability.

1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.

~~1.~~ *~~For e~~Example~~;~~ "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*

2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center (median and/or mean)~~,~~, spread, (range, interquartile range, and/or mean absolute deviation), and overall shape. The focus of mean absolute deviation (MAD) is visualizing deviations from the mean as a measure of variability as opposed to a focus on calculating MAD.

~~2.~~

~~3.~~2. 3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

○ 6.SP.B. Summarize and describe distributions.

~~4.~~ 4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

~~5.~~3. Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.

b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

c. Giving quantitative measures of center (median and/or mean) and variability (range, interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

~~d.~~ Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

d.

Examples: *Bobbie is a sixth grader who competes in the* 100 *meter hurdles. In eight track meets during the season, she recorded the following times (to the nearest one hundredth of a second).*

18.11, 31.23, 17.99, 18.25, 17.50, 35.55, 17.44, 17.85

Is the mean or the median a better representation of Bobbie's hurdle time? Justify your answer. (From Illustrative Mathematics)

~~Mathematics |~~ Seventh Grade ~~7~~

In seventh ~~G~~grade ~~7~~, instruction~~al time~~ should focus on the following areas ~~four critical~~ areas: (1) developing understanding of and applying proportional relationships;
(2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

(1) Students extend their understanding of ratios and rates and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios, rates and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line (constant of proportionality). ~~, called the slope.~~ They distinguish proportional relationships from other relationships.

(2) Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions, ~~and~~ equations, and inequalities in one variable. Students also solve real-world and multistep ~~and use these~~ equations and inequalities ~~to solve problems.~~.

(3) Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

(4) Students build on their previous work with single data distributions to compare two data distributions and address questions about differences

between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences. In grade 7, the concept of probability is introduced, and it is explored in later grades.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Seventh Grade ~~7~~ Overview

Ratios and Proportional Relationships

- □ A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System

- □ A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations

- □ A. Use properties of operations to generate equivalent expressions.
- □ B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry

- ○ A. Draw, construct and describe geometrical figures and describe the relationships between them.
- ○ B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability

- △ A. Use random sampling to draw inferences about a population.
- ○ B. Draw informal comparative inferences about two populations.

△ C Investigate chance processes and develop, use, and evaluate probability models.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For seventh grade this standard is:

- 7.NS.A.3 Solve real-world and mathematical problems involving the four operations with integers and other rational numbers.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Seventh Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In seventh grade, students solve problems involving ratios and rates and discuss how they solved them. Students solve real-world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?". When students compare arithmetic and algebraic solutions to the same problem, they identify correspondences between different approaches.

MP.2 Reason abstractly and quantitatively.
In seventh grade, students represent a wide variety of real-world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

MP.3 Construct viable arguments and critique the reasoning of others.
In seventh grade, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. For example, as students notice when geometric conditions determine a unique triangle, more than one triangle, or no triangle, they have an opportunity to construct viable arguments and critique the reasoning of others. Students should be encouraged to answer questions such as these: "How did you get that?", "Why is that true?" and "Does that always work?". They explain their thinking to others and respond to others' thinking.

MP.4 Model with mathematics.
In seventh grade, students model problem situations visually, symbolically, graphically, in tables, and contextually. Students form expressions, equations, or inequalities from real-

world contexts and connect symbolic and graphical representations. Students use experiments or simulations to generate data sets and create probability models. Proportional relationships present opportunities for modeling. For example, for modeling purposes, the number of people who live in an apartment building might be taken as proportional to the number of stories in the building. Students should be encouraged to answer questions such as "What are some ways to represent the quantities?" or "How might it help to create a table, chart, or graph?"

MP.5 Use appropriate tools strategically.

Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in seventh grade may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data. Students might use physical objects or applets to generate probability data and use graphing calculators or spreadsheets to manage and represent data in different forms. Teachers might ask, "What approach are you considering?" or "Why was it helpful to use ___?"

MP.6 Attend to precision.

In seventh grade, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students define variables, specify units of measure, and label axes accurately. Students use appropriate terminology when referring to rates, ratios, probability models, geometric figures, data displays, and components of expressions, equations, or inequalities. Teachers might ask, "What mathematical language, definitions, or properties can you use to explain ___?

MP.7 Look for and make use of structure.

Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables making connections between the constant of proportionality in a table with the slope of a graph. Students apply properties to generate equivalent expressions (i.e. $6 + 2n = 2(3 + n)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality; $c = 6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real world problems involving scale drawings, surface area, and volume. Students examine tree diagrams or systematic lists to determine the sample space for compound events and verify that they have listed all possibilities. Solving an equation such as $8 = 4\left(n - \frac{1}{2}\right)$ is easier if students can see and make use of structure, temporarily viewing $\left(n - \frac{1}{2}\right)$ as a single entity.

MP.8 Look for and express regularity in repeated reasoning.

In seventh grade, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $\frac{a}{b} = \frac{c}{d}$ if and only if $ad = bc$ and construct other examples and models that confirm their generalization. Students should be encouraged to answer questions such as "How would we prove that ?" or "How is this situation both similar to and different from other situations using these operations?"

Ratios and Proportional Relationships 7.RP

☐ 7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

~~1.~~ *~~For~~ ~~e~~Example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.*

2. Recognize and represent proportional relationships between quantities.

   a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

   b. Identify the constant of proportionality ~~(unit rate)~~ in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. Recognize the constant of proportionality as both the unit rate and as the multiplicative comparison between two quantities.

c. Represent proportional relationships by equations.

~~c.~~ *~~For e~~Example:~~,~~ ~~I~~if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.*

d. Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where *r* is the unit rate.

3. Use proportional relationships to solve multistep ratio, rate and percent problems.

~~3.~~ *Example~~s~~: simple interest, tax, price increases and discounts ~~markups and markdowns~~, gratuities and commissions, fees, percent increase and decrease, percent error.*

The Number System 7.NS

☐ 7.NS.A Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

   a. Describe situations in which opposite quantities combine to make 0.

   ~~a. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*~~

***Example**: If you open a new bank account with a deposit of* $\$30.52$ *and then withdraw* $\$30.52$*, you are left with a* $\$0$ *balance.*

b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite are additive inverses because they have a sum have a sum of 0 (e.g., $12.5 + (-12.5) = 0$). ~~(are additive inverses).~~ Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

d. Apply properties of operations as strategies to add and subtract rational numbers.[4]

Example: $\frac{1}{4} - 5 + \frac{3}{4} + 7 = \left(\frac{1}{4} + \frac{3}{4}\right) + \left((-5) + 5\right) + 2$

~~d.~~

2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide integers and other rational numbers.

   a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $\left(-\frac{1}{2}\right)(-1) = \frac{1}{2}$ ~~(–1)(–1) = 1~~ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

[4] ~~See Glossary, Table 3~~

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

Example: $-4(0.25-1) = ((-4)\times 0.25) + ((-4)\times(-1)) = -1+4 = 3$

~~c.~~

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates ~~in 0s~~ or eventually repeats.

~~3.~~ Solve real-world and mathematical problems involving the four operations with integers and other rational numbers.[1]

Example: *A water well drilling rig has dug to a height of* -60 *feet after one full day of continuous use. If the rig has been running constantly and is currently at a height of* -143.6 *feet, for how long has the rig been running? (Modified from Illustrative Mathematics)*

Expressions and Equations	7.EE

☐ **7.EE.A. Use properties of operations to generate equivalent expressions.**

1. Apply properties of operations ~~as strategies~~ to add, subtract, factor, and expand linear expressions with rational coefficients.

Example: $4x+2 = 2(2x+1)$ *and* $-3\left(x-\frac{5}{3}\right) = -3x+5$

~~1.~~

2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

~~For e~~Examples:

1) ~~,~~ a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."

2) A shirt at a clothing store is on sale for 20% *off the regular price,* p*. The discount can be expressed as* $0.2p$*. The new price for the shirt can be expressed as* $p-0.2p$ *or* $0.8p$*.*

☐ **7.EE.B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.**

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (integers~~whole numbers~~, fractions, and decimals).~~, using tools strategically.~~ Apply

properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

E~~For e~~xamples:

1) If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50.

~~3.~~ *2) If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

   a. Solve word problems leading to equations of the form *px* + *q* = *r* and *p*(*x* + *q*) = *r*, where *p*, *q*, and *r* are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

~~a.~~ *~~For e~~Example: , T~~t~~he perimeter of a rectangle is 54 cm. Its wid~~leng~~th is 6 cm. What is its leng~~wid~~th?*

   b. Solve word problems leading to inequalities of the form *px* + *q* > *r* or *px* + *q* < *r*, where *p*, *q*, and *r* are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

~~For~~ Eexample: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.

~~b.~~

~~$100. Write an inequality for the number of sales you need to make, and describe the solutions.~~

Geometry	7.G

7.G.A. Draw, construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

~~1.~~ ***Example**: Mariko has an $\frac{1}{4}$ inch scale-drawing ($\frac{1}{4}$ inch=1 foot) of the floor plan of her house. On the floor plan, the scaled dimensions of her rectangular living room are $4\frac{1}{2}$ inches by $8\frac{3}{4}$ inches. What is the area of her living room in square feet?*

~~[1]Computations with rational numbers extend the rules for manipulating fractions to complex fractions.~~

2. Draw (freehand, with ruler and protractor, and with technology) two-dimensional geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangles, more than one triangle, or no triangle.

~~2.~~ ***Example**: A triangle with side lengths 3 cm, 4 cm, and 5 cm exists. Use a compass and ruler to draw a triangle with these side lengths. (Modified from Engage NY M6L9)*

3. Describe the two-dimensional figures that results from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

○ 7.G.B. **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.**

~~4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.~~

4. Understand the attributes and measurements of circles.
   a. Know that a circle is a two-dimensional shape created by connecting all of the points equidistant from a fixed point called the center of the circle.
   b. Develop an understanding of circle attributes including radius, diameter, circumference, and area and investigate the relationships between each.
   c. Informally derive and know the formulas for the area and circumference of a circle and use them to solve problems.

5. Use facts about supplementary, complementary, vertical, and adjacent angles ~~in a multi-step problem~~ to write equations and use them to and solve ~~simple equations~~ for an unknown angle in a figure.

***Example**: The ratio of the measurement of an angle to its complement is $1:2$. Create and solve an equation to find the measurement of the angle and its complement. (Modified from Engage NY M5L1)*

~~5.~~

5. ~~Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms~~. Generalize strategies for finding area, volume, and surface areas of two- and three-dimensional objects composed of triangles, quadrilateral, polygons, cubes, and right prims. Solve real-world and mathematical problems in each of these areas.

***Example**: A playground is being updated. Sand underneath a swing needs be at least 15 inches deep. The sand under the swings is currently only 12 inches deep. The rectangular area under the swing set measures 9 feet by 12 feet. How much additional sand will be needed to meet the requirement? (Modified from Illustrative Mathematics)*

~~6.~~

Statistics and Probability	7.SP

△ 7.SP.A. Use random sampling to draw inferences about a population.

1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

2. Use data from a random sample about an unknown characteristic of a population~~to draw inferences about a population with an unknown characteristic of interest.~~ Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions., i.e., generate a sampling distribution.

~~2.~~ *E~~For e~~xample: ~~, e~~Estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*

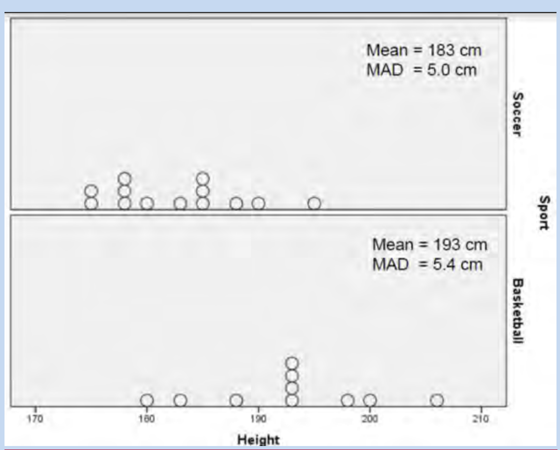
○ 7.SP.B. Draw informal comparative inferences about two populations.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

~~3. For e~~*Example: ,* ~~*the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on*~~

~~*4. a dot plot, the separation between the two distributions of heights is noticeable.*~~

Example*: The difference in the mean height between players on the basketball team versus the soccer team is 10 cm. This difference in the means - 10 cm - is about twice the variability (mean absolute deviation) on either team (i.e., mean divided by the MAD). On a dot plot, the separation between the two distributions of heights is noticeable.*



4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

~~5.~~ *~~For e~~Example: , decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

△ 7.SP.C. **Investigate chance processes and develop, use, and evaluate probability models.**

~~6.~~ Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. ~~Larger numbers indicate greater likelihood.~~ A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Example*: The likelihood of drawing a heart from a deck of cards is* 0.25*. The likelihood of flipping a coin and landing on heads is* 0.5*. It is more likely that a flipped coin will land on heads than it is to choose a heart from a deck of cards. (*0.5 *is greater than* 0.25*).*

6. Approximate the (theoretical) probability of a chance event by collecting data ~~on the chance process that produces it~~ and observing its long-run relative frequency (experiemental probability), ~~and P~~predict the approximate relative frequency given the probability.

E~~For e~~xamples:

1) 1) When drawing chips out of a bag containing an unknown number of red and white chips, estimate the probability of selecting a particular chip color given 50 draws.

~~7.~~ *2) , W~~w~~hen rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*

~~8.~~7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.

~~a.~~ *~~For e~~Example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*

b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.

~~b.~~ *E~~For e~~xample: ~~, f~~Find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

~~9.~~ 8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

c. Design and use a simulation to generate frequencies for compound events.

~~c.~~ *~~For e~~Example: ~~, u~~Use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

~~Mathematics |~~ Eighth Grade ~~8~~

In eighth g~~G~~rade ~~8~~, instruction~~al~~ ~~time~~ should focus on the following ~~three critical~~ areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem and (4) defining the properties of integer exponents and irrational numbers.~~.~~

(1) Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount $m \cdot A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.

2) Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

~~(2)~~ 3) Students are introduced to ~~grasp~~ the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. Students can define, evaluate, and compare functions in multiple forms (pictures, tables, graphs, equations, etc.). ~~They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.~~

~~(3)~~ 4) Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

5) Students use their understanding of multiplication and apply properties to develop an understanding of radicals and integer exponents. Students use and perform operations with numbers expressed in scientific notation. They use their knowledge of rational numbers to develop an understanding of irrational numbers.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Eighth Grade ~~8~~ Overview

The Number System

- △ A. Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

- ☐ A. Work with radicals and integer exponents.
- ☐ B. Understand the connections between proportional relationships, lines, and linear equations.
- ☐ C. Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

- ☐ A. Define, evaluate, and compare functions.
- ☐ B. Use functions to model relationships between quantities.

Geometry

- ☐ A. Understand congruence and similarity using physical models, transparencies, or geometry software.
- ☐ B. Understand and apply the Pythagorean theorem.
- ○ C. Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Statistics and Probability

- △ A. Investigate patterns of association in bivariate data.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Eighth Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In eighth grade, students solve real-world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”

MP.2 Reason abstractly and quantitatively.
In eighth grade, students represent a wide variety of real-world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number(s) or variable(s) as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

MP.3 Construct viable arguments and critique the reasoning of others.
In eighth grade, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?”, “Why is that true?” and “Does that always work?”. They explain their thinking to others and respond to others’ thinking.

MP.4 Model with mathematics.
In eighth grade, students model problem situations symbolically, graphically, in tables, and contextually. Working with the new concept of a function, students learn that relationships between variable quantities in the real-world often satisfy a dependent relationship, in that one quantity determines the value of another. Students form expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. Students use scatterplots to represent data and describe

associations between variables. Students need many opportunities to explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context. Students should be encouraged to answer questions such as "What are some ways to represent the quantities?" or "How might it help to create a table, chart, graph, or ___?"

MP.5 Use appropriate tools strategically.

Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationship between the angles created by a transversal that intersects parallel lines. Teachers might ask, "What approach are you considering?" or "Why was it helpful to use ___?"

MP.6 Attend to precision.

In eighth grade, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays. Teachers might ask, "What mathematical language, definitions, or properties can you use to explain ___?"

MP.7 Look for and make use of structure.

Students routinely seek patterns or structures to model and solve problems. In eighth grade, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

MP.8 Look for and express regularity in repeated reasoning.

In grade eight, students use repeated reasoning to understand the slope formula and to make sense of rational and irrational numbers. Through multiple opportunities to model linear relationships, they notice that the slope of the graph of the linear relationship and the rate of change of the associated function are the same. For example, as students repeatedly check whether points are on the line with a slope of 3 that goes through the point $(1, 2)$, they might abstract the equation of the line in the form $\frac{y-2}{x-1} = 3$. Students should be encouraged to answer questions such as "How would we prove that ___?" or "How is this situation like and different from other situations using these operations?"

The Number System	8.NS

△ 8.NS.A. Know that there are numbers that are not rational, and approximate them by rational numbers.

1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions ~~(e.g., π²).~~

E~~For e~~xamples:,

1) Estimate the value of √2.

~~2.~~ *2) B ~~b~~y truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

Expressions and Equations	8.EE

☐ 8.EE.A. Work with radicals and integer exponents.

1. Know and apply the properties of integer exponents to generate equivalent numerical expressions.

~~1.~~ *E~~For e~~xample:~~,~~ $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.*

2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.
3. Use numbers expressed in the form of a single digit multiplied by ~~times~~ an integer power of 10 (scientific notation) to estimate very large or very small quantities, and ~~to~~ express how many times as much one is than the other.

~~3.~~ *E~~For e~~xample:~~,~~ E~~e~~stimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.*

4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities ~~(e.g., use millimeters per year for seafloor spreading).~~ Interpret scientific notation that has been generated by technology.

~~4.~~ *Example: M~~(e.g., use m~~illimeters per year for seafloor spreading~~).~~*

☐ 8.EE.B. Understand the connections between proportional relationships, lines, and linear equations.

5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

~~5.~~ *E~~For e~~xample:~~,~~ compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

6. Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

☐ 8.EE.C. **Analyze and solve linear equations and pairs of simultaneous linear equations.**

7. Solve linear equations in one variable.

   a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$ *(1 solution)*, $a = a$ *(infinitely many solutions)*, or $a = b$ *(no solution)* results (where a and b are different numbers).

   Example: $-3x - 2 = 7x + 2 - 10x$ *has no solution because the equation simplifies to* $-2 = 2$ *which is false for any value of* x.

   b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8. Analyze and solve pairs of simultaneous linear equations.

a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

b. Solve systems of two linear equations in two variables algebraically, (including but not limited to using substitution and elimination strategies), and estimate solutions by graphing the equations. Solve simple cases by inspection.

~~b.~~ *E~~For e~~xample:~~,~~ 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.*

c. Solve real-world and mathematical problems leading to two linear equations in two variables.

E~~For e~~xample:

1) ~~, g~~Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

~~c.~~ *2) Your family decided to rent a snowmobile at Island Park. Company A charges $125 for the first hour plus $37.50 for each additional hour. Company B charges a $50 one-time rental fee plus $45 per hour. Which company would cost less for you to rent for 3 hours? 5 hours? 8 hours?*

Functions 8.F

☐ 8.F.A. Define, evaluate, and compare functions.

1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.[1]

2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
~~2.~~ *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

~~3.~~ *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*

☐ 8.F.B. Use functions to model relationships between quantities.

4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

5. Describe qualitatively the functional relationship between two quantities by analyzing and sketching a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
~~5.~~

Geometry	8.G

☐ 8.G.A. Understand congruence and similarity using physical models, transparencies, or geometry software.

1. Verify experimentally the properties of rotations, reflections, and translations:
   a. Lines are transformed ~~aken~~ to lines, and line segments to line segments of the same length.
   b. Angles are transformed ~~aken~~ to angles of the same measure.
   c. Parallel lines are transformed ~~aken~~ to parallel lines.
2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations;

Example: given two congruent figures, describe a sequence that exhibits the congruence between them~~.~~

~~2.~~

~~[1]Function notation is not required in Grade 8.~~

3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

~~3.~~ ***Example**: The image of Triangle ABC with* $A = (-3, 0)$, $B = (-3, -2)$ *and* $C = (4, -2)$ *would have coordinates* $A' = (-3-3, 0+2) = (-6, 2)$, $B' = (-3-3, -2+2) = (-6, 0)$, *and* $C' = (4-3, -2+2) = (1, 0)$ *following a translation* 3 *units to the left and* 2 *units up.*

4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations;

~~4.~~ *Example: given two similar two- dimensional figures, describe a sequence that exhibits the similarity between them.*

5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

~~5.~~ *~~For e~~Exampl~~e~~:, A~~a~~rrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

☐ 8.G.B. Understand and apply the Pythagorean Theorem.

6. Explain and justify ~~a proof of~~ the Pythagorean Theorem and its converse using pictures, diagrams, narratives, or models.
7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

○ 8.G.C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics and Probability	8.SP

△ 8.SP.A. Investigate patterns of association in bivariate data.

1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *E~~For e~~xample, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*
4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

~~4.~~ E~~For e~~xample~~:~~, ~~C~~collect data from students in your grade level (sixth, seventh, and eighth) *on* ~~class on~~ whether or not ~~they have a curfew on school nights and whether or not~~ they have assigned chores at home. Is there evidence that a particular grade level tends to have chores? ~~those who have a curfew also tend to have chores?~~(In this example, the two variables are grade level and chores.)

~~Mathematics Standards for High School~~

~~The high school standards specify the mathematics that all students should study in order to be college and career ready. Additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics is indicated by (+), as in this example:~~

~~(+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers).~~

~~All standards without a (+) symbol should be in the common mathematics curriculum for all college and career ready students. Standards with a (+) symbol may also appear in courses intended for all students.~~

~~The high school standards are listed in conceptual categories:~~

- ~~Number and Quantity~~
- ~~Algebra~~
- ~~Functions~~
- ~~Modeling~~
- ~~Geometry~~
- ~~Statistics and Probability~~

~~Conceptual categories portray a coherent view of high school mathematics; a student's work with functions, for example, crosses a number of traditional course boundaries, potentially up through and including calculus.~~

~~Modeling is best interpreted not as a collection of isolated topics but in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol sometimes appears on the heading for a group of standards; in that case, it should be understood to apply to all standards in that group.~~

GRADES 9-12 – CONTENT STANDARDS BY CONCEPTUAL CATEGORIES

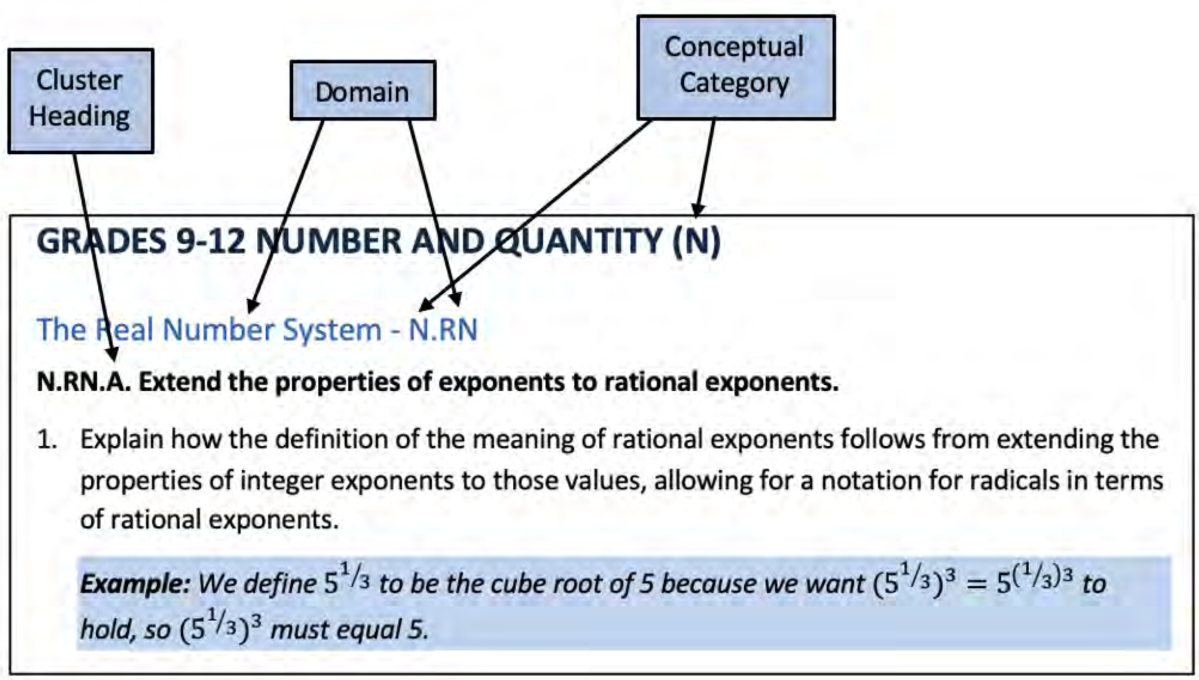
Content Standards by Conceptual Category Identifiers/Coding

The content standards presented by conceptual categories are built on mathematical learning progressions informed by research on cognitive development and by the logical structure of mathematics. These progressions provide the foundation for the grades 9–12 content standards. In this section, the standards are organized by conceptual categories.

The Conceptual Categories are:

- **Number and Quantity (N)**
- **Algebra (A)**
- **Functions (F)**
- **Modeling (★)**
- **Geometry (G)**
- **Statistics and Probability (S)**

The code for each grade 9-12 conceptual category standard begins with the identifier for the conceptual category code (N, A, F, G, S), followed by the domain code, and the standard number, as shown below.



The standard highlighted above is identified as N.RN.A.1, identifying it as a standard in the Number and Quantity conceptual category (N.) within that category's Real Number System domain (RN.), and as the first standard in that domain and in that cluster (A.1). All of the standards in this Framework use a common coding system.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

9-12 Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
Grades 9-12 students should work to understand what a problem is asking, choose a strategy to find a solution, and check the answer to make sure it makes sense. When unable to immediately identify a strategy that will work or when their selected strategy does not work as intended, they must learn to persist in trying a range of potential approaches, looking for how the current problem may relate to previous work they have done. Solving problems is the essence of mathematical work.

MP.2 Reason abstractly and quantitatively.
Grades 9-12 students need to be able to abstract a given situation and represent it symbolically. Students should also make sense of quantities and their relationships in problem situations. Particular attention to units associated with quantities is essential to understanding how the quantities are related. For example, a linear function relating the distance traveled to time needs to specify the units, such as feet and seconds. The slope of that function then gives the rate of change (velocity) given in feet per second. Students should consistently consider the reasonableness of their answer within the context of the problem.

MP.3 Construct viable arguments and critique the reasoning of others.
Grades 9-12 students are increasingly expected to make formal mathematical arguments based on stated assumptions or proper ties, well-defined definitions, and previously established results. Students should be expected to make formal and informal arguments as they progress through the grades 9-12. Students should listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. Moreover, experience with critiquing the arguments produced by classmates is essential to their mathematical development. Reasoning undergirds deep conceptual understanding.

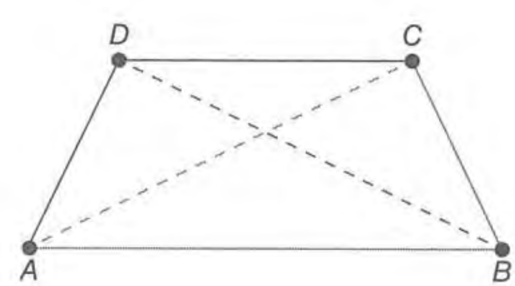
MP.4 Model with mathematics.
Grades 9-12 students need to learn to use mathematics to address problems in everyday life, society, and the workplace. This should occur at a range of levels, from more specific application of mathematical ideas to full-scale mathematical modeling. Routinely interpret

their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

MP.5 Use appropriate tools strategically.
Grades 9-12 students need to be comfortable in using applicable tools when solving a mathematics problem. A range of technological tools should be available, including graphing calculators and software, computer algebra systems, spreadsheets, dynamic geometry software, and statistical software. Physical manipulatives, such as algebra tiles and geometric models, are useful for students and should be incorporated into the 9-12 classroom. Students should be comfortable using paper-and-pencil representations, such as tables, graphs, and other visual representations.

MP.6 Attend to precision.
Grades 9-12 students need to learn to communicate effectively with others, using precise vocabulary. They should use symbols to represent their thinking, clearly describing the meaning of those symbols. By the time students reach grades 9-12 they have learned to examine claims and make explicit use of definitions. They also need to be able to express the precision of the answers they give in real-world contexts, based on the accuracy of the given information.

MP.7 Look for and make use of structure.
Grades 9-12 students examine mathematical situations in order to detect a pattern or structure that may provide further insight. Students use patterns and structure to create equivalent expressions, factor and solve equations, compose functions, and transform figures. For example, drawing an auxiliary line in a geometric figure may help them to better understand the structure behind a situation. Drawing in the diagonals of an isosceles trapezoid creates two overlapping triangles ΔABC and ΔBCA as shown in the following figure; if we can demonstrate their congruence, other properties of the figure will become apparent.



MP.8 Look for and express regularity in repeated reasoning.

Grades 9-12 students notice patterns in calculations that are performed in order to form generalizations and efficient strategies for calculation. For example, grades 9-12 students may expand on their understanding of right triangles to explore the relationship between the legs and hypotenuse of a 45-45-90 triangle to discover that the hypotenuse is $\sqrt{2}$ times the leg.

~~Mathematics | High School~~Grades 9-12 - Number and Quantity (N)

Introduction

Numbers and Number Systems. During the years from kindergarten to eighth grade, students must repeatedly extend their conception of number. At first, "number" means "counting number": 1, 2, 3... Soon after that, 0 is used to represent "none" and the whole numbers are formed by the counting numbers together with zero. The next extension is fractions. At first, fractions are barely numbers and tied strongly to pictorial representations. Yet by the time students understand division of fractions, they have a strong concept of fractions as numbers and have connected them, via their decimal representations, with the base-ten system used to represent the whole numbers. During middle school, fractions are augmented by negative fractions to form the rational numbers. In eighth ~~G~~grade ~~8~~, students extend this system once more, augmenting the rational numbers with the irrational numbers
to form the real numbers. In high school, students will be exposed to yet another extension of number, when the real numbers are augmented by the imaginary numbers to form the complex numbers.

With each extension of number, the meanings of addition, subtraction, multiplication, and division are extended. In each new number system—integers, rational numbers, real numbers, and complex numbers—the four operations stay the same in two important ways: They have the commutative, associative, and distributive properties and their new meanings are consistent with their previous meanings.

Extending the properties of whole-number exponents leads to new and productive notation. For example, properties of whole-number exponents suggest that $(5^{1/3})^3$ should be $5^{(1/3)3} = 5^1 = 5$ and that $5^{1/3}$ should be the cube root of 5.

Calculators, spreadsheets, and computer algebra systems can provide ways for students to become better acquainted with these new number systems and their notation. They can be used to generate data for numerical experiments, to help understand the workings of matrix, vector, and complex number algebra, and to experiment with non-integer exponents.

Quantities. In real world problems, the answers are usually not numbers but quantities: numbers with units, which involves measurement. In their work in measurement up through Grade 8, students primarily measure commonly used attributes such as length, area, and volume. In high school, students encounter a wider variety of units in modeling, e.g., acceleration, currency conversions, derived quantities such as person-hours and heating degree days, social science rates such as per-capita income, and rates in everyday life such as points scored per game or batting averages. They also encounter novel situations in which they themselves must conceive the attributes of interest. For example, to find a good measure of overall highway safety, they might propose measures such as fatalities per year, fatalities per year per driver, or fatalities per vehicle-mile traveled. Such a conceptual process is sometimes called quantification. Quantification is important for science, as when surface area suddenly "stands out" as an important variable in evaporation. Quantification is also important for companies, which must conceptualize relevant attributes and create or choose suitable measures for them.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Number and Quantity Overview

The Real Number System

- A. Extend the properties of exponents to rational exponents
- B. Use properties of rational and irrational numbers.

Quantities

- A. Reason quantitatively and use units to solve problems

The Complex Number System

- A. Perform arithmetic operations with complex numbers
- B. Represent complex numbers and their operations on the complex plane
- C. Use complex numbers in polynomial identities and equations

Vector and Matrix Quantities

- A. Represent and model with vector quantities.
- B. Perform operations on vectors.
- C. Perform operations on matrices and use matrices in applications.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

The Real Number System	N-RN

N.RN.A. Extend the properties of exponents to rational exponents.

1. Explain how the definition of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
   ~~For e~~Example:~~,~~ W~~w~~e define 51/3 to be the cube root of 5 because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.

2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

~~2.~~ ***Example**: Solving the volume of a cube formula, $V = s^3$, for s would involve rewriting the solution as either $s = \sqrt[3]{V}$ or $s = V^{1/3}$.*

N.RN.B. Use properties of rational and irrational numbers.

3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Quantities★	N-Q

N.Q.A Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★
2. Define appropriate quantities for the purpose of descriptive modeling. ★
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

The Complex Number System	N-CN

N.CN.A. Perform arithmetic operations with complex numbers.

1. Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.

~~1.~~ ***Example**: Express the radical, $\pm\sqrt{-24}$, using the imaginary unit, i, in simplified form. Expressing the radical using i in simplified form results in the expression $\pm 2i\sqrt{6}$.*

2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
3. (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

N.CN.B. Represent complex numbers and their operations on the complex plane.

4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation.

~~5.~~ *E~~For e~~xample:~~,~~* $(1 + i\sqrt{3})^3 = 8$ *because (–1 + √3 i)^3 = 8 ~~because (–1 + √3 i)~~ has a radius of ~~modulus~~ 2 and argument 120°.*

6. (+) Calculate the distance between numbers in the complex plane as the absolute value ~~modulus~~ of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

N.CN.C. Use complex numbers in polynomial identities and equations.

7. Solve quadratic equations with real coefficients that have complex solutions.

~~7.~~ ***Example**: Find the complex solutions of the quadratic equation* $5x^2 + 3x + 1 = 0$*, with the solutions of* $x = \frac{3}{10} + \frac{3}{5}i$ *and* $x = \frac{3}{10} - \frac{3}{5}i$.

8. (+) Extend polynomial identities to the complex numbers.

~~8.~~ *~~For e~~Example:~~,~~ rewrite x2 + 4 as (x + 2i)(x – 2i).*

9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Vector and Matrix Quantities	N-VM

N.VM.A. Represent and model with vector quantities.

1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., ***v***, |***v***|, ||***v***||, *v*).
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.

N.VM.B Perform operations on vectors.

4. (+) Add and subtract vectors.
   a. (+) Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.
   b. (+) Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
   c. (+) Demonstrate ~~U~~understanding of vector subtraction ***v*** – ***w*** as ***v*** + (–***w***), where –***w*** is the additive inverse of ***w***, with the same magnitude as ***w*** and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.
5. (+) Multiply a vector by a scalar.
   a. (+) Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as ~~$c(v_x, v_y) = (cv_x, cv_y)$~~ $c(vx\,, vy) = (cvx\,, cvy)$.~~.~~
   b. (+) Compute the magnitude of a scalar multiple *c**v*** using ||*c**v***|| = |*c*|*v*. Compute the direction of *c**v*** knowing that when |*c*|*v* ≠ 0, the direction of *c**v*** is either along ***v*** (for *c* > 0) or against ***v*** (for *c* < 0).

N.VM.C. Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.
9. (+) Demonstrate ~~U~~understanding that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
10. (+) Demonstrate ~~U~~understanding that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.
12. (+) Work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

~~Mathematics | High School~~Grades 9-12 - Algebra (A)

Introduction

Expressions. An expression is a record of a computation with numbers, symbols that represent numbers, arithmetic operations, exponentiation, and, at more advanced levels, the operation of evaluating a function. Conventions about the use of parentheses and the order of operations assure that each expression is unambiguous. Creating an expression that describes a computation involving a general quantity requires the ability to express the computation in general terms, abstracting from specific instances.

Reading an expression with comprehension involves analysis of its underlying structure. This may suggest a different but equivalent way of writing the expression that exhibits some different aspect of its meaning. For example, $p + 0.05p$ can be interpreted as the addition of a 5% tax to a price p. Rewriting $p + 0.05p$ as $1.05p$ shows that adding a tax is the same as multiplying the price by a constant factor.

Algebraic manipulations are governed by the properties of operations and exponents, and the conventions of algebraic notation. At times, an expression is the result of applying operations to simpler expressions. For example, $p + 0.05p$ is the sum of the simpler expressions p and $0.05p$. Viewing an expression as the result of operation on simpler expressions can sometimes clarify its underlying structure.

A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.

Equations and inequalities. An equation is a statement of equality between two expressions, often viewed as a question asking for which values of the variables the expressions on either side are in fact equal. These values are the solutions to the equation. An identity, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.

The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.

An equation can often be solved by successively deducing from it one or more simpler equations. For example, one can add the same constant to both sides without changing the solutions, but squaring both sides might lead to extraneous solutions. Strategic competence in solving includes looking ahead for productive manipulations and anticipating the nature and number of solutions.

Some equations have no solutions in a given number system, but have a solution in a larger system. For example, the solution of $x + 1 = 0$ is an integer, not a whole number; the solution of $2x + 1 = 0$ is a rational number, not an integer; the solutions of $x^2 – 2 = 0$ are real numbers, not rational numbers; and the solutions of $x^2 + 2 = 0$ are complex numbers, not real numbers.

The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, $A = ((b_1+b_2)/2)h$, can be solved for h using the same deductive process.

Inequalities can be solved by reasoning about the properties of inequality. Many, but not all, of the properties of equality continue to hold for inequalities and can be useful in solving them.

Connections to Functions and Modeling. Expressions can define functions, and equivalent expressions define the same function. Asking when two functions have the same value for the same input leads to an equation; graphing the two functions allows for finding approximate solutions of the equation. Converting a verbal description to an equation, inequality, or system of these is an essential skill in modeling.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Algebra Overview

Seeing Structure in Expressions

- A. Interpret the structure of expressions
- B. Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Expressions

- A. Perform arithmetic operations on polynomials
- B. Understand the relationship between zeros and factors of polynomials
- C. Use polynomial identities to solve problems
- D. Rewriterationalexpressions

Creating Equations

- A. Create equations that describe numbers or relationships

Reasoning with Equations and Inequalities

- A. Understand solving equations as a process of reasoning and explain the reasoning
- B. Solve equations and inequalities in one variable
- C. Solve systems of equations
- D. Represent and solve equations and inequalities graphically

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Seeing Structure in Expressions	A-SSE

A.SSE.A. Interpret the structure of linear, quadratic, exponential, polynomial, and rational expressions.

1. Interpret expressions that represent a quantity in terms of its context.★

   a. Interpret parts of an expression, such as terms, factors, and coefficients.

   b. Interpret complicated expressions by viewing one or more of their parts as a single entity.

~~b.~~ *E~~For e~~xample:~~,~~ I~~i~~nterpret P(1+r)n as the product of P and a factor not depending on P.*

2. Use the structure of an expression to identify ways to rewrite it.

~~2.~~ *Example: ~~For example, s~~See $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*

A.SSE.B. Write expressions in equivalent forms to solve problems.

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★

   a. Factor a quadratic expression to reveal the zeros of the function it defines.

   b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

~~b.~~ ***Example**: A high school player punts a football, and the function $h(t) = -16t^2 + 64t + 2$ represents the height h, in feet, of the football at time t seconds after it is punted. Complete the square in the quadratic expression to find the maximum height of the football.*

   c. Use the properties of exponents to transform expressions for exponential functions.

~~c.~~ *E~~For e~~xample:~~,~~ T~~t~~he expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. ★

E~~For e~~xample:~~,~~ calculate mortgage payments.★

Arithmetic with Polynomials and Rational Expressions	A-APR

A.APR.A. Perform arithmetic operations on polynomials.

1. Demonstrate ~~U~~understanding that polynomials form a system analogous to the integers, namely, they are closed under certain ~~the~~ operations.

   a. Perform operations on polynomial expressions (~~of~~ addition, subtraction, ~~and~~ multiplication, division) and compare the system of polynomials to the system of integers when performing operations. ~~; add, subtract, and multiply polynomials.~~

   ~~1.~~ b. Factor and/or expand polynomial expressions, identify and combine like terms, and apply the Distributive property.

A.APR.B. Understand the relationship between zeros and factors of polynomials.

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

A.APR.C. Use polynomial identities to solve problems

4. Prove polynomial identities and use them to describe numerical relationships.

~~4.~~ *E~~For e~~xample~~:,~~ Tthe polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*

5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.[1]

~~[1]The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.~~

A.APR.D. **Rewrite rational expressions.**

6. Rewrite simple rational expressions in different forms~~; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$,~~ using inspection, long division, or, for the more complicated examples, a computer algebra system.

~~6.~~ *Example: Write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$.*

7. (+) Demonstrate ~~U~~understanding that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

~~7.~~

Creating Equations★	A-CED

A.CED.A. Create equations that describe numbers or relationships

1. Create one variable equations and inequalities to solve problems; ~~in one variable and use them to solve problems. *Include equations arising from*~~ ~~including~~ *linear*, ~~*and*~~ *quadratic*, ~~*functions, and simple*~~ *rational and exponential functions.* ★

~~1.~~ ***Example****: Four people may be seated at one rectangular table. If two rectangular tables are placed together end-to-end, 6 people may be seated at the table. If 10 tables are placed together end-to-end, how many people can be seated? How many tables are needed for n people?*

2. Interpret the relationship between two or more quantities. ★
~~2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.~~

   a. Define variables to represent the quantities and write equations to show the relationship.★

Example*: The cost of parking in the parking garage is* \$2.00 *for the first hour and* \$1.00 *for every hour after that. Write an equation in terms of x and y that shows the total cost for parking, y, for x hours. Use the equation to calculate the cost for parking in the garage for* 5 *hours.*

   b. Use graphs to show a visual representation of the relationship while adhering to appropriate labels and scales.★

Example*: Using the equation from A-CED.2a, show how the graph of the equation can be used to predict the cost for a specified amount of time.*

3. Represent constraints using~~by~~ equations or inequalities~~, and by systems of equations and/or inequalities,~~ and interpret solutions as viable or non- viable options in a modeling context. ★
~~3. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*~~

4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. ★

E~~For e~~xample~~:, r~~Rearrange Ohm's law $V = IR$ to highlight resistance R.

~~4.~~

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Reasoning with Equations and Inequalities	A-REI

A.REI.A. Understand solving equations as a process of reasoning and explain the reasoning.

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.REI.B. **Solve equations and inequalities in one variable.**

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
   - ~~3.~~ a. Solve linear equations and inequalities in one variable involving absolute value.
4. Solve quadratic equations in one variable.
   a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
   b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

A.REI.C. **Solve systems of equations**

5. Verify~~Prove~~ that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

~~6.~~ ***Example**: A school club is selling hats and t-shirts for a fundraiser. The group expects to sell a total of 50 items. They make a profit of 15 dollars for each t-shirt sold and 5 dollars for each hat sold. How many hats and t-shirts will the school club need to sell to make a profit of $300?*

7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

~~7.~~ *~~For e~~Example~~; f~~Find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.*

8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.

9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

A.REI.D. Represent and solve equations and inequalities graphically.

10. Demonstrate ~~U~~understanding that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, ~~often forming a curve (which could be a line).~~ Show that any point on the graph of an equation in two variables is a solution to the equation.

11. Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, ~~e.g., using technology to graph the functions, make tables of values, or find successive approximations.~~ Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★

~~11.~~ *Example: ~~e.g.,~~ using technology to graph the functions, make tables of values, or find successive approximations.*

12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

~~Mathematics | High School -~~ – Grades 9 – 12 Functions (F)

Introduction

Functions describe situations where one quantity determines another. For example, the return on $10,000 invested at an annualized percentage rate of 4.25% is a function of the length of time the money is invested. Because we continually make theories about dependencies between quantities in nature and society, functions are important tools in the construction of mathematical models.

In 9-12 ~~school~~ mathematics, functions usually have numerical inputs and outputs and are often defined by an algebraic expression. For example, the time in hours it takes for a car to drive 100 miles is a function of the car's speed in miles per hour, v; the rule $T(v) = 100/v$ expresses this relationship algebraically and defines a function whose name is T.

The set of inputs to a function is called its domain. We often infer the domain to be all inputs for which the expression defining a function has a value, or for which the function makes sense in a given context.

A function can be described in various ways, such as by a graph (e.g., the trace of a seismograph); by a verbal rule, as in, "I'll give you a state, you give me the capital city;" by an algebraic expression like $f(x) = a + bx$; or by a recursive rule. The graph of a function is often a useful way of visualizing the relationship of the function models, and manipulating a mathematical expression for a function can throw light on the function's properties.

Functions presented as expressions can model many important phenomena. Two important families of functions characterized by laws of growth are linear functions, which grow at a constant rate, and exponential functions, which grow at a constant percent rate. Linear functions with a constant term of zero describe proportional relationships.

A graphing utility or a computer algebra system can be used to experiment with properties of these functions and their graphs and to build computational models of functions, including recursively defined functions.

Connections to Expressions, Equations, Modeling, and Coordinates.

Determining an output value for a particular input involves evaluating an expression; finding inputs that yield a given output involves solving an equation. Questions about when two functions have the same value for the same input lead to equations, whose solutions can be visualized from the intersection of their graphs. Because functions describe relationships between quantities, they are frequently used in modeling. Sometimes functions are defined by a recursive process, which can be displayed effectively using a spreadsheet or other technology.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Functions Overview

Interpreting Functions

- A. Understand the concept of a function and use function notation
- B. Interpret functions that arise in applications in terms of the context
- C. Analyze functions using different representations

Building Functions

- A. Build a function that models a relationship between two quantities
- B. Build new functions from existing functions

Linear, Quadratic, and Exponential Models

- A. Construct and compare linear, quadratic, and exponential models and solve problems
- B. Interpret expressions for functions in terms of the situation they model

Trigonometric Functions

- A. Extend the domain of trigonometric functions using the unit circle
- B. Model periodic phenomena with trigonometric functions
- C. Prove and apply trigonometric identities

Mathematical Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Interpreting Functions F-IF

F.IF.A Understand the concept of a function and use function notation

1. Demonstrate u~~U~~nderstand that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range;~~.~~ If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*).

2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Example: Given a function representing a car loan, determine the balance of the loan at different points in time.

~~2.~~

3. Demonstrate ~~Recognize~~ that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

~~3.~~ *Example: ~~For example, t~~The Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.*

F.IF.B Interpret functions that arise in applications in terms of the context. **Include linear, quadratic, exponential, rational, polynomial, square root and cube root, trigonometric, and logarithmic functions.**

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*★

Example: Given a context or verbal description of a relationship, sketch a graph that models the context or description and shows its key features.

5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. ★

~~5.~~ *E~~For e~~xample:~~,~~ I~~i~~f the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function~~.~~*★

6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

F.IF.C. **Analyze functions using different representations.**

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★
   a. Graph linear and quadratic functions and show intercepts, maxima, and minima. ★
   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. ★
   c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. ★
   d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. ★

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. ★

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and/or completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

~~a.~~ ***Example***: *Suppose $h(t) = -5t^2 + 10t + 3$ represents the height of a diver above the water (in meters), t seconds after the diver leaves the springboard. What is the maximum height above the water the diver reaches? After how many seconds, t, does the diver hit the water?*

b. Use the properties of exponents to interpret expressions for exponential functions. Apply to financial situations such as identifying appreciation and depreciation rate for the value of a house or car sometime after its initial purchase.

Example: *The equation for radioactive decay is, $A = A_0 \left(\frac{1}{2}\right)^{t/h}$. When A_0 is the original amount of a radioactive substance, A is the final amount, h is the half-life of the substance, and t is time. Hagerman, Idaho is a hotbed of fossil hunting. The half-life of Carbon-14 is about 5730 years. If a fossil that was found in Hagerman contains 54 grams of Carbon-14 at time $t = 0$, how much Carbon-14 remains at time $t = 17190$ years?*

~~b. *For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.*~~

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

~~E~~ ~~For e~~xample: ~~, g~~Given a graph of one polynomial ~~quadratic~~ function and an algebraic expression for another, say which has the larger/smaller relative maximum and/or minimum.

10. Given algebraic, numeric and/or graphical representations of functions, recognize the function as polynomial, rational, logarithmic, exponential, or trigonometric.

~~9.~~

Building Functions	F-BF

F.BF.A. Build a function that models a relationship between two quantities.

~~1.~~ Write a function that describes a relationship between two quantities. Functions could include linear, exponential, quadratic, simple rational, radical, logarithmic, and trigonometric. ★ ★

a. Determine an explicit expression, a recursive process, or steps for calculation from a context. ★

b. Combine standard function types using arithmetic operations. ★

~~b.~~ *~~E~~ ~~For e~~xample: , B~~b~~uild a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

c. (+) Compose functions. ★

~~c.~~ *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*

2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★

~~2.~~ ***Example**: If the U.S. Census Bureau wrote the following recursive equation to represent how they estimate Idaho's population will grow each year after 2019:* $P(n) = 1.023 \cdot P(n-1)$, $P(0) = 1{,}787{,}000$. $P(n)$ *represents Idaho's population at the end of the* n^{th} *year in terms of Idaho's population at the end of the* $(n-1)^{th}$ *year,* $P(n-1)$. *Predict Idaho's population in 2040.*

F.BF.B Build new functions from existing functions

3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Include, linear, quadratic, exponential, absolute value, simple rational and radical, logarithmic, and trigonometric functions. Utilize using technology to ~~E~~experiment with cases and illustrate an explanation of the effects on the graph. ~~using technology.~~ *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*

4. Find inverse functions algebraically and graphically.

a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. Include linear and simple polynomial, rational, and exponential functions.

~~a.~~ *~~For e~~Example:~~,~~ $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$.*

b. (+) Verify by composition that one function is the inverse of another.

c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.

d. (+) Produce an invertible function from a non-invertible function by restricting the domain.

5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Linear, Quadratic, and Exponential Models★	F-LE

F.LE.A. Construct and compare linear, quadratic, and exponential models and solve problems.

1. Distinguish between situations that can be modeled with linear functions and with exponential functions. ★

   a. Demonstrate~~Prove~~ that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. ★

   b. Identify ~~Recognize~~ situations in which one quantity changes at a constant rate per unit interval relative to another. ★

   c. Identify ~~Recognize~~ situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. ★

2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). ★

3. ~~Observe using~~ Use graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. ★

~~3.~~ ***Example**: Becca's parents are saving for her college education by putting $\$3,000$/year in a safe deposit box. Becca's grandpa is also saving for her college education by putting $\$2,000$/year in an IDeal (Idaho college savings) account with an APR of 6.17%. Build tables to show which account has the most money after 10 years, and how much more? How many years will it take for the total in her grandpa's account to exceed the total in her parents' safe deposit box?*

4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. ★

~~4.~~ ***Example**: Mr. Rico has a savings account that has an interest rate of 7% compounded continuously. The amount in the account is calculated using $A = Pe^{rt}$. If Mr. Rico invested $\$30,000$ on January 1, 2020, when will he have $\$100,000$ in the account?*

F.LE.B. Interpret expressions for functions in terms of the situation they model.

5. Interpret the parameters in a linear or exponential function in terms of a context. ★

Trigonometric Functions F-TF

T.TF.A. Extend the domain of trigonometric functions using the unit circle.

1. Demonstrate ~~Understand~~ radian measure as the ratio ~~of an angle as the length~~ of the arc length ~~on the unit circle~~ subtended by a central ~~the~~ angle to the length of the radius of the unit circle.

 a. Use radian measure to solve problems.

~~1.~~ ***Example**: You live in New Meadows, Idaho, which is located on the 45th parallel ($45°$ North latitude). Approximately how far will you drive, in miles, to attend the Calgary Stampede? Calgary is located at $51°$N latitude, almost due North of New Meadows. (Use $r = 3960$ miles for the radius of the Earth.)*

2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–x, π+x, and 2π–x in terms of their values for x, where x is any real number.

4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

T.TF.B. Model periodic phenomena with trigonometric functions.

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★

***Example**: This past summer you and your friends decided to ride the Ferris wheel at the Idaho State Fair. You wondered how high the highest point on the Ferris wheel was. You asked the operator, and he didn't know, but he told you that the height of the chair was 5 ft off the ground when you got on and the center of the Ferris wheel is 30 ft above that. You checked your phone when you got on and figured out that it took you 12 mins to make one full revolution. Create a model to show your height from the platform at any given time on the Ferris wheel.*

~~5.~~

6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.★

T.TF.C. **Prove and apply trigonometric identities.**

8. Relate ~~Prove~~ the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use the Pythagorean identity it to find the value of a trigonometric function $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given on trigonometric function $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

~~8.~~ ***Example**: Suppose that* $\cos(\theta) = \frac{2}{5}$ *and that* θ *is in the 4th quadrant. Find the exact value of* $\sin(\theta)$ *and* $\tan(\theta)$.

9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

~~Mathematics | High School~~ Grades 9-12 – Modeling (M)

Introduction

Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

A model can be very simple, such as writing total cost as a product of unit price and number bought, or using a geometric shape to describe a physical object like a coin. Even such simple models involve making choices. It is up to us whether to model a coin as a three-dimensional cylinder, or whether a two-dimensional disk works well enough for our purposes. Other situations—modeling a delivery route, a production schedule, or a comparison of loan amortizations—need more elaborate models that use other tools from the mathematical sciences. Real-world situations are not organized and labeled for analysis; formulating tractable models, representing such models, and analyzing them is appropriately a creative process. Like every such process, this depends on acquired expertise as well as creativity.

Some examples of such situations might include:

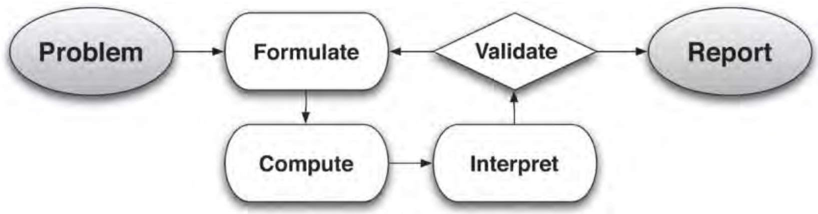
- Estimating how much water and food is needed for emergency relief in a devastated city of 3 million people, and how it might be distributed.
- Planning a table tennis tournament for 7 players at a club with 4 tables, where each player plays against each other player.
- Designing the layout of the stalls in a school fair so as to raise as much money as possible.
- Analyzing stopping distance for a car.
- Modeling savings account balance, bacterial colony growth, or investment growth.
- Engaging in critical path analysis, e.g., applied to turnaround of an aircraft at an airport.
- Analyzing risk in situations such as extreme sports, pandemics, and terrorism.
- Relating population statistics to individual predictions.

In situations like these, the models devised depend on a number of factors: How precise an answer do we want or need? What aspects of the situation do we most need to understand, control, or optimize? What resources of time and tools do we have? The range of models that we can create and analyze is also constrained by the limitations of our mathematical, statistical, and technical skills, and our ability to recognize significant variables and relationships among them. Diagrams of various kinds, spreadsheets and other technology, and algebra are powerful tools for understanding and solving problems drawn from different types of real-world situations.

One of the insights provided by mathematical modeling is that essentially the same mathematical or statistical structure can sometimes model seemingly different situations. Models can also shed light on

the mathematical structures themselves, for example, as when a model of bacterial growth makes more vivid the explosive growth of the exponential function.

The basic modeling cycle is summarized in the diagram below. It involves: (1) identifying variables in the situation and selecting those that represent essential features, (2) formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables, (3) analyzing and performing operations on these relationships to draw conclusions, (4) interpreting the results of the mathematics in terms of the original situation, (5) validating the conclusions by comparing them with the situation, and then either improving the model or, (6) if it is acceptable, reporting on the conclusions and the reasoning behind them. Choices, assumptions, and approximations are present throughout this cycle



In descriptive modeling, a model simply describes the phenomena or summarizes them in a compact form. Graphs of observations are a familiar descriptive model—for example, graphs of global temperature and atmospheric CO_2 over time.

Analytic modeling seeks to explain data on the basis of deeper theoretical ideas, albeit with parameters that are empirically based; for example, exponential growth of bacterial colonies (until cut-off mechanisms such as pollution or starvation intervene) follows from a constant reproduction rate. Functions are an important tool for analyzing such problems.

Graphing utilities, spreadsheets, computer algebra systems, and dynamic geometry software are powerful tools that can be used to model purely mathematical phenomena (e.g., the behavior of polynomials) as well as physical phenomena.

M~~m~~odeling Standards

Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★).

~~Mathematics | High School –~~ Grades 9-12 Geometry (G)

Introduction

An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts—interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material.

Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate, that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.)

During high school, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful proofs. Later in college some students develop Euclidean and other geometries carefully from a small set of axioms.

The concepts of congruence, similarity, and symmetry can be understood from the perspective of geometric transformation. Fundamental are the rigid motions: translations, rotations, reflections, and combinations of these, all of which are here assumed to preserve distance and angles (and therefore shapes generally). Reflections and rotations each explain a particular type of symmetry, and the symmetries of an object offer insight into its attributes—as when the reflective symmetry of an isosceles triangle assures that its base angles are congruent.

In the approach taken here, two geometric figures are defined to be congruent if there is a sequence of rigid motions that carries one onto the other. This is the principle of superposition. For triangles, congruence means the equality of all corresponding pairs of sides and all corresponding pairs of angles. During the middle grades, through experiences drawing triangles from given conditions, students notice ways to specify enough measures in a triangle to ensure that all triangles drawn with those measures are congruent. Once these triangle congruence criteria (ASA, SAS, and SSS) are established using rigid motions, they can be used to prove theorems about triangles, quadrilaterals, and other geometric figures.

Similarity transformations (rigid motions followed by dilations) define similarity in the same way that rigid motions define congruence, thereby formalizing the similarity ideas of "same shape" and "scale factor" developed in the middle grades. These transformations lead to the criterion for triangle similarity that two pairs of corresponding angles are congruent.

The definitions of sine, cosine, and tangent for acute angles are founded on right triangles and similarity, and, with the Pythagorean Theorem, are fundamental in many real-world and theoretical situations. The Pythagorean Theorem is generalized to non-right triangles by the Law of Cosines. Together, the Laws of Sines and Cosines embody the triangle congruence criteria for the cases where three pieces of information suffice to completely solve a triangle. Furthermore, these laws yield two possible solutions in the ambiguous case, illustrating that Side-Side-Angle is not a congruence criterion.

Analytic geometry connects algebra and geometry, resulting in powerful methods of analysis and problem solving. Just as the number line associates numbers with locations in one dimension, a pair of perpendicular axes associates pairs of numbers with locations in two dimensions. This correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof. Geometric transformations of the graphs of equations correspond to algebraic changes in their equations.

Dynamic geometry environments provide students with experimental and modeling tools that allow them to investigate geometric phenomena in much the same way as computer algebra systems allow them to experiment with algebraic phenomena.

Connections to Equations. The correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics, or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Geometry Overview

Congruence

- A. Experiment with transformations in the plane
- B. Understand congruence in terms of rigid motions
- C. Prove geometric theorems
- D. Make geometric constructions

Similarity, Right Triangles, and Trigonometry

- A. Understand similarity in terms of similarity transformations
- B. Prove theorems involving similarity
- C. Define trigonometric ratios and solve problems involving right triangles
- D. Apply trigonometry to general triangles

Circles

- A. Understand and apply theorems about circles
- B. Find arc lengths and areas of sectors of circles

Expressing Geometric Properties with Equations

- A. Translate between the geometric description and the equation for a conic section
- B. Use coordinates to prove simple geometric theorems algebraically

Geometric Measurement and Dimension

- A. Explain volume formulas and use them to solve problems
- B. Visualize relationships between two-dimensional and three-dimensional objects

Modeling with Geometry

- A. A~~a~~pply geometric concepts in modeling situations

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Congruence	G-CO

G.CO.A. Experiment with transformations in the plane

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

2. Represent transformations in the plane using~~, e.g., transparencies and geometry software;~~ and describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not.
~~2.~~ Example: ~~(e.g., T~~translation versus horizontal stretch~~).~~

3. Describe the rotations and reflections that carry a ~~G~~given figure (~~a~~ rectangle, parallelogram, trapezoid, or regular polygon)~~, describe the rotations and reflections that carry it~~ onto itself.

4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

5. Draw the transformation (rotation, reflection, or translation) for a given geometric figure.
~~Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software.~~

***Example:** Given quadrilateral $TMEJ$ with vertices $T(0,-1)$, $M(3,-2)$, $E(-1,-5)$, and $J(-3,-2)$, reflect the shape across the x-axis.*

~~5.~~6. Specify a sequence of transformations that will carry a given figure onto another.

G.CO.B. Understand congruence in terms of rigid motions.

~~6.~~7. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

~~7.~~8. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

9. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

***Example:** In ΔABC and ΔABD (with shared side $\overline{AB}$), we are given that $\angle BAC \cong \angle BAD$ and $\angle ABC \cong \angle ABD$. What pair(s) of corresponding parts is needed to ensure the triangles are congruent by either ASA, SAS, or SSS? What rigid motion would show the triangles are congruent?*

~~8.~~

G.CO.C. Prove geometric theorems and, when appropriate, the converse of theorems.

~~9.~~10. Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; and conversely prove lines are parallel;~~;~~ points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*

~~10.~~11. Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; and conversely prove a triangle is isosceles; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*

~~11.~~ 12. Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*

a. Prove theorems about polygons. Theorems include the measures of interior and exterior angles. Apply properties of polygons to the solutions of mathematical and contextual problems.

G.CO.D. **Make geometric constructions**

~~12.~~13. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Constructions include: *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*

~~13.~~14. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Similarity, Right Triangles, and Trigonometry	G-SRT

G.SRT.A. Understand similarity in terms of similarity transformations

1. Verify experimentally the properties of dilations given by a center and a scale factor:
   a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
   b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
2. ~~Given two figures~~, ~~U~~use the definition of similarity ~~in terms of similarity transformations~~ to decide if two given figures ~~they~~ are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

~~3.~~ ***Example:*** *Given ΔABC and ΔDEF, $\angle A \cong \angle D$, and $\angle B \cong \angle E$, show that $\Delta ABC \sim \Delta DEF$ using a sequence of translations, rotations, reflections, and/or dilations.*

G.SRT.B. Prove theorems involving similarity

4. Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*

~~5.~~ 5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Example: *A high school student visits a giant cedar tree near the town of Elk River, Idaho and the end of his shadow lines up with the end of the tree's shadow. The student is 6 feet tall and his shadow is 8 feet long. The cedar tree's shadow is 228 feet long. How tall is the cedar tree?*

G.SRT.C. Define trigonometric ratios and solve problems involving right triangles

~~6.~~ 6. Demonstrate ~~U~~understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

~~7.~~ 7. Explain and use the relationship between the sine and cosine of complementary angles.

8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★

~~8.~~ ***Example:*** *Mark and Ruth are rock climbing in the Snake River Canyon. Mark is anchoring the rope for Ruth. If the length of the rope from Mark to Ruth is 60 ft, with an angle of elevation of $23°$, how far is Mark from the base of the cliff?*

G.SRT.D. Apply trigonometry to general triangles

9. (+) Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.

11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Circles	G-C

G.C.A. Understand and apply theorems about circles

1. Prove that all circles are similar.
2. Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
3. Prove properties of angles for a quadrilateral and other polygon inscribed in a circle, by constructing ~~Construct~~ the inscribed and circumscribed circles of a triangle.~~,~~ ~~and prove properties of angles for a quadrilateral inscribed in a circle.~~
4. (+) Construct a tangent line to a circle from a point outside the~~a~~ given circle.~~ to the circle~~.

G.C.B. Find arc lengths and areas of sectors of circles

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Expressing Geometric Properties with Equations	G-GPE

G.GPE.A. Translate between the geometric description and the equation for a conic section

1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
2. Derive the equation of a parabola given a focus and directrix.
3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

    ~~3.~~ a. (+) Use equations and graphs of conic sections to model real-world problems.★

G.GPE.B. Use coordinates to prove simple geometric theorems algebraically

4. Use coordinates to prove simple geometric theorems algebraically including the distance formula and its relationship to the Pythagorean Theorem. ~~.~~

~~4.~~ *E ~~For e~~xample: ~~; p~~Prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*

5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems

~~5.~~ *Example: ~~(e.g., f~~Find the equation of a line parallel or perpendicular to a given line that passes through a given point).*

6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles (~~,~~ e.g., using the distance formula).★

Geometric Measurement and Dimension	G-GMD

G.GMD.A. Explain volume formulas and use them to solve problems

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★

~~3.~~ ***Example**: The tank at the top of the Meridian Water Tower is roughly spherical. If the diameter of the sphere is* 50.35 *feet, approximately how much water can the tank hold?*

G.GMD.B. Visualize relationships between two-dimensional and three-dimensional objects

4. Identify the shapes of two-dimensional cross-sections of three-

dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry	G-MG

G.MG.A. Apply geometric concepts in modeling situations

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★
4. Use dimensional analysis for unit conversions to confirm that expressions and equations make sense.★

~~Mathematics | High School~~Grades 9-12 - Statistics and Probability (S)★

Introduction

Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics provides tools for describing variability in data and for making informed decisions that take it into account.

Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns. Quantitative data can be described in terms of key characteristics: measures of shape, center, and spread. The shape of a data distribution might be described as symmetric, skewed, flat, or bell shaped, and it might be summarized by a statistic measuring center (such as mean or median) and a statistic measuring spread (such as standard deviation or interquartile range). Different distributions can be compared numerically using these statistics or compared visually using plots. Knowledge of center and spread are not enough to describe a distribution. Which statistics to compare, which plots to use, and what the results of a comparison might mean, depend on the question to be investigated and the real-life actions to be taken.

Randomization has two important uses in drawing statistical conclusions. First, collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account. Second, randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. A statistically significant outcome is one that is unlikely to be due to chance alone, and this can be evaluated only under the condition of randomness. The conditions under which data are collected are important in drawing conclusions from the data; in critically reviewing uses of statistics in public media and other reports, it is important to consider the study design, how the data were gathered, and the analyses employed as well as the data summaries and the conclusions drawn.

Random processes can be described mathematically by using a probability model: a list or description of the possible outcomes (the sample space), each of which is assigned a probability. In situations such as flipping a coin, rolling a number cube, or drawing a card, it might be reasonable to assume various outcomes are equally likely. In a probability model, sample points represent outcomes and combine to make up events; probabilities of events can be computed by applying the Addition and Multiplication Rules. Interpreting these probabilities relies on an understanding of independence and conditional probability, which can be approached through the analysis of two-way tables.

Technology plays an important role in statistics and probability by making it possible to generate plots, regression functions, and correlation coefficients, and to simulate many possible outcomes in a short amount of time.

Connections to Functions and Modeling.

Functions may be used to describe data; if the data suggest a linear relationship, the relationship can be modeled with a regression line, and its strength and direction can be expressed through a correlation coefficient.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Statistics and Probability Overview

Interpreting Categorical and Quantitative Data

- A. Summarize, represent, and interpret data on a single count or measurement variable
- B. Summarize, represent, and interpret data on two categorical and quantitative variables
- C. Interpret linear models

Making Inferences and Justifying Conclusions

- A. Understand and evaluate random processes underlying statistical experiments
- B. Make inferences and justify conclusions from sample surveys, experiments and observational studies

Conditional Probability and the Rules of Probability

- A. Understand independence and conditional probability and use them to interpret data
- B. Use the rules of probability to compute probabilities of compound events in a uniform probability model

Using Probability to Make Decisions

- A. Calculate expected values and use them to solve problems
- B. Use probability to evaluate outcomes of decisions

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Interpreting Categorical and Quantitative Data S-ID

S.ID.A. Summarize, represent, and interpret data on a single count or measurement variable. Use calculators, spreadsheets, and other technology as appropriate.

1. Differentiate between count data and measurement variable.★

2. Represent measurement data with plots on the real number line (dot plots, histograms, and box plots). ★

~~1.~~ ***Example:*** *Construct a histogram of the current population size in each of Idaho's counties.*

3. ~~Use statistics appropriate to the shape of the data distribution to c~~Compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different variables, Use statistics appropriate to the shape of the distribution for measurement variable. ~~data sets.~~ ★

~~2.~~ ***Example:*** *Compare the histograms of the annual potato yields over the last 25 years for Idaho and Maine using the correct measures of center and spread for the shape of the histograms.*

4. Interpret differences in shape, center, and spread in the context of the variables ~~data sets,~~ accounting for possible effects of extreme data points (outliers) for measurement variables. ★

~~3.~~ ***Example:*** *Describe differences in distributions of annual precipitation over the last 100 years between Boise and Seattle using shape, center, spread and outliers.*

~~4.~~ 5. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

Example: *Estimate the percentage of all Idaho elk hunters who successfully filled their tag last year, using the results from Washington County hunters.*

S.ID.B. **Summarize, represent, and interpret data on two categorical and quantitative variables**

6. Represent ~~Summarize categorical~~ data on two categorical variables on a clustered bar chart and describe how the variables are related. Summarize categorical data for for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

~~5.~~ ***Example:*** *Represent the relationship between student effort (on a scale of 1 – 5) and letter grade in a math class with a clustered bar chart and describe the relationship using a relative frequency table.*

~~6.~~7. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

a. ~~Use data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*~~ Fit a linear function where~~for~~ a scatter plot ~~that~~ suggests a linear relationship and use the fitted function to solve problems in the context of the data. ~~association.~~ ★

b. Use functions fitted to data, focusing on quadratic and exponential models, or choose a function suggested by the context. Utilize technology where appropriate.★

Example: *Use technology to fit a function of the relationship between the board-feet (measured in volume) of trees and the diameter of the trunks of the trees.*

~~a. Fit a function to the data; use functions fitted to~~

~~b.~~ c. Informally assess the fit of a function by plotting and analyzing residuals.

~~c. Fit a linear function for a scatter plot that suggests a linear association.~~

S.ID.C. Interpret linear models

8. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. ★

Example: *Explain why the y-intercept of a linear model relating the volume production of sugar beets to size of farm has no meaning whereas the y-intercept of a linear model relating the volume production of sugar beets related to minimum temperature does have meaning.*

~~7.~~ 9. Compute (using technology) and interpret the correlation coefficient ~~of a linear fit~~. ★

Example: *Find the correlation coefficient between the number of hours firefighters sleep each night and the length of fireline they construct each day. Use the correlation coefficient to explain whether sleep is important.*

10. Distinguish between correlation and causation. ★
~~8.~~

Making Inferences and Justifying Conclusions	S-IC

S.IC.A. Understand and evaluate random processes underlying statistical experiment~~s~~. . Use calculators, spreadsheets, and other technology as appropriate.

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. ★

2. Decide if a specified model is consistent with results from a given data-generating process~~,~~ (e.g., using simulation or validation with given data)~~.~~ ★

~~2.~~ *E~~For e~~xample:~~,~~ a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

S.IC.B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★

4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. ★

5. Use data from a randomized and controlled experiment to compare two treatments; use margins of error to ~~simulations to~~ decide if differences between ~~parameters~~ treatments are significant. ★

6. Evaluate reports of statistical information based on data. ★

~~6.~~ ***Example**: Students may analyze and critique different reports from media, business, and government sources.*

Conditional Probability and the Rules of Probability	S-CP

S.CP.A. Understand independence and conditional probability and use them to interpret data from simulations or experiments.

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). ★

2. Demonstrate ~~U~~understanding that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent. ★

3. Understand the conditional probability of *A* given *B* as $\frac{P(A \cap B)}{P(B)}$, ~~P(A and B)/P(B),~~ and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*. ★

4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. ★

~~4.~~ ~~For e~~Example: ~~, c~~Collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that

the student is in tenth grade. Do the same for other subjects and compare the results.

5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. ★
~~5.~~ ~~For e~~*Example: ~~, c~~Compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

S.CP.B. Use the rules of probability to compute probabilities of compound events in a uniform probability model.

6. Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. ★

7. Apply the Addition Rule, ~~P(A or B) = P(A) + P(B) – P(A and B),~~ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$, and interpret the answer in terms of the model. ★

8. (+) Apply the general Multiplication Rule in a uniform probability model, ~~P(A and B) = P(A)P(B|A) = P(B)P(A|B),~~ $P(A \cap B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model. ★

9. (+) Use permutations and combinations to compute probabilities of

compound events and solve problems. ★

Using Probability to Make Decisions	S-MD

S.MD.A. Calculate expected values and use them to solve problems

1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. ★
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution of the variable. ★

3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. ★

~~For e~~Example:~~, f~~Find the theoretical probability distribution for the number of correct answers obtained by guessing on

all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.

4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. ★

~~4.~~ *~~For e~~Example:~~, f~~Find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*

S.MD.B. **Use probability to evaluate outcomes of decisions**

5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. ★

   a. Find the expected payoff for a game of chance. ★

~~a.~~ *~~For e~~Example:~~, f~~Find the expected winnings from a state lottery ticket or a game at a fast- food restaurant.*

   b. Evaluate and compare strategies on the basis of expected values. ★

~~For e~~Example:~~, c~~Compare a high-deductible versus a low-deductible

automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.

~~6.~~ 6. (+) Use probabilities to make objective ~~fair~~ decisions. ★ ~~(e.g., drawing by lots, using a random number generator).~~

***Example**: The Idaho Department of Transportation classifies highways for overweight loads based on the probability of bridges on a highway failing under given vehicle weights.*

7. (+) Analyze decisions and strategies using probability concepts. ★

~~7.~~ *~~(~~Example: ~~e.g., p~~Product testing, medical testing, or pulling a hockey goalie at the end of a game and replacing goalie with an extra player~~)~~.*

REFERENCES

The works below were used to guide the creation of this document:

Boaler, J. (2016) Mathematical Mindsets. San Francisco, CA: Jossey-Bass.

California Department of Education. (2021). California Math Framework Draft. Sacramento, CA: California Department of Education.

Massachusetts Department of Elementary and Secondary Education. (2017). Massachusetts Curriculum Framework Mathematics. Malden, MA: Massachusetts Department of Elementary and Secondary Education.

Nebraska Department of Education. (2015). Nebraska's College and Career Ready Standards for Mathematics. Lincoln, NE: Nebraska Department of Education.

Florida Department of Education. (2020). Florida B.E.S.T. Standards: Mathematics. Tallahassee, FL: Florida Department of Education.

Student Achievement Partners. (2013). Achieve the Core Mathematics: Focus by Grade Level Documents. Retrieved from https://achievethecore.org/category/774/mathematics-focus-by-grade-level

Texas Education Agency. (2012). Texas Essential Knowledge and Skills for Mathematics. Austin, TX: Texas Education Agency.

~~Note on Courses and Transitions~~

~~The high school portion of the Standards for Mathematical Content specifies the mathematics all students should study for college and career readiness. These standards do not mandate the sequence of high school courses. However, the organization of high school courses is a critical component to implementation of the standards. To that end, sample high school pathways for mathematics – in both a traditional course sequence (Algebra I, Geometry, and Algebra II) as well as an integrated course sequence (Mathematics 1, Mathematics 2, Mathematics 3) – will be made available shortly after the release of the final Common Core State Standards. It is expected that additional model pathways based on these standards will become available as well.~~

~~The standards themselves do not dictate curriculum, pedagogy, or delivery of content. In particular, states may handle the transition to high school in different ways. For example, many students in the U.S. today take Algebra I in the 8th grade, and in some states this is a requirement. The K-7 standards contain the prerequisites to prepare students for Algebra I by 8th grade, and the standards are designed to permit states to continue existing policies concerning Algebra I in 8th grade.~~

~~A second major transition is the transition from high school to post-secondary education for college and careers. The evidence concerning college and career readiness shows clearly that the knowledge, skills, and practices important for readiness include a great deal of mathematics prior to the boundary defined by (+) symbols in these standards. Indeed, some of the highest priority content for college and career readiness comes from Grades 6-8. This body of material includes powerfully useful proficiencies such as applying ratio reasoning in real-world and mathematical problems, computing fluently with positive and negative fractions and decimals, and solving real-world and mathematical problems involving angle measure, area, surface area, and volume. Because important standards for college and career readiness are distributed across grades and courses, systems for evaluating college and career readiness should reach as far back in the standards as Grades 6-8. It is important to note as well that cut scores or other information generated by assessment systems for college and career readiness should be developed in collaboration with representatives from higher education and workforce development programs, and should be validated by subsequent performance of students in college and the workforce.~~

~~Glossary~~

~~**Addition and subtraction within 5, 10, 20, 100, or 1000**. Addition or subtraction of two whole numbers with whole number answers, and with sum or minuend in the range 0-5, 0-10, 0-20, or 0-100, respectively. Example: 8 + 2 = 10 is an addition within 10, 14 – 5 = 9 is a subtraction within 20, and 55 – 18 = 37 is a subtraction within 100.~~

~~**Additive inverses**. Two numbers whose sum is 0 are additive inverses of one another. Example: 3/4 and – 3/4 are additive inverses of one another because 3/4 + (– 3/4) = (– 3/4) + 3/4 = 0.~~

~~**Associative property of addition**. See Table 3 in this Glossary.~~

~~**Associative property of multiplication.** See Table 3 in this Glossary.~~

~~**Bivariate data.** Pairs of linked numerical observations. Example: a list of heights and weights for each player on a football team.~~

~~**Box plot**. A method of visually displaying a distribution of data values by using the median, quartiles, and extremes of the data set. A box shows the middle 50% of the data.[1]~~

~~**Commutative property**. See Table 3 in this Glossary.~~

~~**Complex fraction**. A fraction *A*/*B* where *A* and/or *B* are fractions (*B* nonzero).~~

~~**Computation algorithm**. A set of predefined steps applicable to a class of problems that gives the correct result in every case when the steps are carried out correctly. *See also:* computation strategy.~~

~~**Computation strategy**. Purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another. *See also:* computation algorithm.~~

~~**Congruent**. Two plane or solid figures are congruent if one can be obtained from the other by rigid motion (a sequence of rotations, reflections, and translations).~~

~~**Counting on**. A strategy for finding the number of objects in a group without having to count every member of the group. For example, if a stack of books is known to have 8 books and 3 more books are added to the top, it is not necessary to count the stack all over again. One can find the total by *counting on*—pointing to the top book and saying "eight," following this with "nine, ten, eleven. There are eleven books now."~~

~~**Dot plot.** *See:* line plot.~~

~~**Dilation**. A transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor.~~

~~**Expanded form**. A multi-digit number is expressed in expanded form when it is written as a sum of single-digit multiples of powers of ten. For example, 643 = 600 + 40 + 3.~~

~~**Expected value.** For a random variable, the weighted average of its possible values, with weights given by their respective probabilities.~~

~~**First quartile**. For a data set with median *M*, the first quartile is the median of the data values less than *M*. Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the first quartile is 6.[2] *See also:* median, third quartile, interquartile range.~~

~~**Fraction**. A number expressible in the form *a*/*b* where *a* is a whole number and *b* is a positive whole number. (The word *fraction* in these standards always refers to a non-negative number.) *See also:* rational number.~~

~~**Identity property of 0**. See Table 3 in this Glossary.~~

~~**Independently combined probability models**. Two probability models are said to be combined independently if the probability of each ordered pair in the combined model equals the product of the original probabilities of the two individual outcomes in the ordered pair.~~

~~[1]Adapted from Wisconsin Department of Public Instruction, http://dpi.wi.gov/standards/mathglos.html, accessed March 2, 2010.~~

~~[2]Many different methods for computing quartiles are in use. The method defined here is sometimes called the Moore and McCabe method. See Langford, E., "Quartiles in Elementary Statistics," *Journal of Statistics Education* Volume 14, Number 3 (2006).~~

~~**Integer**. A number expressible in the form *a* or –*a* for some whole number *a*.~~

~~**Interquartile Range**. A measure of variation in a set of numerical data, the interquartile range is the distance between the first and third quartiles of the data set. Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the interquartile range is 15 – 6 = 9. *See also:* first quartile, third quartile.~~

~~**Line plot**. A method of visually displaying a distribution of data values where each data value is shown as a dot or mark above a number line. Also known as a dot plot.[3]~~

~~**Mean**. A measure of center in a set of numerical data, computed by adding the values in a list and then dividing by the number of values in the list.[4] Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean is 21.~~

~~**Mean absolute deviation**. A measure of variation in a set of numerical data, computed by adding the distances between each data value and the mean, then dividing by the number of data values. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean absolute deviation is 20.~~

~~**Median**. A measure of center in a set of numerical data. The median of a list of values is the value appearing at the center of a sorted version of the list—or the mean of the two central values, if the list contains an even number of values. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 90}, the median is 11.~~

~~**Midline.** In the graph of a trigonometric function, the horizontal line halfway between its maximum and minimum values.~~

~~**Multiplication and division within 100**. Multiplication or division of two whole numbers with whole number answers, and with product or dividend in the range 0-100. Example: 72 ÷ 8 = 9.~~

~~**Multiplicative inverses**. Two numbers whose product is 1 are multiplicative inverses of one another. Example: 3/4 and 4/3 are multiplicative inverses of one another because 3/4 × 4/3 = 4/3 × 3/4 = 1.~~

~~**Number line diagram.** A diagram of the number line used to represent numbers and support reasoning about them. In a number line diagram for measurement quantities, the interval from 0 to 1 on the diagram represents the unit of measure for the quantity.~~

~~**Percent rate of change.** A rate of change expressed as a percent. Example: if a population grows from 50 to 55 in a year, it grows by 5/50 = 10% per year.~~

~~**Probability distribution.** The set of possible values of a random variable with a probability assigned to each.~~

~~**Properties of operations**. See Table 3 in this Glossary.~~

~~**Properties of equality**. See Table 4 in this Glossary.~~

~~**Properties of inequality**. See Table 5 in this Glossary.~~

~~**Properties of operations**. See Table 3 in this Glossary.~~

~~**Probability**. A number between 0 and 1 used to quantify likelihood for processes that have uncertain outcomes (such as tossing a coin, selecting a person at random from a group of people, tossing a ball at a target, or testing for a medical condition).~~

~~**Probability model.** A probability model is used to assign probabilities to outcomes of a chance process by examining the nature of the process. The set of all outcomes is called the sample space, and their probabilities sum to 1. *See also:* uniform probability model.~~

~~**Random variable.** An assignment of a numerical value to each outcome in a sample space.~~

~~**Rational expression.** A quotient of two polynomials with a non-zero denominator.~~

~~**Rational number**. A number expressible in the form a/b or $-a/b$ for some fraction a/b. The rational numbers include the integers.~~

~~**Rectilinear figure.** A polygon all angles of which are right angles.~~

~~**Rigid motion**. A transformation of points in space consisting of a sequence of~~

~~[3] Adapted from Wisconsin Department of Public Instruction, *op. cit.*~~
~~[4] To be more precise, this defines the *arithmetic mean*.~~

~~one or more translations, reflections, and/or rotations. Rigid motions are here assumed to preserve distances and angle measures.~~

~~**Repeating decimal**. The decimal form of a rational number. *See also:* terminating decimal.~~

~~**Sample space**. In a probability model for a random process, a list of the individual outcomes that are to be considered.~~

~~**Scatter plot**. A graph in the coordinate plane representing a set of bivariate data. For example, the heights and weights of a group of people could be displayed on a scatter plot.[5]~~

~~**Similarity transformation**. A rigid motion followed by a dilation.~~

~~**Tape diagram**. A drawing that looks like a segment of tape, used to illustrate number relationships. Also known as a strip diagram, bar model, fraction strip, or length model.~~

~~**Terminating decimal.** A decimal is called terminating if its repeating digit is 0.~~

~~**Third quartile**. For a data set with median *M*, the third quartile is the median of the data values greater than *M*. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the third quartile is 15. *See also:* median, first quartile, interquartile range.~~

~~**Transitivity principle for indirect measurement.** If the length of object A is greater than the length of object B, and the length of object B is greater than the length of object C, then the length of object A is greater than the length of object C. This principle applies to measurement of other quantities as well.~~

~~**Uniform probability model**. A probability model which assigns equal probability to all outcomes. *See also:* probability model.~~

~~**Vector.** A quantity with magnitude and direction in the plane or in space, defined by an ordered pair or triple of real numbers.~~

~~**Visual fraction model.** A tape diagram, number line diagram, or area model.~~

~~**Whole numbers**. The numbers 0, 1, 2, 3, ….~~

[5] ~~Adapted from Wisconsin Department of Public Instruction, *op. cit.*~~

~~Table 1. Common addition and subtraction situations.~~[6]

	~~result Unknown~~	~~Change Unknown~~	~~Start Unknown~~
~~add to~~	~~Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now?~~ ~~2 + 3 = ?~~	~~Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two?~~ ~~2 + ? = 5~~	~~Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before?~~ ~~? + 3 = 5~~
~~take from~~	~~Five apples were on the table. I ate two apples. How many apples are on the table now?~~ ~~5 – 2 = ?~~	~~Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat?~~ ~~5 – ? = 3~~	~~Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before?~~ ~~? – 2 = 3~~
	~~total Unknown~~	~~addend Unknown~~	~~Both addends Unknown~~[2]
~~Put together/ take apart~~[1]	~~Three red apples and two green apples are on the table. How many apples are on the table?~~ ~~3 + 2 = ?~~	~~Five apples are on the table. Three are red and the rest are green. How many apples are green?~~ ~~3 + ? = 5, 5 – 3 = ?~~	~~Grandma has five flowers. How many can she put in her red vase and how many in her blue vase?~~ ~~5 = 0 + 5, 5 = 5 + 0~~ ~~5 = 1 + 4, 5 = 4 + 1~~ ~~5 = 2 + 3, 5 = 3 + 2~~
	~~difference Unknown~~	~~Bigger Unknown~~	~~Smaller Unknown~~
~~Compare~~[3]	~~("How many more?" version):~~ ~~Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy?~~ ~~("How many fewer?" version):~~ ~~Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie?~~ ~~2 + ? = 5, 5 – 2 = ?~~	~~(Version with "more"):~~ ~~Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have?~~ ~~(Version with "fewer"):~~ ~~Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have?~~ ~~2 + 3 = ?, 3 + 2 = ?~~	~~(Version with "more"):~~ ~~Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have?~~ ~~(Version with "fewer"):~~ ~~Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have?~~ ~~5 – 3 = ?, ? + 3 = 5~~

~~[1]These take apart situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children understand that the = sign does not always mean makes or results in but always does mean is the same number as.~~

~~[2]Either addend can be unknown, so there are three variations of these problem situations. Both Addends Unknown is a productive extension of this basic situation, especially for small numbers less than or equal to 10.~~

~~[3]For the Bigger Unknown or Smaller Unknown situations, one version directs the correct operation (the version using more for the bigger unknown and using less for the smaller unknown). The other versions are more difficult.~~

~~[6]Adapted from Box 2-4 of Mathematics Learning in Early Childhood, National Research Council (2009, pp. 32, 33).~~

~~Table 2. Common multiplication and division situations.[7]~~

	~~Unknown Product~~	~~Group Size Unknown ("How many in each group?" Division)~~	~~number of Groups Unknown ("How many groups?" Division)~~
	~~$3 \times 6 = ?$~~	~~$3 \times ? = 18$, and $18 \div 3 = ?$~~	~~$? \times 6 = 18$, and $18 \div 6 = ?$~~
~~equal Groups~~	~~There are 3 bags with 6 plums in each bag. How many plums are there in all?~~ ~~*Measurement example*. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?~~	~~If 18 plums are shared equally into 3 bags, then how many plums will be in each bag?~~ ~~*Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?~~	~~If 18 plums are to be packed 6 to a bag, then how many bags are needed?~~ ~~*Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?~~
~~arrays,[4] area[5]~~	~~There are 3 rows of apples with 6 apples in each row. How many apples are there?~~ ~~*Area example*. What is the area of a 3 cm by 6 cm rectangle?~~	~~If 18 apples are arranged into 3 equal rows, how many apples will be in each row?~~ ~~*Area example*. A rectangle has area 18 square centimeters. If one side is 3 cm long, how long is a side next to it?~~	~~If 18 apples are arranged into equal rows of 6 apples, how many rows will there be?~~ ~~*Area example*. A rectangle has area 18 square centimeters. If one side is 6 cm long, how long is a side next to it?~~
~~Compare~~	~~A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost?~~ ~~*Measurement example*. A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?~~	~~A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost?~~ ~~*Measurement example*. A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?~~	~~A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat?~~ ~~*Measurement example*. A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?~~
~~General~~	~~$a \times b = ?$~~	~~$a \times ? = p$, and $p \div a = ?$~~	~~$? \times b = p$, and $p \div b = ?$~~

~~[4]The language in the array examples shows the easiest form of array problems. A harder form is to use the terms rows and columns: The apples in the grocery window are in 3 rows and 6 columns. How many apples are in there? Both forms are valuable.~~
~~[5]Area involves arrays of squares that have been pushed together so that there are no gaps or overlaps, so array problems include these especially important measurement situations.~~

~~[7]The first examples in each cell are examples of discrete things. These are easier for students and should be given~~

~~before the measurement examples.~~

~~Table 3. The properties of operations. Here a, b and c stand for arbitrary numbers in a given number system. The properties of operations apply to the rational number system, the real number system, and the complex number system.~~

~~*Associative property of addition Commutative property of addition Additive identity property of 0 Existence of additive inverses Associative property of multiplication Commutative property of multiplication Multiplicative identity property of 1 Existence of multiplicative inverses*~~ ~~*Distributive property of multiplication over addition*~~	~~$(a + b) + c = a + (b + c)$ $a + b = b + a$~~ ~~$a + 0 = 0 + a = a$~~ ~~For every a there exists $–a$ so that $a + (–a) = (–a) + a = 0$. $(a \times b) \times c = a \times (b \times c)$~~ ~~$a \times b = b \times a$ $a \times 1 = 1 \times a = a$~~ ~~For every $a \neq 0$ there exists $^1/a$ so that $a \times {}^1/a = {}^1/a \times a = 1$.~~ ~~$a \times (b + c) = a \times b + a \times c$~~

~~Table 4. The properties of equality. Here a, b and c stand for arbitrary numbers in the rational, real, or complex number systems.~~

~~*Reflexive property of equality Symmetric property of equality Transitive property of equality Addition property of equality Subtraction property of equality Multiplication property of equality Division property of equality Substitution property of equality*~~	~~$a = a$~~ ~~If $a = b$, then $b = a$.~~ ~~If $a = b$ and $b = c$, then $a = c$. If $a = b$, then $a + c = b + c$. If $a = b$, then $a – c = b – c$. If $a = b$, then $a \times c = b \times c$.~~ ~~If $a = b$ and $c \neq 0$, then $a \div c = b \div c$.~~ ~~If $a = b$, then b may be substituted for a~~ ~~in any expression containing a.~~

~~Table 5. The properties of inequality. Here a, b and c stand for arbitrary numbers in the rational or real number systems.~~

~~Exactly one of the following is true: $a < b$, $a = b$, $a > b$.~~ ~~If $a > b$ and $b > c$ then $a > c$.~~ ~~If $a > b$, then $b < a$. If $a > b$, then $–a < –b$.~~ ~~If $a > b$, then $a \pm c > b \pm c$.~~ ~~If $a > b$ and $c > 0$, then $a \times c > b \times c$. If $a > b$ and $c < 0$, then $a \times c < b \times c$. If $a > b$ and $c > 0$, then $a \div c > b \div c$. If $a > b$ and $c < 0$, then $a \div c < b \div c$.~~

~~Sample of Works Consulted~~

~~Existing state standards documents.~~

~~Research summaries and briefs provided to the Working Group by researchers.~~

~~National Assessment Governing Board, *Mathematics Framework for the 2009 National Assessment of Educational Progress*. U.S. Department of Education, 2008.~~

~~NAEP Validity Studies Panel, Validity Study of the NAEP Mathematics Assessment: Grades 4 and 8. Daro et al., 2007.~~

~~Mathematics documents from: Alberta, Canada; Belgium; China; Chinese Taipei; Denmark; England; Finland; Hong Kong; India; Ireland; Japan; Korea; New Zealand; Singapore; Victoria (British Columbia).~~

~~Adding it Up: Helping Children Learn Mathematics. National Research Council, Mathematics Learning Study Committee, 2001.~~

~~Benchmarking for Success: Ensuring~~

~~U.S. Students Receive a World- Class Education. National Governors Association, Council of Chief State School Officers, and Achieve, Inc., 2008.~~

~~*Crossroads in Mathematics* (1995) and~~

~~*Beyond Crossroads* (2006).~~

~~American Mathematical Association of Two-Year Colleges (AMATYC).~~

~~*Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence*. National Council of Teachers of Mathematics, 2006.~~

~~*Focus in High School Mathematics: Reasoning and Sense Making*. National Council of Teachers of Mathematics. Reston, VA: NCTM.~~

~~*Foundations for Success: The Final Report of the National Mathematics Advisory Panel*. U.S. Department of Education: Washington, DC, 2008.~~

~~*Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report: A PreK-12 Curriculum Framework*.~~

~~*How People Learn: Brain, Mind, Experience, and School*. Bransford, J.D., Brown, A.L., and Cocking, R.R., eds. Committee on Developments in the Science of Learning, Commission on Behavioral and Social Sciences and Education, National Research Council, 1999.~~

~~*Mathematics and Democracy, The Case for Quantitative Literacy*, Steen, L.A. (ed.). National Council on Education and the Disciplines, 2001.~~

~~*Mathematics Learning in Early Childhood: Paths Toward Excellence and*~~

~~*Equity*. Cross, C.T., Woods, T.A., and Schweingruber, S., eds. Committee on Early Childhood Mathematics, National Research Council, 2009.~~

~~*The Opportunity Equation: Transforming Mathematics and Science Education for Citizenship and the Global Economy*. The Carnegie Corporation of New~~

~~York and the Institute for Advanced Study, 2009. Online: http://www.opportunityequation.org/~~

~~*Principles and Standards for School Mathematics*. National Council of Teachers of Mathematics, 2000.~~

~~*The Proficiency Illusion*. Cronin, J., Dahlin, M., Adkins, D., and Kingsbury, G.G.; foreword by C.E. Finn, Jr., and M. J. Petrilli. Thomas B. Fordham Institute, 2007.~~

~~*Ready or Not: Creating a High School Diploma That Counts*. American Diploma Project, 2004.~~

~~*A Research Companion to Principles and Standards for School Mathematics*. National Council of Teachers of Mathematics, 2003.~~

~~*Sizing Up State Standards 2008*. American Federation of Teachers, 2008.~~

~~*A Splintered Vision: An Investigation of U.S. Science and Mathematics*~~

~~*Education*. Schmidt, W.H., McKnight, C.C., Raizen, S.A., et al. U.S. National Research Center for the Third International Mathematics and Science Study, Michigan State University, 1997.~~

~~*Stars By Which to Navigate? Scanning National and International Education Standards in 2009*. Carmichael, S.B., Wilson. W.S, Finn, Jr., C.E., Winkler, A.M., and Palmieri, S. Thomas B. Fordham Institute, 2009.~~

~~Askey, R., "Knowing and Teaching Elementary Mathematics," *American Educator*, Fall 1999.~~

~~Aydogan, C., Plummer, C., Kang, S. J., Bilbrey, C., Farran, D. C., & Lipsey,~~

~~M. W. (2005). An investigation of prekindergarten curricula: Influences on classroom characteristics and child~~

~~engagement. Paper presented at the NAEYC.~~

~~Blum, W., Galbraith, P. L., Henn, H-W. and Niss, M. (Eds) *Applications and Modeling in Mathematics Education*, ICMI Study 14. Amsterdam: Springer.~~

~~Brosterman, N. (1997). *Inventing kindergarten*. New York: Harry N. Abrams.~~

~~Clements, D. H., & Sarama, J. (2009).~~

~~*Learning and teaching early math: The learning trajectories approach*. New York: Routledge.~~

~~Clements, D. H., Sarama, J., & DiBiase, A.-~~

~~M. (2004). Clements, D. H., Sarama, J., & DiBiase, A.-M. (2004). *Engaging young children in mathematics: Standards for early childhood mathematics education*. Mahwah, NJ: Lawrence Erlbaum Associates.~~

~~Cobb and Moore, "Mathematics, Statistics, and Teaching," *Amer. Math. Monthly* 104(9), pp. 801-823, 1997.~~

~~Confrey, J., "Tracing the Evolution of Mathematics Content Standards in the United States: Looking Back and Projecting Forward." K12 Mathematics Curriculum Standards conference proceedings, February 5-6, 2007.~~

~~Conley, D.T. *Knowledge and Skills for University Success*, 2008.~~

~~Conley, D.T. *Toward a More Comprehensive Conception of College Readiness*, 2007.~~

~~Cuoco, A., Goldenberg, E. P., and Mark, J., "Habits of Mind: An Organizing~~

~~Principle for a Mathematics Curriculum," *Journal of Mathematical Behavior*, 15(4), 375-402, 1996.~~

~~Carpenter, T. P., Fennema, E., Franke, M. L., Levi, L., & Empson, S. B. (1999). *Children's Mathematics: Cognitively Guided Instruction*. Portsmouth, NH: Heinemann.~~

~~Van de Walle, J. A., Karp, K., & Bay-Williams, J. M. (2010). *Elementary and Middle School Mathematics: Teaching Developmentally* (Seventh ed.). Boston: Allyn and Bacon.~~

~~Ginsburg, A., Leinwand, S., and Decker, K., "Informing Grades 1-6 Standards Development: What Can Be Learned from High-Performing Hong Kong, Korea, and Singapore?" American Institutes for Research, 2009.~~

~~Ginsburg et al., "What the United States Can Learn From Singapore's World- Class Mathematics System (and what Singapore can learn from the United States)," American Institutes for Research, 2005.~~

~~Ginsburg et al., "Reassessing U.S. International Mathematics Performance: New Findings from the 2003 TIMMS and PISA," American Institutes for Research, 2005.~~

~~Ginsburg, H. P., Lee, J. S., & Stevenson-Boyd, J. (2008). Mathematics education for young children: What it is and how to promote it. *Social Policy Report*, 22(1), 1-24.~~

~~Harel, G., "What is Mathematics? A Pedagogical Answer to a Philosophical Question," in R. B. Gold and R. Simons (eds.), *Current Issues in the Philosophy of Mathematics from the Perspective of Mathematicians.* Mathematical Association of America, 2008.~~

~~Henry, V. J., & Brown, R. S. (2008). First- grade basic facts: An investigation into teaching and learning of an accelerated, high-demand memorization standard. *Journal for Research in Mathematics Education*, 39, 153-183.~~

~~Howe, R., "From Arithmetic to Algebra." Howe, R., "Starting Off Right in~~

~~Arithmetic," http://math.arizona.~~

~~edu/~ime/2008-09/MIME/BegArith.pdf.~~

~~Jordan, N. C., Kaplan, D., Ramineni, C., and Locuniak, M. N., "Early math matters: kindergarten number competence and later mathematics outcomes," *Dev. Psychol.* 45, 850–867, 2009.~~

~~Kader, G., "Means and MADS," *Mathematics Teaching in the Middle School*, 4(6), 1999, pp. 398-403.~~

~~Kilpatrick, J., Mesa, V., and Sloane, F., "U.S. Algebra Performance in an International Context," in Loveless (ed.), *Lessons Learned: What International Assessments Tell Us About Math Achievement.* Washington, D.C.: Brookings Institution Press, 2007.~~

~~Leinwand, S., and Ginsburg, A., "Measuring Up: How the Highest Performing State (Massachusetts) Compares to the Highest Performing Country (Hong Kong) in Grade 3 Mathematics," American Institutes for Research, 2009.~~

~~Niss, M., "Quantitative Literacy and Mathematical Competencies," in *Quantitative Literacy: Why Numeracy Matters for Schools and Colleges*, Madison, B. L., and Steen, L.A. (eds.), National Council on Education and the Disciplines. Proceedings of the National Forum on Quantitative Literacy held at the National Academy of Sciences in Washington, D.C., December 1-2, 2001.~~

~~Pratt, C. (1948). I learn from children. New York: Simon and Schuster.~~

~~Reys, B. (ed.), *The Intended Mathematics Curriculum as Represented in State- Level Curriculum Standards: Consensus or Confusion?* IAP-Information Age Publishing, 2006.~~

~~Sarama, J., & Clements, D. H. (2009).~~

~~*Early childhood mathematics education research: Learning trajectories for young children.* New York: Routledge.~~

~~Schmidt, W., Houang, R., and Cogan, L., "A Coherent Curriculum: The Case of Mathematics," *American Educator*, Summer 2002, p. 4.~~

~~Schmidt, W.H., and Houang, R.T., "Lack~~

~~of Focus in the Intended Mathematics Curriculum: Symptom or Cause?" in Loveless (ed.), *Lessons Learned: What International Assessments Tell Us About Math Achievement.* Washington, D.C.: Brookings Institution Press, 2007.~~

~~Steen, L.A., "Facing Facts: Achieving Balance in High School Mathematics." *Mathematics Teacher*, Vol. 100. Special Issue.~~

~~Wu, H., "Fractions, decimals, and rational numbers," 2007, http://math.berkeley.~~

~~edu/~wu/ (March 19, 2008).~~

~~Wu, H., "Lecture Notes for the 2009 Pre- Algebra Institute," September 15, 2009.~~

~~Wu, H., "Preservice professional development of mathematics teachers," http://math.berkeley.edu/~wu/pspd2. pdf.~~

~~Massachusetts Department of Education.~~

~~Progress Report of the Mathematics Curriculum Framework Revision Panel, Massachusetts Department of Elementary and Secondary Education, 2009.~~

~~www.doe.mass.edu/boe/docs/0509/ item5_report.pdf.~~

~~ACT College Readiness Benchmarks™
ACT College Readiness Standards™
ACT National Curriculum Survey™~~

~~Adelman, C., *The Toolbox Revisited: Paths to Degree Completion From High School Through College*, 2006.~~

~~*Advanced Placement Calculus, Statistics and Computer Science Course Descriptions. May 2009, May 2010.*~~

~~College Board, 2008.~~

~~*Aligning Postsecondary Expectations and High School Practice: The Gap Defined* (ACT: Policy Implications of the ACT National Curriculum Survey Results 2005-2006).~~

~~*Condition of Education, 2004: Indicator 30, Top 30 Postsecondary Courses,* U.S. Department of Education, 2004.~~

~~*Condition of Education, 2007: High School Course-Taking.* U.S. Department of Education, 2007.~~

~~*Crisis at the Core: Preparing All Students for College and Work*, ACT.~~

~~Achieve, Inc., Florida Postsecondary Survey, 2008.~~

~~Golfin, Peggy, et al. CNA Corporation.~~

~~*Strengthening Mathematics at the Postsecondary Level: Literature Review and Analysis*, 2005.~~

~~Camara, W.J., Shaw, E., and Patterson,~~

~~B. (June 13, 2009). First Year English and Math College Coursework. College Board: New York, NY (Available from authors).~~

~~CLEP Precalculus Curriculum Survey: Summary of Results. The College Board, 2005.~~

~~College Board Standards for College Success: Mathematics and Statistics. College Board, 2006.~~

~~Miller, G.E., Twing, J., and Meyers,~~

~~J. "Higher Education Readiness Component (HERC) Correlation Study." Austin, TX: Pearson.~~

~~*On Course for Success: A Close Look at Selected High School Courses That Prepare All Students for College and Work*, ACT.~~

~~*Out of Many, One: Towards Rigorous Common Core Standards from the Ground Up.* Achieve, 2008.~~

~~*Ready for College and Ready for Work: Same or Different?* ACT.~~

~~Rigor at Risk: Reaffirming Quality in the High School Core Curriculum, ACT.~~

~~*The Forgotten Middle: Ensuring that All Students Are on Target for College and Career Readiness before High School*, ACT.~~

~~Achieve, Inc., Virginia Postsecondary Survey, 2004.~~

~~ACT Job Skill Comparison Charts. Achieve, Mathematics at Work, 2008.~~

~~*The American Diploma Project Workplace Study.* National Alliance of Business Study, 2002.~~

~~Carnevale, Anthony and Desrochers, Donna. *Connecting Education Standards and Employment: Course-taking Patterns of Young Workers*, 2002.~~

~~Colorado Business Leaders' Top Skills, 2006.~~

~~*Hawai'i Career Ready Study: access to living wage careers from high school*, 2007.~~

~~States' Career Cluster Initiative. *Essential Knowledge and Skill Statements*, 2008.~~

~~ACT WorkKeys Occupational Profiles™. Program for International Student~~

~~Assessment (PISA), 2006.~~

~~Trends in International Mathematics and Science Study (TIMSS), 2007.~~

~~International Baccalaureate, Mathematics Standard Level, 2006.~~

~~University of Cambridge International Examinations: General Certificate of Secondary Education in Mathematics, 2009.~~

~~EdExcel, General Certificate of Secondary Education, Mathematics, 2009.~~

~~Blachowicz, Camille, and Fisher, Peter. "Vocabulary Instruction." In *Handbook of Reading Research*, Volume III, edited by Michael Kamil, Peter Mosenthal,~~

~~P. David Pearson, and Rebecca Barr,~~

~~pp. 503-523. Mahwah, NJ: Lawrence Erlbaum Associates, 2000.~~

~~Gándara, Patricia, and Contreras, Frances.~~

~~*The Latino Education Crisis: The Consequences of Failed Social Policies.* Cambridge, Ma: Harvard University Press, 2009.~~

~~Moschkovich, Judit N. "Supporting the Participation of English Language Learners in Mathematical Discussions." *For the Learning of Mathematics* 19 (March 1999): 11-19.~~

~~Moschkovich, J. N. (in press). Language, culture, and equity in secondary mathematics classrooms. To appear in F. Lester & J. Lobato (ed.), Teaching~~

~~and Learning Mathematics: Translating Research to the Secondary Classroom, Reston, VA: NCTM.~~

~~Moschkovich, Judit N. "Examining Mathematical Discourse Practices," *For the Learning of Mathematics* 27 (March 2007): 24-30.~~

~~Moschkovich, Judit N. "Using Two Languages when Learning Mathematics: How Can Research Help Us Understand Mathematics Learners Who Use Two Languages?" *Research Brief and*~~

~~*Clip*, National Council of Teachers of~~

~~Mathematics, 2009 http://www.nctm. org/uploadedFiles/Research_News_ and_Advocacy/Research/Clips_and_Briefs/Research_brief_12_Using_2.pdf. (accessed November 25, 2009).~~

~~Moschkovich, J.N. (2007) Bilingual Mathematics Learners: How views of language, bilingual learners, and~~

~~mathematical communication impact~~

~~instruction. In Nasir, N. and Cobb, P. (eds.), *Diversity, Equity, and Access to Mathematical Ideas*. New York: Teachers College Press, 89-104.~~

~~Schleppegrell, M.J. (2007). The linguistic challenges of mathematics teaching and learning: A research review. *Reading & Writing Quarterly,* 23:139-159.~~

~~Individuals with Disabilities Education Act (IDEA), 34 CFR §300.34 (a). (2004).~~

~~Individuals with Disabilities Education Act (IDEA), 34 CFR §300.39 (b)(3). (2004).~~

~~Office of Special Education Programs,~~

~~U.S. Department of Education. "IDEA Regulations: Identification of Students with Specific Learning Disabilities," 2006.~~

~~Thompson, S. J., Morse, A.B., Sharpe, M., and Hall, S., "Accommodations Manual: How to Select, Administer and Evaluate Use of Accommodations and Assessment for Students with Disabilities," 2nd Edition. Council of Chief State School Officers, 2005.~~

INITIAL DRAFT 06/23/2021

Idaho Content Standards – Mathematics

IDAHO STATE DEPARTMENT OF EDUCATION
CONTENT AND CURRICULUM| MATHEMATICS

650 W STATE STREET, 2ND FLOOR
BOISE, IDAHO 83702
208 332 6800 OFFICE
WWW.SDE.IDAHO.GOV

CREATED 06/23/2021

In March of 2020, the Idaho Legislature directed the State Board of Education to replace the present Idaho Content Standards in Mathematics. They wanted standards which work for students, parents, and educators. Specifically, the legislators asked that new standards address the following issues in mathematics:

a. Explicitly state grade levels at which students should demonstrate mastery of addition, subtraction, multiplication, and division facts. Integrate these basics with critical thinking and real-life problem solving throughout the standards to ensure more connections to science, business, and other related disciplines.
b. Reduce the number of standards, use less complex verbiage, and prioritize the more important concepts without marginalizing the accuracy of the standards.
c. Ensure the standards are age and grade level-appropriate especially in the early grades, emphasizing the concrete nature of young minds.
d. Make certain that standards requiring problem solving are age appropriate and do not exceed the knowledge standards accepted for each grade level.

The Superintendent's Office of Public Instruction worked with a variety of stakeholders to accept nominations for working group members. The working group was comprised of twenty-four members representing a cross-section of grade levels and roles. These committees included community members, mathematics consultants, and mathematics educators across all grade levels from Kindergarten to four-year colleges. The time and effort they put into this revision was invaluable. Throughout the process of the revision of the standards, the working group received public comments that the revision committees took into consideration. The working group appreciates those who took time to share their thoughts on the revisions. We hope that the changes to these standards allow them to be useful for all stakeholders, including educators, families, students, and community members. We hope that they bring Idaho into a new chapter of statewide success in mathematics.

Respectfully Submitted by,

The Mathematics Standards Working Group Members

Adam Uptmor, Administrator
Corey Friis, Teacher
Jordan Hagen, Teacher
Kacey Diemert, Higher Education
Melanie Blad, Teacher
Sen. David Lent, Legislator
Brandi Griggs, Community Member

Erin Corwine, Teacher
Justin Pickens, Teacher
Kelli Rich, Teacher
Kathryn Atkinson, Teacher
Kenn Roberts, Community Member
Katie Bösch-Wilson, Teacher
Michele Carney, Higher Education

Rep. Ryan Kerby, Legislator
Ann Abbott, Higher Education
Hem Acharya, Teacher
Shannon Murray, Higher Education
Sen. Janie Ward-Engelking, Legislator
Levi Jaynes, Administrator
Cathy Carson, Higher Education

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PREAMBLE

Focus

In the past, mathematics standards and curricula were often criticized for covering too much content in each grade level. This created a "shallow" understanding of important math concepts as students moved through the grade levels. The Idaho Content Standards for Mathematics address this by concentrating on major and age-appropriate topics in each grade to allow students to focus their learning at a greater depth.

Coherence

Explicit connections of mathematics topics within each grade level and across grade levels results in coherence. Most of these connections happen across grade level, as the standards support a progression of increasing knowledge and skills.

Thinking across grades: The design of the Idaho Content Standards for Mathematics allows administrators and teachers to connect learning within and across grades. For example, the standards develop fractions and multiplication across elementary grade levels, so that students can build new understanding on foundations that were established in previous years. These topics directly connect to learning in the middle and high school grades as students deepen their knowledge of rational numbers and algebra concepts. Therefore, each standard builds on previous learning and is not a completely new topic.

Linking to major topics: Topics within a grade level are identified as major, additional, or supporting. This can be seen in each grade level overview. This identification allows for teachers to make connections between the additional and supporting topics and the major topics. For example, in grade three, bar graphs are not taught in isolation from other topics. Rather, students use information presented in bar graphs to solve problems using the four operations of arithmetic. Each grade level overview shows the major, supporting, and additional topics.

Rigor

Rigorous teaching in mathematics is more than increasing the difficulty or complexity of tasks. Incorporating rigor into classroom instruction and student learning means exploring at a greater depth the standards and ideas with which students are grappling. There are three components of rigor and each is equally important to student mastery: Conceptual Understanding, Procedural Skill and Fluency, and Application.

Conceptual Understanding refers to understanding mathematical concepts, operations, and relations. It is more than knowing isolated facts and methods. Students should be able to understand why a mathematical idea is important and the contexts in which it is useful. Conceptual understanding allows students to connect prior knowledge to new ideas and concepts.

Procedural Skill and Fluency is the ability to apply procedures accurately, efficiently, and flexibly while giving students opportunities to practice basic skills. Students' ability to solve more complex application tasks is dependent on procedural skill and fluency.

Application provides valuable context for learning and the opportunity to solve problems in a relevant and a meaningful way. Through real-world application, students learn to select an efficient method to find a solution, determine whether the solution makes sense by reasoning, and develop critical thinking skills. This may take the form of a word problem or other contextually related problem.

A Special Note about Procedural Skill and Fluency

Number sense is a fundamental bridge to algebraic thinking for middle and high school mathematics. As students increase their number sense, they see relationships between numbers, think flexibly, and recognize emerging patterns. They make reasonable estimates, compute fluently, and use visual models to apply procedures for solving problems based on the particular numbers involved. In short, "number sense reflects a deep understanding of mathematics, but it comes about through a mathematical mindset that is focused on making sense of numbers and quantities" (Boaler, 2016, p. 36). While speed is a component of fluency, it is not the only indicator that a student is fluent; rather, fluency can be observed by watching how the student engages with a particular problem. Furthermore, fluency does not require the most efficient strategy. The standards specify grade-level appropriate strategies or types of strategies with which students should demonstrate fluency (e.g., 1.OA.C.6 allows for students to use counting on, making ten, creating equivalent but easier or known sums, etc.). It should also be noted that teachers should expect some procedures to take longer than others (e.g., fluency with the standard algorithm for division, 6.NS.B.2, as compared to fluently adding and subtracting within 10, 1.OA.C.6). Students with a strong number sense develop foundational skills which transfer to nearly all mathematical domains, from measurement and geometry to data and equations. Students continue to strengthen their number sense when they communicate ideas, explain their reasoning, and discuss the thinking of others. Discussing mathematical thinking with peers gives each student the opportunity to internalize a cohesive structure for numbers.

What the Idaho Content Standards in Mathematics Do

The standards define what all students are expected to know and be able to do, not how teachers should teach. While the standards focus on what is most essential, they do not describe all that can or should be taught. A great deal is left to the discretion of local school districts, teachers, and curriculum developers. No set of grade-level standards can reflect the great variety of abilities, needs, learning rates, and achievement levels in any given classroom. The standards define neither the support materials that some students may need, nor the advanced materials that others may need access to. It is also beyond the scope of the standards to define the full range of support appropriate for English learners and for students with disabilities. All students must have the opportunity to learn rigorous grade level standards if they are to access the knowledge and skills that will be necessary in their post-high-school lives.

Standards vs. Curriculum

No specific curriculum or strategies are required by the State of Idaho to be used to teach the Idaho Content Standards in Mathematics. Local schools and districts make decisions about what resources will be used to teach the standards.

ORGANIZATION OF THE KINDERGARTEN TO GRADE 8 CONTENT STANDARDS

The Kindergarten through grade 8 content standards in this Framework are organized by **grade level**. Within each grade level, standards are grouped first by **domain**. Each domain is further subdivided into **clusters** of related standards.

- **Standards** define what students should understand and be able to do.
- **Clusters** are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.
- **Domains** are larger groups of related standards. Standards from different domains may sometimes be closely related.

The table below shows which domains are addressed at each grade level:

Progression of K–8 Domains

Domain	Grade Level								
	K	1	2	3	4	5	6	7	8
Counting and Cardinality									
Operations and Algebraic Thinking									
Number and Operations in Base Ten									
Number and Operations – Fractions									
The Number System									
Ratios and Proportional Relationships									
Expressions and Equations									
Functions									
Measurement and Data									
Geometry									
Statistics and Probability									

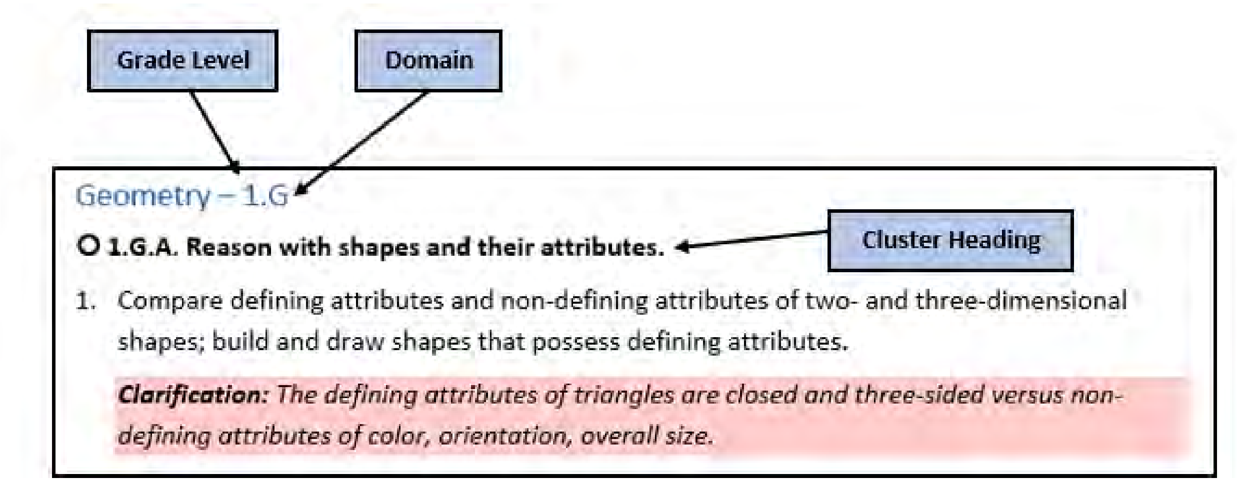
Format for Each Grade Level

Each grade level is presented in the same format:

- An introduction and description of the focus areas for learning at that grade.
- An overview of that grade's domains and clusters.
- The grade-level Standards for Mathematical Practice.
- The content standards for that grade (presented by domain, cluster heading, and individual standard).

Standards Identifiers/Coding

Each standard has a unique identifier that consists of the grade level (K, 1, 2, 3, 4, 5, 6, 7, or 8), the domain code, cluster code, and the standard number, as shown in the example below. The cluster heading also includes a shape (O) to describe its focus in relation to the other clusters within the grade level.



The standard highlighted above is identified as 1.G.A.1, identifying it as a grade 1 (1.) standard in the Geometry domain (G.), and as the first standard in that cluster (A.1). All of the standards use a common coding system.

KINDERGARTEN

Introduction

In kindergarten, instruction should focus on the following: (1) representing, relating, and operating on whole numbers, initially with sets of objects; and (2) describing shapes and space. More learning time in kindergarten should be devoted to number than to other topics.

1. Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as $5 + 2 = 7$ and $7 - 2 = 5$. (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting, and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.
2. Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Kindergarten Overview

Counting and Cardinality

☐ A. Know number names and the count sequence.
☐ B. Count to tell the number of objects.
☐ C. Compare numbers.

Operations and Algebraic Thinking

☐ A. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base 10

☐ A. Work with numbers 11-19 to gain foundations for place value.

Measurement and Data

○ A. Describe and compare measurable attributes.
△ B. Classify objects and count the number of objects in each category.

Geometry

○ A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).
△ B. Analyze, compare, create, and compose shapes.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For kindergarten this standard is:

- K.OA.A.5 Fluently add and subtract within five, including zero.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Kindergarten Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In kindergarten, students begin to build the understanding that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Real-life experiences should be used to support students' ability to connect mathematics to the world. To help students connect the language of mathematics to everyday life, ask students questions such as "How many students are absent?" or have them gather enough blocks for the students at their table. Younger students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" or they may try another strategy.

MP.2 Reason abstractly and quantitatively.
Younger students begin to recognize that a number represents a specific quantity. Then, they connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. For example, a student may write the numeral 11 to represent an amount of objects counted, select the correct number card 17 to follow 16 on a calendar, or build two piles of counters to compare the numbers 5 and 8. In addition, kindergarten students begin to draw pictures, manipulate objects, or use diagrams or charts to express quantitative ideas. Students need to be encouraged to answer questions such as "How do you know?", which reinforces their reasoning and understanding and helps student develop mathematical language.

MP.3 Construct viable arguments and critique the reasoning of others.
Younger students construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They also begin to develop their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking. They begin to develop the ability to reason and analyze situations as they consider questions such as "Are you sure that ___?", "Do you think that would happen all the time?", and "I wonder why ___?"

MP.4 Model with mathematics.

In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. For example, a student may use cubes or tiles to show the different number pairs for 5, or place three objects on a 10-frame and then determine how many more are needed to “make a ten.” Students rely on manipulatives (or other visual and concrete representations) while solving tasks and record an answer with a drawing or equation.

MP.5 Use appropriate tools strategically.
Younger students begin to consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, kindergarteners may decide that it might be advantageous to use linking cubes to represent two quantities and then compare the two representations side-by-side or later, make math drawings of the quantities. Students decide which tools may be helpful to use depending on the problem or task and explain why they use particular mathematical tools.

MP.6 Attend to precision.
Kindergarten students begin to develop precise communication skills, calculations, and measurements. Students describe their own actions, strategies, and reasoning using grade level appropriate vocabulary. Opportunities to work with pictorial representations and concrete objects can help students develop understanding and descriptive vocabulary. For example, students describe and compare two- and three-dimensional shapes and sort objects based on appearance. While measuring objects iteratively (repetitively), students check to make sure that there are no gaps or overlaps. During tasks involving number sense, students check their work to ensure the accuracy and reasonableness of solutions. Students should be encouraged to answer questions such as, “How do you know your answer is reasonable?”

MP.7 Look for and make use of structure.
Younger students begin to discern a pattern or structure in the number system. For instance, students recognize that $3 + 2 = 5$ and $2 + 3 = 5$. Students use counting strategies, such as counting on, counting all, or taking away, to build fluency with facts to 5. Students notice the written pattern in the “teen” numbers—that the numbers start with 1 (representing 1 ten) and end with the number of additional ones. Teachers might ask, “What do you notice when ___?”

MP.8 Look for and express regularity in repeated reasoning.
In the early grades, students notice repetitive actions in counting, computations, and mathematical tasks. For example, the next number in a counting sequence is 1 more when counting by ones and 10 more when counting by tens (or 1 more group of 10). Students

should be encouraged to answer questions such as, “What would happen if ___?” and “There are 8 crayons in the box. Some are red and some are blue. How many of each could there be?” Kindergarten students realize 8 crayons could include 4 of each color ($8 = 4 + 4$), 5 of one color and 3 of another ($8 = 5 + 3$), and so on. For each solution, students repeatedly engage in the process of finding two numbers to join together to equal 8.

Counting and Cardinality – K.CC

☐ K.CC.A. Know number names and the count sequence.

1. Count to 100 by ones and by tens.
2. Starting at a given number, count forward within 100 and backward within 20.
3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0–20 (with 0 representing a count of no objects).

☐ K.CC.B. Count to tell the number of objects.

4. Understand the relationship between numbers and quantities; connect counting to cardinality.
    a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
    b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
    c. Understand that each successive number name refers to a quantity that is one larger. Recognize the one more pattern of counting using objects.
5. Given a group of up to 20 objects, count the number of objects in that group and state the number of objects in a rearrangement of that group without recounting given a verbal or written number from 0–20, count out that many objects.

Clarification: *Objects can be arranged in a line, a rectangular array, or a circle. For as many as 10 objects, they may be arranged in a scattered configuration.*

☐ K.CC.C. Compare numbers.

6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group for groups with up to 10 objects.
7. Compare two numbers between 1 and 10 presented as written numerals.

Operations and Algebraic Thinking – K.OA

☐ K.OA.A. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

1. Represent addition and subtraction of two whole numbers within 10. Use objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
2. Solve addition and subtraction word problems within 10 by using physical, visual, and symbolic representations.

   Clarification: *Students are not expected to independently read word problems.*

3. Decompose whole numbers from 1 to 10 into pairs in more than one way by using physical, visual, or symbolic representations.

   Example*: Decomposing* 5 *may include* $5 = 2 + 3$ *and* $5 = 4 + 1$*.*

4. For a given whole number from 1 to 9, find the number that makes 10 when added to the number by using physical, visual, or symbolic representations.
5. Fluently add and subtract within five, including zero.

   Clarification: *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

Number and Operations in Base 10 – K.NBT

☐ K.NBT.A. Work with numbers 11-19 to gain foundations for place value.

1. Compose (put together) and decompose (break apart) numbers from 11 to 19 into ten ones and some further ones, and record each composition or decomposition by using physical, visual, or symbolic representations; understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

   Example*: Recording the decomposition of* 18 *may look like* $18 = 10 + 8$*.*

Measurement and Data – K.MD

○ K.MD.A. Describe and compare measurable attributes.

1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/ "less of" the attribute, and describe the difference.

   Example*: Directly compare the heights of two children and describe one child as taller/shorter.*

△ K.MD.B. Classify objects and count the number of objects in each category.

3. Classify objects into given categories; count the numbers of objects in each category (up to and including 10) and sort the categories by count.

Geometry – K.G

○ K.G.A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.
2. Correctly name shapes regardless of their orientations or overall size.
3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").

△ K.G.B. Analyze, compare, create, and compose shapes.

4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts, and other attributes.

   Examples:

   1) Number of sides and vertices/ "corners"

   2) Having sides of equal length

5. Model shapes in the world by building shapes from components/materials and drawing shapes.

   Clarification: *Components/materials may include: sticks, clay balls, marshmallows and/or spaghetti.*

6. Compose simple shapes to form larger two-dimensional shapes.

   Example: *Can you join these two triangles with full sides touching to make a rectangle?*

FIRST GRADE

Introduction

In first grade, instruction should focus on the following: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

1. Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers. They use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., "making tens") to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.
2. Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They compare whole numbers (at least to 100) to develop an understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build number sense, they understand the order of the counting numbers and their relative magnitudes.
3. Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.[1]

[1] Students should apply the principle of transitivity of measurement to make indirect comparisons, but they need not use this technical term.

4. Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine shapes, they recognize them from different perspectives and orientations, describe their geometric attributes, and determine how they are alike and different, to develop the background for measurement and for initial understandings of properties such as congruence and symmetry.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

First Grade Overview

Operations and Algebraic Thinking

☐ A. Represent and solve problems involving addition and subtraction.
☐ B. Understand and apply properties of operations and the relationship between addition and subtraction.
☐ C. Add and subtract within 20.
☐ D. Work with addition and subtraction equations.

Number and Operations in Base 10

☐ A. Extend the counting sequence.
☐ B. Understand place value.
☐ C. Use place value understanding and properties of operations to add and subtract.

Measurement and Data

☐ A. Measure lengths indirectly and by iterating (repeating) length units.
○ B. Tell and write time.
△ C. Represent and interpret data.
△ D. Work with money.

Geometry

○ A. Reason with shapes and their attributes.

Standards for Mathematical Practice

1. **1.** Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For first grade this standard is:

- 1.OA.C.6 Demonstrate fluency for addition and subtraction within 10, use strategies to add and subtract within 20.

First Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In first grade, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Younger students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They are willing to try other approaches.

MP.2 Reason abstractly and quantitatively.
Younger students recognize that a number represents a specific quantity. They connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. In first grade students make sense of quantities and relationships while solving tasks. They represent situations by decontextualizing tasks into numbers and symbols. For example, "There are 60 children on the playground and some children go line up. If there are 20 children still playing, how many children lined up?" Students translate the situation into the equation: $60 - 20 = \boxed{}$ and then solve the task. Students also contextualize situations during the problem-solving process. For example, students refer to the context of the task to determine they need to subtract 20 from 60 because the total number of children on the playground is the 20 less than the original number of children playing. Students might also reason about ways to partition two-dimensional geometric figures into halves and fourths.

MP.3 Construct viable arguments and critique the reasoning of others.
First graders construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They also practice their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?", "Explain your thinking.", and "Why is that true?" They not only explain their own thinking, but listen to others' explanations. They decide if the explanations make sense and ask questions. For example, "There are 15 books on the shelf. If you take some books off the shelf and there are now 7 left, how many books did you take off the shelf?" Students might use a variety of strategies to solve the task and then share and discuss their problem-solving strategies with their classmates.

MP.4 Model with mathematics.

In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. First grade students model real-life mathematical situations with a number sentence or an equation and check to make sure equations accurately match the problem context. Students use concrete models and pictorial representations while solving tasks and also write an equation to model problem situations. For example, to solve the problem, "There are 11 bananas on the counter. If you eat 4 bananas, how many are left?" students could write the equation $11 - 4 = 7$. Students also create a story context for an equation such as $13 - 7 = 6$.

MP.5 Use appropriate tools strategically.
In first grade, students begin to consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, first graders decide it might be best to use colored chips to model an addition problem. In first grade students use tools such as counters, place value (base ten) blocks, hundreds number boards, number lines, concrete geometric shapes (e.g., pattern blocks, 3-dimensional solids), and virtual representations to support conceptual understanding and mathematical thinking. Students determine which tools are the most appropriate to use. For example, when solving $12 + 8 = \square$, students explain why place value blocks are more appropriate than counters.

MP.6 Attend to precision.
As young children begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and when they explain their own reasoning. In grade one, students use precise communication, calculation, and measurement skills. Students are able to describe their solution strategies to mathematical tasks using grade-level appropriate vocabulary, precise explanations, and mathematical reasoning. When students measure objects iteratively (repetitively), they check to make sure there are no gaps or overlaps. Students regularly check their work to ensure the accuracy and reasonableness of solutions.

MP.7 Look for and make use of structure.
First graders begin to discern a pattern or structure. For instance, if students recognize $12 + 3 = 15$, then they also know $3 + 12 = 15$. (Commutative property of addition.) To add $4 + 6 + 4$, the first two numbers can be added to make a ten, so $4 + 6 + 4 = 10 + 4 = 14$. While solving addition problems, students begin to recognize the commutative property, for example $7 + 4 = 11$, and $4 + 7 = 11$. While decomposing two-digit numbers, students realize that any two-digit number can be broken up into tens and ones, e.g. $35 = 30 + 5$, $76 = 70 + 6$. Grade

one students make use of structure when they work with subtraction as a missing addend problem, such as $13 - 7 = \square$ can be written as $7 + \square = 13$ and can be thought of as how much more do I need to add to 7 to get to 13?

MP.8 Look for and express regularity in repeated reasoning.

First grade students begin to look for regularity in problem structures when solving mathematical tasks. For example, students add three one-digit numbers by using strategies such as “make a ten” or doubles. Students recognize when and how to use strategies to solve similar problems. For example, when evaluating $8 + 7 + 2$, a student may say, “I know that 8 and 2 equals 10, then I add 7 to get to 17. It helps if I can make a 10 out of two numbers when I start.” Students use repeated reasoning while solving a task with multiple correct answers. For example, students might solve the problem, “There are 12 crayons in the box. Some are red and some are blue. How many of each could there be?” Students use repeated reasoning to find pairs of numbers that add up to 12 (e.g., the 12 crayons could include 6 of each color ($6 + 6 = 12$), 7 of one color and 5 of another ($7 + 5 = 12$), etc.)

Operations and Algebraic Thinking – 1.OA

☐ **1.OA.A. Represent and solve problems involving addition and subtraction.**

1. Solve addition and subtraction word problems within 20 involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions by using physical, visual, and symbolic representations.
2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20 by using physical, visual, and symbolic representations.

Clarification: *Students are not expected to independently read word problems.*

☐ **1.OA.B. Understand and apply properties of operations and the relationship between addition and subtraction.**

3. Apply properties of operations to add.

Examples*:*

1) *If* $8+3=11$ *is known, then* $3+8=11$ *is also known. (commutative property of addition)*

2) To add $2+6+4$*, the second two numbers can be added to make a ten, so* $2+6+4=2+10=12$*. (associative property of addition)*

Clarification: *Students need not use formal terms for these properties.*

4. Restate a subtraction problem as a missing addend problem using the relationship between addition and subtraction.

Example: *The equation* $12-7=?$ *can be restated as* $7+?=12$ *to determine the difference is* 5*.*

☐ **1.OA.C. Add and subtract within 20.**

5. Relate counting to addition and subtraction.

Example: *When students count on* 3 *from* 4*, they should write this as* $4+3=7$*. When students count on for subtraction,* 3 *from* 7*, they should connect this to* $7-3=4$*. Students write "*$7-3=?$*" and think "I count on* $3+?=7$*."*

6. Demonstrate fluency for addition and subtraction within 10, use strategies to add and subtract within 20.

Clarification: *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

Students may use mental strategies such as counting on; making 10, decomposing a number leading to a 10, using the relationship between addition and subtraction; and creating equivalent but easier or known sums.

☐ **1.OA.D. Work with addition and subtraction equations.**

7. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.

Example: *Which of the following equations are true and which are false?* $6 = 6, 7 = 8 - 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2$

8. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers, with the unknown in any position.

Example: *Determine the unknown number that makes the equation true in each of the equations* $8+ ? = 11, 5 = ? - 3,\ 6 + 6 = ?.$

Number and Operations in Base 10 – 1.NBT

☐ **1.NBT.A. Extend the counting sequence.**

1. Starting at a given number, count forward and backwards within 120 by ones. Skip count by twos to 20, by fives to 100, and by tens to 120. In this range, read and write numerals and represent a number of objects with a written numeral.

☐ **1.NBT.B. Understand place value.**

2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand:
   a. 10 can be thought of as a bundle of ten ones — called a “ten.”
   b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
   c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).
3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols $>$, $=$, and $<$.

☐ **1.NBT.C. Use place value understanding and properties of operations to add and subtract.**

4. Add whole numbers within 100 by using physical, visual, and symbolic representations, with an emphasis on place value, properties of operations, and/or the relationship between addition and subtraction.
   a. Add a two-digit number and a one-digit number.

b. Add a two-digit number and a multiple of 10.

c. Understand that when adding two-digit numbers, combine like base-ten units such as tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

6. Subtract multiples of 10 in the range 10–90 from multiples of 10 in the range 10–90 by using physical, visual, and symbolic representations, with an emphasis on place value, properties of operations, and/or the relationships between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Example: $70 - 40$ *can be thought of as* 7 *tens take away* 4 *tens or can be rewritten as a missing addend problem* $40 + ? = 70$.

Measurement and Data – 1.MD

☐ 1.MD.A. Measure lengths indirectly and by iterating (repeating) length units.

1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.

2. Express the length of an object as a whole number of length units by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

Clarification: *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps. Include use of standard units such as inch-tiles or centimeter tiles.*

○ 1.MD.B. Tell and write time.

3. Tell and write time in hours and half-hours using analog and digital clocks.

△ 1.MD.C. Represent and interpret data.

4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

△ 1.MD.D. Work with money.

5. Identify quarters, dimes, and nickels and relate their values to pennies. Find equivalent values (e.g., a nickel is equivalent to five pennies).

Geometry – 1.G

○ 1.G.A. Reason with shapes and their attributes.

1. Compare defining attributes and non-defining attributes of two- and three-dimensional shapes; build and draw shapes that possess defining attributes.

   Clarification: *The defining attributes of triangles are closed and three-sided versus non-defining attributes of color, orientation, overall size.*

2. Compose two-dimensional (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

   Clarification: *Students do not need to learn formal names such as "right rectangular prism."*

3. Partition circles and rectangles into two and four equal shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

   a. Describe the shares using the words halves, fourths, and quarters and use the phrases half of, fourth of, and quarter of.

   b. Describe the whole as two of, or four of the shares.

SECOND GRADE

Introduction

In second grade, instruction should focus on the following: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

1. Students extend their understanding of the base-ten system. This includes ideas of counting in fives, tens, and multiples of hundreds, tens, and ones, as well as number relationships involving these units, including comparing. Students understand multi-digit numbers (up to 1,000) written in base-ten notation, recognizing that the digits in each place represent amounts of thousands, hundreds, tens, or ones (e.g., 853 is 8 hundreds + 5 tens + 3 ones).
2. Students use their understanding of addition to develop fluency with addition and subtraction within 100. They solve problems within 1,000 by applying their understanding of models for addition and subtraction, and they develop, discuss, and use efficient, accurate, and generalizable methods to compute sums and differences of whole numbers in base-ten notation, using their understanding of place value and the properties of operations. They select and accurately apply methods that are appropriate for the context and the numbers involved to mentally calculate sums and differences for numbers with only tens or only hundreds.
3. Students recognize the need for standard units of measure (centimeter and inch) and they use rulers and other measurement tools with the understanding that linear measure involves an iteration of units. They recognize that the smaller the unit, the more iterations they need to cover a given length.
4. Students describe and analyze shapes by examining their sides and angles. Students investigate, describe, and reason about decomposing and combining shapes to make other shapes. Through building, drawing, and analyzing two- and three-dimensional shapes, students develop a foundation for understanding area, volume, congruence, similarity, and symmetry in later grades.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Second Grade Overview

Operations and Algebraic Thinking

☐ A. Represent and solve problems involving addition and subtraction.
☐ B. Add and subtract within 20.
△ C. Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten

☐ A. Understand place value.
☐ B. Use place value understanding and properties of operations to add and subtract.

Measurement and Data

☐ A. Measure and estimate lengths in standard units.
☐ B. Relate addition and subtraction to length.
△ C. Work with time and money.
△ D. Represent and interpret data.

Geometry

○ A. Reason with shapes and their attributes.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For second grade these standards are:

- 2.OA.B.2 Demonstrate fluency for addition and subtraction within 20 using mental strategies. By the end of Grade 2, recall basic facts to add and subtract within 20 with automaticity.
- 2.NBT.5 Fluently add and subtract whole numbers within 100 using understanding of place value and properties of operations.

Second Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In second grade, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. They may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They make conjectures about the solution and plan out a problem-solving approach. An example for this might be giving a student an equation and having him/her write a story to match.

MP.2 Reason abstractly and quantitatively.
Younger students recognize that a number represents a specific quantity. They connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. Second graders begin to know and use different properties of operations and relate addition and subtraction to length. In second grade students represent situations by decontextualizing tasks into numbers and symbols. For example, in the task, "There are 25 children in the cafeteria, and they are joined by 17 more children. How many students are in the cafeteria?" Students translate the situation into an equation, such as: $25 + 17 = \boxed{}$ and then solve the problem. Students also contextualize situations during the problem-solving process. For example, while solving the task above, students might refer to the context of the task to determine that they need to subtract 19 if 19 children leave.

MP.3 Construct viable arguments and critique the reasoning of others.
Second graders may construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They practice their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?", "Explain your thinking.", and "Why is that true?" They not only explain their own thinking, but listen to others' explanations. They decide if the explanations make sense and ask appropriate questions. Students critique the strategies and reasoning of their classmates. For example, to solve $74 - 18$, students may use a variety of strategies, and after working on the task, they

might discuss and critique each other's' reasoning and strategies, citing similarities and differences between various problem-solving approaches.

MP.4 Model with mathematics.
In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. In grade two students model real-life mathematical situations with a number sentence or an equation and check to make sure that their equation accurately matches the problem context. They use concrete manipulatives and pictorial representations to explain the equation. They create an appropriate problem situation from an equation. For example, students create a story problem for the equation $43 + 17 = \boxed{}$ such as "There were 43 gumballs in the machine. Tom poured in 17 more gumballs. How many gumballs are now in the machine?"

MP.5 Use appropriate tools strategically.
In second grade, students consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be better suited. For instance, second graders may decide to solve a problem by drawing a picture rather than writing an equation. Students may use tools such as snap cubes, place value (base ten) blocks, hundreds number boards, number lines, rulers, virtual manipulatives, and concrete geometric shapes (e.g., pattern blocks, three-dimensional solids). Students understand which tools are the most appropriate to use. For example, while measuring the length of the hallway, students can explain why a yardstick is more appropriate to use than a ruler.

MP.6 Attend to precision.
As children begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and when they explain their own reasoning. Second grade students communicate clearly, using grade-level appropriate vocabulary accurately and precise explanations and reasoning to explain their process and solutions. For example, while measuring an object, students carefully line up the tool correctly to get an accurate measurement. During tasks involving number sense, students consider if their answer is reasonable and check their work to ensure the accuracy of solutions.

MP.7 Look for and make use of structure.
Second grade students look for patterns and structures in the number system. For example, students notice number patterns within the tens place as they connect skip counting

by 10s to corresponding numbers on a 100s chart. Students see structure in the base-ten number system as they understand that 10 ones equal a ten, and 10 tens equal a hundred. Students adopt mental math strategies based on patterns (making ten, fact families, doubles). They use structure to understand subtraction as missing addend problems (e.g., $50 - 33 = \square$ can be written as $33 + \square = 50$ and can be thought of as "How much more do I need to add to 33 to get to 50?")

MP.8 Look for and express regularity in repeated reasoning.
Second grade students notice repetitive actions in counting and computation (e.g., number patterns to skip count). When children have multiple opportunities to add and subtract, they look for shortcuts, such as using estimation strategies and then adjust the answer to compensate. Students continually check for the reasonableness of their solutions during and after completing a task by asking themselves, "Does this make sense?"

Operations and Algebraic Thinking – 2.OA

☐ 2.OA.A. Represent and solve problems involving addition and subtraction.

1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions by using physical, visual, and symbolic representations.

☐ 2.OA.B. Add and subtract within 20.

2. Demonstrate fluency for addition and subtraction within 20 using mental strategies. By the end of Grade 2, recall basic facts to add and subtract within 20 with automaticity.

Clarification: *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

Students may use mental strategies such as counting on; making 10; decomposing a number leading to a 10; using the relationship between addition and subtraction; and creating equivalent but easier or known sums.

△ 2.OA.C. Work with equal groups of objects to gain foundations for multiplication.

3. Determine whether a group of objects (up to 20) has an odd or even number of members and write an equation to express an even number as a sum of two equal addends.

Clarification: *Students may pair objects or count them by twos.*

4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

Example*: The total number of objects arranged in a* 2×5 *rectangular array can be found by adding* $2 + 2 + 2 + 2 + 2$.

Number and Operations in Base Ten – 2.NBT

☐ 2.NBT.A. Understand place value.

1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones. Understand:
    a. 100 can be thought of as a bundle of ten tens—called a "hundred."
    b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

Example*: The number* 241 *can be expressed as* $2\ hundreds + 4\ tens + 1\ one$ *or as* $24\ tens + 1\ one$ *or as* $241\ ones$.

2. Count within 1000; skip-count by fives, tens, and 100s. Identify patterns in skip counting starting at any number.
3. Read and write numbers from 0 to 1,000 using standard form, expanded form and word form.

Example*: The number two-hundred forty-one written in standard form is* 241 *and in expanded form is* $200 + 40 + 1$.

4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, recording the results of comparisons with the symbols $>$, $=$, and $<$.

☐ **2.NBT.B. Use place value understanding and properties of operations to add and subtract.**

5. Fluently add and subtract whole numbers within 100 using understanding of place value and properties of operations.

Clarification: *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

6. Add up to four two-digit numbers using strategies based on place value and properties of operations.
7. Add and subtract whole numbers within 1000 by using physical, visual, and symbolic representations, with an emphasis on place value, properties of operations, and/or the relationships between addition and subtraction.
    a. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones.
    b. Understand that sometimes it is necessary to compose or decompose tens or hundreds.

Example: *Students may use equations to represent their strategies based on place value such as:* $324 + 515 = (300 + 500) + (20 + 10) + (4 + 5) = 839$.

8. Use mental strategies to add or subtract a number that is ten more, ten less, one hundred more and one hundred less than a given three-digit number.
9. Explain why addition and subtraction strategies work, using place value and the properties of operations.

Measurement and Data – 2.MD

☐ 2.MD.A. Measure and estimate lengths in standard units.

1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
2. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
3. Estimate lengths using units of inches, feet, centimeters, and meters.
4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

☐ 2.MD.B. Relate addition and subtraction to length.

5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units.

   Clarification: *Students may use drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.*

6. Represent whole numbers as lengths from zero on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

△ 2.MD.C. Work with time and money.

7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.
8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies (up to $10), using $ and ¢ symbols appropriately and whole dollar amounts.

   Example*: A sample question could be, "If you have 2 dimes and 3 pennies, how many cents do you have? If you have $3 and 4 quarters, how many dollars or cents do you have?"*

△ 2.MD.D. Represent and interpret data.

9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Organize and record data on a line plot (dot plot) where the horizontal scale is marked off in whole-number units.
10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in the graph.

Geometry – 2.G

○ 2.G.A. Reason with shapes and their attributes.

1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, squares, rectangles, rhombi, trapezoids, pentagons, hexagons, octagons, and cubes.
2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.
3. Partition circles and rectangles into two, three, or four equal shares. Understand for these examples that decomposing into more equal shares creates smaller shares.
    a. Describe the shares using the words halves, thirds, fourths, and quarter, and use the phrases half of, a third of, a fourth of, and quarter of.
    b. Describe the whole as two of, three of, or four of the shares.
    c. Recognize that equal shares of identical wholes need not have the same shape.

THIRD GRADE

Introduction

In third grade, instruction should focus on the following: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

1. Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.
2. Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, $\frac{1}{2}$ of the paint in a small bucket could be less paint than $\frac{1}{3}$ of the paint in a larger bucket, but $\frac{1}{3}$ of a ribbon is longer than $\frac{1}{5}$ of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.
3. Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps; a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.
4. Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with

definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Third Grade Overview

Operations and Algebraic Thinking

☐ A. Represent and solve problems involving multiplication and division.

☐ B. Understand properties of multiplication and the relationship between multiplication and division.

☐ C. Multiply and divide within 100.

☐ D. Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Number and Operations in Base Ten

○ A. Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations – Fractions

☐ A. Develop understanding of fractions as numbers.

Measurement and Data

☐ A. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

△ B. Represent and interpret data.

☐ C. Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

○ D. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry

△ A. Reason with shapes and their attributes.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For third grade these standards are:

- 3.OA.C.7.b Demonstrate fluency for multiplication within 100. Know from memory all products of two single-digit numbers and related division facts.
- 3.NBT.A.2* Fluently add and subtract whole numbers within 1000 using understanding of place value and properties of operations.

**Designated as a mastery standard because students in third grade fluently add and subtract within 1000 using methods based on place value, properties of operations, and/or the relationship between addition and subtraction. They focus on methods that generalize readily to larger numbers so the relationship between addition and subtraction that these methods can be extended to 1,000,000 in fourth grade and fluency can be reached with such larger numbers.*

Third Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In third grade, mathematically proficient students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Students may use concrete objects, pictures, or drawings to help them conceptualize and solve problems, such as “Jim purchased 5 packages of muffins. Each package contained 3 muffins. How many muffins did Jim purchase?” or “Describe another situation where there would be 5 groups of 3 or 5×3.” Students may check their thinking by asking themselves, “Does this make sense?” Students listen to other students’ strategies and are able to make connections between various methods for a given problem.

MP.2 Reason abstractly and quantitatively.
Third graders should recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. For example: students apply their understanding of the meaning of the equal sign as “the same as” to interpret an equation with an unknown. When given $4 \times \square = 40$, they might think:

- 4 groups of some number is the same as 40
- 4 times some number is the same as 40
- I know that 4 groups of 10 is 40 so the unknown number is 10
- The missing factor is 10 because 4 times 10 equals 40.

Teachers might ask, “How do you know” or “What is the relationship between the quantities?” to reinforce students’ reasoning and understanding.

MP.3 Construct viable arguments and critique the reasoning of others.
Students may construct arguments using concrete referents, such as objects, pictures, and drawings. They refine their mathematical communication skills as they participate in mathematical discussions that the teacher facilities by asking questions such as “How did you get that?” and “Why is that true?” Students explain their thinking to others and respond to others’ thinking. For example, after investigating patterns on the 100s chart, students might explain why the pattern makes sense.

MP.4 Model with mathematics.

Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Third graders should evaluate their results in the context of the situation and reflect on whether the results make sense. For example, students use various contexts and a variety of models (e.g., circles, squares, rectangles, fraction bars, and number lines) to represent and develop understanding of fractions. Students use models to represent both equations and story problems and can explain their thinking. They evaluate their results in the context of the situation and reflect on whether the results make sense. Students should be encouraged to answer questions, such as "What math drawing or diagram could you make and label to represent the problem?" or "What are some ways to represent the quantities?"

MP.5 Use appropriate tools strategically.

Third graders consider the available tools (including drawings and estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper to find all the possible rectangles that have a given perimeter. They compile the possibilities into an organized list or a table and determine whether they have all the possible rectangles. Students should be encouraged to answer questions such as, "Why was it helpful to use ___?"

MP.6 Attend to precision.

As third graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the area of a rectangle they record their answers in square units.

MP.7 Look for and make use of structure.

Students look closely to discover a pattern or structure. For instance, students use properties of operations (e.g., commutative and distributive properties) as strategies to multiply and divide. Teachers might ask, "What do you notice when ___?" or "How do you know if something is a pattern?"

MP.8 Look for and express regularity in repeated reasoning.

Students in third grade should notice repetitive actions in computation and look for more shortcut methods. For example, students use the distributive property as a strategy for using products they know to solve products that they do not know. For example, if students are asked to find the product of 7×8, they might decompose 7 into 5 and 2 and then multiply

5×8 and 2×8 to arrive at $40 + 16$ or 56. In addition, third graders continually evaluate their work by asking themselves, “Does this make sense? Students should be encouraged to answer questions, such as, “What is happening in this situation?” or “What predictions or generalizations can this pattern support?”

Operations and Algebraic Thinking – 3.OA

☐ 3.OA.A. Represent and solve problems involving multiplication and division.

1. Interpret a product of whole numbers as grouping of sets, e.g., 5×7 as five groups of seven objects each.
2. Interpret a quotient of whole numbers as equal sharing, e.g., $56 \div 8$ as the number in each share when 56 objects are split into 8 equal shares, or as the number of shares when 56 objects are split into equal shares of 8 objects each.
3. Use multiplication and division within 100 to solve word problems involving equal groups, arrays, and measurements by using visual and symbolic representations, with a symbol for an unknown number.
4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

> ***Example***: *Determine the unknown number that makes the equation true in each of the equations* $8 \times ? = 48$, $5 = ? \div 3$, $6 \times 6 = ?$.

☐ 3.OA.B. Understand properties of multiplication and the relationship between multiplication and division.

5. Apply the properties of operations to multiply and divide.

> ***Clarification:*** *Students need not use formal terms for these properties (identity, communicative, associative, distributive).*

6. Understand division as determining an unknown factor in a multiplication problem.

☐ 3.OA.C. Multiply and divide within 100.

7. Demonstrate fluency for multiplication within 100.
    a. Demonstrate understanding of strategies that make use of the relationship between multiplication and division or properties of operations.
    b. Know from memory all products of two single-digit numbers and related division facts.

> ***Clarification:*** *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

☐ 3.OA.D. Solve problems involving the four operations, and identify and explain patterns in arithmetic.

8. Solve two-step word problems involving whole numbers using the four operations.
    a. Represent these problems using equations with a letter standing for the unknown quantity.

b. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding.

9. Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations.

Example: *Arithmetic patterns are patterns that change by the same rate, such as adding the same number the series* $2, 4, 6, 8, 10$ *is an arithmetic pattern that increases by* 2 *between each term.*

Number and Operations in Base Ten – 3.NBT

○ **3.NBT.A. Use place value understanding and properties of operations to perform multi-digit arithmetic**.

1. Round a whole number to the tens or hundreds place, using place value understanding or a visual representation.
2. Fluently add and subtract whole numbers within 1000 using understanding of place value and properties of operations.

Clarification: *Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

3. Multiply one-digit whole numbers by multiples of 10 in the range 10– 90 using understanding of place value and properties of operations.

Number and Operations – Fractions – 3.NF

☐ **3.NF.A. Develop understanding of fractions as numbers.**

1. Understand a fraction $\frac{1}{b}$ as the quantity formed by one part when a whole (a single unit) is partitioned into b equal parts; understand $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$.
2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.

   a. Represent a unit fraction $\frac{1}{b}$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size $\frac{1}{b}$ and that the fraction $\frac{1}{b}$ is located $\frac{1}{b}$ of a whole unit from 0 on the number line.

b. Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off a length $\frac{1}{b}$ from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line.

3. Explain equivalence of fractions and compare fractions by reasoning about their size, in limited cases.

a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.

b. Recognize and generate simple equivalent fractions, and explain why the fractions are equivalent, such as by using a visual fraction model.

Example: $\frac{1}{2} = \frac{2}{4}, \frac{4}{6} = \frac{2}{3}$

c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

Example: *Express* 3 *in the form* $3 = \frac{3}{1}$; *recognize that* $\frac{6}{1} = 6$; *locate* $\frac{4}{4}$ *and* 1 *at the same point of a number line diagram.*

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize the comparisons are valid only when the two fractions refer to the same whole. Record the results of the comparisons with the symbols $>, =$ and $<$, and justify the conclusion using visual representations and/or verbal reasoning.

Measurement and Data – 3.MD

☐ 3.MD.A. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

1. Tell and write time to the nearest minute within the same hour and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes.

Clarification: *Students may use tools such as clocks, number line diagrams, and tables to solve problems involving time intervals.*

2. Identify and use the appropriate tools and units of measurement, both customary and metric, to solve one-step word problems using the four operations involving weight, mass, liquid volume, and capacity (within the same system and unit).

Clarification: *Students may use drawings (such as a beaker with a measurement scale) to represent the problem.*

This standard does not include conversions between units. The focus is on measuring and reasonable estimates, use benchmarks to measure weight, and capacity.

△ 3.MD.B. Represent and interpret data.

3. Draw a scaled picture graph and scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

Example*: Draw a bar graph in which each square in the bar graph might represent 5 pets.*

4. Generate measurement data by measuring lengths of objects using rulers marked with halves and fourths of an inch. Record and show the data by making a line plot (dot plot), where the horizontal scale is marked off in appropriate units— whole numbers, halves, or fourths.

☐ 3.MD.C. Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

5. Recognize area as an attribute of plane figures and understand concepts of area measurement.
    a. A square with side length one unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.
    b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.
6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard units).
7. Relate area to the operations of multiplication and addition.
    a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
    b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
    c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.

Example: *Using the distributive property, the area of a shape that is* 6 *by* 7 *can be determined by finding the area of the* 6×5 *section and the* 6×2 *section and then adding the two products together.*

d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

Example*: A pool is comprised of two non-overlapping rectangles in the shape of an "L". The area for a cover of a pool can be found by adding the areas of the two non-overlapping rectangles.*

○ 3.MD.D. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

8. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Geometry – 3.G

△ 3.G.A. Reason with shapes and their attributes.

1. Understand that shapes in different categories may share attributes, and that the shared attributes can define a larger category. Compare and classify shapes by their sides and angles. Recognize rhombi, rectangles, squares, and trapezoids as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
2. Partition two-dimensional figures into equal areas, and express the area of each part as a unit fraction of the whole.

Example*: Draw lines to separate a shape into* 4 *parts with equal area, and describe the area of each part as* $\frac{1}{4}$ *of the area of the shape.*

FOURTH GRADE

Introduction

In fourth grade, instruction should focus on the following: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) and understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

1. Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.
2. Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., $\frac{15}{9} = \frac{5}{3}$), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.
3. Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Fourth Grade Overview

Operations and Algebraic Thinking

☐ A. Use the four operations with whole numbers to solve problems.
△ B. Gain familiarity with factors and multiples.
○ C. Generate and analyze patterns.

Number and Operations in Base Ten

☐ A. Generalize place value understanding for multi-digit whole numbers, less than or equal to 1,000,000.
☐ B. Use place value understanding and properties of operations to perform multi-digit arithmetic on whole numbers less than or equal to 1,000,000.

Number and Operations – Fractions

☐ A. Extend understanding of fraction equivalence and ordering.
☐ B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
☐ C. Understand decimal notation for fractions, and compare decimal fractions.

Standards for Mathematical Practice

1. **1.** Make sense of problems and persevere in solving them.
2. **2.** Reason abstractly and quantitatively.
3. **3.** Construct viable arguments and critique the reasoning of others.
4. **4.** Model with mathematics.
5. **5.** Use appropriate tools strategically.
6. **6.** Attend to precision.
7. **7.** Look for and make use of structure.
8. **8.** Look for and express regularity in repeated reasoning.

Measurement and Data

△ A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
△ B. Represent and interpret data.
○ C. Geometric measurement: understand concepts of angle and measure angles.

Geometry

○ A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For fourth grade this standard is:

- 4.NBT.B.4 Fluently use the standard algorithm for multi-digit whole number addition and subtraction.

Fourth Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In fourth grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Fourth graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, “Does this make sense?” They listen to the strategies of others and will try different approaches. They often will use another method to check their answers. Students might use an equation strategy to solve the word problem. For example, students could solve the problem “Chris bought clothes for school. She bought 3 shirts for \$12 each and a skirt for \$15. How much money did Chris spend on her new school clothes?” with the equation $3 \times \$12 + \$15 = a$. Fourth graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, “Does this make sense?” They listen to the strategies of others and will try different approaches. They often will use another method to check their answers.

MP.2 Reason abstractly and quantitatively.
Fourth graders should recognize that a number represents a specific quantity. They connect the quality to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions, record calculations with numbers, and represent or round numbers using place value concepts. Students might use base 10 blocks or drawings to demonstrate 154×6, as 154 added six times, and develop an understanding of the distributive property. For example: 154×6

$$= (100 + 50 + 4) \times 6$$

$$= (100 \times 6) + (50 \times 6) + (4 \times 6)$$

$$= 600 + 300 + 24 = 924$$

MP.3 Construct viable arguments and critique the reasoning of others.

In fourth grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?", "Explain your thinking," and "Why is that true?" They not only explain their own thinking, but listen to others' explanations. Students explain and defend their answers and solution strategies as they answer question that require an explanation. For example, "Vincent cuts 2 meters of string into 4 centimeter pieces for a craft. How many pieces of string does Vincent have? Explain your reasoning." Students ask appropriate questions, and they decide if explanations make sense. Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fourth graders should evaluate their results in the context of the situation and reflect on whether the results make sense. For example, students may use money (i.e. dollars and coins) or base 10 blocks to solve the following problem: Elsie buys a drink for $1.39 and a granola bar for $0.89. How much change will she receive if she pays with a $5 bill?

MP.5 Use appropriate tools strategically.
Fourth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper, a number line, or base 10 blocks to represent, compare, add, and subtract decimals to the hundredths. Students in fourth grade use protractors to measure angles. They use other measurement tools to understand the relative size of units within a given system and express measurements given in larger units in terms of smaller units.

MP.6 Attend to precision.
As fourth graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. For instance, they may use graph paper or a number line to represent, compare, add, and subtract decimals to the hundredths. Students in fourth grade use protractors to measure angles. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, they use appropriate labels when creating a line plot.

MP.7 Look for and make use of structure.
In fourth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations to explain calculations (partial products model). They relate representations of counting problems such as arrays and area models to the

multiplication principal of counting. They generate number or shape patterns that follow a given rule using two-column tables.

MP.8 Look for and express regularity in repeated reasoning.
Students in fourth grade should notice repetitive actions in computation to make generalizations. Students use models to explain calculations and understand how algorithms work. They also use models to examine patterns and generate their own algorithms. For example, students use visual fraction models to write equivalent fractions.

Operations and Algebraic Thinking – 4.OA

☐ **4.OA.A. Use the four operations with whole numbers to solve problems**.

1. Interpret a multiplication equation as a comparison, e.g., $35 = 5 \times 7$ as 35 is 5 times as many as 7. Represent verbal multiplicative comparisons as equations.
2. Multiply or divide to solve word problems involving multiplicative comparison.

Example: *If the cost of a red hat is three times more than a blue hat that costs* $\$5$ *then a red hat cost* $\$15$.

Clarification: *Students may use drawings and equations with a symbol for the unknown number to represent the problem.*
Distinguish between multiplicative comparison from additive comparison.

3. Solve multistep whole number word problems using the four operations, including problems in which remainders must be interpreted.
    a. Represent these problems using equations with a letter standing for the unknown quantity.
    b. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

△ **4.OA.B. Gain familiarity with factors and multiples.**

4. Find all factor pairs for a whole number in the range 1–100.
    a. Recognize that a whole number is a multiple of each of its factors.
    b. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number.
    c. Determine whether a given whole number in the range 1–100 is prime or composite.

○ **4.OA.C. Generate and analyze patterns.**

5. Generate a number or shape pattern that follows a given rule. Identify and explain features of the pattern that were not explicit in the rule itself.

Example: *Given the rule "Add* 3*" and the starting number* 1*, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*

Number and Operations in Base Ten – 4.NBT

☐ 4.NBT.A. Generalize place value understanding for multi-digit whole numbers, less than or equal to 1,000,000.

1. Recognize that in a multi-digit whole number, a digit in any place represents ten times as much as it represents in the place to its right.
2. Read and write multi-digit whole numbers using standard form, expanded form, and word form. Compare two multi-digit numbers based on meanings of the digits and each place, recording the results of comparisons with the symbols $>$, $=$, and $<$.

   Example: *the number two hundred seventy-five thousand eight hundred two written in standard form is* $275{,}802$ *and in expanded form is* $200{,}000 + 70{,}000 + 5{,}000 + 800 + 2$ *or* $(2 \times 100{,}000) + (7 \times 10{,}000) + (5 \times 1{,}000) + (8 \times 100) + (2 \times 1)$.

3. Use place value understanding or visual representation to round multi-digit whole numbers to any place.

☐ 4.NBT.B. Use place value understanding and properties of operations to perform multi-digit arithmetic on whole numbers less than or equal to 1,000,000.

4. Fluently use the standard algorithm for multi-digit whole number addition and subtraction.

   Example: *What is the difference between* 634 *and* 328 *using the standard algorithm?*

$$\begin{array}{r} 6\,{}^{2}\cancel{3}\,{}^{1}4 \\ -\,3\;\;2\;\;8 \\ \hline 3\;\;0\;\;6 \end{array}$$

   Clarification*: Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers.
   a. Use strategies based on place value and the properties of operations.
   b. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors.
   a. Use strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.

b. Illustrate and explain the calculation by using rectangular arrays, area models, and/or equations.

Clarification for 4.NBT.B.5 and 4.NBT.B.6: *Students should be familiar with multiple strategies but should be able to select and use the strategy with which they most closely connect and understand, with the ultimate goal of supporting students to use more efficient strategies.*

Number and Operations – Fractions – 4.NF

☐ 4.NF.A. Extend understanding of fraction equivalence and ordering.

1. Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{n \times a}{n \times b}$ by using visual fraction models, with attention to how the numbers and sizes of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions, including fractions greater than 1.

Example*: When a horizontal line is drawn through the center of the model, the number of equal parts doubles and the size of the parts is halved.*

2. Compare two fractions with different numerators and different denominators, by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$.
   a. Recognize that comparisons are valid only when the two fractions refer to the same whole.
   b. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions, by using a visual fraction model and/or verbal reasoning.

☐ 4.NF.B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

1. Understand a fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.
   a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
   b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify the conclusions by using a visual fraction model and/or verbal reasoning.

Example: $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$; $\frac{3}{8} = \frac{1}{8} + \frac{2}{8}$; $2\frac{1}{8} = 1 + 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8}$

c. Add and subtract mixed numbers with like denominators by replacing mixed number with an equivalent fraction and/or by using properties of operations and the relationship between addition and subtraction.

d. Solve word problems involving addition and subtraction of fractions, including mixed numbers, with the same denominator. Justify the conclusions using a visual fraction model and/or verbal reasoning.

4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

a. Understand a fraction $\frac{a}{b}$ as a multiple of $\frac{1}{b}$.

Example: *use a visual fraction model to represent* $\frac{5}{4}$ *as the product* $5 \times \frac{1}{4}$*, recording the conclusion by the equation* $\frac{5}{4} = 5 \times \frac{1}{4}$.

b. Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number.

Example: *use a visual fraction model to express* $3 \times \frac{2}{5}$ *as* $6 \times \frac{1}{5}$*, recognizing this product as* $\frac{6}{5}$. *In general,* $n \times \frac{a}{b} = \frac{n \times a}{b}$.

c. Solve word problems involving multiplication of a fraction by a whole number e.g., by using visual fraction models and/or equations to represent the problem.

Example: *If each person at a party will eat* $\frac{3}{8}$ *of a pound of roast beef, and there will be* 5 *people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

☐ **4.NF.C. Understand decimal notation for fractions, and compare decimal fractions.**

5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.

Example: *Express* $\frac{3}{10}$ *as* $\frac{3}{100}$*, and add* $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.

Clarification*: Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.*

6. Use decimal notation to represent fractions with denominators 10 or 100.

Example: *rewrite* 0.62 *as* $\frac{62}{100}$*; describe a length as* 0.62 *meters; locate* 0.62 *on a number line diagram.*

7. Compare two decimals to hundredths by reasoning about their size.
   a. Recognize that comparisons are valid only when the two decimals refer to the same whole.
   b. Record the results of the comparisons with the symbols $>$, $=$, and $<$, and justify the conclusions using visual representations and/or verbal reasoning.

***Clarification**: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.*

Measurement and Data – 4.MD

△ 4.MD.A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

1. Know relative sizes of measurement units within any one system of units.
   a. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit.
   b. Record measurement equivalents in a two-column table.

***Example**: Know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs $(1, 12)$, $(2, 24)$, $(3, 36)$, ...*

2. Use the four operations to solve word problems involving measurements.
   a. Include problems involving simple fractions or decimals.
   b. Include problems that require expressing measurements given in a larger unit in terms of a smaller unit.
   c. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

***Clarification**: Measurement may include, but not limited to, length, area, volume, capacity, mass, weight, and money.*

3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

***Example:** Find the width of a rectangle room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

Clarification: *Students should express their answers in linear (perimeter) and square (area) units. Students are not expected to use the* $1\ cm^2$ *notation.*

△ 4.MD.B. Represent and interpret data.

4. Make a line plot (dot plot) to show a set of measurements in fractions of a unit $\left(\frac{1}{2}, \frac{1}{4}, \frac{1}{8}\right)$. Solve problems involving addition and subtraction of fractions by using information presented in line plots (dot plots).

Example: *From a line plot (dot plot) find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

○ 4.MD.C. Geometric measurement: understand concepts of angle and measure angles.

5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement.
   a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle.

Example: *An angle that turns through* $\frac{1}{360}$ *of a circle is called a "one-degree angle," and can be used to measure angles.*

   b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.

6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

7. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems.
   a. Use an equation with a symbol for the unknown angle measure.
   b. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts.

Geometry – 4.G

○ 4.G.A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

FIFTH GRADE

Introduction

In fifth grade, instruction should focus on the following: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of measurement systems and determining volumes to solve problems; and (4) solving problems using the coordinate plane.

1. Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)
2. Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.
3. Students convert among different-sized measurement units within a given measurement system allowing for efficient and accurate problem solving with multi-step real-world problems as they progress in their understanding of scientific concepts and calculations. Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They

select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real-world and mathematical problems.

4. Students learn to interpret the components of a rectangular coordinate system as lines and understand the precision of location that these lines require. Students learn to apply their knowledge of number and length to the order and distance relationships of a coordinate grid and to coordinate this across two dimensions. Students solve mathematical and real-world problems using coordinates.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (□). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Geometric and Spatial Thinking

Geometric and Spatial Thinking are important in and of themselves, because they connect mathematics with the physical world, and play an important role in modeling occurrences whose origins are not necessarily physical, for example, as networks or graphs. They are also important because they support the development of number and arithmetic concepts and skills. Thus, geometry is essential for all grade levels for many reasons: its mathematical content, its roles in physical sciences, engineering, and many other subjects, and its strong aesthetic connections.

Fifth Grade Overview

Operations and Algebraic Thinking

○ A. Write and interpret numerical expressions.
○ B. Analyze patterns and relationships.

Number and Operations in Base Ten

☐ A. Understand the place value system.
☐ B. Perform operations with multi-digit whole numbers and with decimals to hundredths.

Number and Operations – Fractions

☐ A. Use equivalent fractions as a strategy to add and subtract fractions.
☐ B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Measurement and Data

△ A. Convert like measurement units within a given measurement system.
△ B. Represent and interpret data.
☐ C. Geometric measurement: Understand concepts of volume and relate volume to multiplication and to addition.

Geometry

○ A. Graph points on the coordinate plane to solve real-world and mathematical problems.
○ B. Classify two-dimensional figures into categories based on their properties.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For standards related to knowing single-digit facts from memory, this typically involves generating a response within 3-5 seconds. For fifth grade this standard is:

- 5.NBT.B.5 Demonstrate fluency for multiplication of multi-digit whole numbers using the standard algorithm. Include two-digit × four-digit numbers and, three-digit × three-digit numbers.

Fifth Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
Students solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. For example, Sonia had $2\frac{1}{3}$ candy bars. She promised her brother that she would give him $\frac{1}{2}$ of a candy bar. How much will she have left after she gives her brother the amount she promised? They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”.

MP.2 Reason abstractly and quantitatively.
Fifth graders should recognize that a number represents a specific quantity. They connect quantities to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions that record calculations with numbers and represent or round numbers using place value concepts. For example, students use abstract and quantitative thinking to recognize that $0.5 \times (300 \div 15)$ is $\frac{1}{2}$ of $(300 \div 15)$ without calculating the quotient.

MP.3 Construct viable arguments and critique the reasoning of others.
In fifth grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like “How did you get that?” and “Why is that true?” They explain their thinking to others and respond to others’ thinking. Students use various strategies to solve problems and they defend and justify their work with others. For example, two afterschool clubs are having pizza parties. The teacher will order 3 pizzas for every 5 students in the math club; and 5 pizzas for every 8 students in the student council. If a student is in both groups, decide which party they should attend. How

much pizza will each student get at each party? If a student wants to have the most pizza, which party should they attend?

MP.4 Model with mathematics.
Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fifth graders should evaluate their results in the context of the situation and whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems.

MP.5 Use appropriate tools strategically.
Fifth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems or make predictions from real-world data.

MP.6 Attend to precision.
Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units.

MP.7 Look for and make use of structure.
In fifth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation.

MP.8 Look for and express regularity in repeated reasoning.
Fifth graders use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations.

Operations and Algebraic Thinking – 5.OA

○ 5.OA.A. Write and interpret numerical expressions.

1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

   Example: $4.5 + (3 \times 2)$ *in word form is, four and five tenths plus the quantity* 3 *times* 2.

2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

   Example: *Express the calculation "Add* 8 *and* 7*, then multiply by* 2*" as* $2 \times (8 + 7)$. *Recognize that* $12 \times (7 + 91)$ *is twelve times as large as* $7 + 91$*, without having to calculate the indicated sum or product.*

○ 5.OA.B. Analyze patterns and relationships.

3. Generate two numerical patterns using two given rules.
   a. Identify apparent relationships between corresponding terms.
   b. Form ordered pairs consisting of corresponding terms from the two patterns.
   c. Graph the ordered pairs on a coordinate plane.

   Example: *Given the rule "Add* 3*" and the starting number* 0*, and given the rule "Add* 6*" and the starting number* 0*, generate terms in the resulting sequences. Observe that the terms in one sequence are twice the corresponding terms in the other sequence and explain why this is so.*

Number and Operations in Base Ten – 5.NBT

□ 5.NBT.A. Understand the place value system.

1. Recognize that in a multi-digit number, including decimals, a digit in any place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

   Example: *In the number* 55.55*, each digit is* 5*, but the value of the digits is different because of the placement.*

2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

   Example: 10^2 *which is* $10 \times 10 = 100$*, and* 10^3 *which is* $10 \times 10 \times 10 = 1{,}000$

3. Read, write, and compare decimals to thousandths.
    a. Read and write decimals to thousandths using standard form, expanded form, and word from.

Example: $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times \frac{1}{10} + 9 \times \frac{1}{100} + 2 \times \frac{1}{1000}$

    b. Compare two decimals to thousandths based on meanings of the digits in each place, and record the results of the comparisons using $>$, $=$, and $<$.
4. Use place value understanding to round decimals to any place.

☐ 5.NBT.B. Perform operations with multi-digit whole numbers and with decimals to hundredths.

5. Demonstrate fluency for multiplication of multi-digit whole numbers using the standard algorithm. Include two-digit × four-digit numbers and, three-digit × three-digit numbers.

Example: *What is the product of* 304 *and* 23 *using the standard algorithm?*

$$\begin{array}{r} 3\,{}^{1}0\,4 \\ \text{x}\quad 2\,3 \\ \hline 9\,1\,2 \\ +6\,0\,8\,0 \\ \hline 6\,9\,9\,2 \end{array}$$

Clarification*: Fluency is reached when students are proficient, i.e., when they display accuracy, efficiency, and flexibility.*

6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.
    a. Use strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.
    b. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
7. Add, subtract, multiply, and divide decimals to hundredths.
    a. Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction and between multiplication and division.
    b. Relate the strategy to a written method and explain the reasoning used.

Clarification for 5.NBT.B.6 and 5.NBT.B.7: *Students should be familiar with multiple strategies but should be able to select and use the strategy with which they most closely* *connect and understand, with the ultimate goal of supporting students to use more efficient strategies.*

Number and Operations – Fractions – 5.NF

☐ 5.NF.A. Use equivalent fractions as a strategy to add and subtract fractions.

1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions to produce an equivalent sum or difference of fractions with like denominators.

Example: $\frac{2}{3}+\frac{5}{4}=\frac{8}{12}+\frac{15}{12}=\frac{23}{12}$ *In general,* $\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$.

2. Solve word problems involving addition and subtraction of fractions referring to the same whole (the whole can be a set of objects), including cases of unlike denominators.
    a. Justify the conclusions by using visual fraction models and/or equations to represent the problem.
    b. Use benchmark fractions and number sense of fraction to estimate mentally and assess the reasonableness of answers.

Example: *Recognize an incorrect result* $\frac{2}{5}+\frac{1}{2}=\frac{3}{7}$, *by observing that* $\frac{3}{7}<\frac{1}{2}$.

☐ 5.NF.B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

3. Interpret a fraction as division of the numerator by the denominator $\left(\frac{a}{b}=a\div b\right)$. Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers by using visual fraction models and/or equations to represent the problem.

Example: *Interpret* $\frac{3}{4}$ *as the result of dividing* 3 *by* 4, *noting that* $\frac{3}{4}$ *multiplied by* 4 *equals* 3, *and that when* 3 *wholes are shared equally among* 4 *people each person has a share of size* $\frac{3}{4}$. *If* 9 *people want to share a* 50*-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
    a. Interpret the product $\left(\frac{a}{b}\right)\times q$ as a parts of a partitions of q into b equal parts, equivalently, as the result of the sequence of operations $a\times q\div b$.

Example: *Use a visual model and/or area model to show* $\left(\frac{2}{3}\right) \times 4 = \frac{8}{3}$*, and create a story context for this equation. Do the same with* $\left(\frac{2}{3}\right) \times \left(\frac{4}{5}\right) = \frac{8}{15}$*. In general,* $\left(\frac{a}{b}\right) \times \left(\frac{c}{d}\right) = \frac{ac}{bd}$*.*

b. Find the area of a rectangle with fractional side lengths.
   i. Tile it with unit squares of the appropriate unit fraction side lengths.
   ii. Show that the area is the same by tiling as would be found by multiplying the side lengths.
   iii. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5. Interpret multiplication as scaling (resizing), by:

   a. Comparing the size of a fractional product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

Example: *Without multiplying tell which number is greater:* 225 *or* $\frac{3}{4} \times 225$*;* $\frac{11}{50}$ *or* $\frac{3}{2} \times \frac{11}{50}$*?*

   b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number; explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $\frac{a}{b} = \frac{n \times a}{n \times b}$ to effect of multiplying $\frac{a}{b}$ by 1.

6. Solve real world problems involving multiplication of fractions and mixed numbers by using visual fraction models and/or equations to represent the problem.

Example: *Evan bought 6 roses for his mother,* $\frac{2}{3}$ *of them were red. How many red roses were there?*

7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

   a. Represent division of a unit fraction by a non-zero whole number and compute such quotients using a visual fraction model. Use the relationship between multiplication and division to explain that $\frac{1}{b} \div c = \frac{1}{bc}$ because $\frac{1}{bc} \times c = \frac{1}{b}$.

Example: *Create a story context to explain* $\frac{1}{3} \div 4$*, and use a visual fraction model to show the quotient.*

   b. Represent division of a whole number by a unit fraction, and compute such quotients using a visual fraction model. Use the relationship between multiplication and division to explain that $a \times \frac{1}{b} = ab$ because $ab \times \frac{1}{b} = a$.

Example: *Create a story context to explain* $4 \div \frac{1}{5}$*, and use a visual fraction model to show the quotient.*

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions by using visual fraction models and/or equations to represent the problem.

Example: *How much chocolate will each person get if three people share* $\frac{1}{2}$ *lb of chocolate equally? How many* $\frac{1}{3}$ *cup servings are in two cups of raisins?*

Measurement and Data – 5.MD

△ 5.MD.A. Convert like measurement units within a given measurement system.

1. Convert among different-sized standard measurement units within a given measurement system. Use conversions in solving multi-step, real world problems.

Example: *Convert* 5 *cm to* 0.05 *m.*

△ 5.MD.B. Represent and interpret data.

2. Collect, represent, and interpret numerical data, including whole numbers, fractional and decimal values.

    a. Interpret numerical data, with whole-number values, represented with tables or line plots.

    b. Use graphic displays of data (line plots (dot plots), tables, etc.) to solve real world problems using fractional data.

Example: *Given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

☐ 5.MD.C. Geometric measurement: Understand concepts of volume and relate volume to multiplication and to addition.

8. Recognize volume as an attribute of solid figures and understand volume measurement in terms of cubic units.

    a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.

    b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.

9. Use concrete and/or visual models to measure the volume of rectangular prisms in cubic units by counting cubic cm, cubic in, cubic ft, and nonstandard units.
10. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
    a. Find the volume of a right rectangular prism with whole-number edge lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base.

Example: *To represent the associative property of multiplication,* $(l \times w) \times h = l \times (w \times h)$.

    b. Apply the formulas $V = l \times w \times h$ and $V = B \times h$ (where B stands for the area of the base) for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
    c. Recognize volume as additive.
        i. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.
        ii. Apply this technique to solve real world problems.

Geometry – 5.G

○ 5.G.A. Graph points on the coordinate plane to solve real-world and mathematical problems.

1. Describe and understand the key attributes of the coordinate plane.
    a. Use a pair of perpendicular number lines (axes) with the intersection of the lines (the origin $(0,0)$) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates.
    b. Understand that the x-coordinate, the first number in an ordered pair, indicates movement parallel to the x-axis starting at the origin; and the y-coordinate, the second number, indicates movement parallel to the y-axis starting at the origin.
2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, (x and y both have positive values) and interpret coordinate values of points in the context of the situation.

○ 5.G.B. Classify two-dimensional figures into categories based on their properties.

3. Understand that attributes belonging to a category of two-dimensional figures also belong to all of the subcategories of that category.

   Example: *All rectangles have four right angles and squares are rectangles, so all squares have four right angles.*

4. Classify two-dimensional figures in a hierarchy based on properties.

   Example: *All rectangles are parallelograms because they are all quadrilaterals with two pairs of opposite sides parallel.*

SIXTH GRADE

Introduction

In sixth grade, instruction is focused on the following areas: (1) connecting ratio and rate to whole number multiplication and division, and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; (4) developing understanding of statistical thinking; and (5) reasoning about geometric shapes and their measurements.

1. Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from and extending pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication, division, and fractions from previous grades with ratios, rates, and percents. As students solve a wide variety of problems involving ratios and rates, they create a foundation for proportional reasoning and future work in Algebra and Geometry.

2. Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems, as well as demonstrating fluency in operations with whole numbers and decimals. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular, negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

3. Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students build on their understanding of an unknown quantity from previous grades to know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables,

such as tables of quantities that are in equivalent ratios, and they use equations (such as $y = 3x$) to describe relationships between quantities.

4. Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

5. Students in grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging, or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Sixth Grade Overview

Ratios and Proportional Relationships

☐ A. Understand ratio and rate concepts and use ratio and rate reasoning to solve problems.

The Number System

☐ A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
○ B. Compute fluently with multi-digit numbers and find common factors and multiples.
☐ C. Apply and extend previous understandings of numbers to the system of rational numbers.

Expressions and Equations

☐ A. Apply and extend previous understandings of arithmetic to algebraic expressions.
☐ B. Reason about and solve one-variable equations and inequalities.
☐ C. Represent and analyze quantitative relationships between two variables.

Geometry

△ A. Solve real-world and mathematical problems involving area, surface area, and volume.

Statistics and Probability

○ A. Develop understanding of statistical variability.
○ B. Summarize and describe distributions.

Standards for Mathematical Practice

1. **1.** Make sense of problems and persevere in solving them.
2. **2.** Reason abstractly and quantitatively.
3. **3.** Construct viable arguments and critique the reasoning of others.
4. **4.** Model with mathematics.
5. **5.** Use appropriate tools strategically.
6. **6.** Attend to precision.
7. **7.** Look for and make use of structure.
8. **8.** Look for and express regularity in repeated reasoning.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For sixth grade these standards are:

- 6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.
- 6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Sixth Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In grade 6, students solve problems involving ratios and rates and discuss how they solved them. Students solve real-world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?". Students can explain the relationships between equations, verbal descriptions, and tables and graphs. Mathematically proficient students check their answers to problems using a different method.

MP.2 Reason abstractly and quantitatively.
In grade 6, students represent a wide variety of real-world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities.
Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations or other meaningful moves. To reinforce students' reasoning and understanding, teachers might ask, "How do you know?" or "What is the relationship of the quantities?".

MP.3 Construct viable arguments and critique the reasoning of others.
In grade 6, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" and "Does that always work?". They explain their thinking to others and respond to others' thinking.

MP.4 Model with mathematics.
In grade 6, students model problem situations symbolically, graphically, in tables, contextually and visually. Students form expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. Students begin to represent two

quantities simultaneously. Students use number lines to compare numbers and represent inequalities. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences about and make comparisons between data sets. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate and apply them to a problem context. Students should be encouraged to answer questions such as “What are some ways to represent the quantities?” or “What formula might apply in this situation?”

MP.5 Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 6 may decide to represent figures on the coordinate plane to calculate area. Number lines are used to create dot plots, histograms, and box plots to visually compare the center and variability of the data. Visual fraction models can be used to represent situations involving division of fractions. Additionally, students might use physical objects or applets to construct nets and calculate the surface area of three-dimensional figures. Students should be encouraged to answer questions such as “What approach did you try first?” or “Why was it helpful to use?”

MP.6 Attend to precision.
In grade 6, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations, or inequalities. When using ratio reasoning in solving problems, students are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. Students also learn to express numerical answers with an appropriate degree of precision when working with rational numbers in a situational problem. Teachers might ask, “What mathematical language, definitions, or properties can you use to explain ___?”

MP.7 Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables recognizing both the additive and multiplicative properties. Students apply properties to generate equivalent expressions (i.e. $6 + 2n = 2(3 + n)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality; $c = 6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real-world problems

involving area and volume. Teachers might ask, “What do you notice when ___?” or “What parts of the problem might you eliminate, simplify, or ___?”

MP.8 Look for and express regularity in repeated reasoning.
In grade 6, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $\frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc}$ and construct other examples and models that confirm their generalization. Students connect place value and their prior work with operations to understand algorithms to fluently divide multi-digit numbers and perform all operations with multi-digit decimals. Students informally begin to make connections between rates and representations showing the relationships between quantities. Students should be encouraged to answer questions such as, “How would we prove that ___?” or “How is this situation like and different from other situations?”

Ratios and Proportional Relationships – 6.RP

☐ 6.RP.A. Understand ratio and rate concepts and use ratio and rate reasoning to solve problems.

1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

> ***Examples***:
>
> *1) The ratio of wings to beaks in the bird house at the zoo was* $2:1$*, because for every two wings there was one beak.*
>
> *2) For every vote candidate A received, candidate C received nearly three votes, meaning that candidate C received approximately three times the number of votes as candidate A or candidate A received approximately* $\frac{1}{3}$ *of the number of votes as candidate C.*

2. Understand the concept of a unit rate $\frac{a}{b}$ associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.

> ***Example***: *This recipe has a ratio of three cups of flour to four cups of sugar, so there is* $\frac{3}{4}$ *cup of flour for each cup of sugar; We paid* $\$75$ *for* 15 *hamburgers, which is a rate of five dollars per hamburger.*

3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
   a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
   b. Solve unit rate problems including those involving unit pricing and constant speed.

> ***Example***: *If it took* 7 *hours to mow* 4 *lawns, then at that rate, how many lawns could be mowed in* 35 *hours? At what rate were lawns being mowed?*

   c. Find a percent of a quantity as a rate per 100; solve problems involving finding the whole, given a part and the percent.

> ***Example***: 30% *of a quantity means* $\frac{30}{100}$ *times the quantity.*

   d. Use ratio reasoning to convert measurement units within and between measurement systems; manipulate and transform units appropriately when multiplying or dividing quantities.

Examples:

1) Malik is making a recipe, but he cannot find his measuring cups! He has, however, found a tablespoon. His cookbook says that 1 cup = 16 tablespoons. Explain how he could use the tablespoon to measure out the following ingredients: two cups of flour, $\frac{1}{2}$ cup sunflower seed, and $1\frac{1}{4}$ cup of oatmeal.

2) Jessica is building a doghouse out of wooden planks. If the instructions say the house is 30 inches long, how long would the doghouse be using metric measurements (1 in = 2.54 cm)?

The Number System – 6.NS

☐ 6.NS.A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions. e.g., by using visual fraction models and equations to represent the problem.

Examples:

1) Create a story context for $\frac{2}{3} \div \frac{3}{4}$ and use a visual fraction model to show the quotient.

2) Use the relationship between multiplication and division to explain that $\frac{2}{3} \div \frac{3}{4} = \frac{8}{9}$ because $\frac{3}{4}$ of $\frac{8}{9}$ is $\frac{2}{3}$. In general, $\frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc}$.

3) After hiking $6\frac{1}{2}$ miles along the Salmon River, Fred realized he had traveled $\frac{3}{4}$ of the way to his campsite. What is the total distance Fred will end up traveling during his hike?

4) How many $\frac{3}{4}$ cup servings are in $\frac{2}{3}$ of a cup of yogurt?

5) How wide is a rectangular strip of land with length $\frac{3}{4}$ mi and area $\frac{1}{2}$ square mi?

○ 6.NS.B. Compute fluently with multi-digit numbers and find common factors and multiples.

2. Fluently divide multi-digit numbers using the standard algorithm.

Example: *What is the quotient of 657 and 3 using the standard algorithm?*

$$\begin{array}{r} 219 \\ 3\overline{)657} \\ \underline{-6} \\ 05 \\ \underline{-3} \\ 27 \\ \underline{-27} \\ 0 \end{array}$$

3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Example: *What is the difference of* 1.82 *and* 0.06 *using the standard algorithm?*

$$\begin{array}{r} 1.\,{}^{7}\cancel{8}\,{}^{1}2 \\ -\,0.\;0\;\;6 \\ \hline 1.\;7\;\;6 \end{array}$$

4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

Example: *Express* $36 + 8$ *as* $4(9 + 2)$.

☐ 6.NS.C. Apply and extend previous understandings of numbers to the system of rational numbers.

5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. Use positive and negative numbers (including fractions and decimals) to represent quantities in real-world contexts, explaining the meaning of zero in each situation.

Examples*: Temperature above/below zero, elevation above/below sea level, credits/debits, and positive/negative electric charge*

6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

    a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite.

    b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

7. Understand ordering and absolute value of rational numbers.

a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.

Examples: *Interpret $-3.7 > -7\frac{1}{2}$ as a statement that -3.7 is located to the right of $-7\frac{1}{2}$ on a number line oriented from left to right.*

b. Write, interpret, and explain statements of order for rational numbers in real-world contexts.

Example: *Write $-3°C > -7°C$ to express the fact that $-3°C$ is warmer than $-7°$ C.*

c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.

Example: *For an account balance of -30 dollars, write $|-30| = 30$ to describe the size of the debt in dollars.*

d. Distinguish comparisons of absolute value from statements about order.

Example: *Recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.*

8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Examples: *Samuel draws a coordinate plane on a map of his neighborhood. He found that the distance between two consecutive whole number points is one block. His house is located at $(-4, 6)$, and his school is located at $(-4, -3)$. How many blocks are between Samuel's house and school?*

Expressions and Equations – 6.EE

☐ 6.EE.A. Apply and extend previous understandings of arithmetic to algebraic expressions.

1. Write and evaluate numerical expressions involving whole-number exponents.

2. Write, read, and evaluate expressions in which letters stand for numbers.

    a. Write expressions that record operations with numbers and with letters standing for numbers.

Example: *Express the calculation "Subtract y from 5" as $5 - y$.*

    b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

Example: *Describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.*

    c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

Examples:

1) Use the formulas $V = s^3$ and $A = 6s^2$ to find the volume (V) and surface area (A) of a cube with sides of length $s = \frac{1}{2}$.

2) The formula for finding the perimeter of a rectangle is $P = 2l + 2w$. Find the perimeter of a rug that measures 7.5 ft by 9.5 ft.

3. Apply the properties of operations to generate equivalent expressions.

Examples:

1) Apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$.

2) Apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$.

3) Apply properties of operations to $y + y + y$ to produce the equivalent expression *$3y$.*

4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

Example: *The expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of the numeric value of y.*

☐ **6.EE.B. Reason about and solve one-variable equations and inequalities.**

5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or depending on the purpose at hand, any number in a specified set.
7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q, and x are all nonnegative rational numbers.
8. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem.
    a. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions.
    b. Represent solutions of such inequalities on number line diagrams.

☐ **6.EE.C. Represent and analyze quantitative relationships between two variables.**

9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write equations to represent the relationship between the two quantities. Analyze the relationship using graphs and tables and relate these to the equations. Include an understanding of independent and dependent variables.

Examples:

1) In a problem involving mixing water (W) and orange concentrate (C) to make a consistent flavor of orange juice, list and graph ordered pairs of cups of water and orange concentrate, and write the equations (e.g., $C = \frac{1}{2} \cdot W$ or $W = 2 \cdot C$) to represent the relationship between water (W) and orange concentrate (C).

2) When examining the relationship between time and the growth of a plant. Time tends to be thought of as the independent variable and the height of the plant tends to be thought of as the dependent variable.

Geometry – 6.G

△ **6.G.A. Solve real-world and mathematical problems involving area, surface area, and volume.**

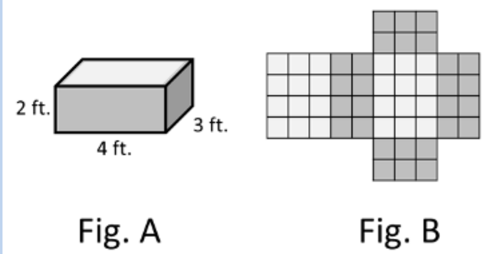
1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side and area by joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

4. Represent three-dimensional figures using nets made up of rectangles and triangles and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Example: *Explain how you could find the surface area of a rectangular prism given a three-dimensional representation (Fig. A) or a net (Fig. B).*



Statistics and Probability – 6.SP

○ **6.SP.A. Develop understanding of statistical variability.**

1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.

   Example: *"How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*

2. Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center (median and/or mean), spread (range, interquartile range, and/or mean absolute deviation), and overall shape. The focus of mean absolute deviation (MAD) is visualizing deviations from the mean as a measure of variability as opposed to a focus on calculating MAD.

3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

○ **6.SP.B. Summarize and describe distributions.**

4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

5. Summarize numerical data sets in relation to their context, such as by:

   a. Reporting the number of observations.

   b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

   c. Giving quantitative measures of center (median, and/or mean) and variability (range, interquartile range, and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Examples: *Bobbie is a sixth grader who competes in the* 100 *meter hurdles. In eight track meets during the season, she recorded the following times (to the nearest one hundredth of a second).*

$18.11, 31.23, 17.99, 18.25, 17.50, 35.55, 17.44, 17.85$

Is the mean or the median a better representation of Bobbie's hurdle time? Justify your answer. (From Illustrative Mathematics)

SEVENTH GRADE

Introduction

In seventh grade, instruction is focused on the following areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

1. Students extend their understanding of ratios and rates and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios, rates, and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line (constant of proportionality). They distinguish proportional relationships from other relationships.
2. Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions, equations, and inequalities in one variable. Students also solve real-world and multistep equations and inequalities.
3. Students continue their work with area from grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in grade 8, they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and

mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

4. Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences. In grade 7 the concept of probability is introduced, and it is explored in later grades.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Seventh Grade Overview

Ratios and Proportional Relationships

☐ A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System

☐ A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations

☐ A. Use properties of operations to generate equivalent expressions.
☐ B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry

○ A. Draw, construct and describe geometrical figures and describe the relationships between them.
○ B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Statistics and Probability

△ A. Use random sampling to draw inferences about a population.
○ B. Draw informal comparative inferences about two populations.
△ C. Investigate chance processes and develop, use, and evaluate probability models.

Mastery Standards

Mastery standards describe those standards that ask students to be able to perform mathematical calculations accurately, efficiently, and flexibly. For seventh grade this standard is:

- 7.NS.A.3 Solve real-world and mathematical problems involving the four operations with integers and other rational numbers.

Seventh Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In seventh grade, students solve problems involving ratios and rates and discuss how they solved them. Students solve real-world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”. When students compare arithmetic and algebraic solutions to the same problem, they identify correspondences between different approaches.

MP.2 Reason abstractly and quantitatively.
In seventh grade, students represent a wide variety of real-world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

MP.3 Construct viable arguments and critique the reasoning of others.
In seventh grade, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. For example, as students notice when geometric conditions determine a unique triangle, more than one triangle, or no triangle, they have an opportunity to construct viable arguments and critique the reasoning of others. Students should be encouraged to answer questions such as these: “How did you get that?”, “Why is that true?” and “Does that always work?”. They explain their thinking to others and respond to others’ thinking.

MP.4 Model with mathematics.
In seventh grade, students model problem situations visually, symbolically, graphically, in tables, and contextually. Students form expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. Students use experiments or

simulations to generate data sets and create probability models. Proportional relationships present opportunities for modeling. For example, for modeling purposes, the number of people who live in an apartment building might be taken as proportional to the number of stories in the building. Students should be encouraged to answer questions such as "What are some ways to represent the quantities?" or "How might it help to create a table, chart, or graph?"

MP.5 Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in seventh grade may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data. Students might use physical objects or applets to generate probability data and use graphing calculators or spreadsheets to manage and represent data in different forms. Teachers might ask, "What approach are you considering?" or "Why was it helpful to use ___?"

MP.6 Attend to precision.
In seventh grade, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students define variables, specify units of measure, and label axes accurately. Students use appropriate terminology when referring to rates, ratios, probability models, geometric figures, data displays, and components of expressions, equations, or inequalities. Teachers might ask, "What mathematical language, definitions, or properties can you use to explain ___?

MP.7 Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables making connections between the constant of proportionality in a table with the slope of a graph. Students apply properties to generate equivalent expressions (i.e. $6 + 2n = 2(3 + n)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality; $c = 6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real world problems involving scale drawings, surface area, and volume. Students examine tree diagrams or systematic lists to determine the sample space for compound events and verify that they have listed all possibilities. Solving an equation such as $8 = 4\left(n - \frac{1}{2}\right)$ is easier if students can see and make use of structure, temporarily viewing $\left(n - \frac{1}{2}\right)$ as a single entity.

MP.8 Look for and express regularity in repeated reasoning.

In seventh grade, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $\frac{a}{b} = \frac{c}{d}$ if and only if $ad = bc$ and construct other examples and models that confirm their generalization. Students should be encouraged to answer questions such as “How would we prove that ___?” or “How is this situation both similar to and different from other situations using these operations?”

Ratios and Proportional Relationships – 7.RP

☐ 7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

Example: *For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour.*

2. Recognize and represent proportional relationships between quantities.
    a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
    b. Identify the constant of proportionality in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. Recognize the constant of proportionality as both the unit rate and as the multiplicative comparison between two quantities.
    c. Represent proportional relationships by equations.

Example*: If total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as* $t = pn$.

    d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.

3. Use proportional relationships to solve multi-step ratio, rate, and percent problems.

Example*: Simple interest, tax, price increases and discounts, gratuities and commissions, fees, percent increase and decrease, percent error*

The Number System – 7.NS

☐ 7.NS.A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

1. Apply and extend previous understandings of addition and subtraction to add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

a. Describe situations in which opposite quantities combine to make zero.

***Example**: If you open a new bank account with a deposit of* $\$30.52$ *and then withdraw* $\$30.52$*, you are left with a* $\$0$ *balance.*

b. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite are additive inverses because they have a sum of 0 (e.g., $12.5 + (-12.5) = 0$). Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

d. Apply properties of operations as strategies to add and subtract rational numbers.

***Example**:* $\frac{1}{4} - 5 + \frac{3}{4} + 7 = \left(\frac{1}{4} + \frac{3}{4}\right) + \left((-5) + 5\right) + 2$

2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide integers and other rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $\left(-\frac{1}{2}\right)(-1) = \frac{1}{2}$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-\left(\frac{p}{q}\right) = \frac{-(p)}{q} = \frac{p}{-(q)}$. Interpret quotients of rational numbers by describing real- world contexts. Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

***Example**:* $-4(0.25 - 1) = \left((-4) \times 0.25\right) + \left((-4) \times (-1)\right) = -1 + 4 = 3$

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates or eventually repeats.

3. Solve real-world and mathematical problems involving the four operations with integers and other rational numbers.

Example: *A water well drilling rig has dug to a height of* -60 *feet after one full day of continuous use. If the rig has been running constantly and is currently at a height of* -143.6 *feet, for how long has the rig been running? (Modified from Illustrative Mathematics)*

Expressions and Equations – 7.EE

☐ 7.EE.A. Use properties of operations to generate equivalent expressions.

1. Apply properties of operations to add, subtract, factor, and expand linear expressions with rational coefficients.

Example: $4x + 2 = 2(2x + 1)$ *and* $-3\left(x - \frac{5}{3}\right) = -3x + 5$

2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

Examples:

1) $a + 0.05a = 1.05$ *means that "increase by* 5%*" is the same as "multiply by* 1.05*."*

2) A shirt at a clothing store is on sale for 20% *off the regular price,* p*. The discount can be expressed as* $0.2p$*. The new price for the shirt can be expressed as* $p - 0.2p$ *or* $0.8p$*.*

☐ 7.EE.B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (integers, fractions, and decimals). Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Examples:

1) If a woman making $\$25$ *per hour gets a* 10% *raise, she will make an additional* $\frac{1}{10}$ *of her salary an hour, or* $\$2.50$*, for a new salary of* $\$27.50$*.*

2) If you want to place a towel bar $9\frac{3}{4}$ *inches long in the center of a door that is* $27\frac{1}{2}$ *inches wide, you will need to place the bar about* 9 *inches from each edge; this estimate can be used as a check on the exact computation.*

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

    a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Example*: The perimeter of a rectangle is* 54 *cm. Its width is* 6 *cm. What is its length?*

    b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Example*: As a salesperson, you are paid* $\$50$ *per week plus* $\$3$ *per sale. This week you want your pay to be at least* $\$100$*. Write an inequality for the number of sales you need to make, and describe the solutions.*

Geometry – 7.G

○ 7.G.A. Draw, construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Example*: Mariko has an* $\frac{1}{4}$ *inch scale-drawing (*$\frac{1}{4}$ *inch=*1 *foot) of the floor plan of her house. On the floor plan, the scaled dimensions of her rectangular living room are* $4\frac{1}{2}$ *inches by* $8\frac{3}{4}$ *inches. What is the area of her living room in square feet?*

2. Draw (freehand, with ruler and protractor, and with technology) two-dimensional geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine unique triangles, more than one triangle, or no triangle.

Example*: A triangle with side lengths* 3 *cm,* 4 *cm, and* 5 *cm exists. Use a compass and ruler to draw a triangle with these side lengths. (Modified from Engage NY M6L9)*

3. Describe the shape of the two-dimensional face of the figure that results from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

○ 7.G.B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

4. Understand the attributes and measurements of circles.
    a. Know that a circle is a two-dimensional shape created by connecting all of the points equidistant from a fixed point called the center of the circle.
    b. Develop an understanding of circle attributes including radius, diameter, circumference, and area and investigate the relationships between each.
    c. Informally derive and know the formulas for the area and circumference of a circle and use them to solve problems.
5. Use facts about supplementary, complementary, vertical, and adjacent angles to write equations and use them to solve for an unknown angle in a figure.

    Example: *The ratio of the measurement of an angle to its complement is* $1:2$. *Create and solve an equation to find the measurement of the angle and its complement. (Modified from Engage NY M5L1)*

6. Generalize strategies for finding area, volume, and surface areas of two- and three-dimensional objects composed of triangles, quadrilateral, polygons, cubes, and right prims. Solve real-world and mathematical problems in each of these areas.

    Example: *A playground is being updated. Sand underneath a swing needs be at least* 15 *inches deep. The sand under the swings is currently only* 12 *inches deep. The rectangular area under the swing set measures* 9 *feet by* 12 *feet. How much additional sand will be needed to meet the requirement? (Modified from Illustrative Mathematics)*

Statistics and Probability – 7.SP

△ 7.SP.A. Use random sampling to draw inferences about a population.

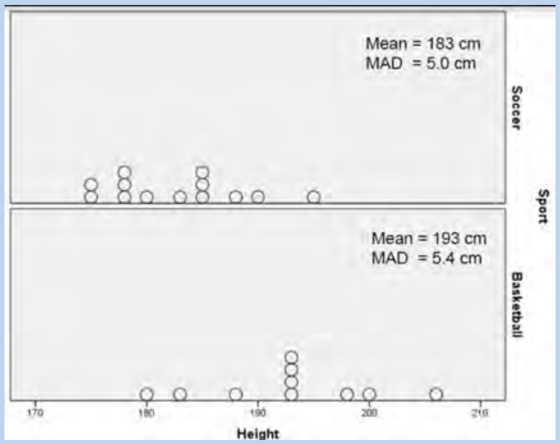
1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
2. Use data from a random sample about an unknown characteristic of a population. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions, i.e., generate a sampling distribution.

    Example: *Estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*

○ 7.SP.B. Draw informal comparative inferences about two populations.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

Example: *The difference in the mean height between players on the basketball team versus the soccer team is 10 cm. This difference in the means - 10 cm - is about twice the variability (mean absolute deviation) on either team (i.e., mean divided by the MAD). On a dot plot, the separation between the two distributions of heights is noticeable.*



4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

Example: *Decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

△ 7.SP.C. Investigate chance processes and develop, use, and evaluate probability models.

5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. A probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Example: *The likelihood of drawing a heart from a deck of cards is 0.25. The likelihood of flipping a coin and landing on heads is 0.5. It is more likely that a flipped coin will land on heads than it is to choose a heart from a deck of cards. (0.5 is greater than 0.25).*

6. Approximate the (theoretical) probability of a chance event by collecting data and observing its long-run relative frequency (experimental probability). Predict the approximate relative frequency given the (theoretical) probability.

Examples:

1) When drawing chips out of a bag containing an unknown number of red and white chips, estimate the probability of selecting a particular chip color given 50 draws.

2) When rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly approximately 200 times, but probably not exactly 200 times.

7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

    a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.

***Example**: If a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*

    b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.

***Example**: Find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

    a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

    b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

    c. Design and use a simulation to generate frequencies for compound events.

***Example**: Use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

EIGHTH GRADE

Introduction

In eighth grade, instruction is focused on the following areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem; and (4) defining the properties of integer exponents and irrational numbers.

1. Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($\frac{y}{x} = m$ or $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount $m \times A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.
2. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.
3. Students are introduced to the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. Students can define, evaluate, and compare functions in multiple forms (pictures, tables, graphs, equations, etc.).

4. Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.
5. Students use their understanding of multiplication and apply properties to develop an understanding of radicals and integer exponents. Students use and perform operations with numbers expressed in scientific notation. They use their knowledge of rational numbers to develop an understanding of irrational numbers.

Focus in the Standards

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Idaho Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Students should spend the large majority of their time on the major work of the grade (☐). Supporting work (△) and, where appropriate, additional work (○) can engage students in the major work of the grade.

Eighth Grade Overview

The Number System

△ A. Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

☐ A. Work with radicals and integer exponents.
☐ B. Understand the connections between proportional relationships, lines, and linear equations.
☐ C. Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

☐ A. Define, evaluate, and compare functions.
☐ B. Use functions to model relationships between quantities.

Geometry

☐ A. Understand congruence and similarity using physical models, transparencies, or geometry software.
☐ B. Understand and apply the Pythagorean Theorem.
○ C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Statistics and Probability

△ A. Investigate patterns of association in bivariate data.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Eighth Grade Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
In eighth grade, students solve real-world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"

MP.2 Reason abstractly and quantitatively.
In eighth grade, students represent a wide variety of real-world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number(s) or variable(s) as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

MP.3 Construct viable arguments and critique the reasoning of others.
In eighth grade, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" and "Does that always work?". They explain their thinking to others and respond to others' thinking.

MP.4 Model with mathematics.
In eighth grade, students model problem situations symbolically, graphically, in tables, and contextually. Working with the new concept of a function, students learn that relationships between variable quantities in the real-world often satisfy a dependent relationship, in that one quantity determines the value of another. Students form expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. Students use scatterplots to represent data and describe associations between variables. Students need many opportunities to explain the connections between the

different representations. They should be able to use all of these representations as appropriate to a problem context. Students should be encouraged to answer questions such as "What are some ways to represent the quantities?" or "How might it help to create a table, chart, graph, or ___?"

MP.5 Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationship between the angles created by a transversal that intersects parallel lines. Teachers might ask, "What approach are you considering?" or "Why was it helpful to use ___?"

MP.6 Attend to precision.
In eighth grade, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays. Teachers might ask, "What mathematical language, definitions, or properties can you use to explain ____?"

MP.7 Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. In eighth grade, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

MP.8 Look for and express regularity in repeated reasoning.
In grade eight, students use repeated reasoning to understand the slope formula and to make sense of rational and irrational numbers. Through multiple opportunities to model linear relationships, they notice that the slope of the graph of the linear relationship and the rate of change of the associated function are the same. For example, as students repeatedly check whether points are on the line with a slope of 3 that goes through the point $(1, 2)$, they might abstract the equation of the line in the form $\frac{y-2}{x-1} = 3$. Students should be encouraged to answer questions such as "How would we prove that ___?" or "How is this situation like and different from other situations using these operations?"

The Number System – 8.NS

△ 8.NS.A. Know that there are numbers that are not rational, and approximate them by rational numbers.

1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

***Examples**:*

1) Estimate the value of $\sqrt{2}$.

2) By truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

Expressions and Equations – 8.EE

☐ 8.EE.A. Work with radicals and integer exponents.

1. Know and apply the properties of integer exponents to generate equivalent numerical expressions.

***Example**:* $3^2 \times 3^{-5} = 3^{-3} = \left(\frac{1}{3}\right)^3 = \frac{1}{27}$

2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
3. Use numbers expressed in the form of a single digit multiplied by an integer power of 10 (scientific notation) to estimate very large or very small quantities, and express how many times as much one is than the other.

***Example**: Estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.*

4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.

***Example**: Millimeters per year for seafloor spreading*

☐ **8.EE.B. Understand the connections between proportional relationships, lines, and linear equations.**

5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

***Example**: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

☐ **8.EE.C. Analyze and solve linear equations and pairs of simultaneous linear equations.**

7. Solve linear equations in one variable.
   a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$ (1 solution), $a = a$ (infinitely many solutions), or $a = b$ (no solution) results (where a and b are different numbers).

***Example**: $-3x - 2 = 7x + 2 - 10x$ has no solution because the equation simplifies to $-2 = 2$ which is false for any value of x.*

   b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8. Analyze and solve pairs of simultaneous linear equations.
   a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs because points of intersection satisfy both equations simultaneously.
   b. Solve systems of two linear equations in two variables algebraically (including but not limited to using substitution and elimination strategies), and estimate solutions by graphing the equations; solve simple cases by inspection.

***Example**: $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.*

c. Solve real-world and mathematical problems leading to two linear equations in two variables.

Examples:

1) Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

2) Your family decided to rent a snowmobile at Island Park. Company A charges $\$125$ *for the first hour plus* $\$37.50$ *for each additional hour. Company B charges a* $\$50$ *one-time rental fee plus* $\$45$ *per hour. Which company would cost less for you to rent for* 3 *hours?* 5 *hours?* 8 *hours?*

Functions – 8.F

☐ **8.F.A. Define, evaluate, and compare functions.**

1. Understand that a function is a rule that assign to each input exactly one output and that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Example: *Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

Example: *The function* $A = s^2$ *giving the area of a square as a function of its side length is not linear because its graph contains the points* $(1, 1)$, $(2, 4)$ *and* $(3, 9)$, *which are not on a straight line.*

☐ **8.F.B. Use functions to model relationships between quantities.**

4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
5. Describe qualitatively the functional relationship between two quantities by analyzing and sketching a graph (e.g., where the function is increasing or decreasing, linear or nonlinear).

Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Geometry – 8.G

☐ 8.G.A. Understand congruence and similarity using physical models, transparencies, or geometry software.

1. Verify experimentally the properties of rotations, reflections, and translations:
   a. Lines are transformed to lines, and line segments to line segments of the same length.
   b. Angles are transformed to angles of the same measure.
   c. Parallel lines are transformed to parallel lines.
2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations.

   Example: *Given two congruent figures, describe a sequence that exhibits the congruence between them.*

3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

   Example: *The image of Triangle ABC with* $A = (-3, 0)$, $B = (-3, -2)$ *and* $C = (4, -2)$ *would have coordinates* $A' = (-3 - 3, 0 + 2) = (-6, 2)$, $B' = (-3 - 3, -2 + 2) = (-6,0)$, *and* $C' = (4 - 3, -2 + 2) = (1,0)$ *following a translation* 3 *units to the left and* 2 *units up.*

4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations.

   Example: *Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.*

5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

   Example: *Arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

☐ 8.G.B. Understand and apply the Pythagorean Theorem.

6. Analyze and justify the Pythagorean Theorem and its converse using pictures, diagrams, narratives, or models.

7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

○ 8.G.C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics and Probability – 8.SP

△ 8.SP.A. Investigate patterns of association in bivariate data.

1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

   ***Example**: In a linear model for a biology experiment, interpret a slope of* 1.5 *cm/hr as meaning that an additional hour of sunlight each day is associated with an additional* 1.5 *cm in mature plant height.*

4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

   ***Example**: Collect data from students in your school on grade level (sixth, seventh, and eighth) and whether or not they have assigned chores at home (yes, no). Is there evidence that a particular grade level tends to have chores? (In this example the two variables are grade level and chores.)*

GRADES 9-12 – CONTENT STANDARDS BY CONCEPTUAL CATEGORIES

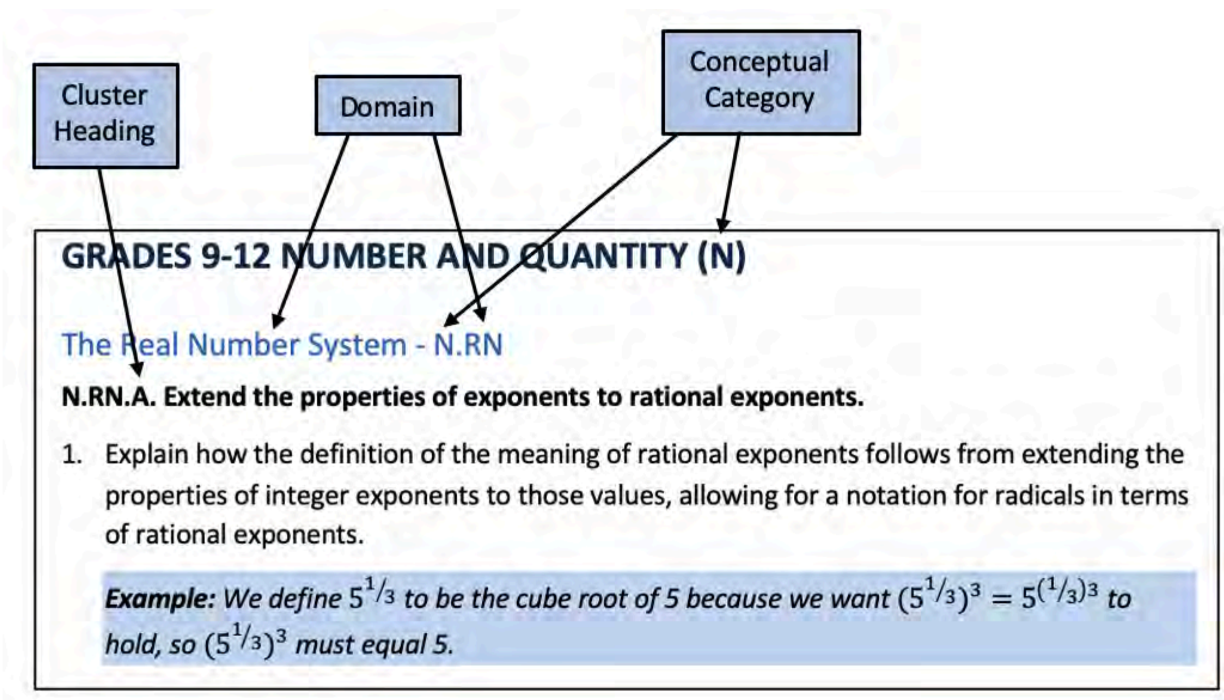
Content Standards by Conceptual Category Identifiers/Coding

The content standards presented by conceptual categories are built on mathematical learning progressions informed by research on cognitive development and by the logical structure of mathematics. These progressions provide the foundation for the grades 9–12 content standards. In this section, the standards are organized by conceptual categories.

The Conceptual Categories are:

- **Number and Quantity (N)**
- **Algebra (A)**
- **Functions (F)**
- **Modeling (★)**
- **Geometry (G)**
- **Statistics and Probability (S)**

The code for each grade 9-12 conceptual category standard begins with the identifier for the conceptual category code (N, A, F, G, S), followed by the domain code, and the standard number, as shown below.



The standard highlighted above is identified as N.RN.A.1, identifying it as a standard in the Number and Quantity conceptual category (N.) within that category's Real Number System domain (RN.), and as the first standard in that domain and in that cluster (A.1). All of the standards in this Framework use a common coding system.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

9-12 Standards for Mathematical Practice

Mathematical Practices

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the K-12 education years.

MP.1 Make sense of problems and persevere in solving them.
Grades 9-12 students should work to understand what a problem is asking, choose a strategy to find a solution, and check the answer to make sure it makes sense. When unable to immediately identify a strategy that will work or when their selected strategy does not work as intended, they must learn to persist in trying a range of potential approaches, looking for how the current problem may relate to previous work they have done. Solving problems is the essence of mathematical work.

MP.2 Reason abstractly and quantitatively.
Grades 9-12 students need to be able to abstract a given situation and represent it symbolically. Students should also make sense of quantities and their relationships in problem situations. Particular attention to units associated with quantities is essential to understanding how the quantities are related. For example, a linear function relating the distance traveled to time needs to specify the units, such as feet and seconds. The slope of that function then gives the rate of change (velocity) given in feet per second. Students should consistently consider the reasonableness of their answer within the context of the problem.

MP.3 Construct viable arguments and critique the reasoning of others.
Grades 9-12 students are increasingly expected to make formal mathematical arguments based on stated assumptions or proper ties, well-defined definitions, and previously established results. Students should be expected to make formal and informal arguments as they progress through the grades 9-12. Students should listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. Moreover, experience with critiquing the arguments produced by classmates is essential to their mathematical development. Reasoning undergirds deep conceptual understanding.

MP.4 Model with mathematics.
Grades 9-12 students need to learn to use mathematics to address problems in everyday life, society, and the workplace. This should occur at a range of levels, from more specific application of mathematical ideas to full-scale mathematical modeling. Routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

MP.5 Use appropriate tools strategically.

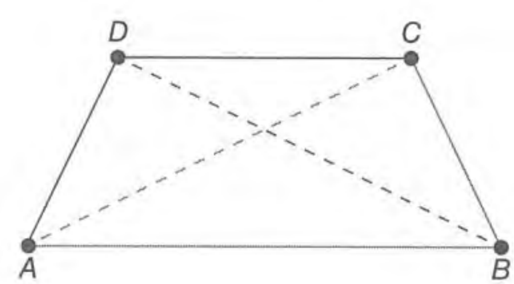
Grades 9-12 students need to be comfortable in using applicable tools when solving a mathematics problem. A range of technological tools should be available, including graphing calculators and software, computer algebra systems, spreadsheets, dynamic geometry software, and statistical software. Physical manipulatives, such as algebra tiles and geometric models, are useful for students and should be incorporated into the 9-12 classroom. Students should be comfortable using paper-and-pencil representations, such as tables, graphs, and other visual representations.

MP.6 Attend to precision.

Grades 9-12 students need to learn to communicate effectively with others, using precise vocabulary. They should use symbols to represent their thinking, clearly describing the meaning of those symbols. By the time students reach grades 9-12 they have learned to examine claims and make explicit use of definitions. They also need to be able to express the precision of the answers they give in real-world contexts, based on the accuracy of the given information.

MP.7 Look for and make use of structure.

Grades 9-12 students examine mathematical situations in order to detect a pattern or structure that may provide further insight. Students use patterns and structure to create equivalent expressions, factor and solve equations, compose functions, and transform figures. For example, drawing an auxiliary line in a geometric figure may help them to better understand the structure behind a situation. Drawing in the diagonals of an isosceles trapezoid creates two overlapping triangles $\Delta ABC$and ΔBCA as shown in the following figure; if we can demonstrate their congruence, other properties of the figure will become apparent.



MP.8 Look for and express regularity in repeated reasoning.

Grades 9-12 students notice patterns in calculations that are performed in order to form generalizations and efficient strategies for calculation. For example, grades 9-12 students may expand on their understanding of right triangles to explore the relationship between the legs and hypotenuse of a 45-45-90 triangle to discover that the hypotenuse is $\sqrt{2}$ times the leg.

GRADES 9-12 NUMBER AND QUANTITY (N)

Introduction

Numbers and Number Systems

During the years from kindergarten to eighth grade, students must repeatedly extend their conception of number. At first, "number" means "counting number": 1, 2, 3.... Soon after that, 0 is used to represent "none" and the whole numbers are formed by the counting numbers together with zero. The next extension is fractions. At first, fractions are barely numbers and tied strongly to pictorial representations. Yet by the time students understand division of fractions, they have a strong concept of fractions as numbers and have connected them, via their decimal representations, with the Base Ten system used to represent the whole numbers. During middle school, fractions are augmented by negative fractions to form the rational numbers. In eighth grade, students extend this system once more, augmenting the rational numbers with the irrational numbers to form the real numbers. In high school, students will be exposed to yet another extension of number, when the real numbers are augmented by the imaginary numbers to form the complex numbers.

With each extension of number, the meanings of addition, subtraction, multiplication, and division are extended. In each new number system—integers, rational numbers, real numbers, and complex numbers—the four operations stay the same in two important ways: They have the Commutative, Associative, and Distributive properties and their new meanings are consistent with their previous meanings.

Extending the properties of whole-number exponents leads to new and productive notation. For example, properties of whole-number exponents suggest that $(5^{1/3})^3$should be $5^{(1/3)3} = 5^1 = 5$ and that $5^{1/3}$ should be the cube root of 5.

Calculators, spreadsheets, and computer algebra systems can provide ways for students to become better acquainted with these new number systems and their notation. They can be used to generate data for numerical experiments, to help understand the workings of matrix, vector, and complex number algebra, and to experiment with non-integer exponents.

Quantities

In real-world problems, the answers are usually not numbers but quantities: numbers with units, which involve measurement. In their work in measurement up through grade 8, students primarily measure commonly used attributes such as length, area, and volume. In high school, students encounter a wider variety of units in modeling, e.g., acceleration, currency conversions, derived quantities such as person-hours and heating degree-days, social science rates such as per-capita income, and rates in everyday life such as points scored per game or batting averages. They also encounter novel situations in which they themselves must conceive the attributes of interest. For example, to find a good measure of overall highway safety, they might propose measures such as fatalities per year, fatalities per year per driver, or fatalities per vehicle-mile traveled. Such a conceptual process is sometimes called quantification. Quantification is important for science, as when surface area suddenly “stands out” as an important variable in evaporation. Quantification is also important for companies, which must conceptualize relevant attributes and create or choose suitable measures for them.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Number and Quantity Overview

The Real Number System

A. Extend the properties of exponents to rational exponents.

B. Use properties of rational and irrational numbers.

Quantities

A. Reason quantitatively and use units to solve problems.

The Complex Number System

A. Perform arithmetic operations with complex numbers.

B. Represent complex numbers and their operations on the complex plane.

C. Use complex numbers in polynomial identities and equations.

Vector and Matrix Quantities

A. Represent and model with vector quantities.

B. Perform operations on vectors.

C. Perform operations on matrices and use matrices in applications.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

The Real Number System - N.RN

N.RN.A. Extend the properties of exponents to rational exponents.

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

Example: *We define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*

2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Example*: Solving the volume of a cube formula, $V = s^3$, for s would involve rewriting the solution as either $s = \sqrt[3]{V}$ or $s = V^{1/3}$.*

N.RN.B. Use properties of rational and irrational numbers.

3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Quantities – N.Q

N.Q.A. Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.★
2. Define appropriate quantities for the purpose of descriptive modeling.★
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.★

The Complex Number System – N.CN

N.CN.A. Perform arithmetic operations with complex numbers.

1. Know there is a complex number i such that $i^2 = -1$, and show that every complex number has the form $a + bi$ with a and b real.

Example*: Express the radical, $\pm\sqrt{-24}$, using the imaginary unit, i, in simplified form. Expressing the radical using i in simplified form results in the expression $\pm 2i\sqrt{6}$.*

2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
3. (+) Find the conjugate of a complex number; use conjugates to find absolute value and quotients of complex numbers.

N.CN.B. Represent complex numbers and their operations on the complex plane.

4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation.

Example: *For example,* $(1 + i\sqrt{3})^3 = 8$ *because* $\left(-1 + i\sqrt{3}\right)$ *has a radius of* 2 *and argument* $120°$.

6. (+) Calculate the distance between numbers in the complex plane as the absolute value of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

N.CN.C. Use complex numbers in polynomial identities and equations.

7. Solve quadratic equations with real coefficients that have complex solutions.

Example: *Find the complex solutions of the quadratic equation* $5x^2 + 3x + 1 = 0$, *with the solutions of* $x = \frac{3}{10} + \frac{3}{5}i$ *and* $x = \frac{3}{10} - \frac{3}{5}i$.

8. (+) Extend polynomial identities to the complex numbers.

Example: *Rewrite* x^2 *+ 4 as* $(x + 2i)\ (x - 2i)$.

9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Vector and Matrix Quantities – N.VM

N.VM.A. Represent and model with vector quantities.

1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., **v**, |**v**|, ||**v**||, v).
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.

N.VM.B. Perform operations on vectors.

4. (+) Add and subtract vectors.
   a. (+) Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.
   b. (+) Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
   c. (+) Demonstrate understanding of vector subtraction **v** – **w** as **v** + (–**w**)**,** where –**w** is the additive inverse of **w**, with the same magnitude as **w** and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.
5. (+) Multiply a vector by a scalar.
   a. (+) Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(vx\ , vy) = (cvx\ , cvy)$.
   b. (+) Compute the magnitude of a scalar multiple c**v** using ||c**v**|| = |c|**v**. Compute the direction of c**v** knowing that when |c|**v** ≠ 0, the direction of c**v** is either along **v** (for $c > 0$) or against **v** (for $c < 0$).

N.VM.C. Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.
9. (+) Demonstrate understanding that, unlike multiplication of numbers, matrix multiplication for square matrices is not a Commutative operation, but still satisfies the Associative and Distributive properties.
10. (+) Demonstrate understanding that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The

determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.

11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.
12. (+) Work with 2×2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

GRADES 9-12 ALGEBRA (A)

Introduction

Expressions

An expression is a record of a computation with numbers, symbols that represent numbers, arithmetic operations, exponentiation, and, at more advanced levels, the operation of evaluating a function. Conventions about the use of parentheses and the Order of Operations assure that each expression is unambiguous. Creating an expression that describes a computation involving a general quantity requires the ability to express the computation in general terms, abstracting from specific instances.

Reading an expression with comprehension involves analysis of its underlying structure. This may suggest a different but equivalent way of writing the expression that exhibits some different aspect of its meaning. For example, $p + 0.05p$ can be interpreted as the addition of a 5% tax to a price p. Rewriting $p + 0.05p$ as $1.05p$ shows that adding a tax is the same as multiplying the price by a constant factor.

Algebraic manipulations are governed by the properties of operations and exponents and the conventions of algebraic notation. At times, an expression is the result of applying operations to simpler expressions. For example, $p + 0.05p$ is the sum of the simpler expressions p and $0.05p$. Viewing an expression as the result of operation on simpler expressions can sometimes clarify its underlying structure. A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.

Equations and Inequalities

An equation is a statement of equality between two expressions, often viewed as a question asking for which values of the variables the expressions on either side are in fact equal. These values are the solutions to the equation. An identity, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.

The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.

An equation can often be solved by successively deducing from it one or more simpler equations. For example, one can add the same constant to both sides without changing the solutions, but squaring both sides might lead to extraneous solutions. Strategic competence in solving includes looking ahead for productive manipulations and anticipating the nature and number of solutions.

Some equations have no solutions in a given number system, but have a solution in a larger system. For example, the solution of $\mathrm{x} + 1 = 0$ is an integer, not a whole number; the solution of $2\mathrm{x} + 1 = 0$ is a rational number, not an integer; the solutions of $\mathrm{x}^2 - 2 = 0$ are real numbers, not rational numbers; and the solutions of $\mathrm{x}^2 + 2 = 0$ are complex numbers, not real numbers.

The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, $A = \left(\frac{b_1+b_2}{2}\right) h$, can be solved for h using the same deductive process. Inequalities can be solved by reasoning about the properties of inequality. Many, but not all, of the properties of equality continue to hold for inequalities and can be useful in solving them.

Connections to Functions and Modeling

Expressions can define functions, and equivalent expressions define the same function. Asking when two functions have the same value for the same input leads to an equation; graphing the two functions allows for finding approximate solutions of the equation. Converting a verbal description to an equation, inequality, or system of these is an essential skill in modeling.

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Algebra Overview

Seeing Structure in Expressions

A. Interpret the structure of linear, quadratic, exponential, polynomial, and rational expressions.

B. Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

A. Perform arithmetic operations on polynomials.

B. Understand the relationship between zeros and factors of polynomials.

C. Use polynomial identities to solve problems.

D. Rewrite rational expressions.

Creating Equations

A. Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities

A. Understand solving equations as a process of reasoning and explain the reasoning.

B. Solve equations and inequalities in one variable.

C. Solve systems of equations.

D. Represent and solve equations and inequalities graphically.

Standards for Mathematical Practice

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
7. **Look for and make use of structure.**
8. **Look for and express regularity in repeated reasoning.**

Seeing Structure in Expressions – A.SSE

A.SSE.A. Interpret the structure of linear, quadratic, exponential, polynomial, and rational expressions.

1. Interpret expressions that represent a quantity in terms of its context. ★
   a. Interpret parts of an expression, such as terms, factors, and coefficients.
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity.

Example: *Interpret $P(1+r)^n$ as the product of P and a factor not depending on P.*

2. Use the structure of an expression to identify ways to rewrite it.

Example: *See $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*

A.SSE.B. Write expressions in equivalent forms to solve problems.

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
   a. Factor a quadratic expression to reveal the zeros of the function it defines.
   b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Example: *A high school player punts a football, and the function $h(t) = -16t^2 + 64t + 2$ represents the height h, in feet, of the football at time t seconds after it is punted. Complete the square in the quadratic expression to find the maximum height of the football.*

   c. Use the properties of exponents to transform expressions for exponential functions.

Example: *The expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1) and use the formula to solve problems.★

Example: *Calculate mortgage payments.*

Arithmetic with Polynomials and Rational Expressions – A.APR

A.APR.A. Perform arithmetic operations on polynomials.

1. Demonstrate understanding that polynomials form a system analogous to the integers, namely, they are closed under certain operations.
    a. Perform operations on polynomial expressions (addition, subtraction, multiplication, division) and compare the system of polynomials to the system of integers when performing operations.
    b. Factor and/or expand polynomial expressions, identify and combine like terms, and apply the Distributive property.

A.APR.B. Understand the relationship between zeros and factors of polynomials.

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

A.APR.C. Use polynomial identities to solve problems.

4. Prove polynomial identities and use them to describe numerical relationships.

Example: *The polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*

5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

A.APR.D. Rewrite rational expressions.

6. Rewrite simple rational expressions in different forms using inspection, long division, or for the more complicated examples, a computer algebra system.

Example*: Write $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$ where $a(x), b(x), q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$.*

7. (+) Demonstrate understanding that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression, add, subtract, multiply, and divide rational expressions.

Creating Equations – A.CED

A.CED.A. Create equations that describe numbers or relationships.

1. Create one variable equations and inequalities to solve problems; including linear, quadratic, rational, and exponential functions.★

***Example**: Four people may be seated at one rectangular table. If two rectangular tables are placed together end-to-end, 6 people may be seated at the table. If 10 tables are placed together end-to-end, how many people can be seated? How many tables are needed for n people?*

2. Interpret the relationship between two or more quantities.★
    a. Define variables to represent the quantities and write equations to show the relationship.★

***Example**: The cost of parking in the parking garage is $\$2.00$ for the first hour and $\$1.00$ for every hour after that. Write an equation in terms of x and y that shows the total cost for parking, y, for x hours. Use the equation to calculate the cost for parking in the garage for 5 hours.*

    b. Use graphs to show a visual representation of the relationship while adhering to appropriate labels and scales.★

***Example**: Using the equation from A-CED.2a, show how the graph of the equation can be used to predict the cost for a specified amount of time.*

3. Represent constraints using equations or inequalities and interpret solutions as viable or non-viable options in a modeling context.★
4. Represent constraints using systems of equations and/or inequalities and interpret solutions as viable or non- viable options in a modeling context.★
5. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.★

Example: Rearrange Ohm's law $V = IR$ to highlight resistance R.

Reasoning with Equations and Inequalities – A.REI

A.REI.A. Understand solving equations as a process of reasoning and explain the reasoning.

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.REI.B. Solve equations and inequalities in one variable.

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

a. Solve linear equations and inequalities in one variable involving absolute value.

4. Solve quadratic equations in one variable.

    a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

    b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

A.REI.C. Solve systems of equations.

5. Verify that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

    Example: *A school club is selling hats and t-shirts for a fundraiser. The group expects to sell a total of* 50 *items. They make a profit of* 15 *dollars for each t-shirt sold and* 5 *dollars for each hat sold. How many hats and t-shirts will the school club need to sell to make a profit of* $\$300$?

7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

    Example: *Find the points of intersection between the line* $y = -3x$ *and the circle* $x^2 + y^2 = 3$.

8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.

9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3×3 or greater).

A.REI.D. Represent and solve equations and inequalities graphically.

10. Demonstrate understanding that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. Show that any point on the graph of an equation in two variables is a solution to the equation.

11. Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions

approximately. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★

***Example**: Use technology to graph the functions, make tables of values, or find successive approximations.*

12. Graph the solutions to a linear inequality in two variables as a half- plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

GRADES 9-12 FUNCTIONS (F)

Introduction

Functions describe situations where one quantity determines another. For example, the return on $\$10{,}000$ invested at an annualized percentage rate of 4.25% is a function of the length of time the money is invested. Because we continually make theories about dependencies between quantities in nature and society, functions are important tools in the construction of mathematical models.

In 9-12 mathematics, functions usually have numerical inputs and outputs and are often defined by an algebraic expression. For example, the time in hours it takes for a car to drive 100 miles is a function of the car's speed in miles per hour, v; the rule $T(v) = \frac{100}{v}$ expresses this relationship algebraically and defines a function whose name is T.

The set of inputs to a function is called its domain. We often infer the domain to be all inputs for which the expression defining a function has a value, or for which the function makes sense in a given context.

A function can be described in various ways, such as, by a graph (e.g., the trace of a seismograph); by a verbal rule, as in, "I'll give you a state, you give me the capital city"; by an algebraic expression like $f(x) = a + bx$; or by a recursive rule. The graph of a function is often a useful way of visualizing the relationship of the function models, and manipulating a mathematical expression for a function can throw light on the function's properties.

Functions presented as expressions can model many important phenomena. Two important families of functions characterized by laws of growth are linear functions, which grow at a constant rate, and exponential functions, which grow at a constant percent rate. Linear functions with a constant term of zero describe proportional relationships.

A graphing utility or a computer algebra system can be used to experiment with properties of these functions and their graphs and to build computational models of functions, including recursively defined functions.

Connections to Expressions, Equations, Modeling, and Coordinates

Determining an output value for a particular input involves evaluating an expression; finding inputs that yield a given output involves solving an equation. Questions about when two functions have the same value for the same input lead to equations whose solutions can be visualized from the intersection of their graphs. Because functions describe relationships between quantities, they are frequently used in modeling. Sometimes functions are defined by a recursive process, which can be displayed effectively using a spreadsheet or other technology.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Functions Overview

Interpreting Functions

A. Understand the concept of a function and use function notation.

B. Interpret functions that arise in applications in terms of the context. Include linear, quadratic, exponential, rational, polynomial, square root and cube root, trigonometric, and logarithmic functions.

C. Analyze functions using different representations.

Building Functions

A. Build a function that models a relationship between two quantities.

B. Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

A. Construct and compare linear, quadratic, and exponential models and solve problems.

B. Interpret expressions for functions in terms of the situation they model.

Trigonometric Functions

A. Extend the domain of trigonometric functions using the unit circle.

B. Model periodic phenomena with trigonometric functions.

C. Prove and apply trigonometric identities.

Standards for Mathematical Practice

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
7. **Look for and make use of structure.**
8. **Look for and express regularity in repeated reasoning.**

Interpreting Functions – F.IF

F.IF.A. Understand the concept of a function and use function notation.

1. Demonstrate understanding that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range**:** If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

   Example*: Given a function representing a car loan, determine the balance of the loan at different points in time.*
3. Demonstrate that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

   Example*: The Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.*

F.IF.B. Interpret functions that arise in applications in terms of the context. Include linear, quadratic, exponential, rational, polynomial, square root and cube root, trigonometric, and logarithmic functions.

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★

   Example*: Given a context or verbal description of a relationship, sketch a graph that models the context or description and shows its key features.*
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.★

   Example*: If the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

F.IF.C. Analyze functions using different representations.

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★
    a. Graph linear and quadratic functions and show intercepts, maxima, and minima.★
    b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.★
    c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.★
    d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.★
    e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.★
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
    a. Use the process of factoring and/or completing the square in quadratic and polynomial functions, where appropriate, to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

***Example**: Suppose $h(t) = -5t^2 + 10t + 3$ represents the height of a diver above the water (in meters), t seconds after the diver leaves the springboard. What is the maximum height above the water the diver reaches? After how many seconds, t, does the diver hit the water?*

    b. Use the properties of exponents to interpret expressions for exponential functions. Apply to financial situations such as identifying appreciation and depreciation rate for the value of a house or car sometime after its initial purchase.

***Example**: The equation for radioactive decay is, $A = A_0\left(\frac{1}{2}\right)^{t/h}$. When A_0 is the original amount of a radioactive substance, A is the final amount, h is the half-life of the substance, and t is time. Hagerman, Idaho is a hotbed of fossil hunting. The half-life of Carbon-14 is about 5730 years. If a fossil that was found in Hagerman contains 54 grams of Carbon-14 at time $t = 0$, how much Carbon-14 remains at time $t = 17190$ years?*

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

***Example**: Given a graph of one polynomial function and an algebraic expression for another, say which has the larger/smaller relative maximum and/or minimum.*

10. Given algebraic, numeric and/or graphical representations of functions, recognize the function as polynomial, rational, logarithmic, exponential, or trigonometric.

Building Functions – F.BF

F.BF.A. Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities. Functions could include linear, exponential, quadratic, simple rational, radical, logarithmic, and trigonometric.★
    a. Determine an explicit expression, a recursive process, or steps for calculation from a context.★
    b. Combine standard function types using arithmetic operations.★

***Example**: Build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

    c. (+) Compose functions.★

***Example**: If $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.*

2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★

***Example**: If the U.S. Census Bureau wrote the following recursive equation to represent how they estimate Idaho's population will grow each year after 2019: $P(n) = 1.023 \cdot P(n-1)$, $P(0) = 1{,}787{,}000$. $P(n)$ represents Idaho's population at the end of the n^{th} year in terms of Idaho's population at the end of the $(n-1)^{th}$ year, $P(n-1)$. Predict Idaho's population in 2040.*

F.BF.B. Build new functions from existing functions.

3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Include, linear, quadratic, exponential, absolute value, simple rational and radical, logarithmic, and trigonometric functions. Utilize using technology to experiment with cases and illustrate an explanation of the effects on the graph. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

4. Find inverse functions algebraically and graphically.
    a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. Include linear and simple polynomial, rational, and exponential functions.

Example: $f(x) = 2x^3$ *or* $f(x) = \frac{x+1}{x-1}$ *for* $x \neq 1$

    b. (+) Verify by composition that one function is the inverse of another.
    c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
    d. (+) Produce an invertible function from a non-invertible function by restricting the domain.
5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Linear, Quadratic, and Exponential Models – F.LE

F.LE.A. Construct and compare linear, quadratic, and exponential models and solve problems.

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.★
    a. Demonstrate that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.★
    b. Identify situations in which one quantity changes at a constant rate per unit interval relative to another.★
    c. Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.★
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (including reading these from a table).★
3. Use graphs and tables to demonstrate that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.★

Example*: Becca's parents are saving for her college education by putting* $3,000*/year in a safe deposit box. Becca's grandpa is also saving for her college education by putting*

$\$2{,}000$/year in an IDeal (Idaho college savings) account with an APR of 6.17%. Build tables to show which account has the most money after 10 years, and how much more? How many years will it take for the total in her grandpa's account to exceed the total in her parents' safe deposit box?

4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is $2, 10$, or e; evaluate the logarithm using technology.★

***Example**: Mr. Rico has a savings account that has an interest rate of 7% compounded continuously. The amount in the account is calculated using $A = Pe^{rt}$. If Mr. Rico invested $\$30{,}000$ on January 1, 2020, when will he have $\$100{,}000$ in the account?*

F.LE.B. Interpret expressions for functions in terms of the situation they model.

5. Interpret the parameters in a linear or exponential function (of the form $f(x) = b^x + k$) in terms of a context.★

Trigonometric Functions – F.TF

T.TF.A. Extend the domain of trigonometric functions using the unit circle.

1. Demonstrate radian measure as the ratio of the arc length subtended by a central angle to the length of the radius of the unit circle.
   a. Use radian measure to solve problems.

***Example**: You live in New Meadows, Idaho, which is located on the 45th parallel ($45°$ North latitude). Approximately how far will you drive, in miles, to attend the Calgary Stampede? Calgary is located at $51°$N latitude, almost due North of New Meadows. (Use $r = 3960$ miles for the radius of the Earth.)*

2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{\pi}{3}$, $\frac{\pi}{4}$, and $\frac{\pi}{6}$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.

4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

T.TF.B. Model periodic phenomena with trigonometric functions.

5. Model periodic phenomena using trigonometric functions with specified amplitude, frequency, and midline.★

***Example**: This past summer you and your friends decided to ride the Ferris wheel at the Idaho State Fair. You wondered how high the highest point on the Ferris wheel was. You asked the operator, and he didn't know, but he told you that the height of the chair was 5 ft off the ground when you got on and the center of the Ferris wheel is 30 ft above that. You checked your phone when you got on and figured out that it took you 12 mins to make one full revolution. Create a model to show your height from the platform at any given time on the Ferris wheel.*

6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.★

T.TF.C. Prove and apply trigonometric identities.

8. Relate the Pythagorean Theorem to the unit circle to discover the Pythagorean identity $sin^2(\theta) + cos^2(\theta) = 1$ and use the Pythagorean identity to find the value of a trigonometric function $(sin(\theta), cos(\theta), or\ tan(\theta))$ given one trigonometric function $(sin(\theta), cos(\theta), or\ tan(\theta))$ and the quadrant of the angle.

***Example**: Suppose that $\cos(\theta) = \frac{2}{5}$ and that θ is in the 4th quadrant. Find the exact value of $\sin(\theta)$ and $\tan(\theta)$.*

9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

CONCEPTUAL CATEGORY: MODELING (★)

Introduction

Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

A model can be very simple, such as writing total cost as a product of unit price and number bought or using a geometric shape to describe a physical object like a coin. Even such simple models involve making choices. It is up to us whether to model a coin as a three-dimensional cylinder, or whether a two-dimensional disk works well enough for our purposes. Other situations—modeling a delivery route, a production schedule, or a comparison of loan amortizations—need more elaborate models that use other tools from the mathematical sciences. Real-world situations are not organized and labeled for analysis; formulating tractable models, representing such models, and analyzing them is appropriately a creative process. Like every such process, this depends on acquired expertise as well as creativity.

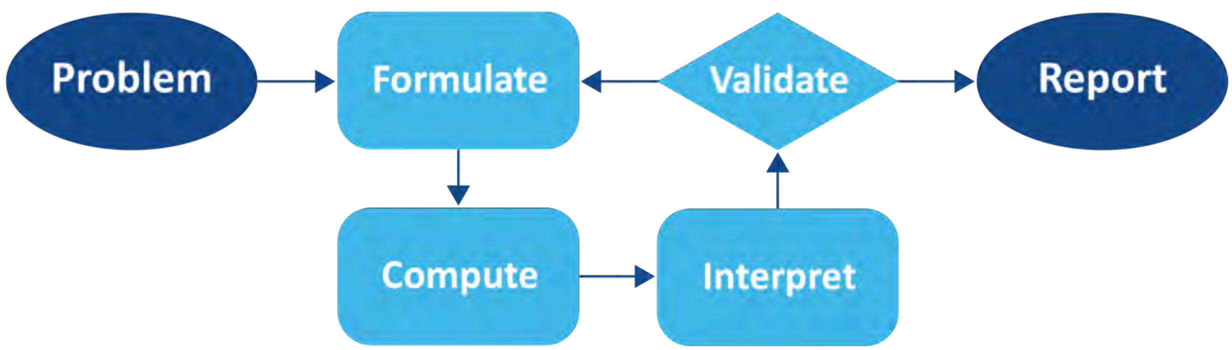
Some examples of such situations might include:

- Estimating how much water and food is needed for emergency relief in a devastated city of three million people, and how it might be distributed.
- Planning a table tennis tournament for seven players at a club with four tables, where each player plays against each other player.
- Designing the layout of the stalls in a school fair so as to raise as much money as possible.
- Analyzing stopping distance for a car.
- Modeling savings account balance, bacterial colony growth, or investment growth.
- Engaging in critical path analysis, e.g., applied to turnaround of an aircraft at an airport.
- Analyzing risk in situations such as extreme sports, pandemics, and terrorism.
- Relating population statistics to individual predictions.

In situations like these, the models devised depend on a number of factors: How precise an answer do we want or need? What aspects of the situation do we most need to understand, control, or optimize? What resources of time and tools do we have? The range of models that we can create and analyze is also constrained by the limitations of our mathematical, statistical, and technical skills, and our ability to recognize significant variables and relationships among them. Diagrams of various kinds, spreadsheets and other technology, and algebra are powerful tools for understanding and solving problems drawn from different types of real-world situations.

One of the insights provided by mathematical modeling is that essentially the same mathematical or statistical structure can sometimes model seemingly different situations. Models can also shed light on the mathematical structures themselves, for example, as when a model of bacterial growth makes more vivid the explosive growth of the exponential function.

The basic modeling cycle is summarized in the diagram below. It involves: (1) identifying variables in the situation and selecting those that represent essential features; (2) formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables; (3) analyzing and performing operations on these relationships to draw conclusions; (4) interpreting the results of the mathematics in terms of the original situation; (5) validating the conclusions by comparing them with the situation, and then either improving the model or; (6) if it is acceptable, reporting on the conclusions and the reasoning behind them. Choices, assumptions, and approximations are present throughout this cycle.



In descriptive modeling, a model simply describes the phenomena or summarizes them in a compact form. Graphs of observations are a familiar descriptive model—for example, graphs of global temperature and atmospheric CO_2 over time.

Analytic modeling seeks to explain data on the basis of deeper theoretical ideas, albeit with parameters that are empirically based; for example, exponential growth of bacterial colonies (until cut-off mechanisms such as pollution or starvation intervene) follows from a constant reproduction rate. Functions are an important tool for analyzing such problems.

Graphing utilities, spreadsheets, computer algebra systems, and dynamic geometry software are powerful tools that can be used to model purely mathematical phenomena (e.g., the behavior of polynomials) as well as physical phenomena.

Modeling Standards

Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific Modeling standards appear throughout the high school standards indicated by a star symbol (★).

GRADES 9-12 GEOMETRY (G)

Introduction

An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts—interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material.

Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.)

During 9-12 mathematics, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful proofs. Later in college, some students develop Euclidean and other geometries carefully from a small set of axioms.

The concepts of congruence, similarity, and symmetry can be understood from the perspective of geometric transformation. Fundamental are the rigid motions: translations, rotations, reflections, and combinations of these, all of which are here assumed to preserve distance and angles (and therefore shapes generally). Reflections and rotations each explain a particular type of symmetry, and the symmetries of an object offer insight into its attributes—as when the reflective symmetry of an isosceles triangle assures that its base angles are congruent.

In the approach taken here, two geometric figures are defined to be congruent if there is a sequence of rigid motions that carries one onto the other. This is the principle of superposition. For triangles, congruence means the equality of all corresponding pairs of sides and all corresponding pairs of angles. During the middle grades, through experiences drawing triangles from given conditions, students notice ways to specify enough measures in a triangle to ensure that all triangles drawn with those measures are congruent. Once these triangle congruence criteria (ASA, SAS, and SSS) are established using rigid motions, they can be used to prove theorems about triangles, quadrilaterals, and other geometric figures.

Similarity transformations (rigid motions followed by dilations) define similarity in the same way that rigid motions define congruence, thereby formalizing the similarity ideas of “same shape” and “scale factor” developed in the middle grades. These transformations lead to the criterion for triangle similarity that two pairs of corresponding angles are congruent.

The definitions of sine, cosine, and tangent for acute angles are founded on right triangles and similarity, and, with the Pythagorean Theorem, are fundamental in many real-world and theoretical situations. The Pythagorean Theorem is generalized to non-right triangles by the Law of Cosines. Together, the Laws of Sines and Cosines embody the triangle congruence criteria for the cases where three pieces of information suffice to completely solve a triangle. Furthermore, these laws yield two possible solutions in the ambiguous case, illustrating that Side-Side-Angle is not a congruence criterion.

Analytic geometry connects algebra and geometry, resulting in powerful methods of analysis and problem solving. Just as the number line associates numbers with locations in one dimension, a pair of perpendicular axes associates pairs of numbers with locations in two dimensions. This correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof. Geometric transformations of the graphs of equations correspond to algebraic changes in their equations.

Dynamic geometry environments provide students with experimental and modeling tools that allow them to investigate geometric phenomena in much the same way as computer algebra systems allow them to experiment with algebraic phenomena.

Connections to Equations

The correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics, or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Geometry Overview

Congruence

A. Experiment with transformations in the plane.
B. Understand congruence in terms of rigid motions.
C. Prove geometric theorems and, when appropriate, the converse of theorems.
D. Make geometric constructions.

Similarity, Right Triangles, and Trigonometry

A. Understand similarity in terms of similarity transformations.
B. Prove theorems involving similarity.
C. Define trigonometric ratios and solve problems involving right triangles.
D. Apply trigonometry to general triangles.

Circles

A. Understand and apply theorems about circles.
B. Find arc lengths and areas of sectors of circles.

Expressing Geometric Properties with Equations

A. Translate between the geometric description and the equation for a conic section.
B. Use coordinates to prove simple geometric theorems algebraically.

Geometric Measurement and Dimension

A. Explain volume formulas and use them to solve problems.
B. Visualize relationships between two-dimensional and three-dimensional objects.

Modeling with Geometry

A. Apply geometric concepts in modeling situations.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Congruence – G.CO

G.CO.A. Experiment with transformations in the plane.

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

2. Represent transformations in the plane and describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not.

   Example: *Translation versus horizontal stretch*

3. Describe the rotations and reflections that carry a given figure (rectangle, parallelogram, trapezoid, or regular polygon) onto itself.

4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

5. Draw the transformation (rotation, reflection, or translation) for a given geometric figure.

   Example: *Given quadrilateral $TMEJ$ with vertices $T(0,-1)$, $M(3,-2)$, $E(-1,-5)$, and $J(-3,-2)$, reflect the shape across the x-axis.*

6. Specify a sequence of transformations that will carry a given figure onto another.

G.CO.B. Understand congruence in terms of rigid motions.

7. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

8. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

9. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

   Example: In ΔABC *and* ΔABD *(with shared side* $\overline{AB}$*), we are given that* $\angle BAC \cong \angle BAD$ *and* $\angle ABC \cong \angle ABD$. *What pair(s) of corresponding parts is needed to ensure the triangles are congruent by either ASA, SAS, or SSS? What rigid motion would show the triangles are congruent?*

G.CO.C. Prove geometric theorems and, when appropriate, the converse of theorems.

10. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; and conversely prove lines are parallel; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
11. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to $180°$; base angles of isosceles triangles are congruent; and conversely prove a triangle is isosceles; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
12. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.
    a. Prove theorems about polygons. Theorems include the measures of interior and exterior angles. Apply properties of polygons to the solutions of mathematical and contextual problems.

G.CO.D. Make geometric constructions.

13. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.) Constructions include: copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
14. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Similarity, Right Triangles, and Trigonometry – G.SRT

G.SRT.A. Understand similarity in terms of similarity transformations.

1. Verify experimentally the properties of dilations given by a center and a scale factor.
    a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
    b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
2. Use the definition of similarity to decide if two given figures are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

3. Use the properties of similarity transformations to establish the Angle-Angle (AA) criterion for two triangles to be similar.

Example: Given ΔABC *and* ΔDEF, $\angle A \cong \angle D$, *and* $\angle B \cong \angle E$, *show that* $\Delta ABC \sim \Delta DEF$ *using a sequence of translations, rotations, reflections, and/or dilations.*

G.SRT.B. Prove theorems involving similarity.

4. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Example: *A high school student visits a giant cedar tree near the town of Elk River, Idaho and the end of his shadow lines up with the end of the tree's shadow. The student is* 6 *feet tall and his shadow is* 8 *feet long. The cedar tree's shadow is* 228 *feet long. How tall is the cedar tree?*

G.SRT.C. Define trigonometric ratios and solve problems involving right triangles.

6. Demonstrate understanding that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

7. Explain and use the relationship between the sine and cosine of complementary angles.

8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★

Example: *Mark and Ruth are rock climbing in the Snake River Canyon. Mark is anchoring the rope for Ruth. If the length of the rope from Mark to Ruth is* 60 *ft, with an angle of elevation of* $23°$, *how far is Mark from the base of the cliff?*

G.SRT.D. Apply trigonometry to general triangles.

9. (+) Derive the formula $A = \frac{1}{2}absin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.

11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., Surveying problems; Resultant forces).

Circles – G.C

G.C.A. Understand and apply theorems about circles.

1. Prove that all circles are similar.
2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
3. Prove properties of angles for a quadrilateral and other polygon inscribed in a circle, by constructing the inscribed and circumscribed circles of a triangle.
4. (+) Construct a tangent line to a circle from a point outside the given circle.

G.C.B. Find arc lengths and areas of sectors of circles.

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Expressing Geometric Properties with Equations – G.GPE

G.GPE.A. Translate between the geometric description and the equation for a conic section.

1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
2. Derive the equation of a parabola given a focus and directrix.
3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.
    a. (+) Use equations and graphs of conic sections to model real-world problems.★

G.GPE.B. Use coordinates to prove simple geometric theorems algebraically.

4. Use coordinates to prove simple geometric theorems algebraically including the distance formula and its relationship to the Pythagorean Theorem.

    Example*: Prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0,\ 2)$.*

5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.

***Example**: Find the equation of a line parallel or perpendicular to a given line that passes through a given point.*

6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles (e.g., using the distance formula).★

Geometric Measurement and Dimension – G.GMD

G.GMD.A. Explain volume formulas and use them to solve problems.

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★

***Example**: The tank at the top of the Meridian Water Tower is roughly spherical. If the diameter of the sphere is* 50.35 *feet, approximately how much water can the tank hold?*

G.GMD.B. Visualize relationships between two-dimensional and three-dimensional objects.

4. Identify the shapes of two-dimensional cross-sections of three- dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry – G.MG

G.MG.A. Apply geometric concepts in modeling situations.

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★
4. Use dimensional analysis for unit conversions to confirm that expressions and equations make sense.★

GRADES 9-12 - STATISTICS AND PROBABILITY (S)

Introduction

Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics provides tools for describing variability in data and for making informed decisions that take it into account.

Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns. Quantitative data can be described in terms of key characteristics: measures of shape, center, and spread. The shape of a data distribution might be described as symmetric, skewed, flat, or bell shaped, and it might be summarized by a statistic measuring center (such as mean or median) and a statistic measuring spread (such as standard deviation or interquartile range). Different distributions can be compared numerically using these statistics or compared visually using plots. Knowledge of center and spread are not enough to describe a distribution. Which statistics to compare, which plots to use, and what the results of a comparison might mean, depend on the question to be investigated and the real-life actions to be taken.

Randomization has two important uses in drawing statistical conclusions. First, collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account. Second, randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. A statistically significant outcome is one that is unlikely to be due to chance alone, and this can be evaluated only under the condition of randomness. The conditions under which data are collected are important in drawing conclusions from the data. In critically reviewing uses of statistics in public media and other reports, it is important to consider the study design, how the data were gathered, and the analyses employed, as well as the data summaries and the conclusions drawn.

Random processes can be described mathematically by using a probability model: a list or description of the possible outcomes (the sample space), each of which is assigned a probability. In situations such as flipping a coin, rolling a number cube, or drawing a card, it might be reasonable to assume various outcomes are equally likely. In a probability model, sample points represent outcomes and combine to make up events; probabilities of events can be computed by applying the Addition and Multiplication Rules. Interpreting these probabilities relies on an understanding of independence and conditional probability, which can be approached through the analysis of two-way tables.

Technology plays an important role in statistics and probability by making it possible to generate plots, regression functions, and correlation coefficients, and to simulate many possible outcomes in a short amount of time.

Connections to Functions and Modeling

Functions may be used to describe data; if the data suggest a linear relationship, the relationship can be modeled with a regression line, and its strength and direction can be expressed through a correlation coefficient.

Note: Standards with a ★ indicate a modeling standard. Standards with a (+) represent standards for advanced classes such as calculus, advanced statistics or discrete mathematics. Standards without a (+) are the present standards for all college and career ready students.

Statistics and Probability Overview

Interpreting Categorical and Quantitative Data

A. Summarize, represent, and interpret data on a single count or measurement variable. Use calculators, spreadsheets, and other technology as appropriate.

B. Summarize, represent, and interpret data on two categorical and quantitative variables.

C. Interpret linear models.

Making Inferences and Justifying Conclusions

A. Understand and evaluate random processes underlying statistical studies. Use calculators, spreadsheets, and other technology as appropriate.

B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Rules of Probability

A. Understand independence and conditional probability and use them to interpret data from simulations or experiments.

B. Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions

A. Calculate expected values and use them to solve problems.

B. Use probability to evaluate outcomes of decisions.

Standards for Mathematical Practice

1. **1.** Make sense of problems and persevere in solving them.
2. **2.** Reason abstractly and quantitatively.
3. **3.** Construct viable arguments and critique the reasoning of others.
4. **4.** Model with mathematics.
5. **5.** Use appropriate tools strategically.
6. **6.** Attend to precision.
7. **7.** Look for and make use of structure.
8. **8.** Look for and express regularity in repeated reasoning.

Interpreting Categorical and Quantitative Data – S.ID

S.ID.A. Summarize, represent, and interpret data on a single count or measurement variable. Use calculators, spreadsheets, and other technology as appropriate.

1. Differentiate between count data and measurement variable.★
2. Represent measurement data with plots on the real number line (dot plots, histograms, and box plots).★

   Example: *Construct a histogram of the current population size in each of Idaho's counties.*

3. Compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different variables, using statistics appropriate to the shape of the distribution for measurement variable.★

   Example: *Compare the histograms of the annual potato yields over the last 25 years for Idaho and Maine using the correct measures of center and spread for the shape of the histograms.*

4. Interpret differences in shape, center, and spread in the context of the variables accounting for possible effects of extreme data points (outliers) for measurement variables.★

   Example: *Describe differences in distributions of annual precipitation over the last 100 years between Boise and Seattle using shape, center, spread and outliers.*

5. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.★

   Example: *Estimate the percentage of all Idaho elk hunters who successfully filled their tag last year, using the results from Washington County hunters.*

S.ID.B. Summarize, represent, and interpret data on two categorical and quantitative variables.

6. Represent data on two categorical variables on a clustered bar chart and describe how the variables are related. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.★

   Example: *Represent the relationship between student effort (on a scale of 1 – 5) and letter grade in a math class with a clustered bar chart and describe the relationship using a relative frequency table.*

7. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★
    a. Fit a linear function to data where a scatter plot suggests a linear relationship and use the fitted function to solve problems in the context of the data.★
    b. Use functions fitted to data, focusing on quadratic and exponential models, or choose a function suggested by the context. Utilize technology where appropriate.★

Example: *Use technology to fit a function of the relationship between the board-feet (measured in volume) of trees and the diameter of the trunks of the trees.*

    c. Informally assess the fit of a function by plotting and analyzing residuals.★

S.ID.C. Interpret linear models.

8. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.★

Example: *Explain why the y-intercept of a linear model relating the volume production of sugar beets to size of farm has no meaning whereas the y-intercept of a linear model relating the volume production of sugar beets related to minimum temperature does have meaning.*

9. Compute (using technology) and interpret the linear correlation coefficient.★

Example: *Find the correlation coefficient between the number of hours firefighters sleep each night and the length of fireline they construct each day. Use the correlation coefficient to explain whether sleep is important.*

10. Distinguish between (linear) correlation and causation.★

Making Inferences and Justifying Conclusions – S.IC

S.IC.A. Understand and evaluate random processes underlying statistical experiments. Use calculators, spreadsheets, and other technology as appropriate.

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.★
2. Decide if a specified model is consistent with results from a given data-generating process (e.g., using simulation or validation with given data).★

Example: *A model says a spinning coin falls heads up with probability* 0.5. *Would a result of* 5 *tails in a row cause you to question the model?*

S.IC.B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.★
4. Use data from a sample survey to estimate a population mean or proportion and a margin of error.★
5. Use data from a randomized and controlled experiment to compare two treatments; use margins of error to decide if differences between treatments are significant.★
6. Evaluate reports of statistical information based on data.★

   Example*: Students may analyze and critique different reports from media, business, and government sources.*

Conditional Probability and the Rules of Probability – S.CP

S.CP.A. Understand independence and conditional probability and use them to interpret data from simulations or experiments.

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).★
2. Demonstrate understanding that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.★
3. Understand the conditional probability of A given B as $\frac{P(A\cap B)}{P(B)}$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.★
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.★

   Example*: Collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*

5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.★

   Example: *Compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

S.CP.B. Use the rules of probability to compute probabilities of compound events in a uniform probability model.

6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.★
7. Apply the Addition Rule, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$, and interpret the answer in terms of the model.★
8. (+) Apply the general Multiplication Rule in a uniform probability model $P(A \cap B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model.★
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.★

Using Probability to Make Decisions – S.MD

S.MD.A. Calculate expected values and use them to solve problems.

1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.★
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution of the variable.★
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.★

   Example: *Find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*

4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.★

Example: *Find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in* 100 *randomly selected households?*

S.MD.B. Use probability to evaluate outcomes of decisions.

5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.★

    a. Find the expected payoff for a game of chance.★

Example: *Find the expected winnings from a state lottery ticket or a game at a fast- food restaurant.*

    b. Evaluate and compare strategies on the basis of expected values.★

Example: *Compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*

6. (+) Use probabilities to make objective decisions.★

Example: *The Idaho Department of Transportation classifies highways for overweight loads based on the probability of bridges on a highway failing under given vehicle weights.*

7. (+) Analyze decisions and strategies using probability concepts.★

Example: *Product testing, medical testing, or pulling a hockey or soccer goalie at the end of a game and replacing the goalie with an extra player.*

REFERENCES

The works below were used to guide the creation of this document:

Boaler, J. (2016) Mathematical Mindsets. San Francisco, CA: Jossey-Bass.

California Department of Education. (2021). California Math Framework Draft. Sacramento, CA: California Department of Education.

Massachusetts Department of Elementary and Secondary Education. (2017). Massachusetts Curriculum Framework Mathematics. Malden, MA: Massachusetts Department of Elementary and Secondary Education.

Nebraska Department of Education. (2015). Nebraska's College and Career Ready Standards for Mathematics. Lincoln, NE: Nebraska Department of Education.

Florida Department of Education. (2020). Florida B.E.S.T. Standards: Mathematics. Tallahassee, FL: Florida Department of Education.

Student Achievement Partners. (2013). Achieve the Core Mathematics: Focus by Grade Level Documents. Retrieved from https://achievethecore.org/category/774/mathematics-focus-by-grade-level

Texas Education Agency. (2012). Texas Essential Knowledge and Skills for Mathematics. Austin, TX: Texas Education Agency.

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~~Introduction~~

Table of Contents

Science Content Standards

Idaho State Department of Education

INTRODUCTION

The Idaho State Content Standards in Science are essential for developing the science literacy of Idaho students, as it is vital that our students understand the fundamental laws and practices within scientific disciplines. This document provides stakeholders with a set of rigorous and relevant science performance standards that prepare students to be informed, contributing citizens of the 21st-century world. The unifying goal is for Idaho students to practice and perform science and use their working knowledge of science to successfully function in a complex world.

~~The Idaho State Science Standards are essential for developing the science literacy of Idaho students, as it is vital that our students understand the fundamental laws and practices within scientific disciplines. This document provides stakeholders with a set of rigorous and relevant science performance standards that prepare students to be informed, contributing citizens of the 21st century world. The unifying goal is for Idaho students to practice and perform science and use their working knowledge of science to successfully function in a complex world.~~

The Idaho Science standards describe the knowledge and skills that students should learn, but they do not prescribe particular curriculum, lessons, teaching techniques, or activities. Standards describe what students are expected to know and be able to do, while the local curriculum describes how teachers will help students master the standards. A wide variety of instructional resources may be used to meet the state content area standards. Decisions about curriculum and instruction are made locally by individual school districts and classroom teachers. The Idaho State Board of Education does not mandate the curriculum used within local schools. However, these science standards should be taught in a way that allows students to analyze the data and make their own decisions about what it means. Students should also be taught the current models and explanations of the scientific community regarding that data.

Organization and Structure of Science Standards

The Idaho Science Standards are based on *A Framework for K-12 Science Education*[1]. That framework outlines three organizational dimensions for each standard:

- **Science and Engineering Practices**
- **Disciplinary Core Ideas** and **Supporting Content**
- **Crosscutting Concepts**

[1] A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press, 2012.

The **Science and Engineering Practices** are used by students to demonstrate understanding of the disciplinary core ideas and crosscutting concepts. These practices update the scientific method in the classroom and include a wider range of skills for an expanded approach to how scientific investigations are conducted in the real world. Engaging in the practices of science and engineering helps students understand the wide range of approaches used to investigate natural phenomena and develop solutions to challenges. Students are expected to demonstrate grade appropriate proficiency in asking questions and defining problems; developing and using models; planning and carrying out investigations; analyzing and interpreting data; using mathematics and computational thinking; constructing explanations and designing solutions; engaging in argument from evidence; and obtaining, evaluating, and communicating information as they gather, analyze, and communicate scientific information.

The **Disciplinary Core Ideas** and **Supporting Content** are the focused, limited set of science ideas identified in the *Framework* as necessary for ALL students throughout their education and beyond their K-12 school years to achieve scientific literacy. The limited number of disciplinary core ideas allows more time for students and teachers to engage in the science and engineering practices as they deeply explore science ideas. To allow students to continually build on and revise their knowledge and abilities, the disciplinary core ideas are built on developmental learning progressions. In the Idaho State Science Standards, The Disciplinary Core Ideas are incorporated within the Supporting Content for clarity. The Supporting Content defines the minimum boundary of content knowledge needed to fully demonstrate mastery of the standard.

The **Crosscutting Concepts** are used to organize and make sense of disciplinary core ideas. They serve as tools that bridge disciplinary boundaries and deepen understanding of science content. With grade-appropriate proficiency, students are expected to use patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change as they gather, analyze, and communicate scientific understanding. These crosscutting concepts provide structure for synthesizing knowledge from various fields into a coherent and scientifically based view of the world.

The K-12 standards are structured to reflect the developmental nature of learning. Within the standards, content is introduced in a spiraled model using connected core ideas that build deepened understanding throughout grade level progressions. The standards increase in complexity and rigor as students move through the grade levels. Curriculums developed by the school districts of Idaho should encompass all three dimensions of each standard.

The following table lists the disciplinary core ideas, crosscutting concepts, and science and engineering practices (more detailed and grade specific descriptions are available in the supplemental support materials):

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• Asking Questions and Defining Problems • Developing and Using Models • Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Using Mathematics and Computational Thinking • Constructing Explanations and Designing Solutions • Engaging in Argument from Evidence • Obtaining, Evaluating, and Communicating Information	LS1: From Molecules to Organisms: Structures and Processes LS2: Ecosystems: Interactions, Energy, and Dynamics LS3: Heredity: Inheritance and Variation of Traits LS4: Biological Evolution: Unity and Diversity PS1: Matter and Its Interactions PS2: Motion and Stability: Forces and Interactions PS3: Energy PS4: Waves ESS1: Earth's Place in the Universe ESS2: Earth's Systems ESS3: Earth and Human Activity	• Patterns • Cause and Effect • Scale, Proportion, and Quantity • Systems and System Models • Energy and Matter • Structure and Function • Stability and Change

Instructional Shifts

While each standard incorporates the three dimensions, this alone does not drive student outcomes; ultimately, student learning depends on how the standards are translated to instructional practices. In order for students to attain the maximum benefit from the Idaho Science Standards, districts are encouraged to incorporate problem solving techniques and deep critical thinking exercises into those practices. Effective science teaching and learning integrates the three dimensions by allowing students to explain scientific phenomena, design solutions to real-world challenges, and build a foundation upon which they can continue to learn and to apply science knowledge and skills within and outside the K-12 education arena.

Interdisciplinary Approaches

The overlapping skills in the science and engineering practices combined with the intellectual tools developed by the crosscutting concepts, build meaningful and substantive connections to interdisciplinary knowledge and skills in all content areas. Student understanding and retention are increased as connections are made to interdisciplinary learning which affords all students equitable access to learning and ensures all students are prepared for college, career, and citizenship.

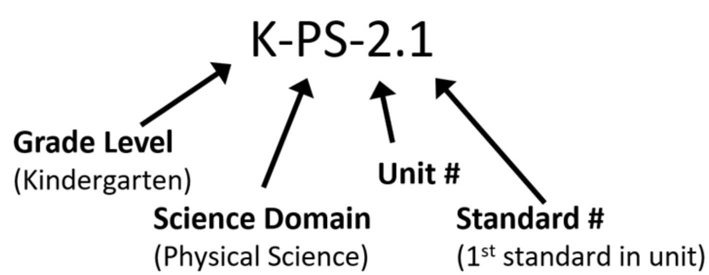
Using this Document

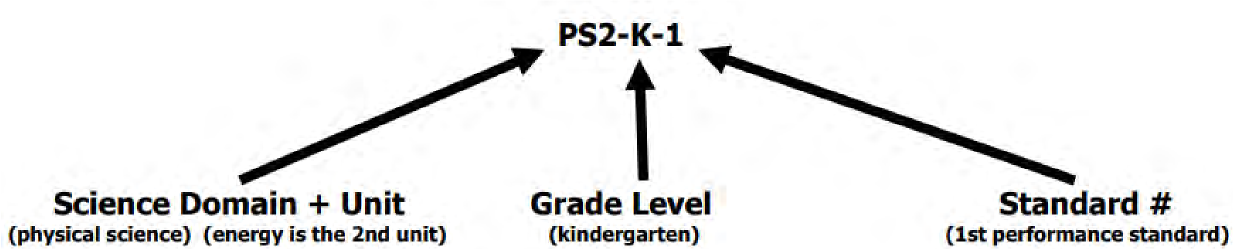
Each standard is followed by the Supporting Content (DCI) in order to add details of what knowledge should be mastered while students are working to achieve each standard. There are often *Further Explanations* and *Assessment Limits* following the content. The *Further Explanations* explain how the concepts embedded within the standard should be emphasized. These often contain examples that are not required, but give guidance about the complexity of ideas to ensure grade appropriate implementation. Assessment limits are similar and do not limit what content is learned about in the classroom, but they do keep assessments from expanding inappropriately outside of the grade-level expectations. These features are included when further clarity is needed.

The coding for each standard labels the grade level, science domain, unit number, and standard number as shown below:

Abbreviations

K – Kindergarten
MS – Middle School
HS – High School
LS – Life Science
ESS – Earth and Space Science
PS – Physical Science
PSC – Physical Science Chemistry
PSP – Physical Science Physics
ETS – Engineering and Technology





~~**Category Headings**~~

~~PS – Performance Standards~~

~~SC – Supporting Content~~

~~**Other Abbreviations**~~

~~ETS – Engineering and Technology~~

~~Standard K - Kindergarten~~

~~MS – Middle School~~

~~HS - High School~~

~~**Science Domains**~~

~~LS – Life Science~~

~~PS – Physical Science~~

~~PSC – Physical Science Chemistry~~

~~PSP – Physical Science Physics~~

~~ESS – Earth and Space Science~~

KINDERGARTEN

Physical Science
K-PS-1 – Motion and Stability: Forces and Interactions

~~ELEMENTARY SCHOOL (KINDERGARTEN)~~

~~PS: Physical Sciences~~

~~PS1-K Motion and Stability: Forces and Interactions~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

K-PS-1.1 ~~PS1-K-1.~~ **Students who demonstrate understanding can:**

With guidance and support, ~~Plan~~ plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Supporting Content PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (K-PS-1.1, K-PS-1.2~~PS1-K-1, PS1-K-2~~)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS-1.1, K-PS-1.2~~PS1-K-1, PS1-K-2~~)

Supporting Content PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion. (K-PS-1.1~~PS1-K-1~~)

Supporting Content PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly. (K-PS-1.1~~PS1-K-1~~)

- **Further Explanation:** Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.
- **~~Content~~ Assessment Limit:** Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced ~~by magnets~~ by magnets.

K-PS-1.2 Students who demonstrate understanding can:

~~PS1-K-2.~~ **With guidance and support, analyze~~Analyze~~ data to determine if a design solution works as intended to change the motion~~speed or direction~~ of an object with a push or a pull.**

Supporting Content PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (K-PS-1.1, K-PS-1.2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS-1.1, K-PS-1.2)

ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (K-PS-1.2~~PS1-K-2~~)

- **Further Explanation:** Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.
- ~~Content~~ **Assessment Limit:** Assessment does not include friction as a mechanism for change in speed.

~~**Supporting Content**~~

~~**PS2.A: Forces and Motion**~~

- ~~Pushes and pulls can have different strengths and directions. (PS1-K-1, PS1-K-2)~~
- ~~Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (PS1-K-1, PS1-K-2)~~

~~**PS2.B: Types of Interactions**~~

- ~~When objects touch or collide, they push on one another and can change motion. (PS1-K-1)~~

~~**PS3.C: Relationship Between Energy and Forces**~~

- ~~A bigger push or pull makes things speed up or slow down more quickly. (PS1-K-1)~~

~~**ETS1.A: Defining Engineering Problems**~~

- ~~A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (PS1-K-2)~~

K-PS-2 – Energy

~~PS2-K Energy~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

K-PS-2.1 ~~PS2-K-1.~~Students who demonstrate understanding can:

Make observations to determine the effect of ~~sunlight~~ the sun's energy on the Earth's surface.

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface. (K-PS-2.1, K-PS-2.2~~PS2-K-1, PS2-K-2~~)

- **Further Explanation:** Examples of Earth's surface could include sand, soil, rocks, and water.
- **~~Content~~ Assessment Limit:** Assessment of temperature is limited to relative measures such as warmer/cooler.

K-PS-2.2 Students who demonstrate understanding can:

~~PS2-K-2.~~ ~~Use tools and materials to D~~design and build a structure that will reduce the warming effect of the sun's energy ~~sunlight~~ on ~~an area.~~a material.

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface. (K-PS-2.1, K-PS-2.2)

- **Further Explanation:** Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun on Earth's surface.

~~Supporting Content~~

~~PS3.B: Conservation of Energy and Energy Transfer~~

- ~~Sunlight warms Earth's surface. (PS2-K-1, PS2-K-2)~~

Life Science
K-LS-1 – Molecules to Organisms: Structure and Processes

~~LS: Life Sciences~~

~~LS1-K Molecules to Organisms: Structure and Processes~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

K-LS-1.1 ~~LS1-K-1.~~Students who demonstrate understanding can:

Use observations to describe ~~patterns of what~~how plants and animals ~~(including humans)~~ **are alike and different in terms of how they live and grow.** ~~need to survive.~~

Supporting Content **LS1.C: Organization for Matter and Energy Flow in Organisms**

All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (**K-LS-1.1**~~LS1-K-1~~)

- **Further Explanation:** Examples of observations~~patterns~~ could include that animals need to take in food but plants produce their own; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

Prior K-LS-1.2 Moved to 1st Grade 1-LS-1.4

~~**LS1-K-2. Use classification supported by evidence to differentiate between living and non-living items.**~~

- ~~Further Explanation: Use chart or Venn diagram to sort objects or pictures into living and not-living items.~~

~~Supporting Content~~

~~**LS1.C: Organization for Matter and Energy Flow in Organisms**~~

- ~~All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (LS1-K-1)~~
- ~~Living and non-living things have distinct characteristics. (LS1-K-2)~~

Earth and Space Science
K-ESS-1 – **Earth's Systems**

~~**ESS: Earth and Space Sciences**~~

~~**ESS1-K Earth's Systems**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

K-ESS-1.1 ~~ESS1-K-1.~~ Students who demonstrate understanding can:

Use and share observations of local weather conditions to describe **variations in patterns throughout the year.** ~~patterns over time, which includes the 4 seasons.~~

Supporting Content **ESS2.D: Weather and Climate**

- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region, at a particular time. People measure these conditions to describe and record ~~the weather and to notice~~ patterns over time. (**K-ESS-1.1**~~ESS1-K-1~~)
- The four seasons occur in a specific order due to their weather patterns. (**K-ESS-1.1**~~ESS1-K-1~~)

Further Explanation: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.

- ~~Content~~ **Assessment Limit**: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.

K-ESS-1.2 Students who demonstrate understanding can:

~~**ESS1-K-2.**~~ With guidance and support, use evidence to construct ~~**Construct**~~ **an** explanation~~**argument supported by evidence for**~~ **of how plants and animals** ~~**(including humans)**~~ interact with their ~~**can change the**~~ **environment to meet their needs.**

ESS2.E: Biogeology

- Plants and animals can change their environment. (**K-ESS-1.2**~~ESS1-K-2~~)

- **Further Explanation:** Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.

Supporting Content

~~ESS2.D: Weather and Climate~~

- ~~Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (ESS1-K-1)~~
- ~~The four seasons occur in a specific order due to their weather patterns. (ESS1-K-1)~~

~~ESS2.E: Biogeology~~

- ~~Plants and animals can change their environment. (ESS1-K-2)~~

~~ESS3.C: Human Impacts on Earth Systems~~

- ~~Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (ESS1-K-2)~~

K-ESS-2 – Weather and Climate

~~ESS2-K Earth and Human Activity~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

K-ESS-2.1 ~~ESS2-K-1.~~ Students who demonstrate understanding can:

Use a model to represent the relationship between the needs of different plants and animals ~~(including humans)~~ and the places they live.

ESS3.A: Natural Resources

- Living things need water, air, and resources from the land, and they live in places that have the things they need. ~~Humans use natural resources for everything they do.~~ (**K-ESS-2.1**~~ESS2-K-1~~)

- **Further Explanation:** Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.

K-ESS-2.2 Students who demonstrate understanding can:

~~ESS2-K-2.~~ Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, ~~severe~~ local weather.

Supporting Content ESS3.B: Natural Hazards

- Some kinds of ~~severe~~ weather are more likely than others in a given region. Weather scientists forecast ~~severe~~the weather so that ~~the~~local communities can prepare for and respond to these events. (**K-ESS-2.2**~~ESS2-K-2~~)

Supporting Content ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (**K-ESS-2.2**~~ESS2-K-2~~)

Further Explanation: Emphasis is on local forms of ~~severe~~ weather. Examples relating weather forecasting to preparing and responding could include using forecasts to plan for staying indoors during severe weather; going to cooling centers during heat waves; covering windows before storms.

K-ESS-2.3 Students who demonstrate understanding can:

~~ESS2-K-3.~~ Communicate ~~solutions~~ ideas that would enable **~~will reduce the impact of~~ humans** to interact in a beneficial way with**~~on~~ the land, water, air, and/or other living things in the local environment.**

Supporting Content ESS3.C: Human Influences**~~Impacts~~ on Earth Systems**

- Things that people do ~~to live comfortably~~ can affect the world around them. ~~But they~~ People can ~~make choices that~~ reduce their ~~impacts~~ effects on the land, water, air, and other living things. (**K-ESS-2.3**~~ESS2-K-3~~)

Supporting Content ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (**K-ESS-2.3**~~ESS2-K-3~~)

Further Explanation: Examples of human influence on the land could include planting trees after a burn, protecting farm fields from erosion, or keeping plastic trash out of waterways.~~Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.~~
~~Supporting Content~~

~~ESS3.A: Natural Resources~~

- ~~Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (ESS2-K-1)~~

~~ESS3.B: Natural Hazards~~

- ~~Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (ESS2-K-2)~~

~~ESS3.C: Human Impacts on Earth Systems~~

- ~~Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (ESS2-K-3)~~

~~ETS1.A: Defining and Delimiting an Engineering Problem~~

- ~~Asking questions, making observations, and gathering information are helpful in thinking about problems. (ESS2-K-2)~~

~~ETS1.B: Developing Possible Solutions~~

- ~~Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (ESS2-K-3)~~

GRADE 1

Physical Science
1-PS-1 – Waves

~~ELEMENTARY SCHOOL (1ST GRADE)~~

~~PS: Physical Sciences~~

~~PS1-1 Waves~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

1-PS-1.1 ~~PS1-1-1.~~ Students who demonstrate understanding can:

With guidance and support, plan~~**Plan**~~ **and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.**

Supporting Content **PS4.A: Wave Properties**

- Sound can make matter vibrate, and vibrating matter can make sound. (**1-PS-1.1**~~PS1-1-1~~)

- **Further Explanation:** Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

1-PS-1.2 Students who demonstrate understanding can:

With guidance and support, make ~~**PS1-1-2. Make**~~ **observations to construct an evidence-based** explanation~~**account**~~ **that objects in darkness can be seen only when illuminated.**

Supporting Content **PS4.B: Electromagnetic Radiation (light)**

- Objects can be seen if light is available to illuminate them or if they give off their own light. (**1-PS-1.2**~~PS1-1-2~~)

  - **Further Explanation:** Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

1-PS-1.3 Students who demonstrate understanding can:

With guidance and support, plan ~~**PS1-1-3. Plan**~~ **and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.**

Supporting Content PS4.B: Electromagnetic Radiation (light)

- Some materials allow light to pass through them, others allow only some light through and others block all the light ~~and create~~creating a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (**1-PS-1.3**~~PS1-1-3~~)

  - **Further Explanation:** Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).
  - **Assessment**~~**Content**~~ **Limit:** Assessment does not include the speed of light.

1-PS-1.4 Students who demonstrate understanding can:

~~Use tools and materials to~~ Design ~~**PS1-1-4. Use tools and materials to design**~~ **and build a device that uses light or sound to communicate** ~~**solve the problem of communicating**~~ **over a distance.**

Supporting Content PS4.C: Information Technologies and Instrumentation

- People also use a variety of devices to communicate (send and receive information) over long distances. (**1-PS-1.4**~~PS1-1-4~~)

- **Further Explanation**: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.
- **Assessment ~~Content~~ Limit:** Assessment does not include technological details for how communication devices work.

Supporting Content

~~**PS4.A: Wave Properties**~~

- ~~Sound can make matter vibrate, and vibrating matter can make sound. (PS1-1-1)~~

~~**PS4.B: Electromagnetic Radiation (light)**~~

- ~~Objects can be seen if light is available to illuminate them or if they give off their own light. (PS1-1-2)~~
- ~~Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (PS1-1-3)~~

~~**PS4.C: Information Technologies and Instrumentation**~~

- ~~People also use a variety of devices to communicate (send and receive information) over long distances. (PS1-1-4)~~

Life Science
1-LS-1 – Molecules to Organisms: Structure and Processes

~~LS: Life Sciences~~

~~Molecules to Organisms: Structure and Processes~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

1-LS-1.1 ~~LS1-1-1.~~Students who demonstrate understanding can:

Design and build ~~**Use materials to design**~~ **a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.**

Supporting Content LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (**1-LS-1.1**~~LS1-1-1~~)

Supporting Content LS1.D: Information Processing

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (**1-LS-1.1**~~LS1-1-1~~)

- **Further Explanation:** Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.

1-LS-1.2 Students who demonstrate understanding can:

Obtain information to identify ~~**LS1-1-2. Read texts and use media to determine**~~ **patterns** ~~**in**~~ **of behavior** ~~**of**~~ **in parents and offspring that help offspring survive.**

Supporting Content LS1.B: Growth and Development of Organisms

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (**1-LS-1.2**~~LS1-1-2~~)

  - **Further Explanation**: Information should be obtained from text readings and media provided by the teacher. Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).

Prior 1-LS-1.3 Moved to 3rd Grade 3-LS-1.3

~~**LS1-1-3. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.**~~

- ~~Further Explanation: Changes organisms go through during their life form a pattern.~~

~~**Content Limit: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.**~~

1-LS-1.3 Students who demonstrate understanding can: *(moved from Kindergarten prior K-LS-1.2)*

Use classification supported by evidence to differentiate between living and non-living items.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Living and non-living things have distinct characteristics. (~~LS1-K-2~~1-LS-1.3)

- Further Explanation: Use chart or Venn diagram to sort objects or pictures into living and not-living items.

Supporting Content

~~**LS1.A: Structure and Function**~~

- ~~All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (LS1-1-1)~~

~~**LS1.B: Growth and Development of Organisms**~~

- ~~Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (LS1-1-2)~~
- ~~Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (LS1-1-3)~~

~~**LS1.D: Information Processing**~~

- ~~Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (LS1-1-1)~~

1-LS-2 – Heredity: Inheritance and Variation of Traits

~~LS2-1 Heredity: Inheritance and Variation of Traits~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

1-LS-2.1~~LS2-1-1.~~ Students who demonstrate understanding can:

Make observations to construct an evidence-based explanation~~**account**~~ **that** offspring~~**young plants and animals**~~ **are** similar to~~**like**~~**, but not** identical to~~**exactly like**~~**, their parents.**

Supporting Content LS3.A: Inheritance of Traits

- Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. (**1-LS-2.**~~LS2-1-1~~)

Supporting Content LS3.B: Variation of Traits

- Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (**1-LS-2.**~~LS2-1-1~~)

- **Further Explanation:** Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.
- ~~Content~~ **Assessment Limit:** Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.

~~Supporting Content~~

~~LS3.A: Inheritance of Traits~~

- ~~Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. (LS2-1-1)~~

~~LS3.B: Variation of Traits~~

- ~~Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (LS2-1-1)~~

Earth and Space Science
1-ESS-1 – **Earth's Place in the Universe**

~~ESS: Earth and Space Sciences~~

~~ESS1-1 Earth's Place in the Universe~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

1-ESS-1.1 ~~ESS1-1-1.~~Students who demonstrate understanding can:

Use observations of the sun, moon, and stars to describe patterns that can be predicted.

Supporting Content **ESS1.A: The Universe and its Stars**

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (**1-ESS-1.1**~~ESS1-1-1~~)

  - **Further Explanation:** Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.
  - **Assessment**~~**Content**~~ **Limit:** Assessment of star patterns is limited to stars being seen at night and not during the day.

1-ESS-1.2 Students who demonstrate understanding can:

~~ESS1-1-2.~~ **Make observations at different times of year to relate the amount of daylight to the time of year.**

Supporting Content **ESS1.B: Earth and the Solar System**

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (**1-ESS-1.2**~~ESS1-1-2~~)
- Seasons are created by weather patterns for a particular region and time. Local patterns create 4 distinct seasons. (**1-ESS-1.2**~~ESS1-1-2~~)

- **Further Explanation:** Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.
- **Assessment ~~Content~~ Limit:** Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.

~~Supporting Content~~

~~ESS1.A: The Universe and its Stars~~

- ~~Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (ESS1-1-1)~~

~~ESS1.B: Earth and the Solar System~~

- ~~Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (ESS1-1-2)~~
- ~~Seasons are created by weather patterns for a particular region and time. Local patterns create 4 distinct seasons. (ESS1-1-2)~~

GRADE 2

Physical Science
2-PS-1 – Matter and Its Interactions

~~ELEMENTARY SCHOOL (2ND GRADE)~~

~~PS: Physical Sciences~~

~~PS1-2 Matter and Its Interactions~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

2-PS-1.1 ~~PS1-2-1~~. Students who demonstrate understanding can:

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Supporting Content PS1.A: Structure and Properties of Matter

- Different kinds of matter exist and many of them can be solid, liquid, or gas depending on temperature. Matter can be described and classified by its observable properties. (**2-PS-1.1**~~PS1-2-1~~)

  - **Further Explanation:** Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.

2-PS-1.2 Students who demonstrate understanding can:

~~**PS1-2-2.**~~ **Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.**

Supporting Content PS1.A: Structure and Properties of Matter

- Different properties are suited to different purposes. (2-PS-1.2, 2-PS-1.3~~PS1-2-2),(PS1-2-3~~)

- **Further Explanation:** Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.
- **Assessment~~Content~~ Limit:** Assessment of quantitative measurements is limited to length.

2-PS-1.3 Students who demonstrate understanding can:

~~**PS1-2-3.**~~ **Make observations to construct an evidence-based** argument that objects, when disassembled, may be used to create new objects using the same set of components. ~~**account of how an object made of a small set of pieces can be disassembled and made into a new object.**~~

Supporting Content PS1.A: Structure and Properties of Matter

- Different properties are suited to different purposes. (2-PS-1.2, 2-PS-1.3)
- A great variety of objects can be built up from a small set of pieces. (**2-PS-1.3**~~PS1-2-3~~)

Further Explanation: Examples of pieces could include blocks, building bricks, or other assorted small objects.

2-PS-1.4 Students who demonstrate understanding can:

~~**PS1-2-4.**~~ **Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.**

Supporting Content PS1.B: Chemical Reactions

- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (**2-PS-1.4**~~PS1-2-4~~)

- **Further Explanation**: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.

Supporting Content

~~**PS1.A: Structure and Properties of Matter**~~

- ~~Different kinds of matter exist and many of them can be solid, liquid, or gas depending on temperature. Matter can be described and classified by its observable properties. (PS1-2-1)~~
- ~~Different properties are suited to different purposes. (PS1-2-2),(PS1-2-3)~~
- ~~A great variety of objects can be built up from a small set of pieces. (PS1-2-3)~~

~~**PS1.B: Chemical Reactions**~~

- ~~Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (PS1-2-4)~~

Life Science
2-LS-1 – Ecosystems: Interactions, Energy, and Dynamics

~~LS: Life Sciences~~

~~LS1-2 Ecosystems: Interactions, Energy, and Dynamics~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

2-LS-1.1 ~~LS1-2-1.~~Students who demonstrate understanding can:

Plan and conduct an investigation to determine **the impact of light and water on the growth of plants.**~~if plants need sunlight and water to grow.~~

Supporting Content **LS2.A: Interdependent Relationships in Ecosystems**

- Plants depend on water and light to grow. (**2-LS-1.1**~~LS1-2-1~~)

Assessment~~**Content**~~ **Limit:** Assessment is limited to testing one variable at a time.

2-LS-1.2 Students who demonstrate understanding can:

~~**LS1-2-2.**~~ **Develop a** ~~**simple**~~ **model that** demonstrates how plants depend on animals for pollination or the dispersal of seeds.~~**mimics the function of an animal in dispersing seeds or pollinating plants.**~~

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Some ~~P~~plants can depend on animals for pollination or to move their seeds around. (**2-LS-1.2**~~LS1-2-2~~)

Supporting Content **ETS1.B: Developing Possible Solutions**

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.(2-LS-1.2~~LS1-2-2~~)

Further Explanation: Emphasis is on the interaction between animals and plants rather than all forms of pollination and seed dispersal.

~~**Supporting Content**~~

~~**LS2.A: Interdependent Relationships in Ecosystems**~~

- ~~Plants depend on water and light to grow. (LS1-2-1)~~
- ~~Plants depend on animals for pollination or to move their seeds around. (LS1-2-2)~~

~~**ETS1.B: Developing Possible Solutions**~~

- ~~Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.(LS1-2-2)~~

2-LS-2 – Biological Adaptation: Unity and Diversity

~~**LS2-2 Biological Adaptation: Unity and Diversity**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

2-LS-2.1 ~~LS2-2-1.~~Students who demonstrate understanding can:

Make observations of plants and animals to compare the diversity of life in different habitats.

Supporting Content **LS4.D: Biodiversity ~~and Humans~~**

- There are many different kinds of living things in any area, and they exist in different places on land and in water. (**2-LS-2.1**~~LS2-2-1~~)

- **Further Explanation:** Emphasis is on the diversity of living things in each of a variety of different habitats.
- **Assessment~~Content~~ Limit:** Assessment does not include specific animal and plant names in specific habitats.

~~Supporting Content~~

~~LS4.D: Biodiversity and Humans~~

- ~~There are many different kinds of living things in any area, and they exist in different places on land and in water. (LS2-2-1)~~

Earth and Space Science
2-ESS-1 – **Earth's Place in the Universe**

~~**ESS: Earth and Space Sciences**~~

~~**ESS1-2 Earth's Place in the Universe**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

2-ESS-1.1 ~~ESS1-2-1.~~Students who demonstrate understanding can:

Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Supporting Content **ESS1.C: The History of Planet Earth**

- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (**2-ESS-1.1**~~ESS1-2-1~~)

- **Further Explanation:** Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.
- **Content Limit:** Assessment does not include quantitative measurements of timescales.

~~**Supporting Content**~~

~~**ESS1.C: The History of Planet Earth**~~

- ~~Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (ESS1-2-1)~~

2-ESS-2 – Earth's Systems

~~ESS2-2 Earth's Systems~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

2-ESS-2.1 ~~ESS2-2-1.~~Students who demonstrate understanding can:

Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

Supporting Content **ESS2.A: Earth Materials and Systems**

- Wind and water can change the shape of the land. (**2-ESS-2.1**~~ESS2-2-1~~)

Supporting Content **ETS1.C: Optimizing the Design Solution**

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (**2-ESS-2.1**~~ESS2-2-1~~)

- **Further Explanation:** Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.

2-ESS-2.2 Students who demonstrate understanding can:

~~ESS2-2-2.~~ **Develop a model to represent the shapes and kinds of land and bodies of water in an area.**

Supporting Content **ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (**2-ESS-2.2**~~ESS2-2-2~~)

- **Assessment~~Content~~ Limit:** Assessment does not include quantitative scaling in models.

2-ESS-2.3 Students who demonstrate understanding can:

~~ESS2-2-3.~~ Obtain information to identify where water is found on Earth and that it can be solid or~~,~~ liquid ~~or gas~~.

Supporting Content **ESS2.C: The Roles of Water in Earth's Surface Processes**

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (**2-ESS-2.3**~~ESS2-2-3~~)

~~Supporting Content~~

~~ESS2.A: Earth Materials and Systems~~

- ~~Wind and water can change the shape of the land. (ESS2-2-1)~~

~~ESS2.B: Plate Tectonics and Large-Scale System Interactions~~

- ~~Maps show where things are located. One can map the shapes and kinds of land and water in any area. (ESS2-2-2)~~

~~ESS2.C: The Roles of Water in Earth's Surface Processes~~

- ~~Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (ESS2-2-3)~~

~~ETS1.C: Optimizing the Design Solution~~

- ~~Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (ESS2-2-1)~~

GRADE 3

Physical Science
3-PS-1 – Motion and Stability: Forces and Interactions

~~ELEMENTARY SCHOOL (3RD GRADE)~~

~~PS: Physical Sciences~~

~~PS1-3 Motion and Stability: Forces and Interactions~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

3-PS-1.1 ~~PS1-3-1.~~Students who demonstrate understanding can:

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Supporting Content PS2.A: Forces and Motion

- Each force acts on one particular object ~~and has~~with both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative additions of forces are used at this level.) (**3-PS-1.1**~~PS1-3-1~~)

- **Further Explanation:** Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.
- **Assessment~~Content~~ Limit:** Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.

3-PS-1.2 Students who demonstrate understanding can:

~~PS1-3-2.~~ **Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.**

Supporting Content PS2.A: Forces and Motion

- Force applied to an object can alter the position and motion of that object: revolve, rotate, float, sink, fall and at rest. (3-PS-1.2~~PS1-3-2~~)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS-1.2~~PS1-3-2~~)

- **Further Explanation:** Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.
- **Assessment~~Content~~ Limit:** Assessment does not include technical terms such as period and frequency.

3-PS-1.3 Students who demonstrate understanding can:~~PS1-3-3.~~

Ask questions to determine cause and effect relationships of static electricity~~electric~~ **or magnetic interactions between two objects not in contact with each other.**

Supporting Content PS2.B: Types of Interactions

- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart. For forces between two magnets, the size of the force also depends on their orientation relative to each other. (3-PS-1.3, 3-PS-1.4)

- **Further Explanation:** An example of static electricity ~~Examples of an electric~~ force could include the force on hair from an electrically charged balloon.~~, and the electrical forces between a charged rod and pieces of paper; e~~ Examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.
- **Assessment~~Content~~ Limit**: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.

3-PS-1.4 Students who demonstrate understanding can:

~~PS1-3-4.~~ **Define a ~~simple design~~ problem that can be solved by applying scientific ideas about magnets.**

Supporting Content PS2.B: Types of Interactions

- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart. ~~and, f~~For forces between two magnets, the size of the force also depends on their orientation relative to each other. (3-PS-1.3, 3-PS-1.4)

Further Explanation: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.

~~**Supporting Content**~~

~~**PS2.A: Forces and Motion**~~

- ~~Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative additions of forces are used at this level.) (PS1-3-1)~~
- ~~Force applied to an object can alter the position and motion of that object: revolve, rotate, float, sink, fall and at rest.(PS1-3-2)~~
- ~~The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (PS1-3-2)~~

~~**PS2.B: Types of Interactions**~~

Life Science
3-LS-1 – From Molecules to Organisms: Structures and Processes

~~LS: Life Sciences~~

~~LS1-1-3.~~ **3-LS-1.1 Students who demonstrate understanding can:** ***(moved from 1st Grade prior 1-LS-1.3)***

Develop models to ~~describe~~ demonstrate that ~~organisms~~ living things, although they have unique and diverse life cycles, ~~but~~ all have ~~in common~~ birth, growth, reproduction, and death in common. ~~**Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.**~~

Supporting Content LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (LS1-1-3)

Further Explanation: Changes organisms go through during their life form a pattern.

Assessment ~~Content~~ Limit: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.

3-LS-2 – Ecosystems: Interactions, Energy, and Dynamics *(Prior 3-LS-1)*

~~**LS1-3 Ecosystems: Interactions, Energy, and Dynamics**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

3-LS-2.1 ~~LS1-3-1.~~ Students who demonstrate understanding can: *(prior 3-LS-1.1)*

Construct an argument that some animals form groups that help members survive

Supporting Content LS2.D: Social Interactions and Group Behavior

- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (**3-LS-2.1**~~LS1-3-1~~)

~~Supporting Content~~

~~LS2.D: Social Interactions and Group Behavior~~

- ~~Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (LS1-3-1)~~

3-LS-3 – Heredity Inheritance and Variation of Traits *(Prior 3-LS-2)*

~~LS2-3 Heredity: Inheritance and Variation of Traits~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

3-LS-3.1 ~~LS2-3-1.~~Students who demonstrate understanding can:

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

Supporting Content LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents.(**3-LS-3.1**~~LS2-3-1~~)

Supporting Content LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (**3-LS-3.1**~~LS2-3-1~~)

- **Further Explanation:** Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on non-human organisms~~ other than humans~~.
- **Assessment~~Content~~ Limit:** Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.

3-LS-3.2 Students who demonstrate understanding can: *(prior 3-LS-2.2)*

~~LS2-3-2.~~ **Use evidence to support the explanation that traits can be influenced by the environment.**

Supporting Content LS3.A: Inheritance of Traits

- Many characteristics involve both inheritance and environment. ~~Other~~ Characteristics result from individuals' interactions with the environment, which can range from diet to learning. ~~Many characteristics involve both inheritance and environment.~~ (**3-LS-3.2** ~~LS2-3-~~2)

Supporting Content LS3.B: Variation of Traits

- The environment also affects the traits that an organism develops. (**3-LS-3.2**~~LS2-3-2~~)

Further Explanation: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.

3-LS-3.3 Students who demonstrate understanding can: *(moved from 5th Grade prior 5-LS-2.3)*

Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Supporting Content LS4.C Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS-3.3)

Further Explanation: Examples of evidence could include needs, ~~and~~ characteristics of the organisms, and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other

~~**LS2-5-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.**~~

~~Further Explanation: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.~~

~~**Supporting Content**~~

~~**LS3.A: Inheritance of Traits**~~

- ~~Many characteristics of organisms are inherited from their parents.(LS2-3-1)~~
- ~~Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (LS2-3-2)~~
- ~~LS3.B: Variation of Traits~~
- ~~Different organisms vary in how they look and function because they have different inherited information. (LS2-3-1)~~
- ~~The environment also affects the traits that an organism develops. (LS2-3-2)~~

Earth and Space Science
3-ESS-1 – **Earth's S**ystems

~~ESS: Earth and Space Sciences~~

~~ESS1-3 Earth's Systems~~

~~Performance Standards~~

- ~~Students who demonstrate understanding can:~~

3-ESS-1.1 ~~ESS1-3-1.~~Students who demonstrate understanding can:

Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Supporting Content ESS2.D: Weather and Climate

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (**3-ESS-1.1**~~ESS1-3-1~~)

  - **Further Explanation:** Examples of data could include average temperature, precipitation, and wind direction.
  - **Assessment**~~Content~~ **Limit:** Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.

3-ESS-1.2 Students who demonstrate understanding can:

~~ESS1-3-2.~~ **Obtain and combine information to describe climates in different regions of the world.**

Supporting Content ESS.D: Weather and Climate

- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (**3-ESS-1.2**~~ESS1-3-2~~)

~~Supporting Content~~

~~**ESS2.D: Weather and Climate**~~

- ~~Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (ESS1-3-1)~~
- ~~Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (ESS1-3-2)~~

3-ESS-2 – Earth and Human Activity

~~**ESS2-3 Earth and Human Activity**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

3-ESS-2.1 ~~ESS2-3-1.~~Students who demonstrate understanding can:

Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Supporting Content **ESS3.B: Natural Hazards**

- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (**3-ESS-2.1**~~ESS2-3-1~~)

- **Further Explanation:** Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.

Supporting Content

~~**ESS3.B: Natural Hazards**~~

- ~~A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (ESS2-3-1)~~

GRADE 4

Physical Science
4-PS-1 - Energy

~~ELEMENTARY SCHOOL (4TH GRADE)~~

~~PS: Physical Sciences~~

~~PS1-4 Energy~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

4-PS-1.1 ~~PS1-4-1~~. Students who demonstrate understanding can:

Use evidence to construct an explanation relating the speed of an object to the energy of that object.

Supporting Content PS3.A: Definitions of Energy

- The faster a given object is moving, the more energy it possesses. (**4-PS-1.1**~~PS1-4-1~~)

- **Assessment~~Content~~ Limit:** Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.

4-PS-1.2 Students who demonstrate understanding can:

~~PS1-4-2.~~ **Make observations to provide evidence that energy can be transferred from ~~place to place~~ by heat, sound, light, heat, and electric currents.**

Supporting Content PS3.A: Definitions of Energy

- Energy can be moved from place to place by moving objects or through heat, sound, light, or electric currents. (PS1-4-2, PS1-4-3)

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS-1.2, 4-PS-1.3~~PS1-4-2, PS1-4-3~~)
- Light ~~also~~ transfers energy from place to place. (**4-PS-1.2**~~PS1-4-2~~)
- Energy can ~~also~~ be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS-1.2, 4-PS-1.4~~PS1-4-2, PS1-4-4~~)

- **Assessment~~Content~~ Limit:** Assessment does not include quantitative measurements of energy.

4-PS-1.3 Students who demonstrate understanding can:

~~PS1-4-3.~~ **Ask questions and predict outcomes about the changes in energy that occur when objects collide.**

Supporting Content PS3.A: Definitions of Energy

- Energy can be moved from place to place by moving objects or through heat, sound, light, or electric currents. (4-PS-1.2, 4-PS-1.3)

Supporting Content PS3.B Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS-1.2, 4-PS-1.3)

Supporting Content PS3.C: Relationship Between Energy and Forces

- When objects collide, the contact forces transfer energy so as to change the objects' motions. (**4-PS-1.3**~~PS1-4-3~~)

- **Further Explanation:** Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.
  Assessment ~~Content~~ Limit: Assessment does not include quantitative measurements of energy.

4-PS-1.4 Students who demonstrate understanding can:

~~PS1-4-4.~~ **Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.**

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced by transforming the energy of motion into electrical energy. (4-PS-1.2, **4-PS-1.4**)

Supporting Content PS3.D: Energy in Chemical Processes and Everyday Life

- The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use. (4-PS-1.4~~PS1-4-4~~)

Supporting Content ETS1.A: Defining Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.(4-PS-1.4~~PS1-4-4~~)

- **Further Explanation:** Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.
- ~~Content~~ **Assessment Limit:** Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.

Supporting Content

~~**PS3.A: Definitions of Energy**~~

- ~~The faster a given object is moving, the more energy it possesses. (PS1-4-1)~~
- ~~Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (PS1-4-2, PS1-4-3)~~

~~**PS3.B: Conservation of Energy and Energy Transfer**~~

- ~~Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (PS1-4-2, PS1-4-3)~~
- ~~Light also transfers energy from place to place. (PS1-4-2)~~
- ~~Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (PS1-4-2, PS1-4-4)~~

~~**PS3.C: Relationship Between Energy and Forces**~~

- ~~When objects collide, the contact forces transfer energy so as to change the objects' motions. (PS1-4-3)~~

~~**PS3.D: Energy in Chemical Processes and Everyday Life**~~

- ~~The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (PS1-4-4)~~

~~**ETS1.A: Defining Engineering Problems**~~

- ~~Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.(PS1-4-4)~~

4-PS-2 - Waves

~~**PS2-4 Waves**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

4-PS-2.1 ~~PS2-4-1.~~Students who demonstrate understanding can:

Develop a model of a simple mechanical wave~~**waves**~~ **to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.**

Supporting Content PS4.A: Wave Properties

- Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (**4-PS-2.1**~~PS2-4-1~~)
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (**4-PS-2.1**~~PS2-4-1~~)

- **Further Explanation:** Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.
- **Assessment ~~Content~~ Limit**: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.

4-PS-2.2 Students who demonstrate understanding can:

~~**PS2-4-2.**~~ **Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.**

Supporting Content PS4.B: Electromagnetic Radiation

- An object can be seen when light reflected from its surface enters the eyes. (**4-PS-2.2**~~PS2-4-2~~)

Assessment ~~Content~~ Limit: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.

4-PS-2.3 Students who demonstrate understanding can:

~~PS2-4-3.~~ **Generate and compare multiple solutions that use patterns to transfer information.**

Supporting Content **PS4.C: Information Technologies and Instrumentation**

- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (**4-PS-2.3**~~PS2-4-3~~)

Supporting Content **ETS1.C: Optimizing the Design Solution**

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (**4-PS-2.3**~~PS2-4-3~~)

- **Further Explanation:** Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.

~~**Supporting Content**~~

~~**PS4.A: Wave Properties**~~

- ~~Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (PS2-4-1)~~
- ~~Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (PS2-4-1)~~

~~**PS4.B: Electromagnetic Radiation**~~

- ~~An object can be seen when light reflected from its surface enters the eyes. (PS2-4-2)~~

~~**PS4.C: Information Technologies and Instrumentation**~~

- ~~Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (PS2-4-3)~~

~~**ETS1.C: Optimizing the Design Solution**~~

- ~~Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (PS2-4-3)~~

Life Science
4-LS-1 – Molecules to Organisms:Structure and Processes

~~LS: Life Sciences~~

~~LS1-4 Molecules to Organisms: Structure and Processes~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

4-LS-1.1 ~~LS1-4-1.~~Students who demonstrate understanding can:

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Supporting Content **LS1.A: Structure and Function**

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (**4-LS-1.1**~~LS1-4-1~~)
- Animals have various body systems with specific functions for sustaining life: skeletal, circulatory. respiratory, muscular, digestive, etc. (**4-LS-1.1**~~LS1-4-1~~).

- **Further Explanation**: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.
- Assessment ~~Content~~ **Limit**: Assessment is limited to macroscopic structures within plant and animal systems.

4-LS-1.2 Students who demonstrate understanding can:

~~LS1-4-2.~~ **Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.**

Supporting Content **LS1.D: Information Processing**

- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (**4-LS-1.2**~~LS1-4-2~~)

- **Further Explanation:** Emphasis is on systems of information transfer.
- **Assessment~~Content~~ Limit:** Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.

Supporting Content

~~**LS1.A: Structure and Function**~~

- ~~Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (LS1-4-1)~~
- ~~Animals have various body systems with specific functions for sustaining life: skeletal, circulatory, respiratory, muscular, digestive, etc. (LS1-4-1).~~

~~**LS1.D: Information Processing**~~

- ~~Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (LS1-4-2)~~

Moved to 5th grade ~~LS2-4 Ecosystems: Interactions, Energy, and Dynamics~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

~~LS2-4-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.~~

- ~~Further Explanation: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.~~
- ~~Content Limit: Assessment does not include molecular explanations.~~

~~Supporting Content~~

~~LS2.A: Interdependent Relationships in Ecosystems~~

- ~~The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (LS2-4-1)~~

~~LS2.B: Cycles of Matter and Energy Transfer in Ecosystems~~

- ~~Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (LS2-4-1)~~

Earth and Space Science
4-PS-1 **– Earth's Place in the Universe**

~~**ESS: Earth and Space Sciences**~~

~~**ESS1-4 Earth's Place in the Universe**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

4-ESS-1.1 ~~ESS1-4-1.~~Students who demonstrate understanding can:

Identify evidence from patterns in rock formations and fossils in rock layers ~~for changes in a landscape over time~~ to support an explanation for changes in a landscape over time.

Supporting Content ESS1.C: The History of Planet Earth

- Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (**4-ESS-1.1**~~ESS1-4-1~~)
- There are three classifications of rocks produced within the rock cycle: sedimentary, metamorphic, and igneous. (**4-ESS-1.1**~~ESS1-4-1~~).

- **Further Explanation:** Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.
- **Assessment~~Content~~ Limit:** Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.

~~Supporting Content~~

~~ESS1.C: The History of Planet Earth~~

- ~~Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (ESS1-4-1)~~
- ~~There are three classifications of rocks produced within the rock cycle: sedimentary, metamorphic, and igneous. (ESS1-4-1).~~

4-ESS-2 – Earth's Systems

~~ESS2-4 Earth's Systems~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

4-ESS-2.1 ~~ESS2-4-1.~~Students who demonstrate understanding can:

Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Supporting Content **ESS2.A: Earth Materials and Systems**

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (**4-ESS-2.1**~~ESS2-4-1~~)

Supporting Content **ESS2.E: Biogeology**

- Living things affect the physical characteristics of their regions. Examples could include a beaver constructing a dam to create a pond or tree roots breaking a rock. (**4-ESS-2.1**~~ESS2-4-1~~)

  - **Further Explanation:** Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.
  - **Assessment ~~Content~~ Limit:** Assessment is limited to a single form of weathering or erosion.

4-ESS-2.2 Students who demonstrate understanding can:

~~ESS2-4-2.~~ **Analyze and interpret data from maps to describe patterns of Earth's features.**

Supporting Content **ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (**4-ESS-2.2**~~ESS2-4-2~~)

  - **Further Explanation**: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.

Supporting Content

~~**ESS2.A: Earth Materials and Systems**~~

- ~~Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (ESS2-4-1)~~

~~**ESS2.B: Plate Tectonics and Large-Scale System Interactions**~~

- ~~The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (ESS2-4-2)~~

~~**ESS2.E: Biogeology**~~

- ~~Living things affect the physical characteristics of their regions. (ESS2-4-1)~~

4-ESS-3 – Earth and Human Activity

~~ESS3-4 Earth and Human Activity~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

4-ESS-3.1 ~~ESS3-4-1.~~Students who demonstrate understanding can:

Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Supporting Content ESS3.A: Natural Resources

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (**4-ESS-3.1**~~ESS3-4-1~~)

Further Explanation: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and atomic energy. Examples of environmental effects could include biological effects from moving parts, erosion, change of habitat, and pollution.~~Examples of environmental effects could include negative biological impacts of wind turbines, erosion due to deforestation, loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.~~

4-ESS-3.2 Students who demonstrate understanding can:

~~ESS3-4-2.~~**Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.**

Supporting Content ESS3.B: Natural Hazards

- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (**4-ESS-3.2**~~ESS3-4-2~~)

Supporting Content ETS1.B: Designing Solutions to Engineering Problems

Testing a solution involves investigating how well it performs under a range of likely conditions. (**4-ESS-3.2**~~ESS3-4-2~~)

- **Further Explanation:** Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.
- **Assessment~~Content~~ Limit:** Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.

~~**Supporting Content**~~

~~**ESS3.A: Natural Resources**~~

- ~~Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (ESS3-4-1)~~

~~**ESS3.B: Natural Hazards**~~

- ~~A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (ESS3-4-2)~~

~~**ETS1.B: Designing Solutions to Engineering Problems**~~

- ~~Testing a solution involves investigating how well it performs under a range of likely conditions. (ESS3-4-2)~~

GRADE 5

Physical Science
5-PS-1 – Matter and Its Interactions

~~Elementary School (5th Grade) PS: Physical Sciences~~

~~PS1-5 Matter and Its Interactions~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

5-PS-1.1 ~~PS1-5-1.~~Students who demonstrate understanding can:

Develop a model to describe that matter is made of particles too small to be seen.

Supporting Content **PS1.A: Structure and Properties of Matter**

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (**5-PS-1.1**~~PS1-5-1~~)

- **Further Explanation**: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.
- **Assessment**~~Content~~ **Limit:** Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.

5-PS-1.2 Students who demonstrate understanding can:

~~PS1-5-2.~~ **Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.**

Supporting Content PS1.A: Structure and Properties of Matter

- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (**5-PS-1.2**~~PS1-5-2~~)

Supporting Content PS1.B: Chemical Reactions

No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (PS1-5-2)

- **Further Explanation:** Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.
  - **Assessment ~~Content~~ Limit**: Assessment does not include distinguishing mass and weight.

5-PS-1.3 Students who demonstrate understanding can:

~~PS1-5-3.~~ **Make observations and measurements to identify materials based on their properties.**

Supporting Content PS1.A: Structure and Properties of Matter ~~Measure~~

Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (**5-PS-1.3**~~PS1-5-3~~)

~~PS1.B: Chemical Reactions~~

~~When two or more different substances are mixed, a new substance with different properties may be formed. (PS1-5-4)~~

- **Further Explanation:** Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.
- **Assessment ~~Content~~ Limit:** Assessment does not include density or distinguishing mass and weight.

5-PS-1.4 Students who demonstrate understanding can:

~~PS1-5-4.~~ **Conduct an investigation to determine whether the mixing of two or more substances results in new substances.**

Supporting Content PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (**5-PS-1.4**)

Supporting Content

~~**PS1.A: Structure and Properties of Matter**~~

- ~~Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (PS1-5-1)~~
- ~~The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (PS1-5-2)~~
- ~~Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (PS1-5-3)~~

~~**PS1.B: Chemical Reactions**~~

- ~~When two or more different substances are mixed, a new substance with different properties may be formed. (PS1-5-4)~~
- ~~No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (PS1-5-2)~~

5-PS-2 – Motion and Stability: Forces and Interactions

~~PS2-5 Motion and Stability: Forces and Interactions~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

5-PS-2.1 ~~PS2-5-1.~~Students who demonstrate understanding can:

Support an argument that ~~the~~ Earth's gravitational force exerted ~~by Earth~~ on objects is directed downward.

Supporting Content **PS2.B: Types of Interactions**

- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (**5-PS-2.1**~~PS2-5-1~~)

Further Explanation: "Downward" is a local description of the direction that points toward the center of the spherical Earth. Examples could include reasoning that since an object that is initially stationary when held moves downward when it is released, there must be a force (gravity) acting on the object that pulls the object toward the center of Earth.

- **Assessment~~Content~~ Limit:** Assessment does not include mathematical representation of gravitational force.

~~Supporting Content~~

~~PS2.B: Types of Interactions~~

- ~~The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (PS2-5-1)~~

5-PS-3 - Energy

~~PS3-5 Energy~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

5-PS-3.1 ~~PS3-5-1~~. Students who demonstrate understanding can:

Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

Supporting Content PS3.D: Energy in Chemical Processes and Everyday Life

- The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (**5-PS-3.1**~~PS3-5-1~~)

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (**5-PS-3.1**~~PS3-5-1~~)

- **Further Explanation:** Examples of models could include diagrams, and flow charts.

Supporting Content

~~**PS3.D: Energy in Chemical Processes and Everyday Life**~~

- ~~The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (PS3-5-1)~~

~~**LS1.C: Organization for Matter and Energy Flow in Organisms**~~

- ~~Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (PS3-5-1)~~

Life Science
5-LS-1 – Molecules to Organisms: Structure and Processes

~~LS: Life Sciences~~

~~LS1-5 Molecules to Organisms: Structure and Processes~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

5-LS-1.1 ~~LS1-5-1~~. Students who demonstrate understanding can:

Support an argument that plants get ~~the materials~~what they need for growth chiefly from air, ~~and~~ water, and energy from the sun.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants acquire their material for growth chiefly from air and water. (**5-LS-1.1**~~LS1-5-1~~)

Supporting Content PS3.D: Energy in Chemical Processes and Everyday Life

- The energy released from food was once energy from the sun. ~~that~~ The energy was captured by plants in the chemical process that forms plant matter (from air and water). (5-LS-1.1, *5-PS-3.1*)

- Further Explanation: Emphasis is on the idea that plant matter comes mostly from air and ~~and~~ water, not from the soil.

Supporting Content

~~LS1.C: Organization for Matter and Energy Flow in Organisms~~

- ~~Plants acquire their material for growth chiefly from air and water. (LS1-5-1)~~

5-LS-2 – Biological Adaptation: Unity and Diversity

~~LS2-5 Biological Adaptation: Unity and Diversity~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

5-LS-2.1 ~~LS2-5-1.~~Students who demonstrate understanding can:

Analyze and interpret data from fossils to provide evidence of the types of **organisms and the environments** that existed ~~**in which they lived**~~ **long ago** and compare those to living organisms and their environments.~~.~~

Supporting Content LS4.A: Evidence of Common Ancestry and Diversity

- Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (**5-LS-2.1**~~LS2-5-1~~)
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (**5-LS-2.1**~~LS2-5-1~~)

- **Further Explanation:** Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.
- **Assessment~~Content~~ Limit**: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.

5-LS-2.2 Students who demonstrate understanding can:

~~**LS2-5-2. Use evidence to construct**~~ **Construct an** argument with evidence~~**explanation**~~ **for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.**

Supporting Content LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (**5-LS-2.2**~~LS2-5-2~~)

Supporting Content LS4.D: Biodiversity ~~and Humans~~

- Populations of animals are classified by their characteristics.(**5-LS-2.2**~~LS2-5-2~~)

- **Further Explanation:** Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.

Moved to the third grade *3-LS-3.3*~~**LS2-5-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.**~~

- ~~Further Explanation: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.~~

5-LS-2.3 Students who demonstrate understanding can: *(prior 5-LS-2.4)*

~~LS2-5-4.~~ **Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals ~~that live~~living there may change.**

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (**5-LS-2.3**~~LS2-5-4~~)

Supporting Content LS4.D: Biodiversity ~~and Humans~~

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (**5-LS-2.3**~~LS2-5-4~~)

- **Further Explanation**: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.
  Assessment~~Content~~ Limit: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.

~~**LS2-4 Ecosystems: Interactions, Energy, and Dynamics**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

5-LS-2.4 Students who demonstrate understanding can: *(moved from 4th Grade prior 4-LS-2.1)*

~~**LS2-4-1.**~~ **Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.**

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (**5-LS-2.4**)

Supporting Content LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (**5-LS-2.4**)

Further Explanation: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.

Assessment ~~Content~~ Limit: Assessment does not include molecular explanations.

~~**Supporting Content**~~

~~**LS2.A: Interdependent Relationships in Ecosystems**~~

~~The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (LS2-4-1)~~

~~**LS2.B: Cycles of Matter and Energy Transfer in Ecosystems**~~

~~Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (LS2-4-1)~~

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Supporting Content

~~LS2.C: Ecosystem Dynamics, Functioning, and Resilience~~

- ~~When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (LS2-5-4)~~

~~LS4.A: Evidence of Common Ancestry and Diversity~~

- ~~Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (LS2-5-1)~~
- ~~Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (LS2-5-1)~~

~~LS4.B: Natural Selection~~

- ~~Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (LS2-5-2)~~

~~LS4.C: Adaptation~~

- ~~For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (LS2-5-3)~~

~~LS4.D: Biodiversity and Humans~~

- ~~Populations of animals are classified by their characteristics.(LS2-5-2)~~
- ~~Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (LS2-5-4)~~

Earth and Space Science
5-ESS-1 – **Earth's Place in the Universe**

~~**ESS: Earth and Space Sciences**~~

~~**ESS1-5 Earth's Place in the Universe**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

5-ESS-1.1 ~~ESS1-5-1.~~Students who demonstrate understanding can:

Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.

Supporting Content **ESS1.A: The Universe and its Stars**

The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (**5-ESS-1.1**)~~ESS1-5-1~~)

- **Assessment**~~**Content**~~ **Limit:** Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, or stage).

5-ESS-1.2 Students who demonstrate understanding can:

~~ESS1-5-2.~~ **Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.**

Supporting Content **ESS1.B: Earth and the Solar System**

- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (**5-ESS-1.2**~~ESS1-5-2~~)

- **Further Explanation:** Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.
- **Assessment ~~Content~~ Limit**: Assessment does not include causes of seasons.

Supporting Content

~~**ESS1.A: The Universe and its Stars**~~

- ~~The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (ESS1-5-1)~~

~~**ESS1.B: Earth and the Solar System**~~

- ~~The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (ESS1-5-2)~~

5-ESS-2 – Earth's Systems

~~ESS2-5 Earth's Systems~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

5-ESS-2.1~~ESS2-5-1~~. Students who demonstrate understanding can:

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Supporting Content ESS2.A: Earth Materials and Systems

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (**5-ESS-2.1**~~ESS2-5-1~~)

Further Explanation: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.
Assessment ~~Content~~ Limit: Assessment is limited to the interactions of two systems at a time.

5-ESS-2.2 Students who demonstrate understanding can:

~~ESS2-5-2.~~ **Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.**

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (ESS2-5-2)

- **Assessment~~Content~~ Limit**: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.

~~Supporting Content~~

~~ESS2.A: Earth Materials and Systems~~

- ~~Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (ESS2-5-1)~~

~~ESS2.C: The Roles of Water in Earth's Surface Processes~~

- ~~Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (ESS2-5-2)~~

5-ESS-3 – Earth and Human Activity

~~ESS3-5 Earth and Human Activity~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

5-ESS-3.1 ~~ESS3-5-1.~~Students who demonstrate understanding can:

~~Support, obtain~~ Obtain and combine information about ways ~~individual~~ communities ~~use science ideas to~~ protect ~~the~~ Earth's resources and environment **using scientific ideas.**

Supporting Content **ESS3.C: Human I~~mpact~~nfluences on Earth Systems**

- Human activities in agriculture, industry, and everyday life have effects on the land, vegetation, streams, ocean, air, and even outer space. Individuals and communities ~~are doing things to help protect Earth's resources and environments.~~ can often mitigate these effects through innovation and technology. (5-ESS-3.1)~~(ESS3-5-1)~~

Supporting Content

~~**ESS3.C: Human Impacts on Earth Systems**~~

- ~~Human activities in agriculture, industry, and everyday life have effects on the land, vegetation, streams, ocean, air, and even outer space. Individuals and communities are doing things to help protect Earth's resources and environments. (ESS3-5-1)~~

MIDDLE SCHOOL

Physical Science
MS-PS-1 – Matter and Its Interactions

~~Middle School (6-8) PS: Physical Sciences~~

~~PS1-MS Matter and Its Interactions~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-PS-1.1 ~~PS1-MS-1.~~ Students who demonstrate understanding can:

Develop models to describe the atomic composition of simple molecules ~~and extended structures~~.

PS1.A Structure and Properties of Matter

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (**MS-PS-1.1** ~~PS1-MS-1~~)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (**MS-PS-1.1** ~~PS1-MS-1~~)

- **Further Explanation:** Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. ~~Examples of extended structures could include sodium chloride or diamonds.~~ Examples of ~~molecular-level~~ models could include drawings, 3D ball and stick structures, or computer representations ~~showing different molecules with different types of atoms~~.
- **Assessment ~~Content~~ Limit:** Assessment does not include valence electrons and bonding energy, ~~discussing~~ the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.

MS-PS-1.2 Students who demonstrate understanding can:

~~PS1-MS-2~~. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Supporting Content PS1.A: Structure and Properties of Matter

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS-1.2, MS-PS-1.3~~PS1-MS-2, PS1-MS- 3~~)

Supporting Content PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS-1.2, MS-PS-1.3, MS-PS-1.5)

  - **Further Explanation**: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.
  - **Assessment~~Content~~ Limit:** Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.

MS-PS-1.3 Students who demonstrate understanding can:

~~**PS1-MS-3.**~~ Construct a scientific explanation, based on evidence, ~~**Gather and make sense of information**~~ **to describe that synthetic materials come from natural resources~~and impact society~~.**

Supporting Content PS1.A: Structure and Properties of Matter

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS-1.2, MS-PS-1.3)

Supporting Content PS1.B Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS-1.2, MS-PS-1.3, MS-PS-1.5)

  - **Further Explanation:** Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.
  - **Assessment~~Content~~ Limit**: Assessment is limited to qualitative information.

MS-PS-1.4 Students who demonstrate understanding can:

~~PS1-MS-4.~~ **Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.**

Supporting Content PS1.A: Structure and Properties of Matter

- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (**MS-PS-1.4**~~PS1-MS-4~~)
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (**MS-PS-1.4** ~~PS1-MS-4~~)
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (**MS-PS-1.4**)

Supporting Content PS3.A: Definitions of Energy

- The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules with in a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (**MS-PS-1.4**~~PS1-MS-4~~)
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (MS-PS-1.4)

- **Further Explanation**: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.

MS-PS-1.5 Students who demonstrate understanding can:

~~PS1-MS-5.~~ **Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.**

Supporting Content PS1.B Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS-1.2, MS-PS-1.3, MS-PS-1.5~~PS1-MS-1, PS1-MS-3, PS1-MS-5~~)
- The total number of each type of atom is conserved, and thus the mass does not change. (**MS-PS-1.5**~~PS1-MS-5~~)

- **Further Explanation**: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.
- **Assessment~~Content~~ Limit**: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.

MS-PS-1.6 Students who demonstrate understanding can:

~~PS1-MS-6~~. Undertake a design project to construct, test, and/or modify a device that either releases or absorbs thermal energy by chemical processes.

Supporting Content PS1.B Chemical Reactions

- Some chemical reactions release energy, others store energy. (**MS-PS-1.6**~~PS1-MS-6~~)

Supporting Content ETS1.B Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results in order to improve it. (**MS-PS-1.6**~~PS1-MS-6~~)

Supporting Content ETS1.C: Developing Possible Solutions

- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process - that is, some of the characteristics may be incorporated into the new design. (MS-PS-1.6)

- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-PS-1.6)~~PS1-MS-6~~)

- **Further Explanation**: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride (i.e., hand-warmers).~~.~~
- **Assessment ~~Content~~ Limit**: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.

~~**Supporting Content**~~

~~**PS1.A Structure and Properties of Matter**~~

- ~~Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (PS1-MS-1)~~
- ~~Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (PS1-MS-2, PS1-MS-3)~~

- ~~Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (PS1-MS-4)~~
- ~~In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (PS1-MS-4)~~
- ~~Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (PS1-MS-1)~~
- ~~The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (PS1-MS-4)~~

~~**PS1.B Chemical Reactions**~~

- ~~Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (PS1-MS-1, PS1-MS-3, PS1-MS-5)~~
- ~~The total number of each type of atom is conserved, and thus the mass does not change. (PS1-MS-5)~~
- ~~Some chemical reactions release energy, others store energy. (PS1-MS-6)~~

~~**PS3.A: Definitions of Energy**~~

- ~~The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules with in a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (PS1-MS-4)~~
- ~~The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (PS1-MS-6)~~

~~**ETS1.B Developing Possible Solutions**~~

- ~~A solution needs to be tested, and then modified on the basis of the test results in order to improve it. (PS1-MS-6)~~
- ~~The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (PS1-MS-6)~~

MS-PS-2 – Motion and Stability: Forces and Interactions

~~**PS2-MS Motion and Stability: Forces and Interactions**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

MS-PS-2.1 ~~PS2-MS-1~~. Students who demonstrate understanding can:

Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

Supporting Content PS2.A: Forces and Motion

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (**MS-PS-2.1**~~PS2-MS-1~~)

  - **Further Explanation**: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.
  - **Assessment~~Content~~ Limit**: Assessment is limited to vertical or horizontal interactions in one dimension.

MS-PS-2.2 Students who demonstrate understanding can:

~~PS2-MS-2.~~ **Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.**

Supporting Content PS2.A: Forces and Motion

- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (**MS-PS-2.2**~~PS2-MS-2~~)
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (**MS-PS-2.2**~~PS2-MS-2~~)

  - **Further Explanation**: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.
  - **Assessment ~~Content~~ Limit:** Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.

MS-PS-2.3 Students who demonstrate understanding can:

~~PS2-MS-3~~. **Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.**

Supporting Content PS2.B: Types of Interactions

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (**MS-PS-2.3**~~PS2-MS-3~~)

- **Further Explanation**: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.
- **Assessment ~~Content~~ Limit**: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.

MS-PS-2.4 Students who demonstrate understanding can:

~~PS2-MS-4~~. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

Supporting Content PS2.B: Types of Interactions

- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (**MS-PS-2.4**~~PS2-MS-4~~)

- **Further Explanation**: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.
- **Assessment ~~Content~~ Limit**: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.

MS-PS-2.5 Students who demonstrate understanding can:

~~PS2-MS-5~~. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Supporting Content PS2.B: Types of Interactions

- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (**MS-PS-2.5**~~PS2-MS-5~~)

- **Further Explanation**: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.
- **Assessment~~Content~~ Limit:** Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.

~~**Supporting Content**~~

~~**PS2.A: Forces and Motion**~~

- ~~For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (PS2-MS-1)~~
- ~~The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (PS2-MS-2)~~
- ~~All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (PS2-MS-2)~~

~~**PS2.B: Types of Interactions**~~

- ~~Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (PS2-MS-3)~~
- ~~Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (PS2-MS-4)~~
- ~~Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (PS2-MS-5)~~

MS-PS-3 – Energy

~~PS3-MS Energy~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-PS-3.1 ~~PS3-MS-1.~~Students who demonstrate understanding can:

Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

Supporting Content PS3.A: Definitions of Energy

- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (**MS-PS-3.1**~~PS3-MS-1~~)

  - **Further Explanation:** Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.

MS-PS-3.2 Students who demonstrate understanding can:

~~**PS3-MS-2.**~~ **Develop a model to describe** ~~**that when the arrangement**~~ the relationship between the relative positions **of objects interacting at a distance** and the relative ~~**changes, different amounts of**~~ **potential energy** ~~**are stored**~~ **in the system.**

Supporting Content PS3.A: Definitions of Energy

- A system of objects may also contain stored (potential) energy, depending on their relative positions. (**MS-PS-3.2**~~PS3-MS-2~~)

Supporting Content PS3.C: Relationship Between Energy and Forces

- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (**MS-PS-3.2**~~PS3-MS-2~~)

- **Further Explanation**: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.
- **Assessment~~Content~~ Limit**: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.

MS-PS-3.3 Students who demonstrate understanding can:

~~PS3-MS-3.~~ Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

Supporting Content PS3.A: Definitions of Energy

- Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS-3.3, MS-PS-3.4~~PS3-MS-3, PS3-MS-4~~)

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS-3.3 ~~PS3-MS-3~~)

Supporting Content ETS1.A: Defining and Delimiting an Engineering Problem

- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (MS-PS-3.3~~PS3-MS-3~~)

Supporting Content ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (MS-PS-3.3~~PS3-MS-3~~)

- **Further Explanation**: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.
- **Assessment~~Content~~ Limit**: Assessment does not include calculating the total amount of thermal energy transferred.

MS-PS-3.4 Students who demonstrate understanding can:

~~PS3-MS-4~~. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

Supporting Content PS3.A: Definitions of Energy

- Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS-3.3, MS-PS-3.4 ~~PS3-MS-3, PS3-MS-4~~)

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS-3.4~~PS3-MS-4~~)

  - **Further Explanation**: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.
  - **Assessment~~Content~~ Limit**: Assessment does not include calculating the total amount of thermal energy transferred.

MS-PS-3.5 Students who demonstrate understanding can:

~~PS3-MS-5.~~ **Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.**

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (**MS-PS-3.5**~~PS3-MS-5~~)

  - **Further Explanation:** Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.
  - **Assessment~~Content~~ Limit**: ~~Assessment~~ does not include calculations of energy.

~~**Supporting Content**~~

~~**PS3.A: Definitions of Energy**~~

- ~~Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (PS3-MS-1)~~
- ~~A system of objects may also contain stored (potential) energy, depending on their relative positions. (PS3-MS-2)~~
- ~~Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (PS3-MS-3, PS3-MS-4)~~

~~**PS3.B: Conservation of Energy and Energy Transfer**~~

- ~~When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (PS3-MS-5)~~
- ~~The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (PS3-MS-4)~~
- ~~Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (PS3-MS-3)~~

~~PS3.C: Relationship Between Energy and Forces~~

- ~~When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (PS3-MS-2)~~

~~ETS1.A: Defining and Delimiting an Engineering Problem~~

- ~~The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (PS3-MS-3)~~
- ~~ETS1.B: Developing Possible Solutions~~
- ~~A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (PS3-MS-3)~~

MS-PS-4 – Waves

~~PS4-MS Waves~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-PS-4.1 ~~PS4-MS-1.~~ Students who demonstrate understanding can:

Use diagrams of ~~**mathematical representations to describe**~~ **a simple** ~~**model for**~~ **wave**~~**s**~~ to explain that (1) a wave has a repeating pattern with a specific amplitude, frequency, and wavelength, and (2) ~~**that includes how the**~~ **amplitude of a wave is related to the energy in a wave.**

Supporting Content PS4.A: Wave Properties

- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (**MS-PS-4.1**~~PS4-MS-1~~)
- Waves transfer energy. (MS-PS-4.1)

  - **Further Explanation**: Emphasis is on describing waves with both qualitative and quantitative thinking.
  - **Assessment**~~**Content**~~ **Limit**: Assessment does not include electromagnetic waves and is limited to standard repeating waves.

MS-PS-4.2 Students who demonstrate understanding can:

~~**PS4-MS-2.**~~ **Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.**

Supporting Content PS4.A: Wave Properties

- A sound wave needs a medium through which it is transmitted. (**MS-PS-4.2**~~PS4-MS-2~~)

Supporting Content PS4.B: Electromagnetic Radiation

- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (**MS-PS-4.2**~~PS4- MS-2~~)
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (**MS-PS-4.2**~~PS4-MS-2~~)
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (**MS-PS-4.2**~~PS4-MS-2~~)
- However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (**MS-PS-4.2**~~PS4-MS-2~~)

- **Further Explanation:** Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.
- **Assessment~~Content~~ Limit**: Assessment is limited to qualitative applications pertaining to light and mechanical waves.

MS-PS-4.3 Students who demonstrate understanding can:

~~PS4-MS-3. Integrate~~Present qualitative scientific and technical information to support the claim that digitized signals (0s and 1s) **~~are a more reliable~~** can be used**~~way~~ to encode and transmit information~~than analog signals~~.**

Supporting Content PS4.C: Information Technologies and Instrumentation

- Digitized signals (sent as wave pulses) are a ~~more~~ reliable way to encode and transmit information. (PS4-MS-3)

- **Further Explanation**: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in WIFI devices, and conversion of stored binary patterns to make sound or text on a computer screen.
- **Assessment~~Content~~ Limit**: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.

~~**Supporting Content**~~

~~**PS4.A: Wave Properties**~~

- ~~A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (PS4-MS-1)~~
- ~~A sound wave needs a medium through which it is transmitted. (PS4-MS-2)~~

~~**PS4.B: Electromagnetic Radiation**~~

- ~~When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (PS4- MS-2)~~
- ~~The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (PS4-MS-2)~~
- ~~A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (PS4-MS-2)~~
- ~~However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (PS4-MS-2)~~

~~**PS4.C: Information Technologies and Instrumentation**~~

- ~~Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (PS4-MS-3)~~

Life Science
MS-LS-1 – Molecules to Organisms: Structure and

~~LS: Life Sciences~~

~~LS1-MS Molecules to Organisms: Structure and Processes~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-LS-1.1 ~~MS-LS1-1~~. Students who demonstrate understanding can:

Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

Supporting Content LS1.A: Structure and Function

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (**MS-LS-1.1**~~LS1-MS-1~~)

  - **Further Explanation:** Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living ~~cells~~things, and understanding that living things may be made of one cell or many and varied cells.

MS-LS-1.2 Students who demonstrate understanding can:

~~MS-LS1-2.~~ **Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.**

Supporting Content LS1.A: Structure and Function

- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (**MS-LS-1.2**~~LS1-MS-2~~)

  - **Further Explanation**: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. These are visible with a light microscope.

- **Assessment~~Content~~ Limit**: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.

MS-LS-1.3 Students who demonstrate understanding can:

~~MS-LS1-3.~~ Make a claim ~~Use argument~~ **supported by evidence for how a living organism is a system of interacting subsystems composed of groups of cells.**

Supporting Content LS1.A: Structure and Function

- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS-1.3~~LS1-MS-3~~)

- **Further Explanation**: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.
- **Assessment~~Content~~ Limit**: Assessment does not include the mechanism of one body system independent of others. Assessment is not focused on human body systems.

MS-LS-1.4 Students who demonstrate understanding can:

~~MS-LS1-4.~~ **Construct a scientific argument based on evidence to defend a claim of life for a specific object or organism.**

Supporting Content LS1.B: Characteristics of Living Things

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (MS-LS-1.4~~LS1-MS-4~~)
- Living things share certain characteristics. (These include response to environment, reproduction, energy use, growth and development, life cycles, made of cells, etc.) (MS-LS-1.4~~LS1-MS-4~~)

- **Further Explanation**: Examples should include both biotic and abiotic items, and should be defended using accepted characteristics of life.
- **Assessment~~Content~~ Limit**: Assessment does not include specific conclusions regarding the living status of viruses, or other disputed examples.

MS-LS-1.5 Students who demonstrate understanding can:

~~MS-LS1-5.~~ **Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.**

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (**MS-LS-1.5**~~LS1-MS-5~~)

  - **Further Explanation**: Emphasis is on tracing movement of matter and flow of energy.
  - **Assessment~~Content~~ Limit**: Assessment does not include the biochemical mechanisms of photosynthesis.

MS-LS-1.6 Students who demonstrate understanding can:

~~MS-LS1-6.~~ **Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.**

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

Within individual organisms, food moves through a series of chemical reactions (cellular respiration) in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (LS1-MS-6)

- **Further Explanation**: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released. Also understanding that the elements in the products are the same as the elements in the reactants .
- **Assessment ~~Content~~ Limit**: Assessment does not include details of the chemical reactions for photosynthesis or respiration.

~~**Supporting Content**~~

~~**LS1.A: Structure and Function**~~

- ~~All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (LS1-MS-1)~~
- ~~Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (LS1-MS-2)~~
- ~~In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs~~
- ~~that are specialized for particular body functions. (LS1-MS-3)~~

~~**LS1.B: Characteristics of Living Things**~~

- ~~Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (LS1-MS-4)~~
- ~~Living things share certain characteristics. (These include response to environment, reproduction, energy use, growth and development, life cycles, made of cells, etc.) (LS1-MS-4)~~

~~**LS1.C: Organization for Matter and Energy Flow in Organisms**~~

- ~~Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (LS1-MS-5)~~
- ~~Within individual organisms, food moves through a series of chemical reactions (cellular respiration) in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (LS1-MS-6)~~

MS-LS-2 – Ecosystems: Interactions, Energy, and Dynamics

~~LS2-MS Ecosystems: Interactions, Energy, and Dynamics~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-LS-2.1 ~~LS2-MS-1.~~ Students who demonstrate understanding can:

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (**MS-LS-2.1**~~LS2-MS-1~~)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (**MS-LS-2.1**~~LS2-MS-1~~)
- Growth of organisms and population increases are limited by access to resources. (**MS-LS-2.1**~~LS2-MS-1~~)

- **Further Explanation**: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.

MS-LS-2.2 Students who demonstrate understanding can:

~~LS2-MS-2.~~ **Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.**

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (**MS-LS-2.2**~~LS2-MS-2~~)

- **Further Explanation**: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.

MS-LS-2.3 Students who demonstrate understanding can:

~~LS2-MS-3.~~ **Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.**

Supporting Content LS2.B: Cycle of Matter and Energy Transfer in Ecosystems

- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (**MS-LS-2.3**~~LS2-MS-3~~)

  - **Further Explanation:** Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.
  - **Assessment~~Content~~ Limit**: Assessment does not include the use of chemical reactions to describe the processes.

MS-LS-2.4 Students who demonstrate understanding can:

~~LS2-MS-4.~~ **Develop a model to describe the flow of energy through the trophic levels of an ecosystem.**

Supporting Content LS2.B: Cycle of Matter and Energy Transfer in Ecosystems

- Food webs can be broken down into multiple energy pyramids. Concepts should include the 10% rule of energy and biomass transfer between trophic levels and the environment. (**MS-LS-2.4**~~LS2-MS-4~~)

  - **Further Explanation**: Emphasis is on describing the transfer of mass and energy beginning with producers, moving to primary and secondary consumers, and ending with decomposers.
  - **Assessment~~Content~~ Limit**: Assessment does not include the use of chemical reactions to describe the processes.

MS-LS-2.5 Students who demonstrate understanding can:

~~LS2-MS-5.~~ **Construct an argument supported by ~~empirical~~ evidence that changes to physical or biological components of an ecosystem affect populations.**

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (**MS-LS-2.5**~~LS2-MS-5~~)

  - **Further Explanation**: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

MS-LS-2.6 Students who demonstrate understanding can:

~~**LS2-MS-6.**~~ Design and evaluate~~**Evaluate competing design**~~ **solutions for maintaining biodiversity and ecosystem services.**

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (**MS-LS-2.6**~~LS2-MS-6~~)

LS4.D: Biodiversity and Humans

- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (**MS-LS-2.6**~~LS2-MS-6~~)

ETS1.B: Developing Possible Solutions

- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (**MS-LS-2.6**~~LS2-MS-6~~)

- **Further Explanation**: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.

~~**Supporting Content**~~

~~**LS2.A: Interdependent Relationships in Ecosystems**~~

- ~~Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (LS2-MS-1)~~
- ~~In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (LS2-MS-1)~~
- ~~Growth of organisms and population increases are limited by access to resources. (LS2-MS-1)~~
- ~~Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (LS2-MS-2)~~

~~**LS2.B: Cycle of Matter and Energy Transfer in Ecosystems**~~

- ~~Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (LS2-MS-3)~~
- ~~Food webs can be broken down into multiple energy pyramids. Concepts should include the 10% rule of energy and biomass transfer between trophic levels and the environment. (LS2-MS-4)~~

~~**LS2.C: Ecosystem Dynamics, Functioning, and Resilience**~~

- ~~Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (LS2-MS-5)~~
- ~~Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (LS2-MS-6)~~

~~**LS4.D: Biodiversity and Humans**~~

- ~~Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (LS2-MS-6)~~

~~ETS1.B: Developing Possible Solutions~~

- ~~There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (LS2-MS-6)~~

MS-LS-3 – Heredity: Inheritance and Variation of Traits

~~LS3-MS Heredity: Inheritance and Variation of Traits~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-LS-3.1 ~~LS3-MS-1.~~Students who demonstrate understanding can:

Develop and use a model to describe why mutations may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

Supporting Content LS3.A: Inheritance of Traits

- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. ~~C~~Structural changes ~~(mutations)~~ to genes (mutations) can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (**MS-LS-3.1**~~LS3-MS-1~~)

Supporting Content LS3.B: Variation of Traits

- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in significant changes to the structure and function of proteins. ~~Some c~~Changes ~~are~~can be beneficial, ~~others~~ harmful, ~~and some~~or neutral to the organism. (**MS-LS-3.1**~~LS3-MS-1~~)

- **Further Explanation**: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.
- **Assessment**~~**Content**~~ **Limit**: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.

MS-LS-3.2 Students who demonstrate understanding can:

~~LS3-MS-2.~~ **Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.**

Supporting Content LS1.B: Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (**MS-LS-3.2**~~LS3-MS-2~~)

Supporting Content LS3.A: Inheritance of Traits

- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (~~LS3-MS-2~~ MS-LS-3.2)
-

Supporting Content LS3.B: Variation of Traits

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS-3.2~~LS3-MS-2~~)

- **Further Explanation**: Emphasis is on using models such as simple Punnett squares and pedigrees, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.

~~Supporting Content~~

~~LS3.A: Inheritance of Traits~~

- ~~Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (LS3-MS-1)~~
- ~~Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (LS3-MS-2)~~

~~LS3.B: Variation of Traits~~

- ~~In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (LS3-MS-2)~~
- ~~In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (LS3-MS-1)~~

MS-LS-4 – Biological Adaptation: Unity and Diversity

~~LS4-MS Biological Adaptation: Unity and Diversity~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-LS-4.1 ~~LS4-MS-1.~~ Students who demonstrate understanding can:

Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

Supporting Content LS4.A: Classification of Organisms

- The collection of fossils and their placement in chronological order is known as the fossil record and documents the change of many life forms throughout the history of the Earth. Anatomical similarities and differences between various organisms living today and between ~~them~~living and once living organisms in the fossil record enable the classification of living things. (MS-LS-4.1, MS-LS-4.2~~LS4-MS-1, LS4-MS-2~~)

  - **Further Explanation**: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.
  - **Assessment~~Content~~ Limit**: Assessment does not include the names of individual species or geological eras in the fossil record.

MS-LS-4.2 Students who demonstrate understanding can:

~~LS4-MS-2.~~ **Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer relationships.**

Supporting Content LS4.A: Classification of Organisms

- The collection of fossils and their placement in chronological order is known as the fossil record and documents the change of many life forms throughout the history of the Earth. Anatomical similarities and differences between various organisms living today and between living and once living organisms in the fossil record enable the classification of living things. (MS-LS-4.1, MS-LS-4.2)

  - **Further Explanation**: Emphasis is on explanations of the relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.

MS-LS-4.3 Students who demonstrate understanding can:

~~LS4-MS-3.~~ **Analyze** visual evidence ~~**displays of pictorial data**~~ **to compare patterns of similarities in the anatomical structures across multiple species of similar classification levels to identify relationships.**

Supporting Content LS4.A: Classification of Organisms

- Scientific genus and species level names indicate a degree of relationship. (**MS-LS-4.3**~~LS4-MS-3~~)

    - **Further Explanation**: Emphasis is on inferring general patterns of relatedness among structures of different organisms by comparing ~~the appearance of~~ diagrams, ~~or~~ pictures, specimens, or fossils.
    - **Assessment**~~**Content**~~ **Limit**: Assessment of comparisons is limited to gross appearance of anatomical structures within genus and species levels. No memorization of classification levels is required.

MS-LS-4.4 Students who demonstrate understanding can:

~~LS4-MS-4.~~ **Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.**

Supporting Content LS4.B: Natural Selection

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (**MS-LS-4.4**~~LS4-MS-4~~)

    - **Further Explanation**: Emphasis is on using concepts of natural selection ~~like~~ including overproduction of offspring, passage of time, variation in a population, selection of favorable traits, and heritability of traits.

MS-LS-4.5 Students who demonstrate understanding can:

~~LS4-MS-5.~~ Obtain, evaluate, and communicate ~~**Gather and synthesize**~~ **information about** ~~**the**~~ **how technologies** ~~**that have changed the way**~~**allow humans to influence the inheritance of desired traits in organisms.**

Supporting Content LS4.B: Natural Selection

- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed ~~on~~ to offspring. (**MS-LS-4.5**~~LS4-MS-5~~)

- **Further Explanation**: Emphasis is on identifying and communicating~~synthesizing~~ information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the influence~~impacts~~ these technologies have on society as well as the technologies leading to these scientific discoveries.

MS-LS-4.6 Students who demonstrate understanding can:

~~**LS4-MS-6.**~~ **Use mathematical** models~~**representations**~~ **to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.**

Supporting Content LS4.C: Adaptation

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (**MS-LS-4.6**~~LS4-MS-6~~)

- **Further Explanation**: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time. Examples could include Peppered moth population changes before and after the industrial revolution.
- **Assessment**~~**Content**~~ **Limit**: Assessment does not include Hardy Weinberg calculations.

~~**Supporting Content**~~

~~**LS4.A: Classification of Organisms**~~

- ~~The collection of fossils and their placement in chronological order is known as the fossil record and documents the change of many life forms throughout the history of the Earth. Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record enable the classification of living things. (LS4-MS-1, LS4-MS-2)~~
- ~~Scientific genus and species level names indicate a degree of relationship. (LS4-MS-3)~~

~~**LS4.B: Natural Selection**~~

- ~~Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (LS4-MS-4)~~
- ~~In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (LS4-MS-5)~~

~~**LS4.C: Adaptation**~~

- ~~Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (LS4-MS-6)~~

Earth and Space Science
MS-ESS-1 – **Earth's Place in the Universe**

~~**ESS: Earth and Space Sciences**~~

~~**ESS1-MS Earth's Place in the Universe**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

MS-ESS-1.1 ~~ESS1-MS-1.~~Students who demonstrate understanding can:

Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Supporting Content **ESS1.A: The Universe and Its Stars**

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (**MS-ESS-1.1**~~ESS1-MS-1~~)

Supporting Content **ESS1.B: Earth and the Solar System**

- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (**MS-ESS-1.1**~~ESS1-MS-1~~)

Further Explanation: Examples of models can be physical, graphical, or conceptual.
Assessment Limit: Assessment does not include recalling lunar phases.

MS-ESS-1.2 Students who demonstrate understanding can:

~~ESS1-MS-2.~~ **Develop and use a model to describe the role of gravity in the orbital motions within galaxies and the solar system.**

Supporting Content **ESS1.A: The Universe and Its Stars**

- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS-1.2)

Supporting Content ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS-1.2, MS-ESS-1.3)

  - **Further Explanation**: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).
  - **Assessment~~Content~~ Limit**: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.

MS-ESS-1.3 Students who demonstrate understanding can:

~~ESS1-MS-3.~~ Analyze and interpret data to determine scale properties of objects in the solar system.

Supporting Content ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (ESS1-MS-2, ESS1-MS-3(MS-ESS-1.2, MS-ESS-1.3)

  - **Further Explanation**: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects, such as relative size, distance, motions, and features. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.
  - **Assessment~~Content~~ Limit**: Assessment does not include recalling facts about properties of the planets and other solar system bodies.

MS-ESS-1.4 Students who demonstrate understanding can:

~~ESS1-MS-4.~~ Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to ~~organize~~ analyze Earth's history.

Supporting Content ESS1.C: The History of Planet Earth

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS-1.4~~ESS1-MS-4~~)

- **Further Explanation**: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age~~ or the earliest fossils of homo sapiens~~) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or large volcanic eruptions.
- **Assessment~~Content~~ Limit**: Assessment does not include recalling the names of specific eons, eras, periods or epochs and events within them.

~~**Supporting Content**~~

~~**ESS1.A: The Universe and Its Stars**~~

- ~~Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (ESS1-MS-1)~~
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (ESS1-MS-2)

ESS1.B: Earth and the Solar System

- ~~The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (ESS1-MS-2, ESS1-MS-3)~~
- ~~This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (ESS1-MS-1)~~
- ~~The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (ESS1-MS-2)~~

~~**ESS1.C: The History of Planet Earth**~~

- ~~The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (ESS1-MS-4)~~

MS-ESS-2 – Earth's Systems

~~ESS2-MS Earth's Systems~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-ESS-2.1 ~~ESS2-MS-1.~~Students who demonstrate understanding can:

Develop a model to describe the cycling of Earth's materials and the internal and external **flows of energy that drive~~s~~ the~~is~~** rock cycle processes~~**process**~~.

Supporting Content ESS2.A: Earth's Materials and Systems

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (**MS-ESS-2.1**~~ESS2-MS-1~~)

- **Further Explanation**: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.
- **Assessment~~Content~~ Limit**: Assessment does not include the identification and naming of minerals.

MS-ESS-2.2 Students who demonstrate understanding can:

~~**ESS2-MS-2.**~~ **Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.**

Supporting Content ESS2.A: Earth's Materials and Systems

- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (**MS-ESS-2.2** ~~ESS2-MS-2~~)

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (**MS-ESS-2.2**~~ESS2-MS-2~~)

Further Explanation: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how ~~many~~ geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.

- ***Assessment Limit:*** Assessment does not include memorization of the formation of specific geographic features of Earth's surface, or the geochemical processes involved in the formation.

MS-ESS-2.3 Students who demonstrate understanding can:

~~**ESS2-MS-3.**~~ **Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.**

Supporting Content **ESS1.C: The History of Planet Earth**

- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (**MS-ESS-2.3**~~ESS2-MS-3~~)

Supporting Content **ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (**MS-ESS-2.3**~~ESS2-MS-3~~)

Further Explanation: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).
Examples of concepts include continental drift and seafloor spreading.

- ***Assessment Limit:*** Assessment of plate tectonics should be limited to large-scale system interactions. ~~Content Limit:~~ Paleomagnetic anomalies in oceanic and continental crust are not assessed.

MS-ESS-2.4 Students who demonstrate understanding can:

~~**ESS2-MS-4.**~~ **Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.**

Supporting Content **ESS2.C: The Roles of Water in Earth's Surface Processes**

- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation, percolation ~~and~~ crystallization, and precipitation, as well as downhill flows on land. (**MS-ESS-2.4**~~ESS2-MS-4~~)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (**MS-ESS-2.4**~~ESS2-MS-4~~)

- **Further Explanation**: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.
- ~~Content~~ **Assessment Limit**: Assessment includes qualitative energy flows, not quantitative energy calculations~~A quantitative understanding of the latent heats of vaporization and fusion is not assessed~~.

MS-ESS-2.5 Students who demonstrate understanding can:

~~**ESS2-MS-5.**~~ **Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.**

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (**MS-ESS-2.5**~~ESS2-MS-5~~)

Supporting Content ESS2.D: Weather and Climate

- Because these patterns are so complex, weather can only be predicted using probability. (**MS-ESS-2.5**~~ESS2-MS-5~~)

- **Further Explanation**: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students ~~(such as weather maps, diagrams, and visualizations)~~ or obtained through laboratory experiments (such as with condensation and the use of barometers).
- **Assessment**~~**Content**~~ **Limit**: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.

MS-ESS-2.6 Students who demonstrate understanding can:

~~**ESS2-MS-6.**~~ **Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.**

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (ESS2-MS-6)

Supporting Content ESS2.D: Weather and Climate

- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (**MS-ESS-2.6**~~ESS2-MS-6~~)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (**MS-ESS-2.6**~~ESS2-MS-6~~)

- **Further Explanation**: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight- driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.
- **Assessment~~Content~~ Limit**: Assessment does not include the dynamics of the Coriolis effect, or recalling names and locations of specific biomes.~~.~~

~~Supporting Content~~

~~ESS1.C: The History of Planet Earth~~

- ~~Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (ESS2-MS-3)~~

~~ESS2.A: Earth's Materials and Systems~~

- ~~All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (ESS2-MS-1)~~
- ~~The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (ESS2-MS-2)~~

~~ESS2.B: Plate Tectonics and Large-Scale System Interactions~~

- ~~Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (ESS2-MS-3)~~

~~ESS2.C: The Roles of Water in Earth's Surface Processes~~

- ~~Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (ESS2-MS-4)~~
- ~~The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (ESS2-MS-5)~~
- ~~Global movements of water and its changes in form are propelled by sunlight and gravity. (ESS2-MS-4)~~
- ~~Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (ESS2-MS-6)~~
- ~~Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (ESS2-MS-2)~~

~~**ESS2.D: Weather and Climate**~~

- ~~Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (ESS2-MS-6)~~
- ~~Because these patterns are so complex, weather can only be predicted using probability. (ESS2-MS-5)~~
- ~~The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (ESS2-MS-6)~~

MS-ESS-3 – Earth and Human Activity

~~ESS3-MS Earth and Human Activity~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

MS-ESS-3.1 ~~ESS3-MS-1.~~ Students who demonstrate understanding can:

Construct a scientific explanation based on evidence for how ~~the uneven distributions of~~ Earth's mineral, energy, and groundwater resources are unevenly distributed as a **the result of past and current** geologic ~~**geoscience**~~ **processes.**

Supporting Content **ESS3.A: Natural Resources**

- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (**MS-ESS-3.1** ~~ESS3-MS-1~~)

- **Further Explanation**: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are changing as a result of ~~removal by humans~~depletion. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).

MS-ESS-3.2 Students who demonstrate understanding can:

~~**ESS3-MS-2.**~~ **Analyze and interpret data on natural hazards to forecast future catastrophic events ~~and inform the development of technologies~~ to mitigate their effects.**

Supporting Content **ESS3.B: Natural Hazards**

- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (**MS-ESS-3.2** ~~ESS3-MS-2~~)

- **Further Explanation**: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions~~, but~~ .~~others~~ Others, such as earthquakes, occur suddenly ~~and with no notice~~, and ~~thus~~ are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of mitigation strategies~~technologies~~ can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).

MS-ESS-3.3 Students who demonstrate understanding can:

~~ESS3-MS-3.~~ **Apply scientific ~~principles~~ to design a method for monitoring ~~and minimizing~~** human activity and increasing beneficial ~~**a**~~ **human** influences~~**impact**~~ **on the environment.**

Supporting Content ESS3.C: Human ~~Impact~~ Influences on Earth Systems

- Human activities can positively and negatively influence ~~can have consequences (positive and negative) on~~ the biosphere, sometimes altering natural habitats and ecosystems. (MS-ESS-3.3)~~causing the extinction of other species. (ESS3-MS-3)~~
- Technology and engineering can potentially help us best manage ~~mitigate impacts on Earth's systems as both human populations and per-capita consumption of~~ natural resources as populations increase. (MS-ESS-3.3, MS-ESS-3.4)~~increase. (ESS3-MS-3, ESS3-MS-4)~~

- **Further Explanation**: Examples of the design process include examining human interactions and designing feasible solutions that promote stewardship.~~environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact.~~ Examples ~~of human impacts~~ can include water usage (such as such as stream and river use, aquifer recharge, or dams and levee construction~~the withdrawal of water from streams and aquifers or the construction of dams and levees~~), land usage (such as urban development, agriculture, wetland benefits, stream reclamation, or fire restoration~~or the removal of wetlands~~), and pollution (such as of the air, water, or land).

MS-ESS-3.4 Students who demonstrate understanding can:

~~ESS3-MS-4.~~ **Construct an argument** based on ~~**supported by**~~ **evidence for how** changes~~**increases**~~ **in human population and per-capita consumption of natural resources** positively and negatively affect~~**impact**~~ **Earth's systems.**

Supporting Content ESS3.C: Human ~~Impact~~ Influences on Earth Systems

- Technology and engineering can potentially help us best manage natural resources as populations increase. (MS-ESS-3.3, MS-ESS-3.4)

- **Further Explanation:** Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of effects~~impacts~~ can include changes made to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. ~~The consequences of increases in human~~

~~populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.~~

MS-ESS-3.5 Students who demonstrate understanding can:

~~**ESS3-MS-5.**~~ **Ask questions to interpret evidence of the factors that cause climate variability** throughout Earth's history.~~**over time.**~~

Supporting Content ESS3.C: Human ~~Impact~~ Influences on Earth Systems

- ~~Mitigating current changes in climate depends on understanding climate science.~~ Current scientific models indicate that human activities, such as the release of greenhouse gases from fossil fuel combustion, can contribute to ~~are the primary factors in~~ the present-day measured rise in Earth's mean surface temperature. Natural activities, such as changes in incoming solar radiation, also contribute to changing global temperatures. (**MS-ESS-3.5**~~ESS3-MS-5~~)

- **Further Explanation:** Examples of factors include human activities (such as fossil fuel combustion and changes in land use) and natural processes (such as changes in incoming solar radiation and volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and natural resource use.

~~**Supporting Content**~~

~~**ESS3.A: Natural Resources**~~

- ~~Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (ESS3-MS-1)~~

~~**ESS3.B: Natural Hazards**~~

- ~~Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (ESS3-MS-2)~~

~~**ESS3.C:**~~

- ~~Human activities can have consequences (positive and negative) on the biosphere, sometimes altering natural habitats and causing the extinction of other species. (ESS3-MS-3)~~
- ~~Technology and engineering can potentially mitigate impacts on Earth's systems as both human populations and per-capita consumption of natural resources increase. (ESS3-MS-3, ESS3-MS-4)~~
- ~~Mitigating current changes in climate depends on understanding climate science. Current scientific models indicate that human activities, such as the release of greenhouse gases from fossil fuel combustion, are the primary factors in the present-day measured rise in Earth's mean~~

~~surface temperature. Natural activities, such as changes in incoming solar radiation, also contribute to changing global temperatures. (ESS3-MS-5)~~

HIGH SCHOOL

Life Science
HS-LS-1 – Molecules to Organisms: Structure and Processes

~~**HIGH SCHOOL (9-12)**~~

~~**LS: Life Sciences (Biology)**~~

~~**LS1-HS Molecules to Organisms: Structure and Processes**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

HS-LS-1.1 ~~LS1-HS-1.~~Students who demonstrate understanding can:

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Supporting Content LS1.A: Structure and Function

- Systems of specialized cells within organisms help them perform the essential functions of life. (**HS-LS-1.1**~~LS1-HS-1~~)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS-1.1, HS-LS-3.1~~LS1-HS-1~~)

- **Further Explanation**: Emphasis is on the structure of the double helix, the pairing and sequencing of the nitrogenous bases, transcription, translation, and protein synthesis.
- **Assessment**~~**Content**~~ **Limit**: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.

HS-LS-1.2 Students who demonstrate understanding can:

~~**LS1-HS-2.**~~ **Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**

Supporting Content LS1.A: Structure and Function

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS-1.2~~LS1- HS-2~~)

- **Further Explanation**: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.
- **Assessment~~Content~~ Limit**: Assessment does not include interactions and functions at the molecular or chemical reaction level.

HS-LS-1.3 Students who demonstrate understanding can:

~~LS1-HS-3.~~ Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Supporting Content LS1.A: Structure and Function

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS-1.3~~LS1-HS-3~~)

- **Further Explanation**: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.
Assessment~~Content~~ Limit: Assessment does not include the cellular processes involved in the feedback mechanism.

HS-LS-1.4 Students who demonstrate understanding can:

~~LS1-HS-4.~~ Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Supporting Content LS1.B: Growth and Development of Organisms

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS-1.4~~LS1-HS-4~~)

- **Assessment ~~Content~~ Limit**: Assessment does not include specific gene control mechanisms~~ or rote memorization of the steps of mitosis~~.

HS-LS-1.5 Students who demonstrate understanding can:

~~LS1-HS-5.~~ **Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.**

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (**HS-LS-1.5**~~LS1-HS-5~~)

- **Further Explanation**: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.
- **Assessment~~Content~~ Limit**: Assessment does not include specific biochemical steps.

HS-LS-1.6 Students who demonstrate understanding can:

~~LS1-HS-6.~~ **Construct ~~and revise~~ an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.**

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- ~~The~~ ~~S~~sugar molecules ~~thus formed~~ contain carbon, hydrogen, and oxygen: their hydrocarbon backbones combined with nitrogen, sulfur and/or phosphorous are used to make monomers (amino acids) and other carbon-based molecules that can be assembled into larger macromolecules (such as proteins or DNA), used for example to form new cells. (**HS-LS-1.6**~~LS1-HS-6~~)
- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS-1.6, HS-LS-1.7~~LS1- HS-6, LS1-HS-7~~)

- **Further Explanation**: Emphasis is on using evidence from models and simulations to support explanations.
- **Assessment~~Content~~ Limit**: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.

HS-LS-1.7 Students who demonstrate understanding can:

~~LS1-HS-7.~~ **Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.**

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS-1.6, HS-LS-1.7)
- As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport

energy to cells. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (**HS-LS-1.7**~~LS1-HS-7~~)

- **Further Explanation**: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.
- Assessment~~Content~~ **Limit**: Assessment should not include identification of the steps or specific processes involved in cellular respiration.

~~**Supporting Content**~~

~~**LS1.A: Structure and Function**~~

- ~~Systems of specialized cells within organisms help them perform the essential functions of life. (LS1-HS-1)~~
- ~~All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (LS1-HS-1)~~
- ~~Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (LS1- HS-2)~~
- ~~Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (LS1-HS-3)~~

~~**LS1.B: Growth and Development of Organisms**~~

- ~~In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (LS1-HS-4)~~

~~**LS1.C: Organization for Matter and Energy Flow in Organisms**~~

- ~~The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (LS1-HS-5)~~
- ~~The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (LS1-HS-6)~~
- ~~As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (LS1- HS-6, LS1-HS-7)~~
- ~~As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to cells. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (LS1-HS-7)~~

HS-LS-2 – Ecosystems: Interactions, Energy, and Dynamics

~~LS2-HS Ecosystems: Interactions, Energy, and Dynamics~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-LS-2.1~~LS2-HS-1~~. Students who demonstrate understanding can:

Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS-2.1, HS-LS-2.2~~LS2-HS-1, LS2-HS-2~~)

- **Further Explanation**: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.
- **Assessment ~~Content~~ Limit**: Assessment does not include deriving mathematical equations to make comparisons.

HS-LS-2.2 Students who demonstrate understanding can:

~~LS2-HS-2.~~ Use mathematical representations to support and ~~revise~~ explanations ~~based on evidence about~~ that biotic and abiotic factors affect~~ing~~ biodiversity ~~and populations in ecosystems of~~at different scales within an ecosystem.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS-2.1, HS-LS-2.2)

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS-2.2, HS-LS-2.5~~LS2-HS-2, LS2-HS-6~~)

- **Further Explanation**: Emphasis is on genetic diversity within a population and species diversity within an ecosystem. Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. **Assessment~~Content~~ Limit**: Assessment is limited to provided data.

Prior HS-LS-2.3 *Removed and combined with prior HS-LS-2.4 to become the new HS-LS-2.3*

~~**LS2-HS-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.**~~

- ~~Further Explanation: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.~~
- ~~Content Limit: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.~~

HS-LS-2.3 Students who demonstrate understanding can: *(formed from the combination of prior HS-LS-2.3 and prior HS-LS-2.4)*

~~**LS2-HS-4.**~~ Construct an explanation using~~**Use**~~ **mathematical representations to support claims for the** ~~**cycling of matter and**~~ **flow of energy** ~~**among organisms**~~ through trophic levels and the cycling of matter **in an ecosystem.**

Supporting Content LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS-2.3, HS-LS-2.4~~LS2-HS-3~~)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (**HS-LS-2.3**~~LS2-HS-4~~)

- **Further Explanation**: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.
- **Assessment ~~Content~~ Limit**: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.

HS-LS-2.4 Students who demonstrate understanding can: *(prior HS-LS-2.5)*

~~LS2-HS-5.~~ **Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.**

Supporting Content LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (**HS-LS-2.4**~~LS2-HS-5~~)
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS-2.3, HS-LS-2.4)

- **Further Explanation**: Examples of models could include simulations and mathematical models.
- **Assessment~~Content~~ Limit**: Assessment does not include the specific chemical steps of photosynthesis and respiration.

HS-LS-2.5 Students who demonstrate understanding can: *(prior HS-LS-2.6)*

~~LS2-HS-6.~~ **Evaluate the claims, evidence, and reasoning that ~~the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but~~ changing the conditions** of a static ecosystem **may result in a new ecosystem.**

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS-2.2, HS-LS-2.5)

- **Further Explanation**: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.

HS-LS-2.6 Students who demonstrate understanding can: *(formed from the combination of prior HS-LS-2.7 and prior HS-LS-4.6)*

~~LS2-HS-7.~~ **Design, evaluate, and/or refine ~~a solution for reducing the impacts~~** practices used to manage a natural resource based on direct and indirect influences **of human activities on ~~the environment and~~ biodiversity** and ecosystem health**.**

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

~~Moreover, anthropogenic c~~Changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate ~~change~~variability, ~~—~~can disrupt an ecosystem and threaten the survival of some species. (**HS-LS-2.6**)~~LS2-HS-7)~~

Supporting Content LS4.C: Adaptation

- Changes in the physical environment, ~~whether naturally occurring or human induced,~~ have ~~thus~~ contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline ~~and sometimes the~~ or possible extinction of some species. (HS-LS-2.6, HS-LS-4.5)

Supporting Content LS4.D: Biodiversity and Humans

- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (**HS-LS-2.6**~~LS2-HS-7~~)

Sustaining ecosystem health and biodiversity is essential to support and enhance life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational, cultural, or inspirational value. Humans depend on the living world for the resources and other benefits provided by biodiversity. ~~Impacts~~ Effects on biodiversity can be mitigated through actions such as habitat conservation, reclamation practices, wildlife management, and invasive species control. Understanding the effects of population growth, wildfire, pollution, and climate variability on changes in biodiversity could help maintain the integrity of biological systems. (**HS-LS-2.6**~~LS2-HS-7, LS4-HS-6.~~)

Supporting Content ESS3.A: Natural Resources

- Resource availability has guided the development of human society. (HS-LS-2.6, *HS-ESS-3.1*)

Supporting Content ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, environmental, and cultural, ~~and environmental~~ impacts. (HS-LS-2.6)

Further Explanation: Emphasis is on how natural resources such as forests, waterways, and land are managed in ways that minimize harm to biodiversity and ecosystem health and activities that can improve and or maintain existing health of ecosystems.

- ~~**Examples of human activities can include urbanization, building dams, and dissemination of invasive species, utilization of non-renewable resources as opposed to renewable resource.**~~

HS-LS-2.7 Students who demonstrate understanding can: *(prior HS-LS-2.8)*

~~LS2-HS-8.~~ Evaluate the evidence for the role of group behavior on individual and species' ~~chances~~ ability to survive and reproduce.

Supporting Content LS2.D: Social Interactions and Group Behavior

Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives, gene pool. (**HS-LS-2.7**~~LS2-HS-8~~)

- **Further Explanation:** Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.

~~Supporting Content~~

~~LS2.A: Interdependent Relationships in Ecosystems~~

- ~~Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (LS2-HS-1, LS2-HS-2)~~

~~LS2.B: Cycles of Matter and Energy Transfer in Ecosystems~~

- ~~Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (LS2-HS-3)~~
- ~~Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (LS2-HS-4)~~
- ~~Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (LS2-HS-5)~~

~~LS2.C: Ecosystem Dynamics, Functioning, and Resilience~~

- ~~A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (LS2-HS-2, LS2-HS-6)~~
- ~~Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (LS2-HS-7)~~

~~LS2.D: Social Interactions and Group Behavior~~

- ~~Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives, gene pool. (LS2-HS-8)~~~~LS4.D: Biodiversity and Humans~~
- ~~LS4.D: Biodiversity and Humans~~

- ~~Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (LS2-HS-7)~~
- ~~Sustaining ecosystem health and biodiversity is essential to support and enhance life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational, cultural, or inspirational value. Humans depend on the living world for the resources and other benefits provided by biodiversity. Impacts on biodiversity can be mitigated through actions such as habitat conservation, reclamation practices, wildlife management, and invasive species control. Understanding the effects of population growth, wildfire, pollution, and climate variability on changes in biodiversity could help maintain the integrity of biological systems. (LS2-HS-7, LS4-HS-6.)~~

HS-LS-3 – Heredity: Inheritance and Variation of Traits

~~LS3-HS Heredity: Inheritance and Variation of Traits~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-LS-3.1 ~~LS3-HS-1~~. Students who demonstrate understanding can:

Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Supporting Content LS1.A: Structure and Function

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. (HS-LS-1.1, HS-LS-3.1~~LS3- HS-1, LS1-HS-1.~~)

Supporting Content LS3.A: Inheritance of Traits

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (**HS-LS-3.1**~~LS3-HS-1~~)

    - Assessment~~Content~~ **Limit**: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.

HS-LS-3.2 Students who demonstrate understanding can:

~~LS3-HS-2.~~ **Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.**

Supporting Content LS3.B: Variation of Traits

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis ~~(cell division)~~, thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (**HS-LS-3.2**~~LS3-HS-2~~)
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (**HS-LS-3.2**~~LS3-HS-2~~, **HS-LS-3.3**~~LS3-HS-3~~)

- **Further Explanation**: Emphasis is on using data to support claims about ~~arguments for~~ the way variation occurs.
- **Assessment~~Content~~ Limit**: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.

HS-LS-3.3 Students who demonstrate understanding can:

~~**LS3-HS-3.**~~ **Apply concepts of ~~statistics and~~ probability** and statistical analysis **to explain the variation and distribution of expressed traits in a population.**

Supporting Content LS3.B: Variation of Traits

- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (**HS-LS-3.2, HS-LS-3.3**)

- **Further Explanation:** Emphasis is on the use of mathematics to describe the probability of traits (alleles) as it relates to genetic and environmental factors in the expression of traits.
- **Assessment~~Content~~ Limit**: Assessment does not include Hardy-Weinberg calculations.

~~Supporting Content~~

~~**LS1.A: Structure and Function**~~

- ~~All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. (LS3- HS-1, LS1-HS-1.)~~

~~**LS3.A: Inheritance of Traits**~~

- ~~Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (LS3-HS-1)~~

~~**LS3.B: Variation of Traits**~~

- ~~In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (LS3-HS-2)~~
- ~~Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (LS3-HS-2, LS3-HS-3)~~

HS-LS-4 – Biological Adaptation: Unity and Diversity

~~**LS4-HS Biological Adaptation: Unity and Diversity**~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-LS-4.1 Students who demonstrate understanding can:

~~LS4-HS- 1.~~ **Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.**

Supporting Content **LS4.A: Evidence of Common Ancestry and Diversity**

- Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; ~~in fact~~, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information can be derived ~~is also derivable~~ from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (**HS-LS-4.1**~~LS4-HS-1~~)

- **Further Explanation**: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.

HS-LS-4.2 Students who demonstrate understanding can:

~~LS4-HS-2.~~ **Construct an explanation based on evidence that the process of evolution,** through the mechanism of natural selection, **primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.**

Supporting Content LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS-4.2, HS-LS-4.3~~LS4-HS-2, LS4-HS-3~~)

Supporting Content LS4.C: Adaptation

- Evolution is a consequence of the interaction of four factors of natural selection :~~:~~ (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (**HS-LS-4.2**~~LS4-HS-2~~)

- **Further Explanation**: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.
- **Assessment~~Content~~ Limit**: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.

HS-LS-4.3 Students who demonstrate understanding can:

~~LS4-HS-3.~~ **Apply concepts of ~~statistics and~~ probability** and statistical analysis **to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.**

Supporting Content LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS-4.2, HS-LS-4.3)

- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (**HS-LS-4.3**~~LS4-HS-3~~)

Supporting Content LS4.C: Adaptation

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. ~~That is, t~~The differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (**HS-LS-4.3,** ~~LS4-HS-3~~ **HS-LS-4.4**~~, LS4-HS-4~~)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (**HS-LS-4.3**~~LS4-HS-3~~)

- **Further Explanation**: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.
- **Assessment**~~**Content**~~ **Limit**: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.

HS-LS-4.4 Students who demonstrate understanding can:

~~**LS4-HS-4.**~~ **Construct an explanation based on evidence for how natural selection leads to adaptation of populations.**

Supporting Content LS4.C: Adaptation

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. The differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (**HS-LS-4.3, HS-LS-4.4**)

- **Further Explanation**: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.

HS-LS-4.5 Students who demonstrate understanding can:

~~**LS4-HS-5.**~~ **Evaluate** models that demonstrate how ~~**the evidence supporting claims that**~~ **changes in** **an** **environment**~~**al conditions**~~ **may result in**~~**: (1) increases in the number of individuals of some species, (2)**~~ the evolution of a population of a given species, **the emergence of new species over** ~~**time**~~**generations**, ~~**and (3)**~~ **or** **the extinction of other species** due to the processes of genetic drift, gene flow, mutation, and natural selection.~~.~~

Supporting Content LS4.C: Adaptation

- Changes in the physical environment~~, whether naturally occurring or human induced~~, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS-2.6, HS-LS-4.5~~LS4-HS-5, LS4-HS-6~~)
- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (**HS-LS-4.5**~~LS4-HS-5~~)

- **Further Explanation**: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, over fishing, application of fertilizers and pesticides, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.

Prior HS-LS-4.6 *Removed and combined with prior HS-LS-2.7 to become the new HS-LS-2.6*

~~**LS4-HS-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.**~~

- ~~Further Explanation: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.~~

~~**Supporting Content**~~

~~**LS4.A: Evidence of Common Ancestry and Diversity**~~

- ~~Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (LS4-HS-1)~~

~~**LS4.B: Natural Selection**~~

- ~~Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (LS4-HS-2, LS4-HS-3)~~
- ~~The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (LS4-HS-3)~~

~~LS4.C: Adaptation~~

- ~~Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (LS4-HS-2)~~
- ~~Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (LS4-HS-3, LS4-HS-4)~~
- ~~Adaptation also means that the distribution of traits in a population can change when conditions change. (LS4-HS-3)~~
- ~~Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (LS4-HS-5, LS4-HS-6)~~
- ~~Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (LS4-HS-5)~~

~~LS4.D: Biodiversity and Humans~~

- ~~Sustaining ecosystem health and biodiversity is essential to support and enhance life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational, cultural, or inspirational value. Humans depend on the living world for the resources and other benefits provided by biodiversity. Impacts on biodiversity can be mitigated through actions such as habitat conservation, reclamation practices, wildlife management, and invasive species control. Understanding the effects of population growth, wildfire, pollution, and climate variability on changes in biodiversity could help maintain the integrity of biological systems. (LS2-HS-7, LS4-HS-6.~~

~~ETS1.B: Developing Possible Solutions~~

- ~~When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (LS4-HS-6)~~
- ~~Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (LS4-HS-6)~~

Physical Science – Chemistry
HS-PSC-1 – Structure and Properties of Matter

~~PSC: Physical Sciences (Chemistry)~~

~~PSC1-HS Structure and Properties of Matter~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-PSC-1.1~~PSC1-HS-1~~. Students who demonstrate understanding can:

Develop models to describe the atomic composition of simple molecules and extended structures.

Supporting Content PS1.A: Structure and Properties of Matter

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (**HS-PSC-1.1**~~PSC1-HS-1~~)

- **Further Explanation**: Emphasis is on reviewing how to develop models of molecules that vary in complexity. This should build on the similar middle school standard (**MS-PS-1.1**~~PS1- MS-1~~). Students should be able to determine valence electrons for representative elements. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of ~~molecular-level~~ models could include drawings, 3D ball and stick structures, or computer representations ~~showing different molecules with different types of atoms~~.
- ~~Content~~ **Assessment Limit**: Students will be provided with the names of the elements, a list of common ions, a list of numerical prefixes and their meanings, and the charges of all cations and anions. ~~within the item as necessary. Confine element symbols to the representative and familiar transition metal elements.~~

HS-PSC-1.2 Students who demonstrate understanding can:

~~PSC1-HS-2.~~ **Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.**

Supporting Content PS1.A: Structure and Properties of Matter

- Each atom has a substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (PSC1-HS-2)

- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect outermost ~~patterns of outer~~ electron states. (HS-PSC-1.2~~PSC1-HS-2~~)

- **Further Explanation**: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.
- ~~Content~~ **Assessment Limit**: ~~Elements will be~~Assessment is limited to main group elements. Assessment is ~~Properties assessed will be~~ limited to relative trends in reactivity, valence electrons, atomic and ionic radius, electronegativity, ionization energy ~~(first)~~, shielding effect, and ~~the most~~ common oxidation number.

HS-PSC-1.3 Students who demonstrate understanding can:

~~**PSC1-HS-3.**~~ **Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of** electrostatic~~**electrical**~~ **forces between particles.**

Supporting Content PS1.A: Structure and Properties of Matter

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PSC-1.3, HS-PSC-1.5~~PSC1-HS-3, PSC1-HS-5~~)

Supporting Content PS2.B: Types of Interactions

- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties (physical and chemical), and transformations of matter, as well as the contact forces between material objects. (~~PSC1-HS-2,~~ HS-PSC-1.3, HS-PSC-1.5, *HS-PSP-1.6*~~PSC1-HS3, PSC1-HS-5~~)

- **Further Explanation**: Emphasis is on understanding the strengths of forces between particles~~, not on naming specific intermolecular forces (such as dipole-dipole)~~. Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.
- ~~Content~~ **Assessment Limit**: Assessment does not include naming specific intermolecular forces (such as dipole-dipole). Assessment will be limited to quantitative calculations of melting and boiling points only.~~Metallic, ionic, and covalent bonds may be included. Graphical representations of melting or boiling points of different substances may be used in the item (e.g., graph of boiling points vs. molar mass or simple bar graph). Structural formulas of compounds may be used to compare the melting/boiling points of compounds~~

HS-PSC-1.4 Students who demonstrate understanding can:

~~**PSC1-HS-4.**~~ **Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and** various modes ~~**other types**~~ **of radioactive decay.**

Supporting Content PS1.C: Nuclear Processes

- Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (**HS-PSC-1.4**~~PSC1-HS-4~~)

- **Further Explanation**: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.
- **Assessment~~Content~~ Limit**: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma modes of radioactive decay~~s~~.

HS-PSC-1.5 Students who demonstrate understanding can:

~~**PSC1-HS-5.**~~ **Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.**

Supporting Content PS1.A: Structure and Properties of Matter

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PSC-1.3, HS-PSC-1.5)

Supporting Content PS2.B: Types of Interactions

- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties (physical and chemical), and transformations of matter, as well as the contact forces between material objects. (~~HS-PSC-1.2~~, HS-PSC-1.3, HS-PSC-1.5, *HS-PSP-1.6*)

- **Further Explanation:** Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.
- **Assessment~~Content~~ Limit**: Assessment is limited to provided molecular structures of specific designed materials. For questions involving polar vs. nonpolar bonds, item distractors
- containing ionic bonds may not be used. Electronegativity differences of < 0.5 should be used for nonpolar covalent bonds. Electronegativity differences of 0.5 – 1.7 should be used for polar covalent bonds.

~~**Supporting Content**~~

~~**PS1.A: Structure and Properties of Matter**~~

- ~~Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (PSC1-HS-1)~~
- ~~Each atom has a substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (PSC1-HS-2)~~

- ~~The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (PSC1-HS-2)~~
- ~~The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (PSC1-HS-3, PSC1-HS-5)~~

~~**PS1.C: Nuclear Processes**~~

- ~~Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (PSC1-HS-4)~~

~~**PS2.B: Types of Interactions**~~

- ~~Attraction and repulsion between electric charges at the atomic scale explain the structure, properties (physical and chemical), and transformations of matter, as well as the contact forces between material objects. (PSC1-HS-2, PSC1-HS3, PSC1-HS-5)~~

HS-PSC-2 – Chemical Reactions

~~PSC2-HS Chemical Reactions~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-PSC-2.1 ~~PSC2-HS-1~~Students who demonstrate understanding can:

Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

Supporting Content PS1.A: Structure and Properties of Matter

- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar physical and chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (**HS-PSC-2.1**~~PSC2-S-1~~)

Supporting Content PS1.B: Chemical Reactions

- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (**HS-PSC-2.1**~~PSC2-HS-1~~, **HS-PSC-2.4** ~~PSC2-HS-4~~)

- **Further Explanation:** Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.
- ***Assessment Limit:*** Assessment is limited to synthesis, decomposition, single replacement/displacement, double replacement/displacement, including neutralization, and combustion reactions. Predict the products of double replacement, single replacement, and combustion reactions only. Assessment excludes writing formulas or names of acids and hydrocarbons.~~Content Limit: Identify types of chemical reactions including: synthesis/formation/combination reactions, decomposition reactions, single replacement/displacement reactions, double replacement/displacement reactions, oxidation-reduction (redox) reactions (single replacement only), acid base reactions, and combustion reactions (for hydrocarbons). Predict the products of double replacement, single replacement, and combustion reactions only. For the second skill statement, do not use acid names or hydrocarbons when translating between words and formulas. Items will include a list of common ions, as needed.~~

HS-PSC-2.2 Students who demonstrate understanding can:

~~PSC2-HS-2.~~ Develop a model to illustrate that the ~~release or absorption of~~ energy ~~from a~~ **transferred during an exothermic or endothermic** chemical reaction **is based on the** ~~system depends upon the changes in total~~ bond energy **difference between bonds broken (absorption of energy) and bonds formed (release of energy).**

Supporting Content PS1.A: Structure and Properties of Matter

- A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (**HS-PSC-2.2**~~PSC2-HS-2~~)

Supporting Content PS1.B: Chemical Reactions

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (**HS-PSC-2.2**~~PSC2-HS-2~~, **HS-PSC-2.3**~~PSC2-HS-3~~)

Further Explanation: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.

- **Assessment~~Content~~ Limit**: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.

HS-PSC-2.3 Students who demonstrate understanding can:

~~**PSC2-HS-3.**~~ **Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.**

Supporting Content PS1.B: Chemical Reactions

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (**HS-PSC-2.2**, **HS-PSC-2.3**)

- **Further Explanation**: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.

  Assessment Limit: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.

- ~~Content Limit: Factors that influence the rate of reaction may include temperature, surface area, size of particles, concentration, and catalysts. Can also include concentration and titration relationships. Provide a graphic showing how a catalyst provides a different pathway for a chemical reaction to occur resulting in a lower activation energy. May include a titration curve.~~

HS-PSC-2.4 Students who demonstrate understanding can: ~~**PSC2-HS-4.**~~

Use mathematical representations to support the claim that the number and type of **atoms, and therefore mass, are conserved during a chemical reaction.**

Supporting Content PS1.B: Chemical Reactions

- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (**HS-PSC-2.1, HS-PSC-2.4**)

- **Further Explanation**: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques. ~~Should also include calculations related to determining the concentration and/or pH of a solution.~~
- ~~Content~~ **Assessment Limit**: Conversion problems will be one to two steps (e.g., grams to moles to atoms/molecules). Compounds and formulas should be provided in the stem of the question. Students should be given molecular masses in problems involving gram to other unit conversions. Molar mass calculations should not be combined with conversion problems. All volumes must be at standard temperature and pressure (STP). A balanced equation and molar masses should be included in the item. Calculations may include grams/moles/volume of reactant to grams/moles/volume of product.

***Prior HS-PSC-2.5** Removed completely*

~~**PSC2-HS-5. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.**~~

- ~~Further Explanation: Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.~~
- ~~Content Limit: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.~~

Supporting Content

~~**PS1.A: Structure and Properties of Matter**~~

- ~~The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar physical and chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (PSC2-S-1)~~
- ~~A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (PSC2-HS-2)~~

~~**PS1.B: Chemical Reactions**~~

- ~~Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (PSC2-HS-2, PSC2-HS-3)~~

- ~~In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (PSC2-HS-5)~~
- ~~The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (PSC2-HS-1, PSC2-HS-4)~~

~~**ETS1.C: Optimizing the Design Solution**~~

- ~~Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (PSC2-HS-5)~~

HS-PSC-3 – Energy

~~**PSC3-HS Energy**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

HS-PSC-3.1 ~~PSC3-HS-1.~~ Students who demonstrate understanding can:

Ask questions to clarify ~~**Evaluate the claims, evidence, and reasoning behind**~~ **the idea that electromagnetic radiation can be described either by a wave model or a particle model**~~**, and that for some situations one model is more useful than the other**~~**.**

Supporting Content **PS4.B: Electromagnetic Radiation**

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (**HS-PSC-3.1**~~PSC3-HS-1~~)

- **Further Explanation**: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include interference, diffraction, and photoelectric effect.
- **Assessment**~~**Content**~~ **Limit**: Assessment does not include using quantum theory.

HS-PSC-3.2 Students who demonstrate understanding can:

~~**PSC3-HS-2**~~ **Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.**

Supporting Content **PS3.A: Definitions of Energy**

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (**HS-PSC-3.2**~~PSC3-HS-2~~, **HS-PSC-3.3**~~PSC3-HS-3~~)

Supporting Content **PS3.B: Conservation of Energy and Energy Transfer**

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (**HS-PSC-3.2**~~PSC3-HS-2~~)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (**HS-PSC-3.2**~~PSC3-HS-2~~, **HS-PSC-3.5**~~PSC3-HS-5~~)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (**HS-PSC-3.2**~~PSC3-HS-2~~)
- The availability of energy limits what can occur in any system. (**HS-PSC-3.2**~~PSC3-HS-2~~)

- **Further Explanation**: Emphasis is on explaining the meaning of mathematical expressions used in the model.
  Assessment Limit: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields. Two temperatures (initial and final), a temperature-time graph, or an enthalpy diagram must be provided.
- ~~Content Limit: Provide two temperatures (initial and final), a temperature-time graph, or an enthalpy diagram.~~

HS-PSC-3.3 Students who demonstrate understanding can:

~~PSC3-HS-3.~~ **Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).**

Supporting Content **PS3.A: Definitions of Energy**

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (**HS-PSC-3.2**, **HS-PSC-3.3**)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (**HS-PSC-3.3**~~PSC3-HS-3~~, **HS-PSC-3.4**~~PSC3-HS-4~~)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (**HS-PSC-3.3**~~PSC3-HS-3~~)

- Further Explanation: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. ~~.~~ Examples of models could include diagrams, drawings, descriptions, and computer simulations.
- ~~Content Limit: Provide equations for the gas laws (i.e., ideal gas law, Boyle's law, Charles' law, and the combined gas laws).~~

HS-PSC-3.4* Students who demonstrate understanding can:

~~**PSC3-HS-4*.**~~ **Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. ---OPTIONAL**

Supporting Content PS3.A: Definitions of Energy

- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (**HS-PSC-3.3, HS-PSC-3.4**)

Supporting Content PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surroundings. ~~environment.~~ (**HS-PSC-3.4**~~PSC3-HS-4~~, **HS-PSC-3.5**~~PSC3-HS-5~~)

- **Further Explanation**: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include calorimeters, heat and cold packs, solar cells, solar ovens, and electrochemical cells. Examples of constraints could include use of renewable energy forms and efficiency.
- **Assessment**~~**Content**~~ **Limit**: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.

HS-PSC-3.5 Students who demonstrate understanding can:

~~**PSC3-HS-5.**~~ **Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).**

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (**HS-PSC-3.2, HS-PSC-3.5**)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (**HS-PSC-3.5**)~~PSC3-HS-5)~~

Supporting Content PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surroundings.(**HS-PSC-3.4, HS-PSC-3.5**)
-

- **Further Explanation**: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually (endothermic/exothermic). Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.
- ~~Content~~ **Assessment Limit**: For items involving specific heat, provide the equation Q = mCpΔT and specific heats. Include the melting and boiling points of water. Limit calculations to ~~Perform calculations for~~ changes that do not involve a change of state. Perform gram to mole and mole to ΔH calculations. Use joules as a unit of measure, as opposed to calories.

~~Supporting Content~~

~~PS4.B: Electromagnetic Radiation~~

- ~~Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (PSC3-HS-1)~~

~~PS3.A: Definitions of Energy~~

- ~~Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (PSC3-HS-2, PSC3-HS-3)~~
- ~~At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (PSC3-HS-3, PSC3-HS-4)~~
- ~~These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (PSC3-HS-3)~~

~~PS3.B: Conservation of Energy and Energy Transfer~~

- ~~Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (PSC3-HS-2)~~
- ~~Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (PSC3-HS-2, PSC3-HS-5)~~

- ~~Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (PSC3-HS-2)~~
- ~~The availability of energy limits what can occur in any system. (PSC3-HS-2)~~
- ~~Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (PSC3-HS-5)~~

~~**PS3.D: Energy in Chemical Processes**~~

- ~~Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (PSC3-HS-4, PSC3-HS-5)~~

Physical Science – Physics
HS-PSP-1 – Motion and Stability: Forces and Interactions

~~**Physical Sciences (Physics)**~~

~~**PSP1-HS Motion and Stability: Forces and Interactions**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

HS-PSP-1.1 ~~PSP1-HS-1.~~Students who demonstrate understanding can:

Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

Supporting Content **PS2.A: Forces and Motion**

- Newton's second law accurately predicts changes in the motion of macroscopic objects. (**HS-PSP-1.1**~~PSP1-HS-1~~)

- **Further Explanation**: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.
- **Assessment**~~Content~~ **Limit**: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.

HS-PSP-1.2 Students who demonstrate understanding can:

~~**PSP1-HS-2.**~~ **Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.**

Supporting Content PS2.A: Forces and Motion

- Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (**HS-PSP-1.2**~~PSP1-HS-2~~)
- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PSP-1.2, HS-PSP-1.3~~PSP1-HS-2, PSP1-HS-3~~)

- **Further Explanation**: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle (Newton's first law).
- **Assessment~~Content~~ Limit**: Assessment is limited to systems of two macroscopic bodies moving in one dimension.

HS-PSP-1.3 Students who demonstrate understanding can:

~~**PSP1-HS-3.**~~ **Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.**

Supporting Content PS2.A: Forces and Motion

- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PSP-1.2, HS-PSP-1.3)

Supporting Content ETS1.A: Defining and Delimiting an Engineering Problem

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (**HS-PSP-1.3**~~PSP1-HS-3~~)

Supporting Content ETS1.C: Optimizing the Design Solution

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (**HS-PSP-1.3**~~PSP1-HS-3~~)

- **Further Explanation**: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.
- **Assessment~~Content~~ Limit**: Assessment is limited to qualitative evaluations and/or algebraic manipulations.

HS-PSP-1.4 Students who demonstrate understanding can:

~~**PSP1-HS-4.**~~ **Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.**

Supporting Content PS2.B: Types of Interactions

- Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PSP-1.4~~PSP1-HS-4~~)
- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PSP-1.4~~PSP1-HS-4~~, HS-PSP-1.5~~PSP1-HS-5~~)

- **Further Explanation:** Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.

  Assessment~~Content~~ Limit: Assessment is limited to systems with two objects. Base equations will be provided.

HS-PSP-1.5 Students who demonstrate understanding can:

~~**PSP1-HS-5.**~~ **Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.**

Supporting Content PS2.B: Types of Interactions

- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (**HS-PSP-1.4**, **HS-PSP-1.5**)

Supporting Content PS3.A: Definitions of Energy

- "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. (HS-PSP-1.5~~PSP1-HS-5~~)

Assessment~~Content~~ Limit: Assessment is limited to designing and conducting investigations with provided materials and tools.

HS-PSP-1.6 Students who demonstrate understanding can:

~~**PSP1-HS-6.**~~ **Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.**

Supporting Content PS1.A: Structure and Properties of Matter

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PSP-1.6~~PSP1-HS-6~~)

Supporting Content PS2.B: Types of Interactions

Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PSP-1.6, ~~HS-PSC-1.2,~~ HS-PSC-1.3, HS-PSC-1.5~~PSP1-HS-6, PSC1-HS-1, PSC1-HS-3~~)

- **Further Explanation:** Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.
- **Assessment**~~Content~~ **Limit**: Assessment is limited to provided molecular structures of specific designed materials.

~~**Supporting Content**~~

~~**PS1.A: Structure and Properties of Matter**~~

- ~~The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (PSP1-HS-6)~~

~~**PS2.A: Forces and Motion**~~

- ~~Newton's second law accurately predicts changes in the motion of macroscopic objects. (PSP1-HS-1)~~
- ~~Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (PSP1-HS-2)~~
- ~~If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (PSP1-HS-2, PSP1-HS-3)~~

~~**PS2.B: Types of Interactions**~~

- ~~Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (PSP1-HS-4)~~
- ~~Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (PSP1-HS-4, PSP1-HS-5)~~
- ~~Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (PSP1-HS-6, PSC1-HS-1, PSC1-HS-3)~~

~~**PS3.A: Definitions of Energy**~~

- ~~"Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. (PSP1-HS-5)~~

~~**ETS1.A: Defining and Delimiting an Engineering Problem**~~

- ~~Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (PSP1-HS-3)~~

~~**ETS1.C: Optimizing the Design Solution**~~

- ~~Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. PSP1-HS-3)~~

HS-PSP-2 – Energy

~~PSP2-HS Energy~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-PSP-2.1 ~~PSP2-HS-1~~ Students who demonstrate understanding can:

Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

Supporting Content **PS3.A: Definitions of Energy**

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (**HS-PSP-2.1**~~PSP2-HS-1~~, **HS-PSP-2.2**~~PSP2-HS-2~~)

Supporting Content **PS3.B: Conservation of Energy and Energy Transfer**

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (**HS-PSP-2.1**~~PSP2-HS-1~~)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (**HS-PSP-2.1**~~PSP2-HS-1~~, **HS-PSP-2.4**~~PSP2-HS-4~~)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (**HS-PSP-2.1**~~PSP2-HS-1~~)
- The availability of energy limits what can occur in any system. (**HS-PSP-2.1**~~PSP2-HS-1~~)

- **Further Explanation**: Emphasis is on explaining the meaning of mathematical expressions used in the model.
- **Assessment**~~Content~~ **Limit:** Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.

HS-PSP-2.2 Students who demonstrate understanding can:

~~PSP2-HS-2.~~ **Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).**

Supporting Content **PS3.A: Definitions of Energy**

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (**HS-PSP-2.1**, **HS-PSP-2.2**)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (**HS-PSP-2.2**~~PSP2-HS-2~~, **HS-PSP-2.3**~~PSP2-HS-3~~)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (**HS-PSP-2.2**~~PSP2-HS-2~~)

- **Further Explanation**: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.

HS-PSP-2.3 Students who demonstrate understanding can:

~~**PSP2-HS-3.**~~ **Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.**

Supporting Content PS3.A: Definitions of Energy

- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (**HS-PSP-2.2**, **HS-PSP-2.3**)

Supporting Content PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (**HS-PSP-2.3**~~PSP2-HS-3~~, **HS-PSP-2.4**~~PSP2-HS-4~~)

Supporting Content ETS1.A: Defining and Delimiting an Engineering Problem

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (**HS-PSP-2.3**~~PSP2-HS-3~~)

- **Further Explanation**: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of multiple~~renewable~~ energy forms and evaluations of efficiency.
- **Assessment** ~~Content~~ **Limit**: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to examples of devices ~~constructed with materials~~ provided to students.

HS-PSP-2.4 Students who demonstrate understanding can:

~~PSP2-HS-4.~~ Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (**HS-PSP-2.1**, **HS-PSP-2.4**)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (**HS-PSP-2.4**~~PSP2-HS-4~~)

Supporting Content PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (**HS-PSP-2.3, HS-PSP-2.4**)

- **Further Explanation**: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.
- **Assessment ~~Content~~ Limit**: Assessment is limited to examples of closed system~~investigations based on materials and tools provided to students~~.

HS-PSP-2.5 Students who demonstrate understanding can:

~~PSP2-HS-5.~~ Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

Supporting Content PS3.C: Relationship Between Energy and Forces

- When two objects interacting through a field change relative position, the energy stored in the field is changed. (**HS-PSP-2.5**~~PSP2-HS-5~~)

- **Further Explanation**: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.
- **Assessment ~~Content~~ Limit**: Assessment is limited to systems containing two objects.

~~Supporting Content~~

~~PS3.A: Definitions of Energy~~

- ~~Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (PSP2-HS-1, PSP2-HS-2)~~
- ~~At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (PSP2-HS-2, PSP2-HS-3)~~
- ~~These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (PSP2-HS-2)~~

~~PS3.B: Conservation of Energy and Energy Transfer~~

- ~~Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (PSP2-HS-1)~~
- ~~Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (PSP2-HS-1, PSP2-HS-4)~~
- ~~Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (PSP2-HS-1)~~
- ~~The availability of energy limits what can occur in any system. (PSP2-HS-1)~~
- ~~Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (PSP2-HS-4)~~

~~PS3.C: Relationship Between Energy and Forces~~

- ~~When two objects interacting through a field change relative position, the energy stored in the field is changed. (PSP2-HS-5)~~

~~PS3.D: Energy in Chemical Processes~~

- ~~Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (PSP2-HS-3, PSP2-HS-4)~~

~~ETS1.A: Defining and Delimiting an Engineering Problem~~

- ~~Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (PSP2-HS-3)~~

HS-PSP-3 – Waves

~~PSP3-HS Waves~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-PSP-3.1 ~~PSP3-HS-1.~~Students who demonstrate understanding can:

Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

Supporting Content PS4.A: Wave Properties

- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (**HS-PSP-3.1**~~PSP3-HS-1~~)

- **Further Explanation**: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.
- **Assessment ~~Content~~ Limit**: Assessment is limited to algebraic relationships and describing those relationships qualitatively.

HS-PSP-3.2 Students who demonstrate understanding can:

~~PSP3-HS-2.~~ **Evaluate questions about the advantages of using digital transmission and storage of information.**

Supporting Content PS4.A: Wave Properties

- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (**HS-PSP-3.2**~~PSP3-HS-2~~, **HS-PSP-3.5**~~PSP3-HS-5~~)

- **Further Explanation**: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.

HS-PSP-3.3 Students who demonstrate understanding can:

~~PSP3-HS-3.~~ **Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.**

Supporting Content PS4.A: Wave Properties

- ~~[From the 3–5 grade band endpoints]~~ Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.)(**HS-PSP-3.3**~~PSP3-HS-3~~)

Supporting Content **PS4.B: Electromagnetic Radiation**

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (**HS-PSP-3.3**~~PSP3-HS-3~~)

- **Further Explanation**: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.
- **Assessment** ~~Content~~ **Limit**: Assessment does not include using quantum theory.

HS-PSP-3.4 Students who demonstrate understanding can:

~~**PSP3-HS-4.**~~ **Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.**

Supporting Content **PS4.B: Electromagnetic Radiation**

- When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (PSP3-HS-4)

- **Further Explanation**: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.
- **Assessment**~~Content~~ **Limit**: Assessment is limited to qualitative descriptions.

HS-PSP-3.5 Students who demonstrate understanding can:

~~**PSP3-HS-5.**~~ **Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.**

Supporting Content **PS3.D: Energy in Chemical Processes**

- Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. (PSP3-HS-5)

Supporting Content PS4.A: Wave Properties

- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (**HS-PSP-3.2, HS-PSP-3.5**)

Supporting Content PS4.B: Electromagnetic Radiation

- Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (**HS-PSP-3.5**~~PSP3-HS-5~~)

Supporting Content PS4.C: Information Technologies and Instrumentation

- Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (**HS-PSP-3.5**~~PSP3-HS-5~~)

- **Further Explanation**: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.
- **Assessment ~~Content~~ Limit**: Assessments are limited to qualitative information. Assessments do not include band theory.

~~**Supporting Content**~~

~~**PS3.A: Definitions of Energy**~~

- ~~Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (PSP2-HS-1, PSP2-HS-2)~~
- ~~At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (PSP2-HS-2, PSP2-HS-3)~~
- ~~These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (PSP2-HS-2)~~

~~**PS3.B: Conservation of Energy and Energy Transfer**~~

- ~~Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (PSP2-HS-1)~~
- ~~Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (PSP2-HS-1, PSP2-HS-4)~~
- ~~Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (PSP2-HS-1)~~
- ~~The availability of energy limits what can occur in any system. (PSP2-HS-1)~~
- ~~Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (PSP2-HS-4)~~

~~**PS3.C: Relationship Between Energy and Forces**~~

- ~~When two objects interacting through a field change relative position, the energy stored in the field is changed. (PSP2-HS-5)~~

~~**PS3.D: Energy in Chemical Processes**~~

- ~~Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (PSP2-HS-3, PSP2-HS-4)~~

~~**ETS1.A: Defining and Delimiting an Engineering Problem**~~

- ~~Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (PSP2-HS-3)~~

~~PSP3-HS Waves~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

~~PSP3-HS-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.~~

- ~~Further Explanation: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.~~
- ~~Content Limit: Assessment is limited to algebraic relationships and describing those relationships qualitatively.~~

~~PSP3-HS-2. Evaluate questions about the advantages of using digital transmission and storage of information.~~

- ~~Further Explanation: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.~~

~~PSP3-HS-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.~~

- ~~Further Explanation: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.~~
- ~~Content Limit: Assessment does not include using quantum theory.~~

~~PSP3-HS-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.~~

- ~~Further Explanation: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.~~
- ~~Content Limit: Assessment is limited to qualitative descriptions.~~

~~PSP3-HS-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.~~

- ~~Further Explanation: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.~~
- ~~Content Limit: Assessments are limited to qualitative information. Assessments do not include band theory.~~

~~Supporting Content~~

~~PS3.D: Energy in Chemical Processes~~

- ~~Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. (PSP3-HS-5)~~

~~PS4.A: Wave Properties~~

- ~~The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (PSP3-HS-1)~~
- ~~Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (PSP3-HS-2, PSP3-HS-5)~~
- ~~[From the 3–5 grade band endpoints] Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.)(PSP3-HS-3)~~

~~PS4.B: Electromagnetic Radiation~~

- ~~Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (PSP3-HS-3)~~
- ~~When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (PSP3-HS-4)~~
- ~~Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (PSP3-HS-5)~~

~~PS4.C: Information Technologies and Instrumentation~~

- ~~Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (PSP3-HS-5)~~

Earth and Space Science
HS-ESS-1 – **Earth's Place in the Universe**

~~**ESS: Earth and Space Sciences**~~

~~**ESS1-HS Earth's Place in the Universe**~~

~~**Performance Standards**~~

~~Students who demonstrate understanding can:~~

HS-ESS-1.1 ~~ESS1-HS-1.~~ Students who demonstrate understanding can:

Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

Supporting Content ESS1.A: The Universe and Its Stars

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (**HS-ESS-1.1**~~ESS1-HS-1~~)

Supporting Content PS3.D: Energy in Chemical Processes and Everyday Life

- Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (ESS1-HS-1)

- **Further Explanation**: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.
- **Assessment~~Content~~ Limit:** Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.

HS-ESS-1.2 Students who demonstrate understanding can:

~~**ESS1-HS-2.**~~ **Construct an explanation of the current model of the origin of the universe based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.**

Supporting Content ESS1.A: The Universe and Its Stars

- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (**HS-ESS-1.2**~~ESS1-HS-2~~, **HS-ESS-1.3**~~ESS1-HS-3~~)
- Origin theories are ~~The Big Bang theory is a current scientific model of the origin of the universe that is~~ supported by evidence such as observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra

of the primordial radiation (cosmic microwave background) that still fills the universe. Other than the hydrogen and helium formed at the time of the event, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (**HS-ESS-1.2**, **HS-ESS-1.3**~~ESS1-HS-2, ESS1-HS-3~~)

Supporting Content PS4 .B Electromagnetic Radiation

- Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. (**HS-ESS-1.2**~~ESS1-HS-2~~)

- **Further Explanation**: Emphasis is on the astronomical evidence of the redshift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the event, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the scientific model (3/4 hydrogen and 1/4 helium).

HS-ESS-1.3 Students who demonstrate understanding can:

~~ESS1-HS-3.~~ **Communicate scientific ideas about the way stars, over their life cycle, ~~produce~~ transform elements.**

Supporting Content ESS1.A: The Universe and Its Stars

- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (**HS-ESS-1.2**, **HS-ESS-1.3**)
- Origin theories are supported by evidence such as observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. Other than the hydrogen and helium formed at the time of the event, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (**HS-ESS-1.2**, **HS-ESS-1.3**)

- **Further Explanation**: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.
- **Assessment~~Content~~ Limit**: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.

HS-ESS-1.4 Students who demonstrate understanding can:

~~ESS1-HS-4.~~ **Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.**

Supporting Content ESS1.B: Earth and the Solar System

- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (**HS-ESS-1.4**~~ESS1-HS-4~~)

- **Further Explanation**: Emphasis is on Newtonian gravitational law s governing orbital motions, which apply to human-made satellites as well as planets and moons.
- **Assessment~~Content~~ Limit**: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.

HS-ESS-1.5 Students who demonstrate understanding can:

~~**ESS1-HS-5.**~~ **Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.**

Supporting Content **ESS1.C: The History of Planet Earth**

- Continental rocks are generally much older than the rocks of the ocean floor. (**HS-ESS-1.5**~~ESS1-HS-5~~)

Supporting Content **ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (**HS-ESS-1.5**~~ESS1-HS-5~~)

Supporting Content **PS1.C: Nuclear Processes**

- Spontaneous radioactive decay follows a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (**HS-ESS-1.5**~~ESS1-HS-5~~, **HS-ESS-1.6**~~ESS1-HS-6~~)

- **Further Explanation**: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages of oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust ~~increasing~~ decreasing with distance away from a central ancient core (a result of past plate interactions).

HS-ESS-1.6 Students who demonstrate understanding can:

~~**ESS1-HS-6.**~~ **Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.**

Supporting Content **ESS1.C: The History of Planet Earth**

- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (**HS-ESS-1.6**~~ESS1-HS-6~~)

Supporting Content PS1.C: Nuclear Processes

- Spontaneous radioactive decay follows a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (**HS-ESS-1.5, HS-ESS-1.6**)

- **Further Explanation**: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.

~~Supporting Content~~

~~**ESS1.A: The Universe and Its Stars**~~

- ~~The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (ESS1-HS-1)~~
- ~~The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (ESS1-HS-2, ESS1-HS-3)~~
- ~~The Big Bang theory is a current scientific model of the origin of the universe that is supported by evidence such as observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. Other than the hydrogen and helium formed at the time of the event, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (ESS1-HS-2, ESS1-HS-3)~~

~~**ESS1.B: Earth and the Solar System**~~

- ~~Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (ESS1-HS-4)~~

~~**ESS1.C: The History of Planet Earth**~~

- ~~Continental rocks are generally much older than the rocks of the ocean floor. (ESS1-HS-5)~~
- ~~Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (ESS1-HS-6)~~

~~**ESS2.B: Plate Tectonics and Large-Scale System Interactions**~~

- ~~Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (ESS1-HS-5)~~

~~**PS1.C: Nuclear Processes**~~

- ~~Spontaneous radioactive decay follows a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (ESS1-HS-5, ESS1-HS-6)~~

~~PS3.D: Energy in Chemical Processes and Everyday Life~~

- ~~Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (ESS1-HS-1)~~

~~PS4 .B Electromagnetic Radiation~~

- ~~Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. (ESS1-HS-2)~~

HS-ESS-2 – Earth's Systems

~~ESS2-HS Earth's Systems~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-ESS-2.1 ~~ESS2-HS-1.~~Students who demonstrate understanding can:

Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

Supporting Content ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (**HS-ESS-2.1**~~ESS2-HS-1~~, **HS-ESS-2.2**~~ESS2-HS-2~~)

Supporting Content ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. (**HS-ESS-2.1**)

- **Further Explanation**: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).
- **Assessment~~Content~~ Limit**: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.

HS-ESS-2.2 Students who demonstrate understanding can:

~~ESS2-HS-2.~~ **Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.**

Supporting Content ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (**HS-ESS-2.1, HS-ESS-2.2**)

Supporting Content ESS2.D: Weather and Climate

- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (**HS-ESS-2.2**)~~ESS2-HS-2~~, **HS-ESS-2.4**)~~ESS2-HS-4~~)

- **Further Explanation**: ~~Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice.~~ Examples ~~could also be taken from~~of other system interactions~~,~~ include how melting ice exposes darker land, which increases temperatures and causes more ice to melt ~~such as~~; how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.

HS-ESS-2.3 Students who demonstrate understanding can:

~~ESS2-HS-3.~~ **Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.**

Supporting Content ESS2.A: Earth Materials and Systems

- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (**HS-ESS-2.3**~~ESS2-HS-3~~)

Supporting Content ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (**HS-ESS-2.3**~~ESS2-HS-3~~)

Supporting Content PS4.A: Wave Properties

- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (**HS-ESS-2.3**~~ESS2-HS-3~~)

- **Further Explanation**: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.

HS-ESS-2.4 Students who demonstrate understanding can:

~~ESS2-HS-4.~~ **Use a model to describe how variations in the flow of energy into and out of Earth's systems result in** variations~~changes~~ **in climate.**

Supporting Content ESS1.B: Earth and the Solar System

- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate **variations**~~changes~~. (**HS-ESS-2.4**~~ESS2-HS-4~~)

Supporting Content ESS2.A: Earth Materials and Systems

- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (**HS-ESS-2.4**~~ESS2-HS-4~~)

Supporting Content ESS2.D: Weather and Climate

- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (**HS-ESS-2.2**), **HS-ESS-2.4**))
- Changes in ~~the atmosphere due to human activity have increased~~ carbon dioxide concentrations in the atmosphere ~~and thus~~ affect climate. (**HS-ESS-2.4**~~ESS2-HS-6~~, **HS-ESS-2.6**~~ESS2-HS-4~~)

- **Further Explanation**: Examples of the causes of variations in climate ~~climate change~~ differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.
- **Assessment Limit**~~**Content Limit**~~: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.

HS-ESS-2.5 Students who demonstrate understanding can:

~~ESS2-HS-5.~~ **Plan and conduct an investigation of** **how** **the** chemical and physical **properties of water** ~~**and its effects on**~~ contribute to the mechanical and chemical mechanisms that affect **Earth materials and surface processes.**

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (**HS-ESS-2.5**~~ESS2-HS-5~~)

- **Further Explanation**: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).

HS-ESS-2.6 Students who demonstrate understanding can:

~~**ESS2-HS-6.**~~ **Develop a ~~quantitative~~ model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.**

Supporting Content ESS2.D: Weather and Climate

- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (**HS-ESS-2.6**~~ESS2-HS-6~~, **HS-ESS-2.7**~~ESS2-HS-7~~)
- Changes in ~~the atmosphere due to human activity have increased~~ carbon dioxide concentrations in the atmosphere ~~and thus~~ affect climate. (**HS-ESS-2.4**~~ESS2-HS-6~~, **HS-ESS-2.6**~~ESS2-HS-4~~)

- **Further Explanation**: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.

HS-ESS-2.7 Students who demonstrate understanding can:

~~**ESS2-HS-7.**~~ **Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.**

Supporting Content ESS2.D: Weather and Climate

- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (**HS-ESS-2.6**, **HS-ESS-2.7**)

Supporting Content ESS2.E: Biogeology

- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (**HS-ESS-2.7**~~ESS2-HS-7~~)

- **Further Explanation**: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.
- **Assessment Limit~~Content Limit~~**: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.

~~Supporting Content~~

~~ESS1.B: Earth and the Solar System~~

- ~~Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. (ESS2-HS-4)~~

~~ESS2.A: Earth Materials and Systems~~

- ~~Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (ESS2-HS-1, ESS2-HS-2)~~
- ~~Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (ESS2-HS-3)~~
- ~~The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (ESS2-HS-4)~~

~~ESS2.B: Plate Tectonics and Large-Scale System Interactions~~

- ~~The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (ESS2-HS-3)~~
- ~~Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic~~
- ~~history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. (ESS2-HS-1)~~

~~ESS2.C: The Roles of Water in Earth's Surface Processes~~

- ~~The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (ESS2-HS-5)~~

~~ESS2.D: Weather and Climate~~

- ~~The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (ESS2-HS-2, ESS2-HS-4)~~
- ~~Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (ESS2-HS-6, ESS2-HS-7)~~
- ~~Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (ESS2-HS-6, ESS2-HS-4)~~

~~ESS2.E: Biogeology~~

- ~~The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (ESS2-HS-7)~~

~~PS4.A: Wave Properties~~

- ~~Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (ESS2-HS-3)~~

HS-ESS-3 – Earth and Human Activity

~~ESS3-HS Earth and Human Activity~~

~~Performance Standards~~

~~Students who demonstrate understanding can:~~

HS-ESS-3.1 ~~ESS3-HS-1.~~Students who demonstrate understanding can:

Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Supporting Content ESS3.A: Natural Resources

- Resource availability has guided the development of human society. (**HS-ESS-3.1**~~ESS3-HS-1~~, *HS-LS-2.6*)

Supporting Content ESS3.B: Natural Hazards

- Natural hazards and other geologic events have shaped the course of human history. They have altered the sizes of human populations and have driven human migrations. (**HS-ESS-3.1**~~ESS3-HS-1~~)

- **Further Explanation**: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.

HS-ESS-3.2 Students who demonstrate understanding can:

~~ESS3-HS-2.~~ **Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.**

Supporting Content ESS3.A: Natural Resources

- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical benefits, costs and risks~~costs and risks as well as benefits~~. New technologies and social regulations can change the balance of these factors. (**HS-ESS-3.2**~~ESS3-HS-2~~)

Supporting Content ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental factors~~impacts~~. (**HS-ESS-3.2**~~ESS3-HS-2~~, **HS-ESS-3.4**~~ESS3-HS-4~~)

- **Further Explanation**: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals)~~ where possible~~, and on minimizing impacts~~ where it is not~~. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). ~~Science knowledge indicates what can happen in natural systems—not what should happen.~~

HS-ESS-3.3 Students who demonstrate understanding can:

~~**ESS3-HS-3. Create a computational simulation to i**~~**Illustrate ~~the~~ relationships among management of natural resources, the sustainability of human populations, and biodiversity.**

Supporting Content ESS3.C: Human Influences~~Impacts~~ on Earth Systems

- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (**HS-ESS-3.3**~~ESS3-HS-3~~)

- **Further Explanation**: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.
- ~~Content Limit: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.~~

HS-ESS-3.4 Students who demonstrate understanding can:

~~**ESS3-HS-4.**~~ **Evaluate or refine a** scientific or **technological solution that ~~reduces impacts~~** mitigates or enhances ~~**of**~~ **human** influences~~**activities**~~ **on natural systems.**

Supporting Content ESS3.C: Human Influences on Earth Systems

- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (**HS-ESS-3.4**~~ESS3- HS-4~~)

Supporting Content ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental factors. (**HS-ESS-3.2**, **HS-ESS-3.4**)

- **Further Explanation**: Examples of data on the influences~~impacts~~ of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity , or ~~areal~~ changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples of human contributions ~~for limiting future impacts~~ could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as cloud seeding~~as altering global temperatures by making large changes to the atmosphere or ocean~~).

HS-ESS-3.5 Students who demonstrate understanding can:

~~**ESS3-HS-5.**~~ **Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.**

Supporting Content ESS3.C: Human **Influences** on Earth Systems

- Human abilities to model, predict, and manage current and future effects on Earth's systems are improving with advancing technologies. (HS-ESS-3.5)
- ~~Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (ESS3-HS-5)~~

- **Further Explanation**: Examples of evidence, for both data and climate model outputs, are for climate variations~~changes~~ (such as precipitation and temperature) and their associated effects~~impacts~~ (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).
- **Assessment**~~**Content**~~ **Limit**: Assessment is limited to one example of a climate variation~~change~~ and its associated effects~~impacts~~.

HS-ESS-3.6 Students who demonstrate understanding can:

~~**ESS3-HS-6.**~~ Communicate how ~~**Use a computational representation to illustrate**~~ **the relationships among Earth systems** ~~**and how those relationships**~~ **are being** influenced by ~~**modified due to**~~ **human activity.**

Supporting Content ESS2.D: Weather and Climate

- Current models project that average global temperatures will continue to rise. The outcomes projected by these models depend on the amounts of greenhouse gases added to the atmosphere each year and the ways these gases are stored by Earth's systems. (**HS-ESS-3.6**)

Supporting Content ESS3.C: Human **Influences** on Earth Systems

- Through computer simulations and and scientific research~~other studies~~, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are influenced by ~~are modified in response to~~ human activities. (**HS-ESS-3.6**~~ESS3-HS-6~~)

- **Further Explanation**: Examples of Earth systems ~~to be considered~~ are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. ~~.~~ A~~-~~n example ~~of the far- reaching impacts from a human activity~~ is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.
- Assessment~~Content~~ **Limit**: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.

~~Supporting Content~~

~~ESS2.D: Weather and Climate~~

- ~~Current models project that, without human intervention, average global temperatures will continue to rise. The outcomes projected by global climate models depend on the amounts of greenhouse gases added to the atmosphere each year and by the ways in which these gases are stored by Earth's systems. (ESS3-HS-6)~~

~~ESS3.A: Natural Resources~~

- ~~Resource availability has guided the development of human society. (ESS3-HS-1)~~
- ~~All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (ESS3-HS-2)~~

~~ESS3.B: Natural Hazards~~

- ~~Natural hazards and other geologic events have shaped the course of human history. They have altered the sizes of human populations and have driven human migrations. (ESS3-HS-1)~~

~~ESS3.C: Human Impacts on Earth Systems~~

- ~~The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (ESS3-HS-3)~~
- ~~Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (ESS3- HS-4)~~
- ~~Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (ESS3-HS-5)~~
- ~~Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (ESS3-HS-6)~~

~~ETS1.B: Developing Possible Solutions~~

- ~~When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, environmental impacts. (ESS3-HS-2, ESS3-HS-4)~~

~~APPENDIX A: SUGGESTED MIDDLE AND HIGH SCHOOL COURSE PROGRESSIONS~~

~~GRADES 6-8 (ASSESSMENT GIVEN AT END OF 8TH GRADE AS EITHER CUMULATIVE ISAT OR CONTENT SPECIFIC EOC)~~

~~CONCEPTUAL PROGRESSIONS MODEL~~

~~COURSE 1 SCS~~	~~COURSE 1 PSS~~	~~COURSE 2 SCS~~	~~COURSE 2 PSS~~	~~COURSE 3 SCS~~	~~COURSE 3 PSS~~
~~PS1.A~~	~~PS1-MS-1~~	~~PS3.C~~	~~PS4-MS-3~~	~~LS2.C~~	~~LS2-MS-5~~
~~PS1.B~~	~~PS1-MS-2~~	~~PS4.B~~	~~LS1-MS-1~~	~~LS4.A~~	~~LS2-MS-6~~
~~PS2.A~~	~~PS1-MS-3~~	~~PS4.C~~	~~LS1-MS-2~~	~~LS4.B~~	~~LS4-MS-1~~
~~PS2.B~~	~~PS1-MS-4~~	~~LS1.A~~	~~LS1-MS-3~~	~~LS4.C~~	~~LS4-MS-2~~
~~PS3.A~~	~~PS1-MS-5~~	~~LS1.B~~	~~LS1-MS-4~~	~~LS4.D~~	~~LS4-MS-3~~
~~PS3.B~~	~~PS1-MS-6~~	~~LS1.C~~	~~LS1-MS-5~~	~~ESS1.C~~	~~LS4-MS-4~~
~~PS4.A~~	~~PS2-MS-1~~	~~LS2.B~~	~~LS1-MS-6~~	~~ESS2.D~~	~~LS4-MS-5~~
~~LS2.A~~	~~PS2-MS-2~~	~~LS3.A~~	~~LS2-MS-3~~	~~ESS3.C~~	~~LS4-MS-6~~
~~ESS1.B~~	~~PS2-MS-3~~	~~LS3.B~~	~~LS2-MS-4~~	~~ESS3.C~~	~~ESS1-MS-4~~
~~ESS2.B~~	~~PS2-MS-4~~	~~ESS1.A~~	~~LS3-MS-1~~	~~ETS1.A~~	~~ESS3-MS-3~~
~~ESS2.C~~	~~PS2-MS-5~~	~~ESS2.A~~	~~LS3-MS-2~~	~~ETS1.B~~	~~ESS3-MS-4~~

~~COURSE 1 SCS~~	~~COURSE 1 PSS~~	~~COURSE 2 SCS~~	~~COURSE 2 PSS~~	~~COURSE 3 SCS~~	~~COURSE 3 PSS~~
~~ESS3.A~~	~~PS3-MS-1~~	~~ESS2.A~~	~~ESS2-MS-1~~	~~NA~~	~~ESS3-MS-5~~
~~ETS1.A~~	~~PS3-MS-2~~	~~ESS2.D~~	~~ESS2-MS-2~~	~~NA~~	~~NA~~
~~ETS1.B~~	~~PS3-MS-3~~	~~ESS3.B~~	~~ESS2-MS-3~~	~~NA~~	~~NA~~
~~NA~~	~~PS3-MS-4~~	~~ETS1.A~~	~~ESS2-MS-4~~	~~NA~~	~~NA~~
~~NA~~	~~PS3-MS-5~~	~~ETS1.B~~	~~ESS2-MS-5~~	~~NA~~	~~NA~~
~~NA~~	~~PS4-MS-1~~	~~NA~~	~~ESS2-MS-6~~	~~NA~~	~~NA~~
~~NA~~	~~PS4-MS-2~~	~~NA~~	~~ESS3-MS-1~~	~~NA~~	~~NA~~
~~NA~~	~~LS2-MS-1~~	~~NA~~	~~ESS3-MS-2~~	~~NA~~	~~NA~~
~~NA~~	~~LS2-MS-2~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~NA~~	~~ESS1-MS-1~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~NA~~	~~ESS1-MS-2~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~

~~COURSE 1 SCS~~	~~COURSE 1 PSS~~	~~COURSE 2 SCS~~	~~COURSE 2 PSS~~	~~COURSE 3 SCS~~	~~COURSE 3 PSS~~
~~NA~~	~~ESS1-MS-3~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~

~~SCIENCE DOMAINS MODEL~~

~~PHYSICAL SCS~~	~~PHYSICAL PSS~~	~~LIFE SCS~~	~~LIFE PSS~~	~~EARTH SCS~~	~~EARTH PSS~~
~~PS1.A~~	~~PS1-MS-1~~	~~LS1.A~~	~~LS1-MS-1~~	~~ESS1.A~~	~~ESS1-MS-1~~
~~PS1.B~~	~~PS1-MS-2~~	~~LS1.B~~	~~LS1-MS-2~~	~~ESS1.B~~	~~ESS1-MS-2~~
~~PS2.A~~	~~PS1-MS-3~~	~~LS1.C~~	~~LS1-MS-3~~	~~ESS1.C~~	~~ESS1-MS-3~~
~~PS2.B~~	~~PS1-MS-4~~	~~LS2.A~~	~~LS1-MS-4~~	~~ESS2.A~~	~~ESS1-MS-4~~
~~PS3.A~~	~~PS1-MS-5~~	~~LS2.B~~	~~LS1-MS-5~~	~~ESS2.B~~	~~ESS2-MS-1~~
~~PS3.B~~	~~PS1-MS-6~~	~~LS2.C~~	~~LS1-MS-6~~	~~ESS2.C~~	~~ESS2-MS-2~~
~~PS3.C~~	~~PS2-MS-1~~	~~LS3.A~~	~~LS2-MS-1~~	~~ESS2.~~	~~ESS2-MS-3~~
~~PS4.A~~	~~PS2-MS-2~~	~~LS3.B~~	~~LS2-MS-2~~	~~ESS3.~~	~~ESS2-MS-4~~
~~PS4.B~~	~~PS2-MS-3~~	~~LS4.A~~	~~LS2-MS-3~~	~~ESS3.B~~	~~ESS2-MS-5~~
~~PS4.C~~	~~PS2-MS-4~~	~~LS4.B~~	~~LS2-MS-4~~	~~ESS3.C~~	~~ESS2-MS-6~~
~~ETS1.A~~	~~PS2-MS-5~~	~~LS4.C~~	~~LS2-MS-5~~	~~ESS3.C~~	~~ESS3-MS-1~~

~~PHYSICAL SCS~~	~~PHYSICAL PSS~~	~~LIFE SCS~~	~~LIFE PSS~~	~~EARTH SCS~~	~~EARTH PSS~~
~~ETS1.B~~	~~PS3-MS-1~~	~~LS4.D~~	~~LS2-MS-6~~	~~NA~~	~~ESS3-MS-2~~
~~NA~~	~~PS3-MS-2~~	~~ETS1.B~~	~~LS3-MS-1~~	~~NA~~	~~ESS3-MS-3~~
~~NA~~	~~PS3-MS-3~~	~~NA~~	~~LS3-MS-2~~	~~NA~~	~~ESS3-MS-4~~
~~NA~~	~~PS3-MS-4~~	~~NA~~	~~LS4-MS-1~~	~~NA~~	~~ESS3-MS-5~~
~~NA~~	~~PS3-MS-5~~	~~NA~~	~~LS4-MS-2~~	~~NA~~	~~NA~~
~~NA~~	~~PS4-MS-1~~	~~NA~~	~~LS4-MS-3~~	~~NA~~	~~NA~~
~~NA~~	~~PS4-MS-2~~	~~NA~~	~~LS4-MS-4~~	~~NA~~	~~NA~~
~~NA~~	~~PS4-MS-3~~	~~NA~~	~~LS-MS-5~~	~~NA~~	~~NA~~
~~NA~~	~~NA~~	~~NA~~	~~LS-MS-6~~	~~NA~~	~~NA~~

~~GRADES 9-12~~

~~MODIFIED SCIENCE DOMAINS MODEL~~

~~BIOLOGY SCS~~	~~BIOLOGY PSS~~	~~CHEMISTRY SCS~~	~~CHEMISTRY PSS~~	~~PHYSICS SCS~~	~~PHYSICS PSS~~
~~LS1.A~~	~~LS1-HS-1~~	~~PS1.A~~	~~PSC1-HS-1~~	~~PS1.A~~	~~PSP1-HS-1~~
~~LS1.B~~	~~LS1-HS-2~~	~~PS1.B~~	~~PSC1-HS-2~~	~~PS2.A~~	~~PSP1-HS-2~~
~~LS1.C~~	~~LS1-HS-3~~	~~PS1.C~~	~~PSC1-HS-3~~	~~PS2.B~~	~~PSP1-HS-3~~
~~LS2.A~~	~~LS1-HS-4~~	~~PS2.B~~	~~PSC1-HS-4~~	~~PS3.A~~	~~PSP1-HS-4~~
~~LS2.B~~	~~LS1-HS-5~~	~~PS3.A~~	~~PSC1-HS-5~~	~~PS3.B~~	~~PSP1-HS-5~~
~~LS2.C~~	~~LS1-HS-6~~	~~PS3.B~~	~~PSC2-HS-1~~	~~PS3.C~~	~~PSP1-HS-6~~
~~LS2.D~~	~~LS1-HS-7~~	~~PS3.D~~	~~PSC2-HS-2~~	~~PS3.D~~	~~PSP2-HS-1~~
~~LS3.A~~	~~LS2-HS-1~~	~~PS4.B~~	~~PSC2-HS-3~~	~~PS4.A~~	~~PSP2-HS-2~~
~~LS3.B~~	~~LS2-HS-2~~	~~ESS2.C~~	~~PSC2-HS-4~~	~~PS4.B~~	~~PSP2-HS-3~~
~~LS4.A~~	~~LS2-HS-3~~	~~ESS2.D~~	~~PSC2-HS-5~~	~~PS4.C~~	~~PSP2-HS-4~~
~~LS4.B~~	~~LS2-HS-4~~	~~ESS3.A~~	~~PSC3-HS-1~~	~~ESS1.A~~	~~PSP2-HS-5~~
~~LS4.C~~	~~LS2-HS-5~~	~~ESS3.C~~	~~PSC3-HS-2~~	~~ESS1.B~~	~~PSP3-HS-1~~
~~LS4.D~~	~~LS2-HS-6~~	~~ETS1.A~~	~~PSC3-HS-3~~	~~ESS2.A~~	~~PSP3-HS-2~~
~~ESS1.C~~	~~LS2-HS-7~~	~~ETS1.B~~	~~PSC3-HS-4~~	~~ESS2.B~~	~~PSP3-HS-3~~
~~ESS2.E~~	~~LS2-HS-8~~	~~ETS1.C~~	~~PSC3-HS-5~~	~~ETS1.A~~	~~PSP3-HS-4~~
~~ESS3.B~~	~~LS3-HS-1~~	~~NA~~	~~ESS2-HS-4~~	~~ETS1.B~~	~~PSP3-HS-5~~
~~ESS3.C~~	~~LS3-HS-2~~	~~NA~~	~~ESS2-HS-5~~	~~ETS1.C~~	~~ESS1-HS-1~~
~~ETS1.A~~	~~LS3-HS-3~~	~~NA~~	~~ESS2-HS-6~~	~~NA~~	~~ESS1-HS-2~~
~~ETS1.B~~	~~LS4-HS-1~~	~~NA~~	~~ESS3-HS-2~~	~~NA~~	~~ESS1-HS-3~~

~~ETS1.C~~	~~LS4-HS-2~~	~~NA~~	~~ESS3-HS-5~~	~~NA~~	~~ESS1-HS-4~~
~~NA~~	~~LS4-HS-3~~	~~NA~~	~~ESS3-HS-6~~	~~NA~~	~~ESS2-HS-1~~
~~NA~~	~~LS4-HS-4~~	~~NA~~	~~NA~~	~~NA~~	~~ESS2-HS-2~~
~~NA~~	~~LS4-HS-5~~	~~NA~~	~~NA~~	~~NA~~	~~ESS2-HS-3~~
~~NA~~	~~LS4-HS-6~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~NA~~	~~ESS1-HS-5~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~NA~~	~~ESS1-HS-6~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~NA~~	~~ESS2-HS-7~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~NA~~	~~ESS3-HS-1~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~NA~~	~~ESS3-HS-3~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~
~~NA~~	~~ESS3-HS-4~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~

~~GRADES 9-12, CONTINUED~~

~~SCIENCE DOMAINS MODEL~~

~~CHEMISTRY SCS~~	~~CHEMISTRY PSS~~	~~PHYSICS SCS~~	~~PHYSICS PSS~~	~~BIOLOGY SCS~~	~~BIOLOGY PSS~~	~~EARTH/SPACE SCS~~	~~EARTH/SPACE PSS~~
~~PS1.A~~	~~PSC1-HS-1~~	~~PS1.A~~	~~PSP1-HS-1~~	~~LS1.A~~	~~LS1-HS-1~~	~~ESS1.A~~	~~ESS1-HS-1~~
~~PS1.B~~	~~PSC1-HS-2~~	~~PS2.A~~	~~PSP1-HS-2~~	~~LS1.B~~	~~LS1-HS-2~~	~~ESS1.B~~	~~ESS1-HS-2~~
~~PS1.C~~	~~PSC1-HS-3~~	~~PS2.B~~	~~PSP1-HS-3~~	~~LS1.C~~	~~LS1-HS-3~~	~~ESS1.C~~	~~ESS1-HS-3~~
~~PS2.B~~	~~PSC1-HS-4~~	~~PS3.A~~	~~PSP1-HS-4~~	~~LS2.A~~	~~LS1-HS-4~~	~~ESS2.A~~	~~ESS1-HS-4~~
~~PS3.A~~	~~PSC1-HS-5~~	~~PS3.B~~	~~PSP1-HS-5~~	~~LS2.B~~	~~LS1-HS-5~~	~~ESS2.B~~	~~ESS1-HS-5~~
~~PS3.B~~	~~PSC2-HS-1~~	~~PS3.C~~	~~PSP1-HS-6~~	~~LS2.C~~	~~LS1-HS-6~~	~~ESS2.C~~	~~ESS1-HS-6~~
~~PS3.D~~	~~PSC2-HS-2~~	~~PS3.D~~	~~PSP2-HS-1~~	~~LS2.D~~	~~LS1-HS-7~~	~~ESS2.D~~	~~ESS2-HS-1~~
~~PS4.B~~	~~PSC2-HS-3~~	~~PS4.A~~	~~PSP2-HS-2~~	~~LS3.A~~	~~LS2-HS-1~~	~~ESS2.E~~	~~ESS2-HS-2~~
~~ETS1.C~~	~~PSC2-HS-4~~	~~PS4.B~~	~~PSP2-HS-3~~	~~LS3.B~~	~~LS2-HS-2~~	~~ESS3.A~~	~~ESS2-HS-3~~
~~NA~~	~~PSC2-HS-5~~	~~PS4.C~~	~~PSP2-HS-4~~	~~LS4.A~~	~~LS2-HS-3~~	~~ESS3.B~~	~~ESS2-HS-4~~
~~NA~~	~~PSC3-HS-1~~	~~ETS1.A~~	~~PSP2-HS-5~~	~~LS4.B~~	~~LS2-HS-4~~	~~ESS3.C~~	~~ESS2-HS-5~~

~~CHEMISTRY SCS~~	~~CHEMISTRY PSS~~	~~PHYSICS SCS~~	~~PHYSICS PSS~~	~~BIOLOGY SCS~~	~~BIOLOGY PSS~~	~~EARTH/SPACE SCS~~	~~EARTH/SPACE PSS~~
~~**NA**~~	~~**PSC3-HS-2**~~	~~**ETS1.C**~~	~~**PSP3-HS-1**~~	~~**LS4.C**~~	~~**LS2-HS-5**~~	~~**ESS3.C**~~	~~**ESS2-HS-6**~~
~~**NA**~~	~~**PSC3-HS-3**~~	~~**NA**~~	~~**PSP3-HS-2**~~	~~**LS4.D**~~	~~**LS2-HS-6**~~	~~**PS1.C**~~	~~**ESS2-HS-7**~~
~~**NA**~~	~~**PSC3-HS-4**~~	~~**NA**~~	~~**PSP3-HS-3**~~	~~**ETS1.B**~~	~~**LS2-HS-7**~~	~~**PS3.D**~~	~~**ESS3-HS-1**~~
~~**NA**~~	~~**PSC3-HS-5**~~	~~**NA**~~	~~**PSP3-HS-4**~~	~~**NA**~~	~~**LS2-HS-8**~~	~~**PS4.A**~~	~~**ESS3-HS-2**~~
~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**PSP3-HS-5**~~	~~**NA**~~	~~**LS3-HS-1**~~	~~**PS4.B**~~	~~**ESS3-HS-3**~~
~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**LS3-HS-2**~~	~~**ETS1.B**~~	~~**ESS3-HS-4**~~
~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**LS3-HS-3**~~	~~**NA**~~	~~**ESS3-HS-5**~~
~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**LS4-HS-1**~~	~~**NA**~~	~~**ESS3-HS-6**~~
~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**LS4-HS-2**~~	~~**NA**~~	~~**NA**~~
~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**LS4-HS-3**~~	~~**NA**~~	~~**NA**~~
~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**NA**~~	~~**LS4-HS-4**~~	~~**NA**~~	~~**NA**~~

~~CHEMISTRY SCS~~	~~CHEMISTRY PSS~~	~~PHYSICS SCS~~	~~PHYSICS PSS~~	~~BIOLOGY SCS~~	~~BIOLOGY PSS~~	~~EARTH/SPACE SCS~~	~~EARTH/SPACE PSS~~
~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~LS4-HS-5~~	~~NA~~	~~NA~~
~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~NA~~	~~LS4-HS-6~~	~~NA~~	~~NA~~

~~APPENDIX B: GLOSSARY OF TERMS~~

~~THIS TOOL PROVIDES TERMINOLOGIES THAT REPRESENT THE OVERARCHING CONCEPTS AND IDEAS NEEDED TO UNDERSTAND THE IDAHO STATE SCIENCE STANDARDS. THE GLOSSARY OF TERMS IS NOT MEANT TO BE EXHAUSTIVE, BUT SEEKS TO ADDRESS CRITICAL TERMS AND DEFINITIONS ESSENTIAL IN BUILDING SCIENCE CONTENT KNOWLEDGE AND UNDERSTANDING. THIS TOOL WILL ASSIST IN PROMOTING CONSISTENCY ACROSS DISCIPLINES, INCREASING STUDENT OUTCOMES, AND IMPROVING STAKEHOLDER COMMUNICATION.~~

~~ANALYZE - STUDYING THE DATA OF AN INVESTIGATION OR EXPERIMENT AND LOOKING FOR TRENDS OR PATTERNS IN THE DATA OR GRAPH TO SEE IF THE CHANGE HAD AN EFFECT~~

~~ARGUMENT/EVIDENCE-BASED ACCOUNT - A REASON OR SET OF REASONS GIVEN WITH THE AIM OF PERSUADING OTHERS THAT AN ACTION OR IDEA IS RIGHT OR WRONG, BASED ON EMPIRICAL EVIDENCE~~

~~CAUSE AND EFFECT - THE RELATIONSHIP BETWEEN EVENTS OR THINGS, WHERE ONE IS THE RESULT OF THE OTHER OR OTHERS (ACTION AND REACTION)~~

~~CLAIM - TO STATE OR ASSERT THAT SOMETHING IS TRUE, TYPICALLY WITHOUT PROVIDING EVIDENCE~~

~~CLASSIFY - GROUPING ITEMS TOGETHER BASED ON TRAITS AND/OR CHARACTERISTICS~~

~~DATA - **THE RESULT OF YOUR EXPERIMENTATION (FACTS, FIGURES, AND OTHER EVIDENCE) THAT YOU USUALLY RECORD ON A CHART AND THEN MAKE A GRAPH**~~

~~EMPIRICAL - **VERIFIABLE BY OBSERVATION (USING SENSES) OR EXPERIENCE**~~

~~EVIDENCE -**THE AVAILABLE BODY OF FACTS OR INFORMATION INDICATING WHETHER A CLAIM OR PROPOSITION IS TRUE OR VALID**~~

~~EXAMPLE - **A THING CHARACTERISTIC OF ITS KIND OR ILLUSTRATING A GENERAL RULE/IDEA**~~

~~EXPERIMENTAL DESIGN - **A METHOD OF RESEARCH IN WHICH A CONTROLLED EXPERIMENTAL VARIABLE IS SUBJECTED TO SPECIAL TREATMENT FOR THE PURPOSE OF COMPARISON WITH A VARIABLE KEPT CONSTANT**~~

~~FACT - **AN OBSERVATION THAT HAS BEEN REPEATEDLY CONFIRMED**~~

~~GRAPH - **A DIAGRAM SHOWING THE VISUAL RELATIONSHIP BETWEEN VARIABLE QUANTITIES**~~

~~HYPOTHESIS - **A TESTABLE STATEMENT ABOUT THE NATURAL WORLD THAT CAN BE USED TO BUILD MORE COMPLEX INFERENCES AND EXPLANATIONS**~~

~~INFERENCE - **A CONCLUSION REACHED ON THE BASIS OF EVIDENCE AND REASONING**~~

~~INTERPRET - **TO EXPLAIN AND UNDERSTAND THE MEANING OF EVIDENCE BASED ON CREDIBLE SCIENTIFIC INFORMATION**~~

~~INVESTIGATION - **A PROCESS TO CARRY OUT A SYSTEMATIC OR FORMAL INQUIRY TO DISCOVER AND EXAMINE THE FACTS**~~

~~LAW - **A DESCRIPTIVE GENERALIZATION ABOUT HOW SOME ASPECT OF THE NATURAL WORLD BEHAVES UNDER STATED CIRCUMSTANCES**~~

~~MEASURE -**TO DETERMINE THE DIMENSIONS, QUANTITY OR CAPACITY OF AN OBJECT**~~

~~MODEL **(COMPUTATIONAL, MATHEMATICAL, ETC.)- A REPRESENTATION OF AN IDEA, OBJECT, PROCESS OR A SYSTEM THAT IS USED TO DESCRIBE, EXPLAIN, AND MAKE PREDICTIONS ABOUT PHENOMENA THAT CANNOT BE EXPERIENCED DIRECTLY**~~

~~OBSERVATION - **RECEIVING KNOWLEDGE OF THE NATURAL WORLD THROUGH OUR SENSES, RECORDING INFORMATION USING SCIENTIFIC TOOLS OR INSTRUMENTS**~~

~~PATTERN/TREND - **CONSISTENT AND RECURRING SET OF CHARACTERISTICS OR TRAITS THAT HELPS IN THE IDENTIFICATION OF A PHENOMENON OR PROBLEM AND SERVES AS AN INDICATOR OR MODEL FOR PREDICTING FUTURE BEHAVIOR**~~

~~PREDICTION - **A FORECAST OR STATEMENT ABOUT AN UNCERTAIN EVENT THAT IS BASED UPON EXPERIENCE OR EVIDENCE**~~

~~RELATIONSHIP - **THE CONNECTIONS BETWEEN TWO VARIABLES**~~

~~SCIENCE - THE PROCESS OF TRYING TO UNDERSTAND THE WORLD AROUND US THROUGH EXPLORATION, INVENTION, AND PROBLEM SOLVING~~

~~SCIENTIFIC REASONING - A JUSTIFICATION THAT CONNECTS EVIDENCE TO A CLAIM~~

~~SIMULATION - THE IMITATION OF THE OPERATION OF A REAL-WORLD PROCESS OR SYSTEM OVER TIME~~

~~SOLUTION - A METHOD OR A PROCESS FOR DEALING WITH A PROBLEM THAT RELIES ON SCIENTIFIC AND/OR ENGINEERING PRACTICES~~

~~THEORY - A SUBSTANTIATED EXPLANATION OF SOME ASPECT OF THE NATURAL WORLD, BASED ON A BODY OF FACTS THAT HAVE BEEN REPEATEDLY CONFIRMED THROUGH OBSERVATION AND EXPERIMENT; THE SCIENTIFIC COMMUNITY VALIDATES EACH THEORY BEFORE IT IS ACCEPTED; IF NEW EVIDENCE IS DISCOVERED THAT THE THEORY DOES NOT ACCOMMODATE, THE THEORY IS GENERALLY MODIFIED IN LIGHT OF THIS NEW EVIDENCE~~

~~VARIABLE - ANY FACTOR THAT CAN BE CONTROLLED, CHANGED, AND/OR MEASURED; USUALLY IN AN EXPERIMENT~~

PROPOSED DRAFT 07/13/2021

Idaho Content Standards - Science

IDAHO STATE DEPARTMENT OF EDUCATION
CONTENT AND CURRICULUM| SCIENCE

650 W STATE STREET, 2ND FLOOR
BOISE, IDAHO 83702
208 332 6800 OFFICE
WWW.SDE.IDAHO.GOV

CREATED 07/13/2021

Table of Contents

Introduction

The Idaho State Content Standards in Science are essential for developing the science literacy of Idaho students, as it is vital that our students understand the fundamental laws and practices within scientific disciplines. This document provides stakeholders with a set of rigorous and relevant science performance standards that prepare students to be informed, contributing citizens of the 21st-century world. The unifying goal is for Idaho students to practice and perform science and use their working knowledge of science to successfully function in a complex world.

The Idaho Science standards describe the knowledge and skills that students should learn, but they do not prescribe particular curriculum, lessons, teaching techniques, or activities. Standards describe what students are expected to know and be able to do, while the local curriculum describes how teachers will help students master the standards. A wide variety of instructional resources may be used to meet the state content area standards. Decisions about curriculum and instruction are made locally by individual school districts and classroom teachers. The Idaho State Board of Education does not mandate the curriculum used within local schools. However, these science standards should be taught in a way that allows students to analyze the data and make their own decisions about what it means. Students should also be taught the current models and explanations of the scientific community regarding that data.

Organization and Structure of Science Standards

The Idaho Science Standards are based on *A Framework for K-12 Science Education*[1]. That framework outlines three organizational dimensions for each standard:

- **Science and Engineering Practices**
- **Disciplinary Core Ideas** and **Supporting Content**
- **Crosscutting Concepts**

The **Science and Engineering Practices** are used by students to demonstrate understanding of the disciplinary core ideas and crosscutting concepts. These practices update the scientific method in the classroom and include a wider range of skills for an expanded approach to how scientific investigations are conducted in the real world. Engaging in the practices of science and engineering helps students understand the wide range of approaches used to investigate natural phenomena and develop solutions to challenges. Students are expected to demonstrate grade appropriate proficiency in asking questions and defining problems; developing and using models; planning and carrying out investigations; analyzing and interpreting data; using mathematics and computational thinking; constructing explanations and designing solutions; engaging in argument from evidence; and obtaining, evaluating, and communicating information as they gather, analyze, and communicate scientific information.

The **Disciplinary Core Ideas** and **Supporting Content** are the focused, limited set of science ideas identified in the *Framework* as necessary for ALL students throughout their education and beyond their K-12 school years to achieve scientific literacy. The limited number of disciplinary core ideas

[1] A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press, 2012.

allows more time for students and teachers to engage in the science and engineering practices as they deeply explore science ideas. To allow students to continually build on and revise their knowledge and abilities, the disciplinary core ideas are built on developmental learning progressions. In the Idaho State Science Standards, The Disciplinary Core Ideas are incorporated within the Supporting Content for clarity. The Supporting Content defines the minimum boundary of content knowledge needed to fully demonstrate mastery of the standard.

The **Crosscutting Concepts** are used to organize and make sense of disciplinary core ideas. They serve as tools that bridge disciplinary boundaries and deepen understanding of science content. With grade-appropriate proficiency, students are expected to use patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change as they gather, analyze, and communicate scientific understanding. These crosscutting concepts provide structure for synthesizing knowledge from various fields into a coherent and scientifically based view of the world.

The K-12 standards are structured to reflect the developmental nature of learning. Within the standards, content is introduced in a spiraled model using connected core ideas that build deepened understanding throughout grade level progressions. The standards increase in complexity and rigor as students move through the grade levels. Curriculums developed by the school districts of Idaho should encompass all three dimensions of each standard.

The following table lists the disciplinary core ideas, crosscutting concepts, and science and engineering practices (more detailed and grade specific descriptions are available in the supplemental support materials):

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• Asking Questions and Defining Problems • Developing and Using Models • Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Using Mathematics and Computational Thinking • Constructing Explanations and Designing Solutions • Engaging in Argument from Evidence • Obtaining, Evaluating, and Communicating Information	LS1: From Molecules to Organisms: Structures and Processes LS2: Ecosystems: Interactions, Energy, and Dynamics LS3: Heredity: Inheritance and Variation of Traits LS4: Biological Evolution: Unity and Diversity PS1: Matter and Its Interactions PS2: Motion and Stability: Forces and Interactions PS3: Energy PS4: Waves ESS1: Earth’s Place in the Universe ESS2: Earth’s Systems ESS3: Earth and Human Activity	• Patterns • Cause and Effect • Scale, Proportion, and Quantity • Systems and System Models • Energy and Matter • Structure and Function • Stability and Change

Instructional Shifts

While each standard incorporates the three dimensions, this alone does not drive student outcomes; ultimately, student learning depends on how the standards are translated to instructional practices. In order for students to attain the maximum benefit from the Idaho Science Standards, districts are encouraged to incorporate problem solving techniques and deep critical thinking exercises into those practices. Effective science teaching and learning integrates the three dimensions by allowing students to explain scientific phenomena, design solutions to real-world challenges, and build a foundation upon which they can continue to learn and to apply science knowledge and skills within and outside the K-12 education arena.

Interdisciplinary Approaches

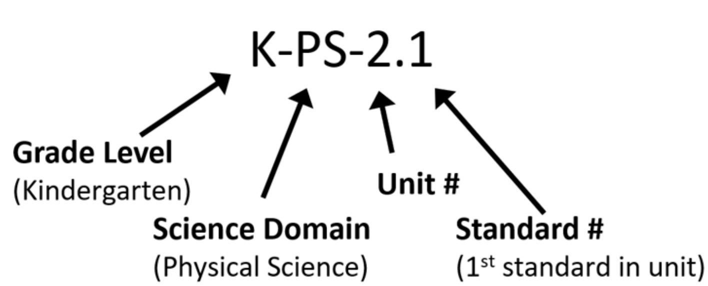
The overlapping skills in the science and engineering practices combined with the intellectual tools developed by the crosscutting concepts, build meaningful and substantive connections to interdisciplinary knowledge and skills in all content areas. Student understanding and retention are increased as connections are made to interdisciplinary learning which affords all students equitable access to learning and ensures all students are prepared for college, career, and citizenship.

Using This Document

Each standard is followed by the Supporting Content (DCI) in order to add details of what knowledge should be mastered while students are working to achieve each standard. There are often *Further Explanations* and *Assessment Limits* following the content. The *Further Explanations* explain how the concepts embedded within the standard should be emphasized. These often contain examples that are not required, but give guidance about the complexity of ideas to ensure grade appropriate implementation. Assessment limits are similar and do not limit what content is learned about in the classroom, but they do keep assessments from expanding inappropriately outside of the grade-level expectations. These features are included when further clarity is needed.

The coding for each standard labels the grade level, science domain, unit number, and standard number as shown below:

Abbreviations
K – Kindergarten
MS – Middle School
HS – High School
LS – Life Science
ESS – Earth and Space Science
PS – Physical Science
PSC – Physical Science Chemistry
PSP – Physical Science Physics
ETS – Engineering and Technology



Kindergarten

Physical Science

K-PS-1 – Motion and Stability: Forces and Interactions

K-PS-1.1 Students who demonstrate understanding can:
With guidance and support, plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Supporting Content PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (K-PS-1.1, K-PS-1.2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS-1.1, K-PS-1.2)

Supporting Content PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion. (K-PS-1.1)

Supporting Content PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly. (K-PS-1.1)

Further Explanation: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.

Assessment Limit: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.

K-PS-1.2 Students who demonstrate understanding can:
With guidance and support, analyze data to determine if a design solution works as intended to change the motion of an object with a push or a pull.

Supporting Content PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (K-PS-1.1, K-PS-1.2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS-1.1, K-PS-1.2)

Supporting Content ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (K-PS-1.2)

Further Explanation: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.

Assessment Limit: Assessment does not include friction as a mechanism for change in speed.

K-PS-2 – Energy

K-PS-2.1 Students who demonstrate understanding can:
Make observations to determine the effect of the sun's energy on the Earth's surface.

Supporting Content PS3.B: Conservation of Energy and Energy Transfer
- Sunlight warms Earth's surface. (K-PS-2.1, K-PS-2.2)

Further Explanation: Examples of Earth's surface could include sand, soil, rocks, and water.

Assessment Limit: Assessment of temperature is limited to relative measures such as warmer/cooler.

K-PS-2.2 Students who demonstrate understanding can:
Design and build a structure that will reduce the warming effect of the sun's energy on a material.

Supporting Content PS3.B: Conservation of Energy and Energy Transfer
- Sunlight warms Earth's surface. (K-PS-2.1, K-PS-2.2)

Further Explanation: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun on Earth's surface.

Life Science

K-LS-1 – Molecules to Organisms: Structure and Processes

K-LS-1.1 Students who demonstrate understanding can:
Use observations to describe how plants and animals are alike and different in terms of how they live and grow.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms
- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS-1.1)

Further Explanation: Examples of observations could include that animals need to take in food, but plants produce their own; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.

Earth and Space Science

K-ESS-1 – Earth's Systems

K-ESS-1.1 Students who demonstrate understanding can:
Use and share observations of local weather conditions to describe variations in patterns throughout the year.

Supporting Content ESS2.D: Weather and Climate

- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region, at a particular time. People measure these conditions to describe and record patterns over time. (K-ESS-1.1)
- The four seasons occur in a specific order due to their weather patterns. (K-ESS-1.1)

Further Explanation: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.

Assessment Limit: Assessment of quantitative observations limited to whole numbers less than 20 and relative measures such as warmer/cooler.

K-ESS-1.2 Students who demonstrate understanding can:
With guidance and support, use evidence to construct an explanation of how plants and animals interact with their environment to meet their needs.

Supporting Content ESS2.E: Biogeology

- Plants and animals can change their environment. (K-ESS-1.2)

Further Explanation: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.

K-ESS-2 – Weather and Climate

K-ESS-2.1 Students who demonstrate understanding can:
Use a model to represent the relationship between the needs of different plants and animals and the places they live.

Supporting Content ESS3.A: Natural Resources

- Living things need water, air, and resources from the land. They live in places that have the things they need. (K-ESS-2.1)

Further Explanation: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.

K-ESS-2.2 Students who demonstrate understanding can:
Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, local weather.

Supporting Content ESS3.B: Natural Hazards
- Some kinds of weather are more likely than others in a given region. Weather scientists forecast the weather so that local communities can prepare for and respond to these events. (K-ESS-2.2)

Supporting Content ETS1.A: Delimiting an Engineering Problem
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-ESS-2.2)

Further Explanation: Emphasis is on local forms of weather. Examples relating weather forecasting to preparing and responding could include using forecasts to plan for staying indoors during severe weather; going to cooling centers during heat waves; covering windows before storms.

K-ESS-2.3 Students who demonstrate understanding can:
Communicate ideas that would enable humans to interact in a beneficial way with the land, water, air, and/or other living things in the local environment.

Supporting Content ESS3.C: Human Influences on Earth Systems
- Things that people do can affect the world around them. People can reduce their effects on the land, water, air, and other living things. (K-ESS-2.3)

Supporting Content ETS1.B: Developing Possible Solutions
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-ESS-2.3)

Further Explanation: Examples of human influence on the land could include planting trees after a burn, protecting farm fields from erosion, or keeping plastic trash out of waterways.

Grade 1

Physical Science

1-PS-1 – Waves

1-PS-1.1 Students who demonstrate understanding can:
With guidance and support, plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Supporting Content PS4.A: Wave Properties

- Sound can make matter vibrate, and vibrating matter can make sound. (1-PS-1.1)

Further Explanation: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

1-PS-1.2 Students who demonstrate understanding can:
With guidance and support, make observations to construct an evidence-based explanation that objects in darkness can be seen only when illuminated.

Supporting Content PS4.B: Electromagnetic Radiation (light)

- Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS-1.2)

Further Explanation: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

1-PS-1.3 Students who demonstrate understanding can:
With guidance and support, plan and conduct investigations to determine the effect of placing materials in the path of a beam of light.

Supporting Content PS4.B: Electromagnetic Radiation (light)

- Some materials allow light to pass through them, others allow only some light through, and others block all the light creating a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1-PS-1.3)

Further Explanation: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).

Assessment Limit: Assessment does not include the speed of light.

1-PS-1.4 Students who demonstrate understanding can:
Design and build a device that uses light or sound to communicate over a distance.

Supporting Content PS4.C: Information Technologies and Instrumentation

- People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS-1.4)

Further Explanation: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drumbeats.

Assessment Limit: Assessment does not include technological details for how communication devices work.

Life Science

1-LS-1 – Molecules to Organisms: Structure and Processes

1-LS-1.1 Students who demonstrate understanding can:
Design and build a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Supporting Content LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS-1.1)

Supporting Content LS1.D: Information Processing

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS-1.1)

Further Explanation: Examples of human problems that can be solved by mimicking plant or animal solutions could include: designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.

1-LS-1.2 Students who demonstrate understanding can:
Obtain information to identify patterns of behavior in parents and offspring that help offspring survive.

Supporting Content LS1.B: Growth and Development of Organisms

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS-1.2)

Further Explanation: Information should be obtained from text readings and media provided by the teacher. Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).

1-LS-1.3 Students who demonstrate understanding can:
Use classification supported by evidence to differentiate between living and non-living items.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Living and non-living things have distinct characteristics. (1-LS-1.3)

Further Explanation: Use chart or Venn diagram to sort objects or pictures into living and not-living items.

1-LS-2 – Heredity: Inheritance and Variation of Traits

1-LS-2.1 Students who demonstrate understanding can:
Make observations to construct an evidence-based explanation that offspring are similar to, but not identical to, their parents.

Supporting Content LS3.A: Inheritance of Traits

- Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. (1-LS-2.1)

Supporting Content LS3.B: Variation of Traits

- Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS-2.1)

Further Explanation: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and a particular breed of dog looks like its parents, but is not exactly the same.

Assessment Limit: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.

Earth and Space Science

1-ESS-1 – Earth's Place in the Universe

1-ESS-1.1 Students who demonstrate understanding can:
Use observations of the sun, moon, and stars to describe patterns that can be predicted.

Supporting Content ESS1.A: The Universe and its Stars

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS-1.1)

Further Explanation: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.

Assessment Limit: Assessment of star patterns is limited to stars being seen at night and not during the day.

1-ESS-1.2 Students who demonstrate understanding can:
Make observations at different times of year to relate the amount of daylight to the time of year.

Supporting Content ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS-1.2)
- Seasons are created by weather patterns for a particular region and time. Local patterns create 4 distinct seasons. (1-ESS-1.2)

Further Explanation: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.

Assessment Limit: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.

Grade 2

Physical Science

2-PS-1 – Matter and Its Interactions

2-PS-1.1 Students who demonstrate understanding can:
Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Supporting Content PS1.A: Structure and Properties of Matter

- Different kinds of matter exist and many of them can be solid, liquid, or gas, depending on temperature. Matter can be described and classified by its observable properties. (2-PS-1.1)

Further Explanation: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.

2-PS-1.2 Students who demonstrate understanding can:
Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

Supporting Content PS1.A: Structure and Properties of Matter

- Different properties are suited to different purposes. (2-PS-1.2, 2-PS-1.3)

Further Explanation: Examples of properties could include strength, flexibility, hardness, texture, and absorbency.

Assessment Limit: Assessment of quantitative measurements is limited to length.

2-PS-1.3 Students who demonstrate understanding can:
Make observations to construct an evidence-based argument that objects, when disassembled, may be used to create new objects using the same set of components.

Supporting Content PS1.A: Structure and Properties of Matter

- Different properties are suited to different purposes. (2-PS-1.2, 2-PS-1.3)
- A great variety of objects can be built up from a small set of pieces. (2-PS-1.3)

Further Explanation: Examples of pieces could include blocks, building bricks, or other assorted small objects.

2-PS-1.4 Students who demonstrate understanding can:
Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

Supporting Content PS1.B: Chemical Reactions

- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS-1.4)

Further Explanation: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.

Life Science

2-LS-1 – Ecosystems: Interactions, Energy, and Dynamics

2-LS-1.1 Students who demonstrate understanding can:
Plan and conduct an investigation to determine the impact of light and water on the growth of plants.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (2-LS-1.1)

Assessment Limit: Assessment is limited to testing one variable at a time.

2-LS-1.2 Students who demonstrate understanding can:
Develop a model that demonstrates how plants depend on animals for pollination or the dispersal of seeds.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Some plants can depend on animals, wind and water for pollination or to move their seeds around. (2-LS-1.2)

Supporting Content ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (2-LS-1.2)

Further Explanation: Emphasis is on the interaction between animals and plants rather than all forms of pollination and seed dispersal.

2-LS-2 – Biological Adaptation: Unity and Diversity

2-LS-2.1 Students who demonstrate understanding can:
Make observations of plants and animals to compare the diversity of life in different habitats.

Supporting Content LS4.D: Biodiversity

- There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS-2.1)

Further Explanation: Emphasis is on the diversity of living things in each of a variety of different habitats.

Assessment Limit: Assessment does not include specific animal and plant names in specific habitats.

Earth and Space Science

2-ESS-1 – Earth's Place in the Universe

2-ESS-1.1 Students who demonstrate understanding can:
Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Supporting Content ESS1.C: The History of Planet Earth

- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS-1.1)

Further Explanation: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.

Assessment Limit: Assessment does not include quantitative measurements of timescales.

2-ESS-2 – Earth's Systems

2-ESS-2.1 Students who demonstrate understanding can:
Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

Supporting Content ESS2.A: Earth Materials and Systems
- Wind and water can change the shape of the land. (2-ESS-2.1)

Supporting Content ETS1.C: Optimizing the Design Solution
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (2-ESS-2.1)

Further Explanation: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.

2-ESS-2.2 Students who demonstrate understanding can:
Develop a model to represent the shapes and kinds of land and bodies of water in an area.

Supporting Content ESS2.B: Plate Tectonics and Large-Scale System Interactions
- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS-2.2)

Assessment Limit: Assessment does not include quantitative scaling in models.

2-ESS-2.3 Students who demonstrate understanding can:
Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes
- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS-2.3)

Grade 3

Physical Science

3-PS-1 – Motion and Stability: Forces and Interactions

3-PS-1.1 Students who demonstrate understanding can:
Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Supporting Content PS2.A: Forces and Motion

- Each force acts on one particular object with both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative additions of forces are used at this level.) (3-PS-1.1)

Supporting Content PS2.B: Types of Interactions

- Objects in contact exert forces on each other (3-PS-1.1)

Further Explanation: Examples could include an unbalanced force on one side of a ball can make it start moving; and balanced forces pushing on a box from both sides will not produce any motion at all.

Assessment Limit: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.

3-PS-1.2 Students who demonstrate understanding can:
Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

Supporting Content PS2.A: Forces and Motion

- Force applied to an object can alter the position and motion of that object: revolve, rotate, float, sink, fall and at rest. (3-PS-1.2)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS-1.2)

Further Explanation: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.

Assessment Limit: Assessment does not include technical terms such as period and frequency.

3-PS-1.3 Students who demonstrate understanding can:
Ask questions to determine cause and effect relationships of static electricity or magnetic interactions between two objects not in contact with each other.

Supporting Content PS2.B: Types of Interactions

- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart. For forces between two magnets, the size of the force also depends on their orientation relative to each other. (3-PS-1.3, 3-PS-1.4)

Further Explanation: An example of static electricity force could include the force on hair from an electrically charged balloon. Examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.

Assessment Limit: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.

3-PS-1.4 Students who demonstrate understanding can:
Define a problem that can be solved by applying scientific ideas about magnets.

Supporting Content PS2.B: Types of Interactions

- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart. For forces between two magnets, the size of the force also depends on their orientation relative to each other. (3-PS-1.3, 3-PS-1.4)

Further Explanation: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.

Life Science

3-LS-1 – From Molecules to Organisms: Structures and Processes

3-LS-1.1 Students who demonstrate understanding can:
Develop models to demonstrate that living things, although they have unique and diverse life cycles, all have birth, growth, reproduction, and death in common.

Supporting Content LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS-1.1)

Further Explanation: Changes organisms go through during their life form a pattern.

Assessment Limit: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.

3-LS-2 – Ecosystems: Interactions, Energy, and Dynamics

3-LS-2.1 Students who demonstrate understanding can:
Construct an argument that some animals form groups that help members survive.

Supporting Content LS2.D: Social Interactions and Group Behavior

- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (3-LS-2.1)

3-LS-3 – Heredity Inheritance and Variation of Traits

3-LS-3.1 Students who demonstrate understanding can:
Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

Supporting Content LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents. (3-LS-3.1)

Supporting Content LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (3-LS-3.1)

Further Explanation: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on non-human organisms.

Assessment Limit: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.

3-LS-3.2 Students who demonstrate understanding can:
Use evidence to support the explanation that traits can be influenced by the environment.

Supporting Content LS3.A: Inheritance of Traits

- Many characteristics involve both inheritance and environment. Characteristics result from individuals' interactions with the environment, which can range from diet to learning. (3-LS-3.2)

Supporting Content LS3.B: Variation of Traits

- The environment affects the traits that an organism develops. (3-LS-3.2)

Further Explanation: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and a pet dog that is given too much food and little exercise may become overweight.

3-LS-3.3 Students who demonstrate understanding can:
Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Supporting Content LS4.C Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS-3.3)

Further Explanation: Examples of evidence could include needs, characteristics of the organisms, and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.

Earth and Space Science

3-ESS-1 – Earth's Systems

3-ESS-1.1 Students who demonstrate understanding can:
Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Supporting Content ESS.D: Weather and Climate

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS-1.1)

Further Explanation: Examples of data could include average temperature, precipitation, and wind direction.

Assessment Limit: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.

3-ESS-1.2 Students who demonstrate understanding can:
Obtain and combine information to describe climates in different regions of the world.

Supporting Content ESS.D: Weather and Climate

- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS-1.2)

3-ESS-2 – Earth and Human Activity

3-ESS-2.1 Students who demonstrate understanding can:
Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Supporting Content ESS3.B: Natural Hazards

- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS-2.1)

Further Explanation: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.

Grade 4

Physical Science

4-PS-1 - Energy

4-PS-1.1 Students who demonstrate understanding can:
Use evidence to construct an explanation relating the speed of an object to the energy of that object.

Supporting Content PS3.A: Definitions of Energy
- The faster a given object is moving, the more energy it possesses. (4-PS-1.1)

Assessment Limit: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.

4-PS-1.2 Students who demonstrate understanding can:
Make observations to provide evidence that energy can be transferred by heat, sound, light, and electric currents.

Supporting Content PS3.A: Definitions of Energy
- Energy can be moved from place to place by moving objects or through heat, sound, light, or electric currents. (4-PS-1.2, 4-PS-1.3)

Supporting Content PS3.B Conservation of Energy and Energy Transfer
- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS-1.2, 4-PS-1.3)
- Light transfers energy from place to place. (4-PS-1.2)
- Energy can be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced by transforming the energy of motion into electrical energy. (4-PS-1.2, 4-PS-1.4)

Assessment Limit: Assessment does not include quantitative measurements of energy.

4-PS-1.3 Students who demonstrate understanding can:
Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Supporting Content PS3.A: Definitions of Energy
- Energy can be moved from place to place by moving objects or through heat, sound, light, or electric currents. (4-PS-1.2, 4-PS-1.3)

Supporting Content PS3.B Conservation of Energy and Energy Transfer
- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS-1.2, 4-PS-1.3)

Supporting Content PS3.C: Relationship Between Energy and Forces
- When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS-1.3)

Further Explanation: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.

Assessment Limit: Assessment does not include quantitative measurements of energy.

<u>**4-PS-1.4**</u> Students who demonstrate understanding can:
Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Energy can be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced by transforming the energy of motion into electrical energy. (4-PS-1.2, 4-PS-1.4)

Supporting Content PS3.D: Energy in Chemical Processes and Everyday Life

- The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS-1.4)

Supporting Content ETS1.A: Defining Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (4-PS-1.4)

Further Explanation: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.

Assessment Limit: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.

4-PS-2 - Waves

<u>**4-PS-2.1**</u> Students who demonstrate understanding can:
Develop a model of a simple mechanical wave to describe patterns of amplitude and wavelength and that waves can cause objects to move.

Supporting Content PS4.A: Wave Properties

- Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (4-PS-2.1)
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS-2.1)

Further Explanation: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.

Assessment Limit: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.

<u>**4-PS-2.2**</u> Students who demonstrate understanding can:
Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

Supporting Content PS4.B: Electromagnetic Radiation

- An object can be seen when light reflected from its surface enters the eyes. (4-PS-2.2)

Assessment Limit: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.

4-PS-2.3 Students who demonstrate understanding can:
Generate and compare multiple solutions that use patterns to transfer information.

Supporting Content PS4.C: Information Technologies and Instrumentation

- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS-2.3)

Supporting Content ETS1.C: Optimizing the Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (4-PS-2.3)

Further Explanation: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.

Life Science

4-LS-1 – Molecules to Organisms: Structure and Processes

4-LS-1.1 Students who demonstrate understanding can:
Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Supporting Content LS1.A: Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS-1.1)
- Animals have various body systems with specific functions for sustaining life: skeletal, circulatory. respiratory, muscular, digestive, etc. (4-LS-1.1)

Further Explanation: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.

Assessment Limit: Assessment is limited to macroscopic structures within plant and animal systems.

4-LS-1.2 Students who demonstrate understanding can:
Use a model to describe how animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Supporting Content LS1.D: Information Processing

- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS-1.2)

Further Explanation: Emphasis is on systems of information transfer.

Assessment Limit: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.

Earth and Space Science

4-PS-1 – Earth's Place in the Universe

4-ESS-1.1 Students who demonstrate understanding can:
Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.

Supporting Content ESS1.C: The History of Planet Earth

- Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS-1.1)
- There are three classifications of rocks produced within the rock cycle: sedimentary, metamorphic, and igneous. (4-ESS-1.1)

Further Explanation: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.

Assessment Limit: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.

4-ESS-2 – Earth's Systems

4-ESS-2.1 Students who demonstrate understanding can:
Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Supporting Content ESS2.A: Earth Materials and Systems

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS-2.1)

Supporting Content ESS2.E: Biogeology

- Living things affect the physical characteristics of their regions. Examples could include a beaver constructing a dam to create a pond or tree roots breaking a rock. (4-ESS-2.1)

Further Explanation: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.

Assessment Limit: Assessment is limited to a single form of weathering or erosion.

4-ESS-2.2 Students who demonstrate understanding can:
Analyze and interpret data from maps to describe patterns of Earth's features.

Supporting Content ESS2.B Plate Tectonics and Large-Scale System Interactions

- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS-2.2)

Further Explanation: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.

4-ESS-3 – Earth and Human Activity

4-ESS-3.1 Students who demonstrate understanding can:
Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Supporting Content ESS3.A: Natural Resources

- Energy and fuels that are modified from natural sources affect the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS-3.1)

Further Explanation: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and atomic energy. Examples of environmental effects could include biological effects from moving parts, erosion, change of habitat, and pollution.

4-ESS-3.2 Students who demonstrate understanding can:
Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Supporting Content ESS3.B: Natural Hazards

- A variety of hazards result from natural processes (e.g., earthquakes, floods, tsunamis, volcanic eruptions). Hazards cannot be eliminated, but their impacts can be reduced. (4-ESS-3.2)

Supporting Content ETS1.B: Designing Solutions to Engineering Problems

- Testing a solution involves investigating how well it performs under a range of likely conditions. (4-ESS-3.2)

Further Explanation: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.

Assessment Limit: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.

Grade 5

Physical Science

5-PS-1 – Matter and Its Interactions

5-PS-1.1 Students who demonstrate understanding can:
Develop a model to describe that matter is made of particles too small to be seen.

Supporting Content PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS-1.1)

Further Explanation: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.

Assessment Limit: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.

5-PS-1.2 Students who demonstrate understanding can:
Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

Supporting Content PS1.A: Structure and Properties of Matter

- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS-1.2)

Supporting Content PS1.B: Chemical Reactions

- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS-1.2)

Further Explanation: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.

Assessment Limit: Assessment does not include distinguishing mass and weight.

5-PS-1.3 Students who demonstrate understanding can:
Make observations and measurements to identify materials based on their properties.

Supporting Content PS1.A: Structure and Properties of Matter

- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS-1.3)

Further Explanation: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.

Assessment Limit: Assessment does not include density or distinguishing mass and weight.

5-PS-1.4 Students who demonstrate understanding can:
Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Supporting Content PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS-1.4)

5-PS-2 – Motion and Stability: Forces and Interactions

5-PS-2.1 Students who demonstrate understanding can:
Support an argument that Earth's gravitational force exerted on objects is directed downward.

Supporting Content PS2.B: Types of Interactions

- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS-2.1)

Further Explanation: "Downward" is a local description of the direction that points toward the center of the spherical Earth. Examples could include reasoning that since an object that is initially stationary when held moves downward when it is released, there must be a force (gravity) acting on the object that pulls the object toward the center of Earth.

Assessment Limit: Assessment does not include mathematical representation of gravitational force.

5-PS-3 - Energy

5-PS-3.1 Students who demonstrate understanding can:
Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

Supporting Content PS3.D: Energy in Chemical Processes and Everyday Life

- The energy released from food was once energy from the sun. The energy was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS-3.1, *5-LS-1.1*)

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (5-PS-3.1)

Further Explanation: Examples of models could include diagrams, and flow charts.

Life Science

5-LS-1 – Molecules to Organisms: Structure and Processes

5-LS-1.1 Students who demonstrate understanding can:
Support an argument that plants get what they need for growth chiefly from air, water, and energy from the sun.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants acquire their material for growth chiefly from air and water. (5-LS-1.1)

Supporting Content PS3.D: Energy in Chemical Processes and Everyday Life

- The energy released from food was once energy from the sun. ~~that~~ the energy was captured by plants in the chemical process that forms plant matter (from air and water). (5-LS-1.1, *5-PS-3.1*)

Further Explanation: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.

5-LS-2 – Biological Adaptation: Unity and Diversity

5-LS-2.1 Students who demonstrate understanding can:
Analyze and interpret data from fossils to provide evidence of the types of organisms and the environments that existed long ago and compare those to living organisms and their environments.

Supporting Content LS4.A: Evidence of Common Ancestry and Diversity

- Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (5-LS-2.1)
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (5-LS-2.1)

Further Explanation: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.

Assessment Limit: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.

5-LS-2.2 Students who demonstrate understanding can:
Construct an argument with evidence for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

Supporting Content LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing (5-LS-2.2)

Supporting Content LS4.D: Biodiversity

- Populations of animals are classified by their characteristics. (5-LS-2.2)

Further Explanation: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.

<u>**5-LS-2.3**</u> Students who demonstrate understanding can:
Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals living there may change.

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (5-LS-2.3)

Supporting Content LS4.D: Biodiversity

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (5-LS-2.3)

Further Explanation: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.

Assessment Limit: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.

<u>**5-LS-2.4**</u> Students who demonstrate understanding can:
Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS-2.4)

Supporting Content LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Matter cycles between the air and soil, and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS-2.4)

Further Explanation: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.

Assessment Limit: Assessment does not include molecular explanations.

Earth and Space Science

5-ESS-1 – Earth's Place in the Universe

<u>**5-ESS-1.1**</u> Students who demonstrate understanding can:
Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.

Supporting Content ESS1.A: The Universe and Its Stars

- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS-1.1)

Assessment Limit: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, or stage).

<u>**5-ESS-1.2**</u> Students who demonstrate understanding can:
Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Supporting Content ESS1.B: Earth and the Solar System

- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS-1.2)

Further Explanation: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.

Assessment Limit: Assessment does not include causes of seasons.

5-ESS-2 – Earth's Systems

<u>**5-ESS-2.1**</u> Students who demonstrate understanding can:
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Supporting Content ESS2.A Earth Materials and Systems

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS-2.1)

Further Explanation: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.

Assessment Limit: Assessment is limited to the interactions of two systems at a time.

5-ESS-2.2 Students who demonstrate understanding can:
Describe and graph the relative amounts of fresh and salt water in various reservoirs, to interpret and analyze the distribution of water on Earth.

Supporting Content ESS2.C: The Roles of Water in Earth's Processes

- Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS-2.2)

Assessment Limit: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.

5-ESS-3 – Earth and Human Activity

5-ESS-3.1 Students who demonstrate understanding can:
Obtain and combine information about ways communities protect Earth's resources and environment using scientific ideas.

Supporting Content ESS3.C: Human Influences on Earth Systems

- Human activities in agriculture, industry, and everyday life have effects on the land, vegetation, streams, ocean, air, and even outer space. Individuals and communities can often mitigate these effects through innovation and technology. (5-ESS-3.1)

Middle School

Physical Science

MS-PS-1 – Matter and Its Interactions

MS-PS-1.1 Students who demonstrate understanding can:
Develop models to describe the atomic composition of simple molecules.

Supporting Content PS1.A: Structure and Properties of Matter

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS-1.1)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.q., crystals). (MS-PS-1.1)

Further Explanation: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of models could include drawings, 3D ball and stick structures, or computer representations.

Assessment Limit: Assessment does not include valence electrons and bonding energy, the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.

MS-PS-1.2 Students who demonstrate understanding can:
Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Supporting Content PS1.A: Structure and Properties of Matter

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS-1.2, MS-PS-1.3)

Supporting Content PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS-1.2, MS-PS-1.3, MS-PS-1.5)

Further Explanation: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.

Assessment Limit: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.

<u>**MS-PS-1.3**</u> Students who demonstrate understanding can:
Construct a scientific explanation, based on evidence, to describe that synthetic materials come from natural resources.

Supporting Content PS1.A: Structure and Properties of Matter

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS-1.2, MS-PS-1.3)

Supporting Content PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS-1.2, MS-PS-1.3, MS-PS-1.5)

Further Explanation: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, plastics, and alternative fuels.

Assessment Limit: Assessment is limited to qualitative information.

<u>**MS-PS-1.4**</u> Students who demonstrate understanding can:
Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Supporting Content PS1.A: Structure and Properties of Matter

- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS-1.4)
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS-1.4)
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS-1.4)

Supporting Content PS3.A: Definitions of Energy

- The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (MS-PS-1.4)
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (MS-PS-1.4)

Further Explanation: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.

MS-PS-1.5 Students who demonstrate understanding can:
Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

Supporting Content PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS-1.2, MS-PS-1.3, MS-PS-1.5)
- The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS-1.5)

Further Explanation: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.

Assessment Limit: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.

MS-PS-1.6 Students who demonstrate understanding can:
Undertake a design project to construct, test, and/or modify a device that either releases or absorbs thermal energy by chemical processes.

Supporting Content PS1.B: Chemical Reactions

- Some chemical reactions release energy, others store energy. (MS-PS-1.6)

Supporting Content ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results in order to improve it. (MS-PS-1.6)

Supporting Content ETS1.C: Developing Possible Solutions

- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process - that is, some of the characteristics may be incorporated into the new design. (MS-PS-1.6)
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-PS-1.6)

Further Explanation: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride (i.e., hand-warmers).

Assessment Limit: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.

MS-PS-2 – Motion and Stability: Forces and Interactions

<u>MS-PS-2.1</u> Students who demonstrate understanding can:
Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

Supporting Content PS2.A: Forces and Motion

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS-2.1)

Further Explanation: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.

Assessment Limit: Assessment is limited to vertical or horizontal interactions in one dimension.

<u>MS-PS-2.2</u> Students who demonstrate understanding can:
Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

Supporting Content PS2.A: Forces and Motion

- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS-2.2)
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS-2.2)

Further Explanation: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.

Assessment Limit: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to changes in one variable at a time. Assessment does not include the use of trigonometry.

<u>MS-PS-2.3</u> Students who demonstrate understanding can:
Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

Supporting Content PS2.B: Types of Interactions

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS-2.3)

Further Explanation: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.

Assessment Limit: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.

MS-PS-2.4 Students who demonstrate understanding can:
Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

Supporting Content PS2.B: Types of Interactions

- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS-2.4)

Further Explanation: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.

Assessment Limit: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.

MS-PS-2.5 Students who demonstrate understanding can:
Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Supporting Content PS2.B: Types of Interactions

- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MS-PS-2.5)

Further Explanation: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.

Assessment Limit: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.

MS-PS-3 – Energy

MS-PS-3.1 Students who demonstrate understanding can:
Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

Supporting Content PS3.A: Definitions of Energy
- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS-3.1)

Further Explanation: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a whiffle ball versus a tennis ball.

MS-PS-3.2 Students who demonstrate understanding can:
Develop a model to describe the relationship between the relative positions of objects interacting at a distance and the relative potential energy in the system.

Supporting Content PS3.A: Definitions of Energy
- A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS-3.2)

Supporting Content PS3.C: Relationship Between Energy and Forces
- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS-3.2)

Further Explanation: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.

Assessment Limit: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.

MS-PS-3.3 Students who demonstrate understanding can:
Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

Supporting Content PS3.A: Definitions of Energy
- Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS-3.3, MS-PS-3.4)

Supporting Content PS3.B: Conservation of Energy and Energy Transfer
- Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS-3.3)

Supporting Content ETS1.A: Defining and Delimiting an Engineering Problem
- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (MS-PS-3.3)

Supporting Content ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (MS-PS-3.3)

Further Explanation: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.

Assessment Limit: Assessment does not include calculating the total amount of thermal energy transferred.

MS-PS-3.4 Students who demonstrate understanding can:
Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

Supporting Content PS3.A: Definitions of Energy

- Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS-3.3, MS-PS-3.4)

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS-3.4)

Further Explanation: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.

Assessment Limit: Assessment does not include calculating the total amount of thermal energy transferred.

MS-PS-3.5 Students who demonstrate understanding can:
Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS-3.5)

Further Explanation: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.

Assessment Limit: Assessment does not include calculations of energy.

MS-PS-4 – Waves

MS-PS-4.1 Students who demonstrate understanding can:
Use diagrams of a simple wave to explain that (1) a wave has a repeating pattern with a specific amplitude, frequency, and wavelength, and (2) the amplitude of a wave is related to the energy in the wave.

Supporting Content PS4.A: Wave Properties

- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS-4.1)
- Waves transfer energy. (MS-PS-4.1)

Further Explanation: Emphasis is on describing waves with both qualitative and quantitative thinking.

Assessment Limit: Assessment does not include electromagnetic waves and is limited to standard repeating waves.

MS-PS-4.2 Students who demonstrate understanding can:
Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Supporting Content PS4.A: Wave Properties

- A sound wave needs a medium through which it is transmitted. (MS-PS-4.2)

Supporting Content PS4.B: Electromagnetic Radiation

- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS-4.2)
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS-4.2)
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS-4.2)
- However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS-4.2)

Further Explanation: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.

Assessment Limit: Assessment is limited to qualitative applications pertaining to light and mechanical waves.

MS-PS-4.3 Students who demonstrate understanding can:
Present qualitative scientific and technical information to support the claim that digitized signals (0s and 1s) can be used to encode and transmit information.

Supporting Content PS4.C: Information Technologies and Instrumentation

- Digitized signals (sent as wave pulses) are a reliable way to encode and transmit information. (MS-PS-4.3)

Further Explanation: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in WIFI devices, and conversion of stored binary patterns to make sound or text on a computer screen.

Assessment Limit: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.

Life Science

MS-LS-1 – Molecules to Organisms: Structure and

MS-LS-1.1 Students who demonstrate understanding can:
Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

Supporting Content LS1.A: Structure and Function

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS-1.1)

Further Explanation: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.

MS-LS-1.2 Students who demonstrate understanding can:
Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Supporting Content LS1.A: Structure and Function

- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS-1.2)

Further Explanation: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. These are visible with a light microscope.

Assessment Limit: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.

MS-LS-1.3 Students who demonstrate understanding can:
Make a claim supported by evidence for how a living organism is a system of interacting subsystems composed of groups of cells.

Supporting Content LS1.A: Structure and Function

- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS-1.3)

Further Explanation: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.

Assessment Limit: Assessment does not include the mechanism of one body system independent of others. Assessment is not focused on human body systems.

MS-LS-1.4 Students who demonstrate understanding can:
Construct a scientific argument based on evidence to defend a claim of life for a specific object or organism.

Supporting Content LS1.B: Characteristics of Living Things

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (MS-LS-1.4)
- Living things share certain characteristics. (These include response to environment, reproduction, energy use, growth and development, life cycles, made of cells, etc.) (MS-LS-1.4)

Further Explanation: Examples should include both biotic and abiotic items, and should be defended using accepted characteristics of life.

Assessment Limit: Assessment does not include specific conclusions regarding the living status of viruses, or other disputed examples.

MS-LS-1.5 Students who demonstrate understanding can:
Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS-1.5)

Further Explanation: Emphasis is on tracing movement of matter and flow of energy.

Assessment Limit: Assessment does not include the biochemical mechanisms of photosynthesis.

MS-LS-1.6 Students who demonstrate understanding can:
Develop a conceptual model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as matter moves through an organism.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Within individual organisms, food moves through a series of chemical reactions (cellular respiration) in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS-1.6)

Further Explanation: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released. Also understanding that the elements in the products are the same as the elements in the reactants.

Assessment Limit: Assessment does not include details of the chemical reactions for photosynthesis or respiration.

MS-LS-2 – Ecosystems: Interactions, Energy, and Dynamics

MS-LS-2.1 Students who demonstrate understanding can:
Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS-2.1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS-2.1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS-2.1)

Further Explanation: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.

MS-LS-2.2 Students who demonstrate understanding can:
Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS-2.2)

Further Explanation: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.

MS-LS-2.3 Students who demonstrate understanding can:
Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Supporting Content LS2.B: Cycling of Matter and Energy Transfer in Ecosystems

- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS-2.3)

Further Explanation: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.

Assessment Limit: Assessment does not include the use of chemical reactions to describe the processes.

<u>MS-LS-2.4</u> Students who demonstrate understanding can:
Develop a model to describe the flow of energy through the trophic levels of an ecosystem.

Supporting Content LS2.B: Cycling of Matter and Energy Transfer in Ecosystems

- Food webs can be broken down into multiple energy pyramids. Concepts should include the 10% rule of energy and biomass transfer between trophic levels and the environment. (MS-LS-2.4)

Further Explanation: Emphasis is on describing the transfer of mass and energy beginning with producers, moving to primary and secondary consumers, and ending with decomposers.

Assessment Limit: Assessment does not include the use of chemical reactions to describe the processes.

<u>MS-LS-2.5</u> Students who demonstrate understanding can:
Construct an argument supported by evidence that changes to physical or biological components of an ecosystem affect populations.

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS-2.5)

Further Explanation: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

<u>MS-LS-2.6</u> Students who demonstrate understanding can:
Design and evaluate solutions for maintaining biodiversity and ecosystem services.

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS-2.6)

Supporting Content LS4.D: Biodiversity

- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (MS-LS-2.6)

Supporting Content ETS1.B: Developing Possible Solutions

- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-LS-2.6)

Further Explanation: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.

MS-LS-3 – Heredity: Inheritance and Variation of Traits

MS-LS-3.1 Students who demonstrate understanding can:
Develop and use a model to describe why mutations may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

Supporting Content LS3.A: Inheritance of Traits

- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Structural changes to genes (mutations) can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS-3.1)

Supporting Content LS3.B: Variation of Traits

- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in significant changes to the structure and function of proteins. Changes can be beneficial, harmful, or neutral to the organism. (MS-LS-3.1)

Further Explanation: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.

Assessment Limit: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.

MS-LS-3.2 Students who demonstrate understanding can:
Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Supporting Content LS1.B: Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (MS-LS-3.2)

Supporting Content LS3.A: Inheritance of Traits

- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS-3.2)

Supporting Content LS3.B: Variation of Traits

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS-3.2)

Further Explanation: Emphasis is on using models such as simple Punnett squares and pedigrees, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.

MS-LS-4 – Biological Adaptation: Unity and Diversity

MS-LS-4.1 Students who demonstrate understanding can:
Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

Supporting Content LS4.A: Classification of Organisms

- The collection of fossils and their placement in chronological order is known as the fossil record and documents the change of many life forms throughout the history of the Earth. Anatomical similarities and differences between various organisms living today and between living and once living organisms in the fossil record enable the classification of living things. (MS-LS-4.1, MS-LS-4.2)

Further Explanation: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.

Assessment Limit: Assessment does not include the names of individual species or geological eras in the fossil record.

MS-LS-4.2 Students who demonstrate understanding can:
Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer relationships.

Supporting Content LS4.A: Classification of Organisms

- The collection of fossils and their placement in chronological order is known as the fossil record and documents the change of many life forms throughout the history of the Earth. Anatomical similarities and differences between various organisms living today and between living and once living organisms in the fossil record enable the classification of living things. (MS-LS-4.1, MS-LS-4.2)

Further Explanation: Emphasis is on explanations of the relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.

MS-LS-4.3 Students who demonstrate understanding can:
Analyze visual evidence to compare patterns of similarities in the anatomical structures across multiple species of similar classification levels to identify relationships.

Supporting Content LS4.A: Classification of Organisms

- Scientific genus and species level names indicate a degree of relationship. (MS-LS-4.3)

Further Explanation: Emphasis is on inferring general patterns of relatedness among structures of different organisms by comparing diagrams, pictures, specimens, or fossils.

Assessment Limit: Assessment of comparisons is limited to gross appearance of anatomical structures within genus and species levels. No memorization of classification levels is required.

<u>**MS-LS-4.4**</u> Students who demonstrate understanding can:
Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

Supporting Content LS4.B: Natural Selection

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS-4.4)

Further Explanation: Emphasis is on using concepts of natural selection including overproduction of offspring, passage of time, variation in a population, selection of favorable traits, and heritability of traits.

<u>**MS-LS-4.5**</u> Students who demonstrate understanding can:
Obtain, evaluate, and communicate information about how technologies allow humans to influence the inheritance of desired traits in organisms.

Supporting Content LS4.B: Natural Selection

- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed to offspring. (MS-LS-4.5)

Further Explanation: Emphasis is on identifying and communicating information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the influence these technologies have on society as well as the technologies leading to these scientific discoveries.

<u>**MS-LS-4.6**</u> Students who demonstrate understanding can:
Use mathematical models to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Supporting Content LS4.C: Adaptation

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS-4.6)

Further Explanation: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time. Examples could include Peppered Moth population changes before and after the industrial revolution.

Assessment Limit: Assessment does not include Hardy-Weinberg calculations.

Earth and Space Science

MS-ESS-1 – Earth's Place in the Universe

MS-ESS-1.1 Students who demonstrate understanding can:
Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Supporting Content ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS-1.1)

Supporting Content ESS1.B: Earth and the Solar System

- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS-1.1)

Further Explanation: Examples of models can be physical, graphical, or conceptual.

Assessment Limit: Assessment does not include recalling lunar phases.

MS-ESS-1.2 Students who demonstrate understanding can:
Develop and use a model to describe the role of gravity in the orbital motions within galaxies and the solar system.

Supporting Content ESS1.A: The Universe and Its Stars

- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS-1.2)

Supporting Content ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS-1.2, MS-ESS-1.3)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS-1.2)

Further Explanation: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).

Assessment Limit: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.

<u>**MS-ESS-1.3**</u> Students who demonstrate understanding can:
Analyze and interpret data to determine scale properties of objects in the solar system.

Supporting Content ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS-1.2, MS-ESS-1.3)

Further Explanation: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects, such as relative size, distance, motions, and features. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.

Assessment Limit: Assessment does not include recalling facts about properties of the planets and other solar system bodies.

<u>**MS-ESS-1.4**</u> Students who demonstrate understanding can:
Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to analyze Earth's history.

Supporting Content ESS1.C: The History of Planet Earth

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS-1.4)

Further Explanation: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or large volcanic eruptions.

Assessment Limit: Assessment does not include recalling the names of specific eons, eras, periods or epochs and events within them.

MS-ESS-2 – Earth's Systems

MS-ESS-2.1 Students who demonstrate understanding can:
Develop a model to describe the cycling of Earth's materials and the internal and external flows of energy that drive the rock cycle processes.

Supporting Content ESS2.A: Earth's Materials and Systems

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS-2.1)

Further Explanation: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.

Assessment Limit: Assessment does not include the identification and naming of minerals.

MS-ESS-2.2 Students who demonstrate understanding can:
Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Supporting Content ESS2.A: Earth's Materials and Systems

- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS-2.2)

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS-2.2)

Further Explanation: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.

Assessment Limit: Assessment does not include memorization of the formation of specific geographic features of Earth's surface, or the geochemical processes involved in the formation.

MS-ESS-2.3 Students who demonstrate understanding can:
Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

Supporting Content ESS1.C: The History of Planet Earth

- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (MS-ESS-2.3)

Supporting Content ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS-2.3)

Further Explanation: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches). Examples of concepts include continental drift and seafloor spreading.

Assessment Limit: Assessment of plate tectonics should be limited to large-scale system interactions. Paleomagnetic anomalies in oceanic and continental crust are not assessed.

MS-ESS-2.4 Students who demonstrate understanding can:
Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation, crystallization, percolation, and precipitation, as well as downhill flows on land. (MS-ESS-2.4)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS-2.4)

Further Explanation: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.

Assessment Limit: Assessment includes qualitative energy flows, not quantitative energy calculations.

MS-ESS-2.5 Students who demonstrate understanding can:
Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS-2.5)

Supporting Content ESS2.D: Weather and Climate

- Because these patterns are so complex, weather can only be predicted using probability. (MS-ESS-2.5)

Further Explanation: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students or obtained through laboratory experiments (such as with condensation and the use of barometers).

Assessment Limit: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.

<u>**MS-ESS-2.6**</u> Students who demonstrate understanding can:
Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS-2.6)

Supporting Content ESS2.D: Weather and Climate

- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS-2.6)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS-2.6)

Further Explanation: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight- driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.

Assessment Limit: Assessment does not include the dynamics of the Coriolis effect, or recalling names and locations of specific biomes.

MS-ESS-3 – Earth and Human Activity

MS-ESS-3.1 Students who demonstrate understanding can:
Construct a scientific explanation based on evidence for how Earth's mineral, energy, and groundwater resources are unevenly distributed as a result of past and current geologic processes.

Supporting Content ESS3.A: Natural Resources

- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS-3.1)

Further Explanation: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are changing as a result of depletion. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).

MS-ESS-3.2 Students who demonstrate understanding can:
Analyze and interpret data on natural hazards to forecast future catastrophic events to mitigate their effects.

Supporting Content ESS3.B: Natural Hazards

- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS-3.2)

Further Explanation: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions. Others, such as earthquakes, occur suddenly, and are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of mitigation strategies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).

MS-ESS-3.3 Students who demonstrate understanding can:
Apply scientific practices to design a method for monitoring human activity and increasing beneficial human influences on the environment.

Supporting Content ESS3.C: Human Influences on Earth Systems

- Human activities can positively and negatively influence the biosphere, sometimes altering natural habitats and ecosystems. (MS-ESS-3.3)
- Technology and engineering can potentially help us best manage natural resources as populations increase. (MS-ESS-3.3, MS-ESS-3.4)

Further Explanation: Examples of the design process include examining human interactions and designing feasible solutions that promote stewardship. Examples can include water usage (such as stream and river use, aquifer recharge, or dams and levee construction), land usage (such as urban development, agriculture, wetland benefits, stream reclamation, or fire restoration), and pollution (such as of the air, water, or land).

MS-ESS-3.4 Students who demonstrate understanding can:
Construct an argument based on evidence for how changes in human population and per-capita consumption of natural resources positively and negatively affect Earth's systems.

Supporting Content ESS3.C: Human Influences on Earth Systems

- Technology and engineering can potentially help us best manage natural resources as populations increase. (MS-ESS-3.3, MS-ESS-3.4)

Further Explanation: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of effects can include changes made to the appearance, composition, and structure of Earth's systems as well as the rates at which they change

MS-ESS-3.5 Students who demonstrate understanding can:
Ask questions to interpret evidence of the factors that cause climate variability throughout Earth's history.

Supporting Content ESS3.C: Human Influences on Earth Systems

- Current scientific models indicate that human activities, such as the release of greenhouse gases from fossil fuel combustion, can contribute to the present-day measured rise in Earth's mean surface temperature. Natural activities, such as changes in incoming solar radiation, also contribute to changing global temperatures. (MS-ESS-3.5)

Further Explanation: Examples of factors include human activities (such as fossil fuel combustion and changes in land use) and natural processes (such as changes in incoming solar radiation and volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and natural resource use.

High School

Life Science

HS-LS-1 – Molecules to Organisms: Structure and Processes

HS-LS-1.1 Students who demonstrate understanding can:
Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Supporting Content LS1.A: Structure and Function

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS-1.1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS-1.1, HS-LS-3.1)

Further Explanation: Emphasis is on the structure of the double helix, the pairing and sequencing of the nitrogenous bases, transcription, translation, and protein synthesis.

Assessment Limit: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.

HS-LS-1.2 Students who demonstrate understanding can:
Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Supporting Content LS1.A: Structure and Function

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS-1.2)

Further Explanation: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.

Assessment Limit: Assessment does not include interactions and functions at the molecular or chemical reaction level.

HS-LS-1.3 Students who demonstrate understanding can:
Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Supporting Content LS1.A: Structure and Function

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS-1.3)

Further Explanation: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.

Assessment Limit: Assessment does not include the cellular processes involved in the feedback mechanism.

<u>**HS-LS-1.4**</u> Students who demonstrate understanding can:
Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Supporting Content LS1.B: Growth and Development of Organisms

- In multicellular organisms, individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS-1.4)

Assessment Limit: Assessment does not include specific gene control mechanisms.

<u>**HS-LS-1.5**</u> Students who demonstrate understanding can:
Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS-1.5)

Further Explanation: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.

Assessment Limit: Assessment does not include specific biochemical steps.

<u>**HS-LS-1.6**</u> Students who demonstrate understanding can:
Construct an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- Sugar molecules contain carbon, hydrogen, and oxygen: their hydrocarbon backbones combined with nitrogen, sulfur and/or phosphorous are used to make monomers (amino acids) and other carbon-based molecules that can be assembled into larger macromolecules (such as proteins or DNA), used for example to form new cells. (HS-LS-1.6)
- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS-1.6, HS-LS-1.7)

Further Explanation: Emphasis is on using evidence from models and simulations to support explanations.

Assessment Limit: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.

<u>**HS-LS-1.7**</u> Students who demonstrate understanding can:
Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Supporting Content LS1.C: Organization for Matter and Energy Flow in Organisms

- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS-1.6, HS-LS-1.7)
- As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken, and new compounds are formed that can transport energy to cells. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (HS-LS-1.7)

Further Explanation: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.

Assessment Limit: Assessment should not include identification of the steps or specific processes involved in cellular respiration.

HS-LS-2 – Ecosystems: Interactions, Energy, and Dynamics

HS-LS-2.1 Students who demonstrate understanding can:
Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS-2.1, HS-LS-2.2)

Further Explanation: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.

Assessment Limit: Assessment does not include deriving mathematical equations to make comparisons.

HS-LS-2.2 Students who demonstrate understanding can:
Use mathematical representations to support explanations that biotic and abiotic factors affect biodiversity at different scales within an ecosystem.

Supporting Content LS2.A: Interdependent Relationships in Ecosystems

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS-2.1, HS-LS-2.2)

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS-2.2, HS-LS-2.5)

Further Explanation: Emphasis is on genetic diversity within a population and species diversity within an ecosystem. Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.

Assessment Limit: Assessment is limited to provided data.

<u>**HS-LS-2.3**</u> Students who demonstrate understanding can:
Construct an explanation using mathematical representations to support claims for the flow of energy through trophic levels and the cycling of matter in an ecosystem.

Supporting Content LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS-2.3, HS-LS-2.4)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS-2.3)

Further Explanation: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.

Assessment Limit: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.

<u>**HS-LS-2.4**</u> Students who demonstrate understanding can:
Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Supporting Content LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS-2.4)
- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS-2.3, HS-LS-2.4)

Further Explanation: Examples of models could include simulations and mathematical models.

Assessment Limit: Assessment does not include the specific chemical steps of photosynthesis and respiration.

HS-LS-2.5 Students who demonstrate understanding can:
Evaluate the claims, evidence, and reasoning that changing the conditions of a static ecosystem may result in a new ecosystem.

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS-2.2, HS-LS-2.5)

Further Explanation: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.

HS-LS-2.6 Students who demonstrate understanding can:
Design, evaluate, and/or refine practices used to manage a natural resource based on direct and indirect influences of human activities on biodiversity and ecosystem health.

Supporting Content LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Changes in the environment, including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate variability, can disrupt an ecosystem and threaten the survival of some species. (HS-LS-2.6)

Supporting Content LS4.C: Adaptation

- Changes in the physical environment, have contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline or possible extinction of some species. (HS-LS-2.6, HS-LS-4.5)

Supporting Content LS4.D: Biodiversity

- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (LS2-HS-6)
- Sustaining ecosystem health and biodiversity is essential to support and enhance life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational, cultural, or inspirational value. Humans depend on the living world for the resources and other benefits provided by biodiversity. Effects on biodiversity can be mitigated through actions such as habitat conservation, reclamation practices, wildlife management, and invasive species control. Understanding the effects of population growth, wildfire, pollution, and climate variability on changes in biodiversity could help maintain the integrity of biological systems. (HS-LS-2.6)

Supporting Content ESS3.A: Natural Resources

- Resource availability has guided the development of human society. (HS-LS-2.6, *HS-ESS-3.1*)

Supporting Content ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, environmental, and cultural, impacts. (HS-LS-2.6)

Further Explanation: Emphasis is on how natural resources such as forests, waterways, and land are managed in ways that minimize harm to biodiversity and ecosystem health and activities that can improve and or maintain existing health of ecosystems.

<u>**HS-LS-2.7**</u> Students who demonstrate understanding can:
Evaluate the evidence for the role of group behavior on individual and species' ability to survive and reproduce.

Supporting Content LS2.D: Social Interactions and Group Behavior

- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives, gene pool. (HS-LS-2.7)

Further Explanation: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.

HS-LS-3 – Heredity: Inheritance and Variation of Traits

HS-LS-3.1 Students who demonstrate understanding can:
Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Supporting Content LS1.A: Structure and Function
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS-1.1, HS-LS-3.1)

Supporting Content LS2.A: Inheritance of Traits
- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS-3.1)

Assessment Limit: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.

HS-LS-3.2 Students who demonstrate understanding can:
Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Supporting Content LS3.B: Variation of Traits
- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis, thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS-3.2)
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus, the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS-3.2, HS-LS-3.3)

Further Explanation: Emphasis is on using data to support claims about the way variation occurs.

Assessment Limit: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.

HS-LS-3.3 Students who demonstrate understanding can:
Apply concepts of probability and statistical analysis to explain the variation and distribution of expressed traits in a population.

Supporting Content LS3.B: Variation of Traits
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus, the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS-3.2, HS-LS-3.3)

Further Explanation: Emphasis is on the use of mathematics to describe the probability of traits (alleles) as it relates to genetic and environmental factors in the expression of traits.

Assessment Limit: Assessment does not include Hardy-Weinberg calculations.

HS-LS-4 – Biological Adaptation: Unity and Diversity

HS-LS-4.1 Students who demonstrate understanding can:
Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Supporting Content LS4.A: Evidence of Common Ancestry and Diversity

- Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information can be derived from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS-4.1)

Further Explanation: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.

HS-LS-4.2 Students who demonstrate understanding can:
Construct an explanation based on evidence that the process of evolution, through the mechanism of natural selection, primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Supporting Content LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS-4.2, HS-LS-4.3)

Supporting Content LS4.C: Adaptation

- Evolution is a consequence of the interaction of four factors of natural selection: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS-4.2)

Further Explanation: Emphasis is on using evidence to explain the influence each of the four factors has on the number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.

Assessment Limit: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.

HS-LS-4.3 Students who demonstrate understanding can:
Apply concepts of probability and statistical analysis to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

Supporting Content LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS-4.2, HS-LS-4.3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS-4.3)

Supporting Content LS4.C: Adaptation

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS-4.3, HS-LS-4.4)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS-4.3)

Further Explanation: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.

Assessment Limit: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.

HS-LS-4.4 Students who demonstrate understanding can:
Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

Supporting Content LS4.C: Adaptation

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. The differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS-4.3, HS-LS-4.4)

Further Explanation: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.

HS-LS-4.5 Students who demonstrate understanding can:
Evaluate models that demonstrate how changes in an environment may result in the evolution of a population of a given species, the emergence of new species over generations, or the extinction of other species due to the processes of genetic drift, gene flow, mutation, and natural selection.

Supporting Content LS4.C: Adaptation

- Changes in the physical environment, have contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline or possible extinction of some species. (HS-LS-2.6, HS-LS-4.5)
- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS-4.5)

Further Explanation: Emphasis is on determining cause and effect relationships for how changes to the environment such as drought, flood, fire, deforestation, overfishing, application of fertilizers and pesticides, and the rate of change of the environment affect distribution or disappearance of traits in species.

Physical Science – Chemistry

HS-PSC-1 – Structure and Properties of Matter

HS-PSC-1.1 Students who demonstrate understanding can:
Develop models to describe the atomic composition of simple molecules and extended structures.

Supporting Content PS1.A: Structure and Properties of Matter
- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (HS-PSC-1.1)

Further Explanation: Emphasis is on reviewing how to develop models of molecules that vary in complexity. This should build on the similar middle school standard (PS1- MS-1). Students should be able to determine valence electrons for representative elements. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of models could include drawings, 3D ball and stick structures, or computer representations

Assessment Limit: Students will be provided with the names of the elements, a list of common ions, a list of numerical prefixes and their meanings, and the charges of all cations and anions.

HS-PSC-1.2 Students who demonstrate understanding can:
Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

Supporting Content PS1.A: Structure and Properties of Matter
- Each atom has a substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PSC-1.2)
- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect outermost electron states. (HS-PSC-1.2)

Further Explanation: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.

Assessment Limit: Assessment is limited to main group elements. Assessment is limited to relative trends in reactivity, valence electrons, atomic and ionic radius, electronegativity, ionization energy, shielding effect, and common oxidation number.

<u>HS-PSC-1.3</u> Students who demonstrate understanding can:
Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrostatic forces between particles.

Supporting Content PS1.A: Structure and Properties of Matter

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PSC-1.3, HS-PSC-1.5)

Supporting Content PS2.B: Types of Interactions

- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties (physical and chemical), and transformations of matter, as well as the contact forces between material objects. (HS-PSC-1.3, HS-PSC-1.5, *HS-PSP-1.6*)

Further Explanation: Emphasis is on understanding the strengths of forces between particles. Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.

Assessment Limit: Assessment does not include naming specific intermolecular forces (such as dipole-dipole). Assessment will be limited to quantitative calculations of melting and boiling points only.

<u>HS-PSC-1.4</u> Students who demonstrate understanding can:
Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and the various modes of radioactive decay.

Supporting Content PS1.C: Nuclear Processes

- Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HS-PSC-1.4)

Further Explanation: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.

Assessment Limit: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma modes of radioactive decay.

<u>HS-PSC-1.5</u> Students who demonstrate understanding can:
Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Supporting Content PS1.A: Structure and Properties of Matter

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PSC-1.3, HS-PSC-1.5)

Supporting Content PS2.B: Types of Interactions

- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties (physical and chemical), and transformations of matter, as well as the contact forces between material objects. (HS-PSC-1.3, HS-PSC-1.5, *HS-PSP-1.6*)

Further Explanation: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.

Assessment Limit: Assessment is limited to provided molecular structures of specific designed materials. For questions involving polar vs. nonpolar bonds, item distractors containing ionic bonds may not be used. Electronegativity differences of < 0.5 should be used for nonpolar covalent bonds. Electronegativity differences of 0.5 – 1.7 should be used for polar covalent bonds.

HS-PSC-2 – Chemical Reactions

HS-PSC-2.1 Students who demonstrate understanding can:
Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

Supporting Content PS1.A: Structure and Properties of Matter

- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar physical and chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PSC-2.1)

Supporting Content PS1.B: Chemical Reactions

- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PSC-2.1, HS-PSC-2.4)

Further Explanation: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.

Assessment Limit: Assessment is limited to synthesis, decomposition, single replacement/displacement, double replacement/displacement, including neutralization, and combustion reactions. Predict the products of double replacement, single replacement, and combustion reactions only. Assessment excludes writing formulas or names of acids and hydrocarbons.

HS-PSC-2.2 Students who demonstrate understanding can:
Develop a model to illustrate that the energy transferred during an exothermic or endothermic chemical reaction is based on the bond energy difference between bonds broken (absorption of energy) and bonds formed (release of energy).

Supporting Content PS1.A: Structure and Properties of Matter

- A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (HS-PSC-2.2)

Supporting Content PS1.B: Chemical Reactions

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PSC-2.2, HS-PSC-2.3)

Further Explanation: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.

Assessment Limit: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.

HS-PSC-2.3 Students who demonstrate understanding can:
Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

Supporting Content PS1.B: Chemical Reactions

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PSC-2.2, HS-PSC-2.3)

Further Explanation: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.

Assessment Limit: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.

HS-PSC-2.4 Students who demonstrate understanding can:
Use mathematical representations to support the claim that the number and type of atoms, and therefore mass, are conserved during a chemical reaction.

Supporting Content PS1.B: Chemical Reactions

- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PSC-2.1, HS-PSC-2.4)

Further Explanation: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.

Assessment Limit: Conversion problems will be one to two steps (e.g., grams to moles to atoms/molecules). Compounds and formulas should be provided in the stem of the question. Students should be given molecular masses in problems involving gram to other unit conversions. Molar mass calculations should not be combined with conversion problems. All volumes must be at standard temperature and pressure (STP). A balanced equation and molar masses should be included in the item. Calculations may include grams/moles/volume of reactant to grams/moles/volume of product.

HS-PSC-3 – Energy

HS-PSC-3.1 Students who demonstrate understanding can:
Ask questions to clarify the idea that electromagnetic radiation can be described either by a wave model or a particle model.

Supporting Content PS4.B: Electromagnetic Radiation

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (HS-PSC-3.1)

Further Explanation: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include interference, diffraction, and photoelectric effect.

Assessment Limit: Assessment does not include using quantum theory.

HS-PSC-3.2 Students who demonstrate understanding can:
Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

Supporting Content PS3.A: Definitions of Energy

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PSC-3.2, HS-PSC-3.3)

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (HS-PSC-3.2)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PSC-3.2 HS-PSC-3.5)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g., relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (HS-PSC-3.2)
- The availability of energy limits what can occur in any system. (HS-PSC-3.2)

Further Explanation: Emphasis is on explaining the meaning of mathematical expressions used in the model.

Assessment Limit: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields. Two temperatures (initial and final), a temperature-time graph, or an enthalpy diagram must be provided.

HS-PSC-3.3 Students who demonstrate understanding can:
Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

Supporting Content PS3.A: Definitions of Energy

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PSC-3.2, HS-PSC-3.3)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PSC-3.3, HS-PSC-3.4)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases, the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (HS-PSC-3.3)

Further Explanation: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.

HS-PSC-3.4* Students who demonstrate understanding can:
Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. ---OPTIONAL

Supporting Content PS3.A: Definitions of Energy

- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PSC-3.3, HS-PSC-3.4)

Supporting Content PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surroundings. (HS-PSC-3.4, HS-PSC-3.5)

Further Explanation: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include calorimeters, heat and cold packs, solar cells, solar ovens, and electrochemical cells. Examples of constraints could include use of renewable energy forms and efficiency.

Assessment Limit: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.

<u>**HS-PSC-3.5**</u> Students who demonstrate understanding can:

Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PSC-3.2 HS-PSC-3.5)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS-PSC-3.5)

Supporting Content PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surroundings. (HS-PSC-3.4, HS-PSC-3.5)

Further Explanation: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually (endothermic/exothermic). Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.

Assessment Limit: For items involving specific heat, provide the equation $Q = mCp\Delta T$ and specific heats. Include the melting and boiling points of water. Limit calculations to changes that do not involve a change of state. Perform gram to mole and mole to ΔH calculations. Use joules as a unit of measure, as opposed to calories.

Physical Science – Physics

HS-PSP-1 – Motion and Stability: Forces and Interactions

<u>**HS-PSP-1.1**</u> Students who demonstrate understanding can:
Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

Supporting Content PS2.A: Forces and Motion

- Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS-PSP-1.1)

Further Explanation: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.

Assessment Limit: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.

<u>**HS-PSP-1.2**</u> Students who demonstrate understanding can:
Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

Supporting Content PS2.A: Forces and Motion

- Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (HS-PSP-1.2)
- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PSP-1.2, HS-PSP-1.3)

Further Explanation: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle (Newton's first law).

Assessment Limit: Assessment is limited to systems of two macroscopic bodies moving in one dimension.

<u>**HS-PSP-1.3**</u> Students who demonstrate understanding can:
Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

Supporting Content PS2.A: Forces and Motion

- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PSP-1.2, HS-PSP-1.3)

Supporting Content ETS1.A: Defining and Delimiting an Engineering Problem

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-PSP-1.3)

Supporting Content ETS1.C: Optimizing the Design Solution

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-PSP-1.3)

Further Explanation: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.

Assessment Limit: Assessment is limited to qualitative evaluations and/or algebraic manipulations.

<u>**HS-PSP-1.4**</u> Students who demonstrate understanding can:
Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

Supporting Content PS2.B: Types of Interactions

- Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PSP-1.4)
- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PSP-1.4, HS-PSP-1.5)

Further Explanation: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.

Assessment Limit: Assessment is limited to systems with two objects. Base equations will be provided.

<u>HS-PSP-1.5</u> Students who demonstrate understanding can:
Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

Supporting Content PS2.B: Types of Interactions

- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PSP-1.4, HS-PSP-1.5)

Supporting Content PS3.A: Definitions of Energy

- "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. (HS-PSP-1.5)

Assessment Limit: Assessment is limited to designing and conducting investigations with provided materials and tools.

<u>HS-PSP-1.6</u> Students who demonstrate understanding can:
Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Supporting Content PS1.A: Structure and Properties of Matter

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PSP-1.6)

Supporting Content PS2.B: Types of Interactions

- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PSP-1.6, *HS-PSC-1.3, HS-PSC-1.5*)

Further Explanation: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.

Assessment Limit: Assessment is limited to provided molecular structures of specific designed materials.

HS-PSP-2 – Energy

HS-PSP-2.1 Students who demonstrate understanding can:
Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

Supporting Content PS3.AL Definitions of Energy

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PSP-2.1, HS-PSP-2.2)

Supporting Content PS3.B: Conservation of Energy and Energy Transfer

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (HS-PSP-2.1)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PSP-2.1, HS-PSP-2.4)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g., relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (HS-PSP-2.1)
- The availability of energy limits what can occur in any system. (HS-PSP-2.1)

Further Explanation: Emphasis is on explaining the meaning of mathematical expressions used in the model.

Assessment Limit: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.

HS-PSP-2.2 Students who demonstrate understanding can:
Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

Supporting Content PS3.AL Definitions of Energy

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PSP-2.1, HS-PSP-2.2)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PSP-2.2, HS-PSP-2.3)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases, the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (HS-PSP-2.2)

Further Explanation: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.

<u>**HS-PSP-2.3**</u> Students who demonstrate understanding can:
Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Supporting Content PS3.AL Definitions of Energy
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PSP-2.2, HS-PSP-2.3)

Supporting Content PS3.D: Energy in Chemical Processes
- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (HS-PSP-2.3, HS-PSP-2.4)

Supporting Content ETS1.A: Defining and Delimiting an Engineering Problem
- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-PSP-2.3)

Further Explanation: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of multiple energy forms and evaluations of efficiency.

Assessment Limit: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to examples of devices provided to students.

<u>**HS-PSP-2.4**</u> Students who demonstrate understanding can:
Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Supporting Content PS3.B: Conservation of Energy and Energy Transfer
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PSP-2.1, HS-PSP-2.4)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS-PSP-2.4)

Supporting Content PS3.D: Energy in Chemical Processes
- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (HS-PSP-2.3, HS-PSP-2.4)

Further Explanation: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.

Assessment Limit: Assessment is limited to examples of closed system investigations.

HS-PSP-2.5 Students who demonstrate understanding can:
Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

Supporting Content PS3.C: Relationship Between Energy and Forces

- When two objects interacting through a field change relative position, the energy stored in the field is changed. (HS-PSP-2.5)

Further Explanation: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.

Assessment Limit: Assessment is limited to systems containing two objects.

HS-PSP-3 – Waves

HS-PSP-3.1 Students who demonstrate understanding can:
Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

Supporting Content PS4.A: Wave Properties

- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (HS-PSP-3.1)

Further Explanation: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.

Assessment Limit: Assessment is limited to algebraic relationships and describing those relationships qualitatively.

HS-PSP-3.2 Students who demonstrate understanding can:
Evaluate questions about the advantages of using digital transmission and storage of information.

Supporting Content PS4.A: Wave Properties

- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (HS-PSP-3.2, HS-PSP-3.5)

Further Explanation: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.

HS-PSP-3.3 Students who demonstrate understanding can:
Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

Supporting Content PS4.A: Wave Properties

- Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) (HS-PSP-3.3)

Supporting Content PS4.B: Electromagnetic Radiation

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (HS-PSP-3.3)

Further Explanation: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.

Assessment Limit: Assessment does not include using quantum theory.

<u>**HS-PSP-3.4**</u> Students who demonstrate understanding can:
Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

Supporting Content PS4.B: Electromagnetic Radiation

- When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (PSP3-HS-4)

Further Explanation: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.

Assessment Limit: Assessment is limited to qualitative descriptions.

<u>**HS-PSP-3.5**</u> Students who demonstrate understanding can:
Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Supporting Content PS3.D: Energy in Chemical Processes

- Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. (HS-PSP-3.5)

Supporting Content PS4.A: Wave Properties

- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (HS-PSP-3.2, HS-PSP-3.5)

Supporting Content PS4.B: Electromagnetic Radiation

- Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (HS-PSP-3.5)

Supporting Content PS4.C: Information Technologies and Instrumentation

- Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (HS-PSP-3.5)

Further Explanation: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.

Assessment Limit: Assessments are limited to qualitative information. Assessments do not include band theory.

Earth and Space Science

HS-ESS-1 – Earth's Place in the Universe

HS-ESS-1.1 Students who demonstrate understanding can:
Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

Supporting Content ESS1.A: The Universe and Its Stars

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS-1.1)

Supporting Content PS3.D: Energy in Chemical Processes and Everyday Life

- Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (HS-ESS-1.1)

Further Explanation: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.

Assessment Limit: Assessment does not include details of the atomic and subatomic processes involved with the sun's nuclear fusion.

HS-ESS-1.2 Students who demonstrate understanding can:
Construct an explanation of the current model of the origin of the universe based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

Supporting Content ESS1.A: The Universe and Its Stars

- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS-1.2, HS-ESS-1.3)
- Origin theories are supported by evidence such as observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. Other than the hydrogen and helium formed at the time of the event, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS-1.2, HS-ESS-1.3)

Supporting Content PS4.B: Electromagnetic Radiation

- Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. (HS-ESS-1.2)

Further Explanation: Emphasis is on the astronomical evidence of the redshift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the event, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the scientific model (3/4 hydrogen and 1/4 helium).

<u>**HS-ESS-1.3**</u> Students who demonstrate understanding can:
Communicate scientific ideas about the way stars, over their life cycle, transform elements.

Supporting Content ESS1.A: The Universe and Its Stars

- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS-1.2, HS-ESS-1.3)
- Origin theories are supported by evidence such as observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. Other than the hydrogen and helium formed at the time of the event, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS-1.2, HS-ESS-1.3)

Further Explanation: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.

Assessment Limit: Details of the many different nucleosynthesis pathways for stars of different masses are not assessed.

<u>**HS-ESS-1.4**</u> Students who demonstrate understanding can:
Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Supporting Content ESS1.B: Earth and the Solar System

- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (HS-ESS-1.4)

Further Explanation: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons.

Assessment Limit: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.

<u>**HS-ESS-1.5**</u> Students who demonstrate understanding can:
Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

Supporting Content ESS1.C: The History of Planet Earth

- Continental rocks are generally much older than the rocks of the ocean floor. (HS-ESS-1.5)

Supporting Content ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (HS-ESS-1.5)

Supporting Content PS1.C: Nuclear Processes

- Spontaneous radioactive decay follows a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (HS-ESS-1.5, HS-ESS-1.6)

Further Explanation: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages of oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core (a result of past plate interactions).

<u>**HS-ESS-1.6**</u> Students who demonstrate understanding can:
Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Supporting Content ESS1.C: The History of Planet Earth

- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (HS-ESS-1.6)

Supporting Content PS1.C: Nuclear Processes

- Spontaneous radioactive decay follows a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (HS-ESS-1.5, HS-ESS-1.6)

Further Explanation: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.

HS-ESS-2 – Earth's Systems

HS-ESS-2.1 Students who demonstrate understanding can:
Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

Supporting Content ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS-2.1, HS-ESS-2.2)

Supporting Content ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. (HS-ESS-2.1)

Further Explanation: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).

Assessment Limit: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.

HS-ESS-2.2 Students who demonstrate understanding can:
Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

Supporting Content ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS-2.1, HS-ESS-2.2)

Supporting Content ESS2.D: Weather and Climate

- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS-2.2, HS-ESS-2.4)

Further Explanation: Examples of system interactions include how melting ice exposes darker land, which increases temperatures and causes more ice to melt; how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.

<u>**HS-ESS-2.3**</u> Students who demonstrate understanding can:
Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

Supporting Content ESS2.A: Earth Material and Systems

- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (HS-ESS-2.3)

Supporting Content ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS-2.3)

Supporting Content PS4.A: Wave Properties

- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (HS-ESS-2.3)

Further Explanation: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.

<u>HS-ESS-2.4</u> Students who demonstrate understanding can:
Use a model to describe how variations in the flow of energy into and out of Earth's systems result in variations in climate.

Supporting Content ESS1.B: Earth and the Solar System

- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate variations. (HS-ESS-2.4)

Supporting Content ESS2.A: Earth Material and Systems

- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS-2.4)

Supporting Content ESS2.D: Weather and Climate

- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS-2.2, HS-ESS-2.4)
- Changes in carbon dioxide concentrations in the atmosphere affect climate. (HS-ESS-2.6, HS-ESS-2.4)

Further Explanation: Examples of the causes of variations in climate differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.

Assessment Limit: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.

<u>HS-ESS-2.5</u> Students who demonstrate understanding can:
Plan and conduct an investigation of how the chemical and physical properties of water contribute to the mechanical and chemical mechanisms that affect Earth materials and surface processes.

Supporting Content ESS2.C: The Roles of Water in Earth's Surface Processes

- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS-2.5)

Further Explanation: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).

HS-ESS-2.6 Students who demonstrate understanding can:
Develop a model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

Supporting Content ESS2.D: Weather and Climate

- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS-2.6, HS-ESS-2.7)
- Changes in carbon dioxide concentrations in the atmosphere affect climate. (HS-ESS-2.6, HS-ESS-2.4)

Further Explanation: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.

HS-ESS-2.7 Students who demonstrate understanding can:
Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Supporting Content ESS2.D: Weather and Climate

- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS-2.6, HS-ESS-2.7)

Supporting Content ESS2.E: Biogeology

- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (ESS2-HS-7)

Further Explanation: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.

Assessment Limit: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.

HS-ESS-3 – Earth and Human Activity

HS-ESS-3.1 Students who demonstrate understanding can:
Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Supporting Content ESS3.A: Natural Resources

- Resource availability has guided the development of human society. (HS-ESS-3.1, *HS-LS-2.6*)

Supporting Content ESS3.B: Natural Hazards

- Natural hazards and other geologic events have shaped the course of human history. They have altered the sizes of human populations and have driven human migrations. (HS-ESS-3.1)

Further Explanation: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.

HS-ESS-3.2 Students who demonstrate understanding can:
Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

Supporting Content ESS3.A: Natural Resources

- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical benefits, costs and risks. New technologies and social regulations can change the balance of these factors. (HS-ESS-3.2)

Supporting Content ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental factors. (HS-ESS-3.2, HS-ESS-3.4)

Further Explanation: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) and on minimizing impacts. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas).

HS-ESS-3.3 Students who demonstrate understanding can:
Illustrate relationships among management of natural resources, the sustainability of human populations, and biodiversity.

Supporting Content ESS3.C: Human Influences on Earth Systems

- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS-3.3)

Further Explanation: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.

HS-ESS-3.4 Students who demonstrate understanding can:
Evaluate or refine a scientific or technological solution that mitigates or enhances human influences on natural systems.

Supporting Content ESS3.C: Human Influences on Earth Systems

- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS-3.4)

Supporting Content ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental factors. (HS-ESS-3.2, HS-ESS-3.4)

Further Explanation: Examples of data on the influences of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples of human contributions could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as cloud seeding).

HS-ESS-3.5 Students who demonstrate understanding can:
Analyze geoscience data and the results from global climate models to make an evidence-based explanation of how climate variability can affect Earth's systems on a global and regional scale.

Supporting Content ESS3.C: Human Influences on Earth Systems

- Human abilities to model, predict, and manage current and future effects on Earth's systems are improving with advancing technologies. (HS-ESS-3.5)

Further Explanation: Examples of evidence, for both data and climate model outputs, are for climate variations (such as precipitation and temperature) and their associated effects (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).

Assessment Limit: Assessment is limited to one example of a climate variation and its associated effect.

HS-ESS-3.6 Students who demonstrate understanding can:
Communicate how relationships among Earth systems are being influenced by human activity.

Supporting Content ESS2.D: Weather and Climate

- Current models project that average global temperatures will continue to rise. The outcomes projected by these models depend on the amounts of greenhouse gases added to the atmosphere each year and the ways these gases are stored by Earth's systems. (HS-ESS-3.6)

Supporting Content ESS3.C: Human Influences on Earth Systems

- Through computer simulations and scientific research, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are influenced by human activities. (HS-ESS-3.6)

Further Explanation: Examples of Earth systems are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. A n example is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.

Assessment Limit: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.

SUBJECT

Less Than Ten (10) Students Reported in Average Daily Attendance

REFERENCE

October 2017	Superintendent reported to the Board that eight (8) schools had requested approval and eight (8) were approved.
October 2018	Superintendent reported to the Board that nine (9) schools had requested approval and nine (9) were approved.
October 2019	Superintendent reported to the Board that nine (9) schools had requested approval and nine (9) were approved.
October 2020	Superintendent reported to the Board that six (6) schools had requested approval and six (6) were approved.

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-1003 (2)(f), Idaho Code

BACKGROUND/DISCUSSION

Section 33-1003 (2)(f), Idaho Code, states that *"Any elementary school having less than ten (10) pupils in average daily attendance shall not be allowed to participate in the state or county support program unless the school has been approved for operation by the state board of education."* At the November 1999 meeting, the State Board of Education (Board) delegated authority to the State Superintendent of Public Instruction to approve elementary schools to operate with less than ten (10) average daily attendance. A report listing the elementary schools that have requested to operate with less than ten (10) average daily attendance and whether approval was granted is to be provided to the Board at the October meeting.

Five (5) schools have requested to operate with less than ten (10) average daily attendance during the 2021-2022 school year. Superintendent Ybarra has approved all of the requests. (Attachment 1)

IMPACT

These approved schools will generate state funding for their school districts, per Chapter 10, Title 33, Idaho Code.

ATTACHMENTS

Attachment 1 – Superintendent Ybarra's approval of list of approved schools

BOARD STAFF COMMENTS AND RECOMMENDATIONS

Section 33-107(4)(d) and (e), Idaho Code authorizes the Board to:

(d) Delegate to its executive secretary, the superintendent of public instruction, if necessary to enhance effectiveness and efficiency, such powers as [s]he requires to perform duties and render decisions prescribed to the State board involving the exercise of judgment and discretion that affect the public schools in Idaho;

(e) Delegations of powers under this subsection must be adopted as statements of agency action by the state board, as provided in section 33-105(2), Idaho Code, and pursuant to a process that provides for notice, opportunity for input and formal adoption by the State Board….

Statements of agency action are adopted through the Board's Governing Policies and Procedures approval process. To comply with section 33-107(4), Idaho Code, this delegation should be incorporated into Board policy IV.B. State Department of Education. The original delegation and annual reporting requirement was made by the Board at the November 18-19, 1999 Board meeting. In addition to the statutory provisions regarding the delegation of duties to the Board's executive officers, in 2014, the Board amended its bylaws to require all Board action that "impacts the ongoing future behavior of the agencies and institutions to be incorporated into Board Policy." In order to stay compliant with Section 33-107, Idaho regarding the delegation of responsibilities assigned to the Board through Idaho Code and the Board's by-laws, the delegation of approval of schools with less than ten (10) students in average daily attendance should be established in Board policy.

BOARD ACTION

This item is for informational purposes only.

IDAHO
STATE DEPARTMENT OF EDUCATION

SHERRI YBARRA, ED.S.
SUPERINTENDENT OF PUBLIC INSTRUCTION

650 W. STATE STREET, 2ND FLOOR
BOISE, IDAHO 83702
(208) 332-6800 OFFICE / 711 TRS
WWW.SDE.IDAHO.GOV

DATE: August 31, 2021

TO: Superintendent Ybarra

FROM: Julie Oberle

SUBJECT: Approval of Elementary Schools Having Less Than 10 ADA

Idaho Code 33-1003(2)(f) states,

Minimum Pupils Required. Any elementary school having less than ten (10) pupils in average daily attendance shall not be allowed to participate in the state or county support program unless the school has been approved for operation by the state board of education.

At the November 1999 meeting, the State Board of Education delegated authority to the State Superintendent of Public Instruction to approve elementary schools to operate with less than ten (10) average daily attendance. A report listing the elementary schools that have requested to operate with less than ten (10) average daily attendance and whether approval was granted will be provided to the State Board of Education.

Attached is a list of school districts and elementary schools requesting approval to operate during the 2021-2022 school year with less than ten (10) average daily attendance. I have on file a letter from each school district on this list. I recommend approval of these schools to participate in the state support program. Upon receiving your approval, I will prepare materials for the October State Board of Education meeting, and a letter to each school district advising them of the approval.

Please let me know if you have any questions or if you would like to discuss.

I, Sherri Ybarra, Superintendent of Public Instruction, approve the attached list of schools to operate during the 2021-2022 school year with less than ten (10) average daily attendance.

Sherri A. Ybarra

Supporting Schools and Students to Achieve

2021-2022 Elementary Schools Approved to Operate with Less than 10 ADA
Idaho Code 33-1003(2)(f)

School District Name	Building Number	Building Name	Estimated Enrollment	Superintendent
111 Butte County	438	HOWE ELEMENTARY	8	Joe Steele
191 Prairie	491	PRAIRIE ELEMENTARY-JR HIGH SCHOOL	8	Randy Davidson
193 Mountain Home	517	PINE ELEMENTRY-JR HIGH SCHOOL	4	James Gilbert
364 Pleasant Valley	800	PLEASANT VALLEY ELEMENTRY-JR HIGH SCHOOL	7	Heather Williams
416 Three Creek	835	THREE CREEK ELEMENTRY-JR HIGH SCHOOL	6	Dena Pollock

SUBJECT

IDAPA 08.02.03.004.06, Alternate Assessment Achievement Standards - Waiver

REFERENCE

May 2011	Board approved the Idaho Alternate Assessment Achievement Standards.
September 2015	Board approved a temporary rule amending the Alternate Assessment Achievement Standards and the performance level descriptions for the Idaho Alternate Assessment Achievement Assessment.
October 2016	Board approved a temporary rule extending the Alternate Assessment Achievement Standards and the performance level descriptions for the Idaho Alternate Assessment Achievement Assessment.
June 2017	Board approved proposed rule Docket No. 08-0203-1711
October 2017	Board approved the Pending Rule Docket No. 08-0203- 1711
March 23, 2020	Board approved partial waiver of IDAPA 08.02.03.105, waiving the college entrance exam, senior project graduation requirements for students graduating in 2020 and administration of the ISAT for the 2020-2021 school year.
October 2020	Board approved partial waiver of IDAPA 08.02.03.105, waiving the senior project graduation requirement for students graduating in 2021.
December 2020	Board approved partial waiver of IDAPA 08.02.03.105, waiving the requirement the college entrance exam requirement for students graduating in 2021.

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-105, 33-1612 and 33-2002, Idaho Code
IDAPA 08.02.03.004.06
Elementary Secondary Education Act, as amended by the Every Student Succeeds Act Pub.L. 114-95 (2015)

BACKGROUND/DISCUSSION

In 2011, Idaho joined the National Center and State Collaborative (NCSC), a project led by 24 states and five (5) centers to develop an alternate assessment based on alternate achievement standards for students with the most significant cognitive disabilities. The alternate assessment was developed to ensure that all students with significant cognitive disabilities are able to participate in an assessment that is a measure of what they know and can do in relation to the grade-level Idaho Content Standards. The adoption of the NCSC recommended standards was approved in May 2011, and amendments were approved by the

State Board of Education in September 2015 through a temporary rule, and then again in 2016 through the proposed and pending rule process. In 2017, the Board approved Idaho-specific performance levels and scale score ranges for this assessment through the approval of Docket 08-0203-1711.

When the NCSC grant ended, Idaho began partnering with several other states to develop new alternate assessments in English language arts (ELA)/Literacy and Mathematics, consistent with the Every Student Succeeds Act (ESSA) peer review requirement that these assessments be regularly updated and refreshed.

Following the initial development process for its new alternate assessments in ELA/Literacy and Mathematics, Idaho conducted an embedded field test of new items in the spring of 2019. An operational field test of the new alternate assessments in ELA/Literacy and Mathematics was originally scheduled for spring 2020. However, that administration was cancelled due to COVID-19.

Idaho rescheduled the operational field test for the alternate assessments in ELA/Literacy and Mathematics for spring 2021. Under this timeline, Idaho would have pursued standard setting in summer 2021 and released student scores on these assessments in fall 2021. However, the ongoing disruptions caused by COVID-19 during the 2020-2021 school year have introduced significant technical concerns that would limit the validity and reliability of any alternate assessment ELA/Literacy and Mathematics performance standards developed based on student performance this year.

The U.S. Department of Education denied Idaho's original request to produce only raw scores for the alternate assessments in ELA/Literacy and Mathematics following the 2020-2021 school year based on requirements under the Individuals with Disabilities Education Act (IDEA) to produce scores at the same level of detail as students taking the regular assessments in these subjects. Separately, the U.S. Department of Education did approve Idaho's request not to produce scores for the alternate assessment in Science, since the regular Science assessment was also a field test in 2020-2021.

Idaho is not able to use the alternate assessment achievement standards the Board previously approved in 2017 because those components were generated for the old assessment, and do not align in terms of content or grade range. To meet the requirements under IDEA, Idaho can either go through the technically questionable standard setting or use similar achievement standards developed elsewhere on a provisional basis. This proposed action would temporarily waive the alternate assessment achievement standards incorporated by reference in IDAPA 08.02.03. If approved, the Department anticipates using cut scores developed by another state in Idaho's alternate assessment development group that also assesses students at grades 3-8 and 11 to produce provisional scores available to educators, students, and families.

IMPACT

Temporarily waiving the Alternate Assessment Achievement Standards allows for the creation of temporary, provisional alternate assessment scores for English Language Arts/Literacy and Mathematics to meet IDEA requirements, without necessitating a full standard setting based on inadequate data.

ATTACHMENTS

Attachment 1 – Current Idaho Alternate Assessment Achievement Standards Performance Level Descriptors

BOARD STAFF COMMENTS AND RECOMMENDATIONS

IDAPA 08.02.01.007 authorizes the Board to waive any education rule not required by state or federal law. This authorization grants the Board the authority to provide school districts and charter schools with added flexibility to respond to the COVID-19 pandemic. Rules are waived for a limited set period. Any ongoing changes must go through the negotiated rulemaking process. Waiver of any rule only removes the requirement in question. The authorization does not allow the Board to set a new rule in its place without going through the temporary rule process or the negotiated rule process.

Should the Board approve the waiver of the current Alternate Assessment Achievement Standards the Board will still need to take formal action to set new achievement standards for use during the 2021-2022 school year.

BOARD ACTION

I move to waive IDAPA 08.02.03.004.06, Alternate Assessment Achievement Standards for the 2021-2022 school year.

Moved by___________Seconded by___________Carried Yes No _____

IDAHO ALTERNATE ASSESSMENT ACHIEVEMENT STANDARDS

PERFORMANCE LEVEL DESCRIPTORS

English Language Arts and Mathematics
IDAPA 08.02.03.004

As approved by the Idaho State
Board of Education October 18, 2017

Performance Levels

The ID-NCSC Alternate Assessment uses a scale score system to express the student's specific performance score. The scale score is used as the basis for assigning a student's performance level in each content area. Table 1 shows the scale score ranges for performance levels for each grade and content area. The student's demonstration of the grade level skills and knowledge required by the assessment is reported as a performance level ranging from 1 to 4, with Levels 3 and 4 designated as 'Meets Expectations.'

ID-NCSC developed Performance Level Descriptors (PLDs) for mathematics and English language arts at grades 3-8 and 11 through an iterative process involving multiple stakeholder groups. The ID-NCSC partnership developed grade-level PLDs to summarize the knowledge, skills, and abilities prioritized for the ID-NCSC Alternate Assessment that students need to attain at each level of achievement (Level 1- Level 4). Each performance level is understood to include the knowledge, skills and abilities of the preceding performance levels.

It is through PLDs that teachers, parents, and the public can see not only that grade-level content a student should know and do to meet expectations, but also how well the student needs to perform—what depth, breadth, and complexity is an appropriately high expectation. The test results are one way teachers find out what a student has learned and in what areas a student needs more help; the test results help teachers, schools, parents and guardians build a path to student learning.

Table 1
Performance-Level Scale Score Ranges

Performance Level	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 11
English Language Arts							
Level 4	1251-1290	1258-1290	1256-1290	1253-1290	1255-1290	1250-1290	1255-1290
Level 3	1240-1250	1240-1257	1240-1255	1240-1252	1240-1254	1240-1249	1240-1254
Level 2	1234-1239	1234-1239	1232-1239	1231-1239	1236-1239	1230-1239	1236-1239
Level 1	1200-1233	1200-1233	1200-1231	1200-1230	1200-1235	1200-1229	1200-1235
Mathematics							
Level 4	1254-1290	1251-1290	1255-1290	1249-1290	1254-1290	1249-1290	1249-1290
Level 3	1240-1253	1240-1250	1240-1254	1240-1248	1240-1253	1240-1248	1240-1248
Level 2	1236-1239	1233-1239	1231-1239	1234-1239	1232-1239	1234-1239	1234-1239
Level 1	1200-1235	1200-1232	1200-1230	1200-1233	1200-1231	1200-1233	1200-1233

English Language Arts

Grade 3 ELA Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low text complexity - *Brief text with straightforward ideas and relationships; short, simple sentences.*	**Low text complexity** - *Brief text with straightforward ideas and relationships; short, simple sentences.*	**Moderate text complexity** - *Text with clear, complex ideas and relationships and simple; compound sentences.*	**High text complexity** - *Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.*
In reading, he/she is able to: • identify the topic of a literary text • identify a detail from a literary text • identify a character or setting in a literary text • identify the topic of an informational text • identify a title, caption, or heading in an informational text • identify an illustration related to a given topic • identify a topic presented by an illustration • identify the meaning of words (i.e., nouns)	**In reading, he/she is able to:** • determine the central idea and supporting details in literary text • determine the main idea and identify supporting details in informational text • determine the main idea of visually presented information • identify the purpose of text features in informational text • use information from charts, graphs, diagrams, or timelines in informational text to answer questions • use context to identify the meaning of multiple meaning words	**In reading, he/she is able to:** • determine the central idea and supporting details in literary text • determine the main idea and identify supporting details in informational text • determine the main idea of visually presented information • identify the purpose of text features in informational text • use information from charts, graphs, diagrams, or timelines in informational text to answer questions • use context to identify the meaning of multiple meaning words	**In reading, he/she is able to:** • determine the central idea and supporting details in literary text • determine the main idea and identify supporting details in informational text • determine the main idea of visually presented information • identify the purpose of text features in informational text • use information from charts, graphs, diagrams, or timelines in informational text to answer questions • use context to identify the meaning of multiple meaning words
	AND with Moderate text complexity - *Text with clear, complex ideas and relationships and simple; compound sentences.*	**AND with High text complexity** - *Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.*	
	• use details from a literary text to answer specific questions • describe the relationship between characters, and character and setting in literary text	• use details from a literary text to answer specific questions • describe the relationship between characters, and character and setting in literary text	
	AND with accuracy, he/she is able to: • identify simple words (i.e., words with a consonant at the beginning, a consonant at the end, and a short vowel in the middle)	**AND with accuracy, he/she is able to:** • identify grade level words	
AND in writing, he/she is able to: • identify a statement related to an everyday topic	**AND in writing, he/she is able to:** • identify elements of a narrative text to include beginning, middle, and end • identify the category related to a set of facts	**AND in writing, he/she is able to:** • identify a text feature (e.g., captions, graphs or diagrams) to present information in explanatory text	

Grade 4 ELA Performance Level Descriptors

<table>
<tr><th>Level 1</th><th>Level 2</th><th>Level 3</th><th>Level 4</th></tr>
<tr><td>Low text complexity - Brief text with straightforward ideas and relationships; short, simple sentences.</td><td>Low text complexity - Brief text with straightforward ideas and relationships; short, simple sentences.</td><td>Moderate text complexity - Text with clear, complex ideas and relationships and simple; compound sentences.</td><td>High text complexity - Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.</td></tr>
<tr><td rowspan="4">In reading, he/she is able to:
• identify a topic of a literary text
• identify a detail from a literary text
• identify a character in a literary text
• identify charts, graphs, diagrams, or timelines in an informational text
• identify a topic of an informational text
• use context to identify the meaning of multiple meaning words
• identify general academic words</td><td>In reading, he/she is able to:
• determine the theme of literary text and identify supportive details
• describe character traits using text-based details in literary text
• determine the main idea of informational text
• locate information in charts, graphs, diagrams, or timelines
• use information from charts, graphs, diagrams, or timelines in informational text to answer questions
• use general academic words</td><td>In reading, he/she is able to:
• determine the theme of literary text and identify supportive details
• determine the main idea of informational text
• explain how the information provided in charts, graphs, diagrams, or timelines contributes to an understanding of informational text
• use information from charts, graphs, diagrams, or timelines in informational text to answer questions
• use general academic words</td><td rowspan="5">In reading, he/she is able to:
• determine the theme of literary text and identify supportive details
• determine the main idea of informational text
• explain how the information provided in charts, graphs, diagrams, or timelines contributes to an understanding of informational text
• use information from charts, graphs, diagrams, or timelines in informational text to answer questions
• use general academic words</td></tr>
<tr><td>AND with Moderate text complexity - Text with clear, complex ideas and relationships and simple; compound sentences.</td><td>AND with High text complexity - Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.</td></tr>
<tr><td>• use details from a literary text to answer specific questions
• use context to identify the meaning of multiple meaning words</td><td>• use details from a literary text to answer specific questions
• describe character traits using text-based details in literary text
• use context to identify the meaning of multiple meaning words</td></tr>
<tr><td>AND with accuracy, he/she is able to:
• identify simple words (i.e., words with a consonant at the beginning, a consonant at the end, and a short vowel in the middle)</td><td>AND with accuracy, he/she is able to:
• identify grade level words</td></tr>
<tr><td>AND in writing, he/she is able to:
• identify the concluding sentence in a short explanatory text</td><td>AND in writing, he/she is able to:
• identify elements of a narrative text to include beginning, middle, and end
• identify a concluding sentence related to information in explanatory text</td><td>AND in writing, he/she is able to:
• identify a text feature (e.g., headings, charts, or diagrams) to present information in explanatory text</td></tr>
</table>

Grade 5 ELA Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low text complexity - *Brief text with straightforward ideas and relationships; short, simple sentences.*	**Low text complexity -** *Brief text with straightforward ideas and relationships; short, simple sentences.*	**Moderate text complexity -** *Text with clear, complex ideas and relationships and simple; compound sentences.*	**High text complexity -** *Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.*
In reading, he/she is able to: • identify an event from the beginning of a literary text • identify a detail from a literary text • identify a character, setting and event in a literary text • identify the topic of an informational text • identify the main idea of an informational text • identify the difference in how information is presented in two sentences	**In reading, he/she is able to:** • compare characters, settings, and events in literary text • determine the main idea and identify supporting details in informational text • use details from the text to support an author's point in informational text • compare and contrast how information and events are presented in two informational texts • use context to identify the meaning of multiple meaning words	**In reading, he/she is able to:** • compare characters, settings, and events in literary text • determine the main idea and identify supporting details in informational text • use details from the text to support an author's point in informational text • compare and contrast how information and events are presented in two informational texts • use context to identify the meaning of multiple meaning words	**In reading, he/she is able to:** • compare characters, settings, and events in literary text • determine the main idea and identify supporting details in informational text • use details from the text to support an author's point in informational text • compare and contrast how information and events are presented in two informational texts • use context to identify the meaning of multiple meaning words
	AND with Moderate text complexity - *Text with clear, complex ideas and relationships and simple; compound sentences.*	**AND with High text complexity -** *Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.*	
	• summarize a literary text from beginning to end • use details from a literary text to answer specific questions	• summarize a literary text from beginning to end • use details from a literary text to answer specific questions	
AND in writing, he/she is able to: • identify the category related to a set of common nouns	**AND in writing, he/she is able to:** • identify elements of a narrative text to include beginning, middle, and end • identify a sentence that is organized for a text structure such as comparison/contrast	**AND in writing, he/she is able to:** • support an explanatory text topic with relevant information	

Grade 6 ELA Performance Level Descriptors

<table>
<tr><th>Level 1</th><th>Level 2</th><th>Level 3</th><th>Level 4</th></tr>
<tr>
<td>Low text complexity - Brief text with straightforward ideas and relationships; short, simple sentences.</td>
<td>Low text complexity - Brief text with straightforward ideas and relationships; short, simple sentences.</td>
<td>Moderate text complexity - Text with clear, complex ideas and relationships and simple; compound sentences.</td>
<td>High text complexity - Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.</td>
</tr>
<tr>
<td rowspan="3">In reading, he/she is able to:
• identify an event from the beginning or end of a literary text
• identify a detail from a literary text
• identify a character in a literary text
• identify the topic of an informational text
• identify the main idea of an informational text
• identify a fact from an informational text
• identify a description of an individual or event in an informational text
• use context to identify the meaning of multiple meaning words
• identify the meaning of general academic words</td>
<td>In reading, he/she is able to:
• summarize a literary text from beginning to end without including personal opinions
• support inferences about characters using details in literary text
• use details from the text to elaborate a key idea in informational text</td>
<td>In reading, he/she is able to:
• summarize a literary text from beginning to end without including personal opinions
• support inferences about characters using details in literary text
• summarize an informational text without including personal opinions
• use details from the text to elaborate a key idea in informational text
• use evidence from the text to support an author’s claim in informational text
• summarize information presented in two informational texts
• use domain specific words accurately</td>
<td rowspan="4">In reading, he/she is able to:
• summarize a literary text from beginning to end without including personal opinions
• use details from a literary text to answer specific questions
• support inferences about characters using details in literary text
• use details from the text to elaborate a key idea in an informational text
• use evidence from the text to support an author’s claim in informational text
• use domain specific words accurately</td>
</tr>
<tr>
<td>AND with Moderate text complexity - Text with clear, complex ideas and relationships and simple; compound sentences.</td>
<td>AND with High text complexity - Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.</td>
</tr>
<tr>
<td>• use details from a literary text to answer specific questions
• use context to identify the meaning of multiple meaning words</td>
<td>• use details from a literary text to answer specific questions
• use context to identify the meaning of multiple meaning words</td>
</tr>
<tr>
<td>AND in writing, he/she is able to:
• identify an everyday order of events</td>
<td>AND in writing, he/she is able to:
• identify elements of an explanatory text to include introduction, body, and conclusion
• identify the next event in a brief narrative</td>
<td>AND in writing, he/she is able to:
• identify transition words and phrases to convey a sequence of events in narrative text</td>
</tr>
</table>

Grade 7 ELA Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low text complexity - *Brief text with straightforward ideas and relationships; short, simple sentences.*	**Low text complexity -** *Brief text with straightforward ideas and relationships; short, simple sentences.*	**Moderate text complexity** - *Text with clear, complex ideas and relationships and simple; compound sentences.*	**High text complexity** - *Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.*
In reading, he/she is able to: • identify a theme from a literary text • identify an inference from a literary text • identify a conclusion from an informational text • identify a claim the author makes in an informational text • compare and contrast two statements related to the same topic • use context to identify the meaning of words	**In reading, he/she is able to:** • identify the relationship between individuals or events in an informational text • use evidence from the text to support an author's claim in informational text in informational text	**In reading, he/she is able to:** • use details to support a conclusion from informational text • use details to explain how the interactions between individuals, events or ideas in informational texts are influenced by each other • use evidence from the text to support an author's claim in informational text • compare and contrast how two authors write about the same topic in informational texts • use context to identify the meaning of grade-level phrases	**In reading, he/she is able to:** • use details to support a conclusion from informational text • use details to explain how the interactions between individuals, events or ideas in informational texts are influenced by each other • use evidence from the text to support an author's claim in informational text • compare and contrast how two authors write about the same topic in informational texts • use context to identify the meaning of grade-level phrases
	AND with Moderate text complexity - *Text with clear, complex ideas and relationships and simple; compound sentences.*	**AND with High text complexity** - *Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.*	
	• use details to support themes from literary text • use details to support inferences from literary text	• use details to support themes from literary text • use details to support inferences from literary text	
AND in writing, he/she is able to: • identify a graphic that includes an event as described in a text	**AND in writing, he/she is able to:** • identify elements of an explanatory text to include introduction, body, and conclusion • identify the next event in a brief narrative	**AND in writing, he/she is able to:** • identify a sentence that provides a conclusion in narrative text	

Grade 8 ELA Performance Level Descriptors

<table>
<tr><th>Level 1</th><th>Level 2</th><th>Level 3</th><th>Level 4</th></tr>
<tr><td>Low text complexity - Brief text with straightforward ideas and relationships; short, simple sentences.</td><td>Low text complexity - Brief text with straightforward ideas and relationships; short, simple sentences.</td><td>Moderate text complexity - Text with clear, complex ideas and relationships and simple; compound sentences.</td><td>High text complexity - Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.</td></tr>
<tr><td rowspan="3">In reading, he/she is able to:
• identify a theme from a literary text
• identify an inference from a literary text
• identify a fact related to a presented argument in informational text
• identify a similar topic in two informational texts
• use context to identify the meaning of multiple meaning words
• identify the meaning of general academic words</td><td>In reading, he/she is able to:
• use details to support a conclusion from literary text
• identify an inference drawn from an informational text
• identify the portion of text which contains specific information
• identify an argument the author makes in informational text
• examine parts of two informational texts to identify where the texts disagree on matters of fact or interpretation
• use domain specific words or phrases accurately</td><td>In reading, he/she is able to:
• use details to support a conclusion from literary text
• use details to support an inference from informational text
• identify the information (e.g., facts or quotes) in a section of text that contributes to the development of an idea
• identify an argument the author makes in informational text
• examine parts of two informational texts to identify where the texts disagree on matters of fact or interpretation
• use domain specific words and phrases accurately</td><td rowspan="4">In reading, he/she is able to:
• use details to support a conclusion from literary text
• use details to support an inference from informational text
• identify the information (e.g., facts or quotes) in a section of text that contributes to the development of an idea
• identify an argument the author makes in informational text
• examine parts of two informational texts to identify where the texts disagree on matters of fact or interpretation
• use domain specific words and phrases accurately</td></tr>
<tr><td>AND with Moderate text complexity - Text with clear, complex ideas and relationships and simple; compound sentences.</td><td>AND with High text complexity - Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.</td></tr>
<tr><td>• analyze the development of a theme including the relationship between a character and an event in literary text
• use context to identify the meaning of grade-level words and phrases</td><td>• analyze the development of a theme including the relationship between a character and an event in literary text
• use context to identify the meaning of grade-level words and phrases</td></tr>
<tr><td>AND in writing, he/she is able to:
• identify a writer's opinion</td><td>AND in writing, he/she is able to:
• identify elements of an explanatory text to include introduction, body, and conclusion
• identify an idea relevant to a claim</td><td>AND in writing, he/she is able to:
• identify relevant information to support a claim</td></tr>
</table>

Grade 11 ELA Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low text complexity - *Brief text with straightforward ideas and relationships; short, simple sentences.*	**Low text complexity** - *Brief text with straightforward ideas and relationships; short, simple sentences.*	**Moderate text complexity** - *Text with clear, complex ideas and relationships and simple; compound sentences.*	**High text complexity** - *Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.*
In reading, he/she is able to: • identify a summary of a literary text • identify an event from a literary text • identify the central idea of an informational text • identify facts from an informational text • identify what an author tells about a topic in informational text • use context to identify the meaning of multiple meaning words • identify a word used to describe a person, place, thing, action or event	**In reading, he/she is able to:** • use details to support a summary of literary text • identify a conclusion from an informational text • identify key details that support the development of a central idea of an informational text • use details presented in two informational texts to answer a question • explain why an author uses specific word choices within texts	**In reading, he/she is able to:** • use details to support a summary of literary text • use details to support a conclusion presented in informational text • identify key details that support the development of a central idea of an informational text • use details presented in two informational texts to answer a question • explain why an author uses specific word choices within texts	**In reading, he/she is able to:** • use details to support a summary of literary text • use details to support a conclusion presented in informational text • identify key details that support the development of a central idea of an informational text • use details presented in two informational texts to answer a question • explain why an author uses specific word choices within texts
	AND with Moderate text complexity - *Text with clear, complex ideas and relationships and simple; compound sentences.*	**AND with High text complexity** - *Text with detailed and implied complex ideas and relationships; a variety of sentence types including phrases and transition words.*	
	• evaluate how the author's use of specific details in literary text contributes to the text • determine an author's point of view about a topic in informational text • use context to identify the meaning of grade-level phrases	• evaluate how the author's use of specific details in literary text contributes to the text • determine an author's point of view about a topic in informational text • use context to identify the meaning of grade-level phrases	
AND in writing, he/she is able to: • identify information which is unrelated to a given topic	**AND in writing, he/she is able to:** • identify elements of an argument to include introduction, claim, evidence, and conclusion • identify how to group information for a specific text structure	**AND in writing, he/she is able to:** • identify relevant information to address a given topic and support the purpose of a text	

Grade 3 Mathematics Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low task complexity - *Simple problems using common mathematical terms and symbols*	**Low task complexity** - *Simple problems using common mathematical terms and symbols*	**Moderate task complexity** - *Common problems presented in mathematical context using various mathematical terms and symbols*	**High task complexity** - *Multiple mathematical ideas presented in problems using various mathematical terms and symbolic representations of numbers, variables, and other item elements*
He/she is able to: • solve addition problems • identify growing number patterns • identify an object showing a specified number of parts shaded • identify which object has the greater number of parts shaded • identify an object equally divided in two parts • identify the number of objects to be represented in a pictograph	**He/she is able to:** • solve addition and subtraction word problems • identify an arrangement of objects which represents factors in a problem • solve multiplication equations in which both numbers are equal to or less than five • identify multiplication patterns • identify a set of objects as nearer to 1 or 10 • identify a representation of the area of a rectangle	**He/she is able to:** • solve addition and subtraction word problems • check the correctness of an answer in the context of a scenario • solve multiplication equations in which both numbers are equal to or less than five • identify multiplication patterns • match fraction models to unitary fractions • compare fractions with different numerators and the same denominator • transfer data from an organized list to a bar graph	**He/she is able to:** • solve addition and subtraction word problems • check the correctness of an answer in the context of a scenario • solve multiplication equations in which both numbers are equal to or less than five • identify multiplication patterns • match fraction models to unitary fractions • compare fractions with different numerators and the same denominator • transfer data from an organized list to a bar graph
	AND with Moderate task complexity - *Common problems presented in mathematical context using various mathematical terms and symbols*	**AND with High task complexity** - *Common problems presented in mathematical context using various mathematical terms and symbols*	
	• identify geometric figures which are divided into equal parts	• round numbers to nearest 10 • identify geometric figures which are divided into equal parts • count unit squares to compute the area of a rectangle	

Grade 4 Mathematics Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low task complexity - *Simple problems using common mathematical terms and symbols*	**Low task complexity -** *Simple problems using common mathematical terms and symbols*	**Moderate task complexity -** *Common problems presented in mathematical context using various mathematical terms and symbols*	**High task complexity -** *Multiple mathematical ideas presented in problems using various mathematical terms and symbolic representations of numbers, variables, and other item elements*
He/she is able to: • identify an array with the same number of objects in each row • identify values rounded to nearest tens place • identify equivalent representations of a fraction (e.g., shaded diagram) • compare representations of a fraction (e.g., shaded diagram) • identify a rectangle with the larger or smaller perimeter • identify a given attribute of a shape • identify the data drawn in a bar graph that represents the greatest value	**He/she is able to:** • match a model to an multiplication expression using two single digit numbers • identify a model of a multiplicative comparison • show division of objects into equal groups • round numbers to nearest 10, 100 or 1000 • differentiate parts and wholes • compute the perimeter of a rectangle	**He/she is able to:** • solve multiplication word problems • show division of objects into equal groups • round numbers to nearest 10, 100, or 1000 • compare two fractions with different denominators • sort a set of 2-dimensional shapes • compute the perimeter of a rectangle • transfer data to a graph	**He/she is able to:** • solve multiplication word problems • show division of objects into equal groups • round numbers to nearest 10, 100 or 1000 • compare two fractions with different denominators • sort a set of 2-dimensional shapes • compute the perimeter of a rectangle • transfer data to a graph
	AND with Moderate task complexity - *Common problems presented in mathematical context using various mathematical terms and symbols*	**AND with High task complexity -** *Common problems presented in mathematical context using various mathematical terms and symbols*	
	• identify equivalent fractions • select a 2-dimensional shape with a given attribute	• solve a multiplicative comparison word problem using up to two-digit numbers • check the correctness of an answer in the context of a scenario • identify equivalent fractions	

Grade 5 Mathematics Performance Level Descriptors

<table>
<tr><th>Level 1</th><th>Level 2</th><th>Level 3</th><th>Level 4</th></tr>
<tr><td>Low task complexity - Simple problems using common mathematical terms and symbols</td><td>Low task complexity - Simple problems using common mathematical terms and symbols</td><td>Moderate task complexity - Common problems presented in mathematical context using various mathematical terms and symbols</td><td>High task complexity - Multiple mathematical ideas presented in problems using various mathematical terms and symbolic representations of numbers, variables, and other item elements</td></tr>
<tr><td rowspan="3">He/she is able to:
solve one-step subtraction word problems
divide sets (no greater than 6) into two equal parts
identify values in the tenths place
identify a number in the ones, tens or hundreds place
identify a given axis of a coordinate plan
match the conversion of 3 feet to 1 yard to a model
calculate elapsed time (i.e., hours)
identify whether the values increase or decrease in a line graph</td><td>He/she is able to:
identify if the total will increase or decrease when combining sets
perform operations with decimals
identify a symbolic representation of the addition of two fractions
identify place values to the hundredths place
convert standard measurements</td><td>He/she is able to:
solve multiplication and division word problems
perform operations with decimals
solve word problems involving fractions
identify place values to the hundredths place
locate a given point on a coordinate plane when given an ordered pair
convert standard measurements
convert between minutes and hours
make quantitative comparisons between data sets shown as line graphs</td><td rowspan="3">He/she is able to:
solve multiplication and division word problems
perform operations with decimals
solve word problems involving fractions
identify place values to the hundredths place
locate a given point on a coordinate plane when given an ordered pair
convert standard measurements
convert between minutes and hours
make quantitative comparisons between data sets shown as line graphs</td></tr>
<tr><td>AND with Moderate task complexity - Common problems presented in mathematical context using various mathematical terms and symbols</td><td>AND with High task complexity - Common problems presented in mathematical context using various mathematical terms and symbols</td></tr>
<tr><td>compare the values of two products based upon multipliers
round decimals to nearest whole number</td><td>compare the values of two products based upon multipliers
round decimals to nearest whole number</td></tr>
</table>

Grade 6 Mathematics Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low task complexity - *Simple problems using common mathematical terms and symbols*	**Low task complexity -** *Simple problems using common mathematical terms and symbols*	**Moderate task complexity -** *Common problems presented in mathematical context using various mathematical terms and symbols*	**High task complexity -** *Multiple mathematical ideas presented in problems using various mathematical terms and symbolic representations of numbers, variables, and other item elements*
He/she is able to: • identify a model of a given percent • match a given unit rate to a model • identify a representation of two equal sets • identify a number less than zero on a number line • identify the meaning of an unknown in a modeled equation • count the number of grids or tiles inside a rectangle to find the area of a rectangle • identify the object that appears most frequently in a set of data (mode) • identify a representation of a set of data arranged into even groups (mean)	**He/she is able to:** • match a given ratio to a model • recognize a representation of the sum of two halves • solve real world measurement problems involving unit rates • identify a representation of a value less than zero • identify the median or the equation needed to determine the mean of a set of data	**He/she is able to:** • perform operations using up to three-digit numbers • solve real world measurement problems involving unit rates • identify positive and negative values on a number line • determine the meaning of a value from a set of positive and negative integers • solve word problems with expressions including variables • compute the area of a parallelogram • identify the median or the equation needed to determine the mean of a set of data	**He/she is able to:** • solve real world measurement problems involving unit rates • identify positive and negative values on a number line • solve word problems with expressions including variables • compute the area of a parallelogram • identify the median or the equation needed to determine the mean of a set of data
	AND with Moderate task complexity *- Common problems presented in mathematical context using various mathematical terms and symbols*	**AND with High task complexity -** *Common problems presented in mathematical context using various mathematical terms and symbols*	
	• perform one-step operations with two decimal numbers • solve word problems using a percent	• perform one-step operations with two decimal numbers • solve word problems using a percent • solve word problems using ratios and rates	

Grade 7 Mathematics Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low task complexity - *Simple problems using common mathematical terms and symbols*	**Low task complexity -** *Simple problems using common mathematical terms and symbols*	**Moderate task complexity -** *Common problems presented in mathematical context using various mathematical terms and symbols*	**High task complexity -** *Multiple mathematical ideas presented in problems using various mathematical terms and symbolic representations of numbers, variables, and other item elements*
He/she is able to: • identify a representation which represents a negative number and its multiplication or division by a positive number • identify representations of area and circumference of a circle • identify representations of surface area • make qualitative comparisons when interpreting a data set presented on a bar graph or in a table	**He/she is able to:** • match a given ratio to a model • identify the meaning of an unknown in a modeled equation • describe a directly proportional relationship (i.e., increases or decreases) • find the surface area of three-dimensional right prism	**He/she is able to:** • solve division problems with positive/negative whole numbers • solve word problems involving ratios • use a proportional relationship to solve a percentage problem • identify proportional relationships between quantities represented in a table • identify unit rate (constant of proportionality) in tables and graphs of proportional relationships • compute the area of a circle • find the surface area of a three-dimensional right prism	**He/she is able to:** • solve division problems with positive/negative whole numbers • solve word problems involving ratios • identify proportional relationships between quantities represented in a table • compute the area of a circle • find the surface area of a three-dimensional right prism
	AND with Moderate task complexity - *Common problems presented in mathematical context using various mathematical terms and symbols*	**AND with High task complexity -** *Common problems presented in mathematical context using various mathematical terms and symbols*	
	• solve multiplication problems with positive/negative whole numbers • interpret graphs to qualitatively contrast data sets	• solve multiplication problems with positive/negative whole numbers • evaluate variable expressions that represent word problems • interpret graphs to qualitatively contrast data sets	

Grade 8 Mathematics Performance Level Descriptors

Level 1	Level 2	Level 3	Level 4
Low task complexity - *Simple problems using common mathematical terms and symbols*	**Low task complexity -** *Simple problems using common mathematical terms and symbols*	**Moderate task complexity -** *Common problems presented in mathematical context using various mathematical terms and symbols*	**High task complexity -** *Multiple mathematical ideas presented in problems using various mathematical terms and symbolic representations of numbers, variables, and other item elements*
He/she is able to: • locate a given decimal number on a number line • identify the relatively larger data set when given two data sets presented in a graph • identify congruent rectangles • identify similar rectangles • identify an attribute of a cylinder • identify a rectangle with the larger or smaller area as compared to another rectangle • identify an ordered pair and its point on a graph	**He/she is able to:** • identify the solution to an equation which contains a variable • identify the y-intercept of a linear graph • match a given relationship between two variables to a model • identify a data display that represents a given situation • interpret data presented in graphs to identify associations between variables	**He/she is able to:** • locate approximate placement of an irrational number on a number line • solve a linear equation which contains a variable • identify the relationship shown on a linear graph • calculate slope of a positive linear graph • compute the change in area of a figure when its dimensions are changed • solve for the volume of a cylinder • plot provided data on a graph	**He/she is able to:** • locate approximate placement of an irrational number on a number line • solve a linear equation which contains a variable • identify the relationship shown on a linear graph • compute the change in area of a figure when its dimensions are changed • plot provided data on a graph
	AND with Moderate task complexity - *Common problems presented in mathematical context using various mathematical terms and symbols*	**AND with High task complexity -** *Common problems presented in mathematical context using various mathematical terms and symbols*	
	• identify congruent figures • use properties of similarity to identify similar figures • interpret data tables to identify the relationship between variables	• interpret data presented in graphs to identify associations between variables • interpret data tables to identify the relationship between variables • use properties of similarity to identify similar figures • identify congruent figures	

Grade 11 Mathematics Performance Level Descriptors

<table>
<tr><th>Level 1</th><th>Level 2</th><th>Level 3</th><th>Level 4</th></tr>
<tr>
<td>Low task complexity -
Simple problems using common mathematical terms and symbols</td>
<td>Low task complexity -
Simple problems using common mathematical terms and symbols</td>
<td>Moderate task complexity -
Common problems presented in mathematical context using various mathematical terms and symbols</td>
<td>High task complexity -
Multiple mathematical ideas presented in problems using various mathematical terms and symbolic representations of numbers, variables, and other item elements</td>
</tr>
<tr>
<td rowspan="3">He/she is able to:
• arrange a given number of objects into two sets in multiple combinations
• match an equation with a variable to a provided real world situation
• determine whether a given point is or is not part of a data set shown on a graph
• identify an extension of a linear graph
• use a table to match a unit conversion
• complete the formula for area of a figure</td>
<td>He/she is able to:
• identify the model that represents a square number
• identify variable expressions which represent word problems
• identify the hypotenuse of a right triangle
• identify the greatest or least value in a set of data shown on a number line
• identify the missing label on a histogram
• calculate the mean and median of a set of data</td>
<td>He/she is able to:
• compute the value of an expression that includes an exponent
• identify variable expressions which represent word problems
• solve real world measurement problems that require unit conversions
• find the missing attribute of a three-dimensional figure
• determine two similar right triangles when a scale factor is given
• make predictions from data tables and graphs to solve problems
• plot data on a histogram
• calculate the mean and median of a set of data</td>
<td rowspan="3">He/she is able to:
• identify variable expressions which represent word problems
• solve real world measurement problems that require unit conversions
• determine two similar right triangles when a scale factor is given
• make predictions from data tables and graphs to solve problems
• plot data on a histogram
• calculate the mean and median of a set of data</td>
</tr>
<tr>
<td>AND with Moderate task complexity -
Common problems presented in mathematical context using various mathematical terms and symbols</td>
<td>AND with High task complexity -
Common problems presented in mathematical context using various mathematical terms and symbols</td>
</tr>
<tr>
<td>• identify the linear representation of a provided real world situation
• use an equation or a linear graphical representation to solve a word problem</td>
<td>• identify the linear representation of a provided real world situation
• use an equation or a linear graphical representation to solve a word problem
• identify a histogram which represents a provided data set</td>
</tr>
</table>

SUBJECT

ARP ESSER 2.5% of State Set-Aside Reserve funds for Non-Title and Low Title LEAs

REFERENCE

April 5, 2021	The Board approved use of $11,851,300 of the $19,589,000 in ESSER II 10% SEA reserve funds for distribution to local education agencies who receive no ESSER II or low ESSER II funding through the Title I formula distribution; and to approve the use of up to $300,000 in ESSER II SEA reserve funding for use by the State Department of Education to administer the distribution of ESSER funding to local education agencies; and preliminarily designate the use of the 2.5% of the SEA reserve funds to local education agencies who receive no ARP ESSER funds or low ARP ESSER funds based on their Title I student populations.

BACKGROUND/DISCUSSION

The American Rescue Plan (ARP) ESSER was signed into law March 11, 2021 and provides Idaho $439,942,041 for K-12 education. Of this amount, 90% will be allocated to local education agencies (LEAs). Of this amount, LEAs must spend 20% of their funds on addressing lost instructional time. The remaining 10% State Set-Aside Reserve must be used to address learning loss (5%), summer enrichment (1%), after school programs (1%) and emergency needs and administrative costs (3%) identified by the State Board members. On April 5, 2021, the Board approved to designate 2.5% of the State Education Agency (SEA) Set-Aside Reserve for non-Title and low Title LEAs. Idaho received the grant award notice for 2/3 of the ARP ESSER funds on March 24, 2021. The State will receive the remaining funds after a Plan and Application are submitted. The Idaho ARP ESSER State Plan was submitted to USED on June 17, 2021 after an extension was requested and approved. USED responded with feedback and a request for additional information on July 13, 2021 for sections C, D, and the GEPA statement. The Superintendent submitted an updated Plan on July 23, 2021. On August 23, 2021, USED requested additional feedback on section D. Board members approved the Plan, which was provided by the State Board office, on August 26, 2021. The final version of the Idaho ARP ESSER State Plan was submitted to USED on August 30, 2021.

Of Idaho’s $43,994,204 State Set-Aside Reserve, 3% or $13,198,261, is available for “Other Emergency needs by the SEA”. On April 5, 2021, in a Special Board Meeting, the Board approved the use of 2.5% or $10,998,551 to fund LEAs that did not receive any Title I-A funds and additional LEAs that are low Title I-A funded.

The recommended methodology for awarding 2.5% of the ARP ESSER State Set-Aside Reserve in the amount of $10,998,551 is:

1. To first fund Idaho Bureau of Educational Services for the Deaf and Blind (IBESDB) $590,000;
2. To fund a base amount of $349,062 to LEAs who did not receive a Title I-A allocation for the 2020-2021 school year; and
3. To increase the allocation for the Title I-A LEAs who fall below the base amount.

After funding IBESDB off the top and using the minimum base amount of $349,062, 16 non-Title LEAs will receive the minimum allocation and 42 low-Title LEAs will receive additional funds to bring them up to the base amount of $349,062.

This methodology reflects the same methodology used to determine allocations for the $1M in Coronavirus Relief Funds, Non- ESSER fund. See Attachment 1, ARP ESSER State Set-Aside 2.5%, for a list of the allocations using the methodology above.

ATTACHMENT

Attachment 1 – ARP ESSER State Set-Aside 2.5%

IMPACT

The ARP ESSER allocations from the 2.5% State Set-Aside reserve amount of $10,998,551 for non-Title and low Title LEAs, including the IBESDB, will help mitigate the on-going impact of COVID-19 for students and educators.

BOARD STAFF COMMENTS AND RECOMMENDATIONS

The US Department of Education approved the Board ARP Act ESSER Plan on September 13, 2021. Current SEA Set Aside Funding Proposals Consist of:

Total 10% SEA Set Aside	**$43,994,204**	**Proposed Use**	**Remaining**
3% of Total - Emergency Needs	$13,198,261	2.5% Non-Title, Low-Title $10,998,551	$2,199,710
5% of Total - Learning Loss	$21,997,102	AOC Use $100,000 Mathematics Accelerated Learning Collaborative $3,500,000	$18,397,102
1% of Total - Summer Enrichment	$4,399,420		$4,399,420
1% of Total - After School Programs	$4,399,421		$4,399,421

Two of these proposals the Board will consider under a separate agenda item and are recommended by the Accountability Oversight Committee and the Unfinished Learning Work Group. Additional proposals are being considered that align with the provisions the Board identified in the ARP Act ESSER Plan and identified uses of the SEA Set Aside Funds. These proposals will be brought to the Board for consideration once finalized.

BOARD ACTION

I move to approve the methodology and allocations provided in Attachment 1 for the non-Title and low Title LEAs, including the Idaho Bureau of Educational Services for the Deaf and Blind, using the 2.5% of the ARP ESSER SEA State Set-Aside Reserve approved by the Board on April 5, 2021.

Moved by __________ Seconded by __________ Carried Yes _____ No _____

ARP ESSER State Set Aside
Reserve - 2.5%
DRAFT 7.15.2021

ARP ESSER STATE SET Aside	$439,942,041
2.5% of the State Set-Aside Reserve for distribution to non-title/ low-title schools	$10,998,551

	80% Discretionary	20% Learning Loss	Total	Percentage of Total Allocation	Base or Additional Amount	E3 Total + E3 Set Aside	Grand Total
596 IDAHO BUREAU OF EDUCATIONAL SERVICES FOR THE DEAF AND THE BLIND	0	0	0	0	590000	590000	590000
553 PINECREST ACADEMY OF IDAHO, INC.	0	0	0	0	349062	349062	349062
92 SWAN VALLEY ELEMENTARY DISTRICT	0	0	0	0	349062	349062	349062
364 PLEASANT VALLEY ELEMENTARY DISTRICT	0	0	0	0	349062	349062	349062
383 ARBON ELEMENTARY DISTRICT	0	0	0	0	349062	349062	349062
394 AVERY ELEMENTARY DISTRICT	0	0	0	0	349062	349062	349062
416 THREE CREEK JOINT ELEMENTARY DISTRICT	0	0	0	0	349062	349062	349062
453 IDAHO VIRTUAL HIGH SCHOOL, INC.	0	0	0	0	349062	349062	349062
480 NORTH IDAHO STEM CHARTER ACADEMY, INC.	0	0	0	0	349062	349062	349062
486 UPPER CARMEN PUBLIC CHARTER SCHOOL, INC.	0	0	0	0	349062	349062	349062
489 IDAHO COLLEGE AND CAREER READINESS ACADEMY, INC.	0	0	0	0	349062	349062	349062
491 COEUR D'ALENE CHARTER ACADEMY, INC.	0	0	0	0	349062	349062	349062
493 NORTH STAR CHARTER SCHOOL, INC.	0	0	0	0	349062	349062	349062
540 ISLAND PARK CHARTER SCHOOL, INC.	0	0	0	0	349062	349062	349062
191 PRAIRIE ELEMENTARY DISTRICT - NON ESSER NOT COMMITED TO SPEND; DID NOT RECEIVE IA ALLO	0	0	0	0	349062	349062	349062
469 IDAHO VIRTUAL EDUCATION PARTNERS, INC. - NON ESSER NOT COMMITED TO SPEND; DID NOT RECEIVE IA	0	0	0	0	349062	349062	349062
470 THE KOOTENAI BRIDGE ACADEMY, INC. - DECLINED	0	0	0	0	349062	349062	349062
550 DORAL ACADEMY OF IDAHO, INC.	78355.7011	19588.92528	97944.62638	0.000248848	251117.3736	251117.3736	349062
149 NORTH GEM DISTRICT	106697.749	26674.43726	133372.1863	0.000338859	215689.8137	215689.8137	349062
472 PALOUSE PRAIRIE EDUCATIONAL ORGANIZATION, INC.	108140.9583	27035.23956	135176.1978	0.000343443	213885.8022	213885.8022	349062
292 SOUTH LEMHI DISTRICT	121077.041	30269.26025	151346.3012	0.000384526	197715.6988	197715.6988	349062
485 IDAHO STEM ACADEMY, INC.	124685.0641	31171.26601	155856.3301	0.000395985	193205.6699	193205.6699	349062
488 SYRINGA MOUNTAIN SCHOOL, INC.	124849.3318	31212.33294	156061.6647	0.000396506	193000.3353	193000.3353	349062
531 FERN-WATERS PUBLIC CHARTER SCHOOL, INC.	125582.6698	31395.66745	156978.3372	0.000398835	192083.6628	192083.6628	349062
302 NEZPERCE JOINT DISTRICT	129114.4257	32278.60643	161393.0321	0.000410052	187668.9679	187668.9679	349062
511 PEACE VALLEY CHARTER SCHOOL, INC.	145118.7947	36279.69868	181398.4934	0.00046088	167663.5066	167663.5066	349062
182 MACKAY JOINT DISTRICT	147893.7458	36973.43645	184867.1823	0.000469693	164194.8177	164194.8177	349062
456 FALCON RIDGE PUBLIC CHARTER SCHOOL, INC.	149483.6226	37370.90566	186854.5283	0.000474742	162207.4717	162207.4717	349062
121 CAMAS COUNTY DISTRICT	154458.5878	38614.64695	193073.2347	0.000490542	155988.7653	155988.7653	349062
382 ROCKLAND DISTRICT	160841.562	40210.39049	201051.9524	0.000510813	148010.0476	148010.0476	349062
508 HAYDEN CANYON CHARTER SCHOOL, INC.	163528.5125	40882.12812	204410.6406	0.000519347	144651.3594	144651.3594	349062
566 Cardinal Academy, Incorporated	166062.342	41515.5855	207577.9275	0.000527394	141484.0725	141484.0725	349062
532 TREASURE VALLEY CLASSICAL ACADEMY, INC.	172576.8	43144.2	215721	0.000548083	133341	133341	349062
342 CULDESAC JOINT DISTRICT	178864.0772	44716.0193	223580.0965	0.000568051	125481.9035	125481.9035	349062
283 KENDRICK JOINT DISTRICT	181709.4287	45427.35719	227136.7859	0.000577087	121925.2141	121925.2141	349062
287 TROY SCHOOL DISTRICT	182876.9029	45719.22572	228596.1286	0.000580795	120465.8714	120465.8714	349062
559 THOMAS JEFFERSON CHARTER SCHOOL, INC.	185833.7218	46458.43045	232292.1522	0.000590185	116769.8478	116769.8478	349062
305 HIGHLAND JOINT DISTRICT	186508.3928	46627.09819	233135.491	0.000592328	115926.509	115926.509	349062
560 Alturas Preparatory Academy, Inc.	187305.3845	46826.34613	234131.7307	0.000594859	114930.2693	114930.2693	349062

		80% Discretionary	20% Learning Loss	Total	Percentage of Total Allocation	Base or Additional Amount	E3 Total + E3 Set Aside	Grand Total
234	BLISS JOINT DISTRICT	189254.0103	47313.50258	236567.5129	0.000601048	112494.4871	112494.4871	349062
528	FORGE INTERNATIONAL, LLC	193865.2398	48466.30995	242331.5498	0.000615693	106730.4502	106730.4502	349062
433	MIDVALE DISTRICT	196159.1212	49039.78029	245198.9014	0.000622978	103863.0986	103863.0986	349062
161	CLARK COUNTY DISTRICT	202589.0289	50647.25723	253236.2862	0.000643398	95825.71383	95825.71383	349062
544	MOSAICS PUBLIC SCHOOL, INC.	204706.9091	51176.72729	255883.6364	0.000650124	93178.36356	93178.36356	349062
243	SALMON RIVER JOINT SCHOOL DISTRICT	211271.7511	52817.93778	264089.6889	0.000670973	84972.31108	84972.31108	349062
288	WHITEPINE JOINT SCHOOL DISTRICT	220805.1454	55201.28636	276006.4318	0.00070125	73055.56821	73055.56821	349062
513	PROJECT IMPACT STEM ACADEMY, INC.	221192.3479	55298.08698	276490.4349	0.00070248	72571.56511	72571.56511	349062
497	PATHWAYS IN EDUCATION - NAMPA, INC.	223703.2973	55925.82433	279629.1216	0.000710455	69432.87837	69432.87837	349062
549	Gem Prep: Meridian North LLC.	227009.4784	56752.36961	283761.8481	0.000720955	65300.15194	65300.15194	349062
282	GENESEE JOINT DISTRICT	230491.074	57622.76851	288113.8426	0.000732012	60948.15744	60948.15744	349062
478	LEGACY PUBLIC CHARTER SCHOOL, INC.	231148.1449	57787.03623	288935.1811	0.000734099	60126.81886	60126.81886	349062
454	ROLLING HILLS PUBLIC CHARTER SCHOOL, INC.	236211.1106	59052.77766	295263.8883	0.000750178	53798.11172	53798.11172	349062
482	AMERICAN HERITAGE CHARTER SCHOOL, INC.	236293.2445	59073.31112	295366.5556	0.000750439	53695.44439	53695.44439	349062
451	VICTORY CHARTER SCHOOL, INC.	254192.559	63548.13974	317740.6987	0.000807285	31321.30131	31321.30131	349062
483	CHIEF TAHGEE ELEMENTARY ACADEMY, INC.	255377.6332	63844.4083	319222.0415	0.000811048	29839.9585	29839.9585	349062
458	LIBERTY CHARTER SCHOOL, INC.	258375.519	64593.87976	322969.3988	0.000820569	26092.6012	26092.6012	349062
432	CAMBRIDGE JOINT DISTRICT	258956.3228	64739.08069	323695.4034	0.000822414	25366.59656	25366.59656	349062
492	ANSER OF IDAHO, INC.	259936.0624	64984.01559	324920.0779	0.000825525	24141.92206	24141.92206	349062
418	MURTAUGH JOINT DISTRICT	276532.9685	69133.24212	345666.2106	0.000878235	3395.789383	3395.789383	349062
						10998551.27	10998551.27	