

**Missouri Assessment Program (MAP)
Alignment Forms Validation Study:
Appendices A through E**

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Prepared for: Missouri Department of Elementary and Secondary Education
205 Jefferson Street
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Jefferson City, Missouri 65102

Prepared under: Contract No: C308004001-002

February 5, 2010

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Appendix A

MAP Communication Arts: Detailed Statistical Results

In Appendix A, we present the full alignment results on the Communication Arts 2010 and 2011 test forms. These alignment results include: (a) the four Webb measures, (b) consensus DOK ratings by GLE, (d) item DOK ratings per reviewer, and (e) items matched to GLEs.

Webb Alignment Indicators

The following tables include complete statistical results on the Webb alignment indicators, including means and standard deviations per strand for each grade-level MAP test for Communication Arts.

Categorical Concurrence

We present the categorical concurrence results for grades 3 through 8 of the MAP Communication Arts 2010 and 2011 test forms. Each table includes: the target number of items from the test blueprint; the mean number of items matched by panelists; the standard deviation among panelists' ratings; and, the final alignment conclusion (Yes or No). The bottom row indicates the percentage of strands that met the minimum alignment criterion. Note that the total mean items matched may exceed the number of items on the assessment, as raters were able to match items to more than one strand.

Table A-1. Categorical Concurrence for Communication Arts 2010 and 2011 Test Forms, Grade 3: Mean Number Items per Strand

Big Idea	2010 Test Form			2011 Test Form		
	Mean Items	SD	At Least Six Items per Big Idea	Mean Items	SD	At Least Six Items per Big Idea
Reading - Processes	9.43	4.61	YES	9.14	3.02	YES
Reading - Fiction	16.57	4.65	YES	21.57	2.99	YES
Reading - NonFiction	15.57	0.98	YES	9.57	1.27	YES
Writing - Process	1.14	0.38	NO	1.67	0.58	NO
Writing - Text Development	14.29	1.11	YES	14.29	2.56	YES
Writing - Forms/Types	0.00	0.00	NO	1.25	0.50	NO

Table A-2. Categorical Concurrence for Communication Arts 2010 and 2011 Test Forms, Grade 4: Mean Number of Items per Strand

Big Idea	2010 Test Form			2011 Test Form		
	Mean Items	SD	At Least Six Items per Big Idea	Mean Items	SD	At Least Six Items per Big Idea
Reading - Processes	6.86	2.73	YES	8.86	3.89	YES
Reading - Fiction	15.71	3.59	YES	11.14	3.53	YES
Reading - NonFiction	20.00	1.53	YES	19.86	2.48	YES
Writing - Process	0.00	0.00	NO	1.00	0.00	NO
Writing - Text Development	11.86	2.12	YES	11.43	1.72	YES
Writing - Forms/Types	2.75	0.50	NO	3.17	1.47	NO

Table A-3. Categorical Concurrence for Communication Arts 2010 and 2011 Test Forms, Grade 5: Mean Number of Items per Strand

Big Idea	2010 Test Form			2011 Test Form		
	Mean Items	SD	At Least Six Items per Big Idea	Mean Items	SD	At Least Six Items per Big Idea
Reading - Processes	8.14	2.61	YES	8.43	0.79	YES
Reading - Fiction	18.00	2.38	YES	13.14	2.34	YES
Reading - NonFiction	15.57	0.79	YES	19.29	0.95	YES
Writing - Process	0.00	0.00	NO	0.00	0.00	NO
Writing - Text Development	13.00	0.82	YES	13.00	1.91	YES
Writing - Forms/Types	1.00	0.00	NO	1.00	0.00	NO

Table A-4. Categorical Concurrence for Communication Arts 2010 and 2011 Test Forms, Grade 6: Mean Number of Items per Strand

Big Idea	2010 Test Form			2011 Test Form		
	Mean Items	SD	At Least Six Items per Big Idea	Mean Items	SD	At Least Six Items per Big Idea
Reading - Processes	26.00	4.93	YES	26.43	5.06	YES
Reading - Fiction	10.00	0.82	YES	8.86	2.73	YES
Reading - NonFiction	6.00	2.58	YES	5.00	2.00	NO
Writing - Process	1.00	0.00	NO	1.00	0.00	NO
Writing - Text Development	12.43	2.44	YES	14.29	3.55	YES
Writing - Forms/Types	0.00	0.00	NO	1.00	0.00	NO

Table A-5. Categorical Concurrence for Communication Arts 2010 and 2011 Test Forms, Grade 7: Mean Number of Items per Strand

Big Idea	2010 Test Form			2011 Test Form		
	Mean Items	SD	At Least Six Items per Big Idea	Mean Items	SD	At Least Six Items per Big Idea
Reading - Processes	21.71	8.58	YES	23.14	8.23	YES
Reading - Fiction	9.43	2.51	YES	10.00	3.87	YES
Reading - NonFiction	10.86	5.58	YES	9.86	4.22	YES
Writing - Process	1.00	0.00	NO	1.00	0.00	NO
Writing - Text Development	17.86	2.04	YES	17.14	2.41	YES
Writing - Forms/Types	1.00	0.00	NO	0.00	0.00	NO

Table A-6. Categorical Concurrence for Communication Arts 2010 and 2011 Test Forms, Grade 8: Mean Number of Items per Strand

Big Idea	2010 Test Form			2011 Test Form		
	Mean Items	SD	At Least Six Items per Big Idea	Mean Items	SD	At Least Six Items per Big Idea
Reading - Processes	21.00	4.47	YES	22.29	4.50	YES
Reading - Fiction	9.17	3.25	YES	7.14	3.08	YES
Reading - NonFiction	11.50	3.62	YES	11.43	2.94	YES
Writing - Process	0.00	0.00	NO	1.00	0.00	NO
Writing - Text Development	15.83	1.60	YES	17.29	1.70	YES
Writing - Forms/Types	1.50	0.71	NO	2.00	1.00	NO

Depth-of-Knowledge Consistency

The Depth-of-Knowledge (DOK) consistency results for grades 3 through 8 of the MAP test for Communication Arts are presented below. The tables present the results of the comparison between the depth-of-knowledge expected in the GLEs and the depth-of-knowledge assessed by items. The tables include the mean percentage of items rated as below, at the same level, or above the DOK level of the GLEs along with the corresponding standard deviations. GLEs with at least 50% of items at the same (or above) DOK level met the minimum criterion.

Table A-7. DOK Consistency for Communication Arts 2010 and 2011 Test Forms , Grade 3: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

Big Idea	2010 Test Form							2010 Test Form						
	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met
Reading - Processes	62%	0.17	38%	0.17	0%	0.00	N	64%	0.16	35%	0.17	1%	0.03	N
Reading - Fiction	22%	0.14	68%	0.14	10%	0.13	Y	23%	0.13	72%	0.13	5%	0.06	Y
Reading - NonFiction	38%	0.14	54%	0.19	8%	0.07	Y	28%	0.17	64%	0.26	7%	0.11	Y
Writing - Process	7%	0.19	93%	0.19	0%	0.00	Y	33%	0.58	67%	0.58	0%	0.00	Y
Writing - Text Development	21%	0.08	78%	0.08	1%	0.03	Y	18%	0.13	79%	0.13	3%	0.06	Y
Writing - Forms/Types	0%	0.00	0%	0.00	0%	0.00	N	0%	0.00	100%	0.00	0%	0.00	Y

Table A-8. DOK Consistency for Communication Arts 2010 and 2011 Test Forms, Grade 4: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

Big Idea	2010 Test Form							2010 Test Form						
	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met
Reading - Processes	26%	0.28	74%	0.28	0%	0.00	Y	29%	0.28	69%	0.26	2%	0.05	Y
Reading - Fiction	22%	0.13	77%	0.13	1%	0.03	Y	28%	0.11	70%	0.12	2%	0.04	Y
Reading - NonFiction	14%	0.09	84%	0.08	2%	0.04	Y	12%	0.09	80%	0.09	8%	0.07	Y
Writing - Process	0%	0.00	0%	0.00	0%	0.00	N	100%	0.00	0%	0.00	0%	0.00	N
Writing - Text Development	11%	0.10	89%	0.10	0%	0.00	Y	16%	0.22	84%	0.22	0%	0.00	Y
Writing - Forms/Types	100%	0.00	0%	0.00	0%	0.00	N	75%	0.39	25%	0.39	0%	0.00	N

Table A-9. DOK Consistency for Communication Arts 2010 and 2011 Test Forms, Grade 5: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

Big Idea	2010 Test Form							2010 Test Form						
	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met
Reading - Processes	23%	0.15	77%	0.15	0%	0.00	Y	25%	0.25	75%	0.25	0%	0.00	Y
Reading - Fiction	9%	0.07	70%	0.10	20%	0.06	Y	11%	0.06	84%	0.10	5%	0.05	Y
Reading - NonFiction	82%	0.08	17%	0.09	1%	0.03	N	81%	0.08	19%	0.08	0%	0.00	N
Writing - Process	0%	0.00	0%	0.00	0%	0.00	N	0%	0.00	0%	0.00	0%	0.00	N
Writing - Text Development	8%	0.08	86%	0.10	6%	0.08	Y	9%	0.12	87%	0.11	4%	0.05	Y
Writing - Forms/Types	0%	0.00	100%	0.00	0%	0.00	Y	25%	0.00	75%	0.00	0%	0.00	Y

Table A-10. DOK Consistency for Communication Arts 2010 and 2011 Test Forms, Grade 6: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

Big Idea	2010 Test Form							2010 Test Form						
	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met
Reading - Processes	78%	0.12	21%	0.12	1%	0.02	N	81%	0.18	19%	0.18	1%	0.02	N
Reading - Fiction	29%	0.18	62%	0.16	9%	0.09	Y	37%	0.17	59%	0.16	4%	0.09	Y
Reading - NonFiction	60%	0.18	34%	0.22	7%	0.08	N	50%	0.31	41%	0.34	9%	0.12	Y
Writing - Process	100%	0.00	0%	0.00	0%	0.00		100%	0.00	0%	0.00	0%	0.00	N
Writing - Text Development	24%	0.21	64%	0.18	12%	0.19	Y	26%	0.21	63%	0.16	11%	0.14	Y
Writing - Forms/Types	0%	0.00	0%	0.00	0%	0.00	N	100%	0.00	0%	0.00	0%	0.00	N

Table A-11. DOK Consistency for Communication Arts 2010 and 2011 Test Forms, Grade 7: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

Big Idea	2010 Test Form							2010 Test Form						
	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met
Reading - Processes	72%	0.29	28%	0.29	0%	0.00	N	75%	0.26	25%	0.26	0%	0.00	N
Reading - Fiction	52%	0.19	42%	0.14	6%	0.09	N	54%	0.27	39%	0.20	7%	0.11	N
Reading - NonFiction	56%	0.20	39%	0.14	5%	0.09	N	62%	0.09	37%	0.11	1%	0.04	N
Writing - Process	100%	0.00	0%	0.00	0%	0.00	N	100%	0.00	0%	0.00	0%	0.00	N
Writing - Text Development	27%	0.18	66%	0.17	7%	0.13	Y	25%	0.18	69%	0.14	7%	0.12	Y
Writing - Forms/Types	33%	0.58	67%	0.58	0%	0.00	Y	0%	0.00	0%	0.00	0%	0.00	N

Table A-12. DOK Consistency for Communication Arts 2010 and 2011 Test Forms, Grade 8: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

Big Idea	2010 Test Form							2010 Test Form						
	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met	Percent Below	SD	Percent At	SD	Percent Above	SD	DOK Consistency Target Met
Reading - Processes	76%	0.12	24%	0.12	0%	0.00	N	75%	0.18	25%	0.18	0%	0.00	N
Reading - Fiction	40%	0.29	52%	0.24	8%	0.07	Y	47%	0.20	52%	0.18	2%	0.04	Y
Reading - NonFiction	64%	0.15	36%	0.15	0%	0.00	N	57%	0.13	43%	0.12	1%	0.02	N
Writing - Process	0%	0.00	0%	0.00	0%	0.00	N	100%	0.00	0%	0.00	0%	0.00	N
Writing - Text Development	27%	0.09	68%	0.08	6%	0.14	Y	34%	0.21	61%	0.20	5%	0.11	Y
Writing - Forms/Types	50%	0.71	50%	0.71	0%	0.00	Y	33%	0.58	67%	0.58	0%	0.00	Y

Range-of-Knowledge Correspondence

The results for Range-of-Knowledge correspondence for grades 3 through 8 of the MAP test for Communication Arts are presented below. The tables include the mean number, standard deviation, and percentage of GLEs by content strand. For acceptable range-of-knowledge correspondence, a minimum of 50% of content GLEs within each strand should be matched to at least one item.

Table A-13. Range-of-Knowledge for Communication Arts 2010 and 2011 Test Forms, Grade 3: Mean Percent of GLEs per Strand Linked with Items

Big Idea	2010 Test Form Range of GLEs						2011 Test Form Range of GLEs						
	Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand		Range-of- Knowledge Target Met	Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand		Range-of- Knowledge Target Met	
		M	S.D.	M	S.D.			M	S.D.	M	S.D.		
Reading - Processes	9.43	3.00	0.00	100	0.00	Y	9.14	3.00	0.00	100	0.00	Y	
Reading - Fiction	16.57	2.29	0.49	76	0.16	Y	21.57	2.14	0.38	71	0.13	Y	
Reading - NonFiction	15.57	2.00	0.00	67	0.00	Y	9.57	1.43	0.53	48	0.18	N	
Writing - Process	1.14	1.00	0.00	100	0.00	Y	1.67	1.00	0.00	100	0.00	Y	
Writing - Text Development	14.29	2.86	0.69	57	0.14	Y	14.29	2.71	0.76	54	0.15	Y	
Writing - Forms/Types	0.00	0.00	0.00	0	0.00	N	1.25	1.00	0.00	100	0.00	Y	
Percentage of strands with 50% of GLEs linked to at least one item						83%	Percentage of strands with 50% of GLEs linked to at least one item						83%

Table A-14. Range-of-Knowledge for Communication Arts 2010 and 2011 Test Forms, Grade 4: Mean Percent of GLEs per Strand Linked with Items

Big Idea	2010 Test Form Range of GLEs					Range-of-Knowledge Target Met	2011 Test Form Range of GLEs					Range-of-Knowledge Target Met	
	Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			
		M	S.D.	M	S.D.			M	S.D.	M	S.D.		
Reading - Processes	6.86	1.29	0.49	43	0.16	N	8.86	1.57	0.53	52	0.18	Y	
Reading - Fiction	15.71	3.00	0.00	100	0.00	Y	11.14	2.86	0.38	95	0.13	Y	
Reading - NonFiction	20.00	3.00	0.00	100	0.00	Y	19.86	2.86	0.38	95	0.13	Y	
Writing - Process	0.00	0.00	0.00	0	0.00	N	1.00	< 1	NA ¹	< 1	NA	N	
Writing - Text Development	11.86	3.43	0.53	69	0.11	Y	11.43	3.00	0.82	60	0.16	Y	
Writing - Forms/Types	2.75	1.00	0.00	100	0.00	Y	3.17	1.00	0.00	100	0.00	Y	
Percentage of strands with 50% of GLEs linked to at least one item						67%	Percentage of strands with 50% of GLEs linked to at least one item						83%

¹ Only one of six reviewers assigned this Big Idea to items.

Table A-15. Range-of-Knowledge for Communication Arts 2010 and 2011 Test Forms, Grade 5: Mean Percent of GLEs per Strand Linked with Items

Big Idea	2010 Test Form Range of GLEs					Range-of- Knowledge Target Met	2011 Test Form Range of GLEs					Range-of- Knowledge Target Met	
	Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			
		M	S.D.	M	S.D.			M	S.D.	M	S.D.		
Reading - Processes	8.14	3.00	0.00	100	0.00	Y	8.43	3.00	0.00	100	0.00	Y	
Reading - Fiction	18.00	3.00	0.00	100	0.00	Y	13.14	3.00	0.00	100	0.00	Y	
Reading - NonFiction	15.57	2.57	0.53	86	0.18	Y	19.29	2.57	0.53	86	0.18	Y	
Writing - Process	0.00	0.00	0.00	0	0.00	N	0.00	0.00	0.00	0	0.00	N	
Writing - Text Development	13.00	3.00	0.82	60	0.16	Y	13.00	2.29	0.49	46	0.10	N	
Writing - Forms/Types	1.00	1.00	0.00	100	0.00	Y	1.00	1.00	0.00	100	0.00	Y	
Percentage of strands with 50% of GLEs linked to at least one item						83%	Percentage of strands with 50% of GLEs linked to at least one item						67%

Table A-16. Range-of-Knowledge for Communication Arts 2010 and 2011 Test Forms, Grade 6: Mean Percent of GLEs per Strand Linked with Items

Big Idea	2010 Test Form Range of GLEs					Range-of- Knowledge Target Met	2011 Test Form Range of GLEs					Range-of- Knowledge Target Met	
	Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			
		M	S.D.	M	S.D.			M	S.D.	M	S.D.		
Reading - Processes	26.00	2.14	0.38	71	0.13	Y	26.43	2.14	0.69	71	0.23	Y	
Reading - Fiction	10.00	2.86	0.38	95	0.13	Y	8.86	2.43	0.53	81	0.18	Y	
Reading - NonFiction	6.00	2.00	0.58	67	0.19	Y	5.00	1.86	0.69	62	0.23	Y	
Writing - Process	1.00	1.00	0.00	100	0.00	Y	1.00	1.00	0.00	100	0.00	Y	
Writing - Text Development	12.43	3.29	0.95	66	0.19	Y	14.29	3.00	1.00	60	0.20	Y	
Writing - Forms/Types	0.00	0.00	0.00	0	0.00	N	1.00	1.00	0.00	100	0.00	Y	
Percentage of strands with 50% of GLEs linked to at least one item						83%	Percentage of strands with 50% of GLEs linked to at least one item						100%

Table A-17. Range-of-Knowledge for Communication Arts 2010 and 2011 Test Forms, Grade 7: Mean Percent of GLEs per Strand Linked with Items

Big Idea	2010 Test Form Range of GLEs					Range-of-Knowledge Target Met	2011 Test Form Range of GLEs					Range-of-Knowledge Target Met	
	Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			
		M	S.D.	M	S.D.			M	S.D.	M	S.D.		
Reading - Processes	21.71	2.43	0.53	81	0.18	Y	23.14	2.29	0.49	76	2.29	y	
Reading - Fiction	9.43	2.29	0.49	76	0.16	Y	10.00	2.14	0.69	71	2.14	y	
Reading - NonFiction	10.86	2.57	0.53	86	0.18	Y	9.86	2.57	0.53	86	2.57	Y	
Writing - Process	1.00	1.00	0.00	100	0.00	Y	1.00	1.00	0.00	100	0.00	Y	
Writing - Text Development	17.86	3.00	0.82	60	0.16	Y	17.14	2.86	0.90	57	2.86	Y	
Writing - Forms/Types	1.00	1.00	0.00	100	0.00	Y	0.00	0.00	0.00	0	0.00	N	
Percentage of strands with 50% of GLEs linked to at least one item						100%	Percentage of strands with 50% of GLEs linked to at least one item						83%

Table A-18. Range-of-Knowledge for Communication Arts 2010 and 2011 Test Forms, Grade 8: Mean Percent of GLEs per Strand Linked with Items

Big Idea	2010 Test Form Range of GLEs					Range-of-Knowledge Target Met	2011 Test Form Range of GLEs					Range-of-Knowledge Target Met	
	Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand			
		M	S.D.	M	S.D.			M	S.D.	M	S.D.		
Reading - Processes	21.00	2.33	0.52	78	0.17	Y	22.29	2.43	0.53	81	0.18	Y	
Reading - Fiction	9.17	2.50	0.55	83	0.18	Y	7.14	2.29	0.49	76	0.16	Y	
Reading - NonFiction	11.50	2.17	0.75	72	0.25	Y	11.43	2.00	0.82	67	0.27	Y	
Writing - Process	0.00	0.00	0.00	0	0.00	N	1.00	1.00	0.00	100	0.00	Y	
Writing - Text Development	15.83	3.00	0.89	60	0.18	Y	17.29	3.43	0.98	69	0.20	Y	
Writing - Forms/Types	1.50	1.00	0.00	100	0.00	Y	2.00	1.00	0.00	100	0.00	Y	
Percentage of strands with 50% of GLEs linked to at least one item						83%	Percentage of strands with 50% of GLEs linked to at least one item						100%

Balance-of-Knowledge Representation

The results for Balance-of-Knowledge representation for grades 3 through 8 of the MAP test for Communication Arts are presented below. The tables also include the percentage of items linked to each strand. The minimum acceptable balance index is 70 out of 100.

Table A-19. Balance-of-Knowledge Representation for Communication Arts 2010 and 2011 Test Forms, Grade 3: Mean Balance Index per Strand

Big Idea	2010 Test Form								2011 Test Form							
	GLEs per Big Idea	Mean Items per Big Idea		Mean % of Total Items Linked to Big Idea		Mean Balance Index		Balance Index Target Met	Mean Items per Big Idea	Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Mean Balance Index		Balance Index Target Met
		M	M	M	S.D.	M	S.D.			M	M	M	S.D.	M	S.D.	
Reading - Processes	3	9.43	3.00	17%	0.08	0.77	0.06	Y	9.14	3.00	16%	0.05	0.79	0.07	Y	
Reading - Fiction	3	16.57	2.29	29%	0.08	0.59	0.08	N	21.57	2.14	39%	0.05	0.57	0.07	N	
Reading - NonFiction	3	15.57	2.00	27%	0.02	0.61	0.05	N	9.57	1.43	17%	0.02	0.63	0.03	N	
Writing - Process	1	1.14	1.00	2%	0.01	1.00	0.02	Y	1.67	1.00	3%	0.01	1.00	0.01	Y	
Writing - Text Development	5	14.29	2.86	25%	0.02	0.61	0.03	N	14.29	2.71	26%	0.05	0.63	0.03	N	
Writing - Forms/Types	1	0	0	0	0	0	0	N	1.25	1.00	2%	0.01	1.00	0.01	Y	
Percent of Big Ideas with Balance Index of 0.70 or Higher								33%	Percent of Big Ideas with Balance Index of 0.70 or Higher							50%

Table A-20. Balance-of-Knowledge Representation for Communication Arts 2010 and 2011 Test Forms, Grade 4: Mean Balance Index per Strand

Big Idea	2010 Test Form								2011 Test Form							
	GLEs per Big Idea	Mean Items per Big Idea		Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Balance-of-Knowledge Representation		Mean Items per Big Idea	Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Balance-of-Knowledge Representation	
		M	M	M	S.D.	M	S.D.	M	S.D.		M	S.D.	M	S.D.	M	S.D.
Reading - Processes	3	6.86	1.29	12%	0.05	0.99	0.02	Y	8.86	1.57	16%	0.07	0.75	0.06	Y	
Reading - Fiction	3	15.71	3.00	28%	0.06	0.62	0.08	N	11.14	2.86	20%	0.06	0.63	0.03	N	
Reading - NonFiction	3	20.00	3.00	36%	0.03	0.54	0.07	N	19.86	2.86	36%	0.05	0.58	0.03	N	
Writing - Process	1	0	0	0	0	0	0	N	< 1	< 1	< 1	NA	1.00	NA	Y	
Writing - Text Development	5	11.86	3.43	21%	0.04	0.70	0.04	Y	11.43	3.00	21%	0.03	0.76	0.07	Y	
Writing - Forms/Types	1	2.75	1.00	5%	0.01	1.00	0.02	Y	3.17	1.00	6%	0.03	1.00	0.03	Y	
Percent of Big Ideas with Balance Index of 0.70 or Higher								50%	Percent of Big Ideas with Balance Index of 0.70 or Higher							67%

**Table A-21. Balance-of-Knowledge Representation for Communication Arts 2010 and 2011 Test Forms, Grade 5:
Mean Balance Index per Strand**

Big Idea	2010 Test Form								2011 Test Form							
	GLEs per Big Idea	Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Mean Balance Index		Balance Index Target Met	Mean Items per Big Idea	Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Mean Balance Index		Balance Index Target Met
		M	M	M	S.D.	M	S.D.			M	M	M	S.D.	M	S.D.	
Reading - Processes	3	8.14	3.00	15%	0.05	0.72	0.03	Y	8.43	3.00	15%	0.01	0.71	0.05	Y	
Reading - Fiction	3	18.00	3.00	33%	0.04	0.50	0.09	N	13.14	3.00	24%	0.04	0.55	0.06	N	
Reading - NonFiction	3	15.57	2.57	28%	0.01	0.47	0.08	N	19.29	2.57	35%	0.02	0.49	0.08	N	
Writing - Process	1	0	0	0	0	0	0	N	0	0	0	0	0	0	N	
Writing - Text Development	5	13.00	3.00	24%	0.01	0.59	0.06	N	13.00	2.29	24%	0.03	0.71	0.04	Y	
Writing - Forms/Types	1	1.00	1.00	0.02	0	1.00	0.00	Y	1.00	1.00	2%	0.00	1.00	0.00	Y	
Percent of Big Ideas with Balance Index of 0.70 or Higher								33%	Percent of Big Ideas with Balance Index of 0.70 or Higher						50%	

Table A-22. Balance-of-Knowledge Representation for Communication Arts 2010 and 2011 Test Forms, Grade 6: Mean Balance Index per Strand

Big Idea	2010 Test Form								2011 Test Form							
	GLEs per Big Idea	Mean Items per Big Idea		Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Balance-of-Knowledge Representation		Mean Items per Big Idea	Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Balance-of-Knowledge Representation	
		M	M	M	S.D.	M	S.D.	M	S.D.		M	S.D.	M	S.D.	M	S.D.
Reading - Processes	3	26.00	2.14	46%	0.09	0.49	0.07	N	26.43	2.14	48%	0.09	0.55	0.08	N	
Reading - Fiction	3	10.00	2.86	18%	0.01	0.69	0.03	N	8.86	2.43	16%	0.05	0.69	0.03	N	
Reading - NonFiction	3	6.00	2.00	11%	0.05	0.64	0.03	N	5.00	1.86	9%	0.04	0.73	0.04	Y	
Writing - Process	1	1.00	1.00	2%	0.01	1.00	0.00	Y	1.00	1.00	2%	0.01	1.00	0.00	Y	
Writing - Text Development	5	12.43	3.29	22%	0.04	0.64	0.04	N	14.29	3.00	26%	0.06	0.75	0.05	Y	
Writing - Forms/Types	1	0	0	0	0	0	0	N	1.00	1.00	2%	0.01	1.00	0.00	Y	
Percent of Big Ideas with Balance Index of 0.70 or Higher								16%	Percent of Big Ideas with Balance Index of 0.70 or Higher							67%

**Table A-23. Balance-of-Knowledge Representation for Communication Arts 2010 and 2011 Test Forms, Grade 7:
Mean Balance Index per Strand**

Big Idea	2010 Test Form								2011 Test Form							
	GLEs per Big Idea	Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Mean Balance Index		Balance Index Target Met	Mean Items per Big Idea	Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Mean Balance Index		Balance Index Target Met
		M	M	M	S.D.	M	S.D.			M	M	M	S.D.	M	S.D.	
Reading - Processes	3	21.71	2.43	36%	0.14	0.66	0.08	N	23.14	2.29	38%	0.13	0.65	0.08	N	
Reading - Fiction	3	9.43	2.29	15%	0.04	0.78	0.04	Y	10.00	2.14	16%	0.06	0.78	0.03	Y	
Reading - NonFiction	3	10.86	2.57	18%	0.09	0.67	0.04	N	9.86	2.57	16%	0.07	0.66	0.04	N	
Writing - Process	1	1.00	1.00	2%	0.00	1.00	0.02	Y	1.00	1.00	2%	0.00	1.00	0.01	Y	
Writing - Text Development	5	17.86	3.00	29%	0.03	0.69	0.05	N	17.14	2.86	28%	0.04	0.69	0.06	N	
Writing - Forms/Types	1	1.00	1.00	2%	0.00	1.00	0.00	Y	0	0	0	0	0	0	N	
Percent of Big Ideas with Balance Index of 0.70 or Higher								50%	Percent of Big Ideas with Balance Index of 0.70 or Higher						33%	

Table A-24. Balance-of-Knowledge Representation for Communication Arts 2010 and 2011 Test Forms, Grade 8: Mean Balance Index per Strand

Big Idea	2010 Test Form								2011 Test Form							
	GLEs per Big Idea	Mean Items per Big Idea		Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Balance-of-Knowledge Representation		Mean Items per Big Idea	Mean GLEs Linked with Items		Mean % of Total Items Linked to Big Idea		Balance-of-Knowledge Representation	
		M	M	M	S.D.	M	S.D.	M	S.D.		M	S.D.	M	S.D.	M	S.D.
Reading - Processes	3	21.00	2.33	35%	0.07	0.73	0.06	Y	22.29	2.43	37%	0.07	0.74	0.07	Y	
Reading - Fiction	3	9.17	2.50	15%	0.05	0.72	0.03	Y	7.14	2.29	12%	0.05	0.68	0.04	N	
Reading - NonFiction	3	11.50	2.17	19%	0.06	0.56	0.05	N	11.43	2.00	19%	0.05	0.57	0.05	N	
Writing - Process	1	0	0	0	0	0	0	N	1.00	1.00	2%	0.00	1.00	0.00	Y	
Writing - Text Development	5	15.83	3.00	26%	0.03	0.68	0.05	N	17.29	3.43	29%	0.03	0.70	0.05	Y	
Writing - Forms/Types	1	1.50	1.00	3%	0.01	1.00	0.03	Y	2.00	1.00	3%	0.02	1.00	0.02	Y	
Percent of Big Ideas with Balance Index of 0.70 or Higher								50%	Percent of Big Ideas with Balance Index of 0.70 or Higher							67%

Consensus DOK Ratings on GLEs

Tables A-25 through A-30 present DOK ratings established through group consensus for each Communication Arts GLE for Reading and Writing based on the Grade Level Expectations 2.0. Column 1 lists the Strand letter along with the Big Idea number, while Column 2 lists the full code for each GLE (Strand letter, Big Idea number, and specific GLE letter and grade level). Column 3 includes the titles and content descriptions corresponding with the GLEs. Column 4 indicates the DOK rating assigned to the GLE by the group.

Table A-25. Consensus DOK Ratings by GLE for Communication Arts, Grade 3

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
R R.1		Reading	2
		Develop and apply skills and strategies to the reading process	3
	R.1.e.3	Vocabulary - Develop vocabulary through text, using a. root words b. synonyms and antonyms c. context clues d. glossary e. dictionary, with assistance	2
	R.1.h.3	Post-Reading - Apply post-reading skills to demonstrate comprehension of text: a. answer basic comprehension questions b. identify and explain the relationship between the main idea and supporting details b identify cause and effect c. make predictions c. make predicftions f. draw conclusions g. analyze h. paraphrase i. summarize	3
R.2	R.1.i.3	Making Connections - Identify and explain relevant connections between a. text to text (text ideas --- information and relationships in various fiction and non-fiction works--compare and contrast)	3
		Develop and apply skills and strategies to comprehend, analyze and evaluate fiction, poetry and drama from a variety of cultures and times	2
	R.2.a.3	Text Features - Use grade level text to (a)locate and apply information in title, table of contents and glossary (b)locate and recognize the text features of fiction, poetry and drama	1
	R.2.b.3	Literary Techniques - Identify and explain examples of sensory details, sound devices, and figurative language in text along with basic literary techniques	2
	R.2.c.3	Literary Elements - Use details from text to a. demonstrate comprehension skills previously introduced b. make inferences c. compare and contrast d. identify cause and effect e. identify the narrator f. identify events from the beginning, middle and end g. identify author's purpose h. identify settings, character traits, and problems and solutions	2
R.3		Develop and apply skills and strategies to comprehend, analyze and evaluate nonfiction (such as biographies, newspapers, technical manuals) from a variety of cultures and times	2
	R.3.a.3	Text Features - Locate and interpret key information in illustrations, title, chapter headings, table of contents, glossary, charts, diagrams, graphs, captions and maps	2
	R.3.b.3	Literary Techniques - Identify and/or explain examples of sensory details, sound devices, and figurative language in text along with basic literary techniques	2

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK	
W W.1	R.3.c.3	Text Structures - Use details from text to a. demonstrate comprehension skills previously introduced b. answer questions c. explain main idea and supporting details d. sequence events e. identify simple cause and effect f. draw conclusions g. compare and contrast h. make inferences i. identify author's purpose for writing text j. identify problems and solutions	2	
		Writing Apply a writing process in composing text	3 3	
W.2	W.1.a.3	Writing Process - Follow a writing process to a. independently use a simple pre-writing strategy b. generate a draft c. reread and revise work for audience and purpose, ideas and content, organization and sentence structure, and word choice (refer to W2A, W2B, W2C, W2D) d. edit for conventions (refer to W2E)	3	
		Compose well-developed text	2	
		W.2.a.3	Audience and purpose - Compose text (a) showing awareness of audience (b) in a format appropriate to audience and purpose	3
		W.2.b.3	Ideas and Content - Compose text with (a) a clear controlling idea (b) relevant details/examples	3
		W.2.c.3	Organization and Sentence Structure - Compose text with (a) a beginning, middle and end (b) sentence variety (including imperative and exclamatory)	2
W.3	W.2.d.3	Word Choice - Compose text using words that are related to the topic, and some words that are specific and accurate	2	
		W.2.e.3	Conventions - In written text a. space correctly between words in a sentence and in margins b. capitalize months of year, titles of individuals, greeting and closing of letter c. use correct ending punctuation in imperative and exclamatory sentences d. correctly use verbs that agree with the subject, and comparative and superlative forms of adverbs and adjectives e. correctly spell simple compounds, homophones, contractions and words with affixes f. use standard spelling and classroom resources, including dictionary, to edit for correct spelling	1
		W.3	Write effectively in various forms and types of writing	3
Forms/Types/Modes of Writing -Compose a. narrative, descriptive, expository, and/or persuasive texts, using appropriate text features b. text emphasizing the format of diary/journal entries and friendly letters	3			

Table A-26. Consensus DOK Ratings by GLE for Communication Arts, Grade 4

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
R		Reading	2
R.1	R.1.e.4	Develop and apply skills and strategies to the reading process	3
		Vocabulary - through text, using a. root words and affixes b. synonyms and antonyms c. context clues d. glossary and dictionary	2
		R.1.h.4	Post-Reading - Apply post-reading skills to demonstrate

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
		comprehension of text: a. answer basic comprehension questions b identify and explain the relationship between the main idea and supporting details c. make predictions f. draw conclusions g. analyze h. paraphrase i. summarize	
	R.1.i.4	Making Connections - Identify and explain relevant connections between a. text to text (text ideas ---information and relationships in various fiction and non-fiction works--compare and contrast)	3
R.2	R.2	Develop and apply skills and strategies to comprehend, analyze and evaluate fiction, poetry and drama from a variety of cultures and times	2
	R.2.a.4	Text Features - Use grade level text to a. locate, interpret and apply information in title, table of contents and glossary b. locate and recognize the text features of fiction, poetry and drama	2
	R.2.b.4	Literary Techniques - Identify and/or explain examples of sensory details, sound devices, and figurative language in text along with basic literary techniques previously introduced	2
	R.2.c.4	Literary Elements - Use details from text to a. demonstrate comprehension skills previously introduced b. make inferences c. compare and contrast d. identify cause and effect e. identify author's purpose f. identify setting, character traits, problems and solutions, and story events	2
R.3		Develop and apply skills and strategies to comprehend, analyze and evaluate nonfiction (such as biographies, newspapers, technical manuals) from a variety of cultures and times	2
	R.3.a.4	Text Features - Apply information in illustrations, title, chapter headings, table of contents, glossary, charts, diagrams, graphs, captions and maps to comprehend text	2
	R.3.b.4	Literary Techniques - Identify and/or explain examples of sensory details, sound devices, and figurative language in text along with basic literary techniques	2
	R.3.c.4	Text Structure - Use details from text to a. demonstrate comprehension skills previously introduced b. explain main idea and supporting details c. sequence events d. identify cause and effect e. draw conclusions f. compare and contrast g. make predications h. make inferences i. distinguish between fact and opinion j. identify and explain author's purpose k. identify problems and solutions	2
W		Writing	3
W.1		Apply a writing process in composing text	3
	W.1.a.4	Writing Process - Follow a writing process to a. independently use a simple prewriting strategy b. generate a draft c. reread, revise for audience and purpose, ideas and content, organization and sentence structure, and word choice (refer to W2A, W2B, W2C, W2D) d. edit for conventions (refer to W2E)	3
W.2		Compose well-developed text	2
	W.2.a.4	Audience and purpose - Compose text a. showing awareness of audience b. in a format appropriate to audience and purpose	3
	W.2.b.4	Ideas and Content - Compose text with a. a clear controlling idea b. relevant details /examples	3
	W.2.c.4	Organization and Sentence Structure - Compose text with a. a beginning, middle, and end b. a logical sequence of events c. sentence variety	2

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
W.3	W.2.d.4	Word choice - Compose text using a. words that are specific, accurate, and suited to the topic b. sensory detail	2
	W.2.f.4	Conventions - In written text a. capitalize holidays, names of counties and countries b. use commas in a series, and between city and state c. use apostrophe in contractions and singular possessives, with assistance d. correctly use verbs that agree with compound subject, and conjunctions e. use standard spelling and classroom resources, including dictionary, to edit for correct spelling	1
		Write effectively in various forms and types of writing	3

Table A-27. Consensus DOK Ratings by GLE for Communication Arts, Grade 5

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
R		Reading	2
R.1		Develop and apply skills and strategies to the reading process	3
	R.1.e.5	Vocabulary - Develop vocabulary through text, using a. roots and affixes b. synonyms and antonyms c. context clues d. glossary and dictionary	2
	R.1.h.5	Post-Reading - Apply post-reading skills to demonstrate comprehension of text: a. answer basic comprehension questions b identify and explain the relationship between the main idea and supporting details c. make predictions f. draw conclusions g. analyze h. paraphrase i. summarize	3
	R.1.i.5	Making Connections - Compare, contrast and analyze connections between a. text to text (information and relationships in various fiction and non-fiction works)	3
R.2		Develop and apply skills and strategies to comprehend, analyze and evaluate fiction, poetry and drama from a variety of cultures and times	2
	R.2.a.5	Text Features - Use grade level text to a. locate, interpret and apply information in title, table of contents and glossary b. locate and recognize the text features of fiction, poetry and drama	2
	R.2.b.5	Literary Techniques - Identify and explain examples of sensory details, figurative language, and basic literary techniques in text, emphasizing a. simile b. metaphor c. personification d. analyze literary techniques previously introduced	2
	R.2.c.5	Literary Elements - Use details from text to a. demonstrate comprehension skills previously introduced b. make inferences c. compare and contrast d. identify and explain cause and effect e. explain author's purpose f. identify setting, character traits, problems and solutions, and story events	2
R.3		Develop and apply skills and strategies to comprehend, analyze and evaluate nonfiction (such as biographies, newspapers, technical manuals) from a variety of cultures and times	2
	R.3.a.5	Text Features - Apply information in text features, graphics, such as maps, diagrams, charts and index, to clarify and connect concepts to the main ideas	2

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
W W.1 W.2 W.3	R.3.b.5	Literary Techniques - Identify and explain examples of sensory details, figurative language, and basic literary techniques in text, emphasizing a. simile b. metaphor c. personification d. analyze literary techniques previously introduced	2
	R.3.c.5	Text Structures - Use details from text to a. demonstrate comprehension skills previously introduced b. explain main idea and supporting details c. sequence events d. identify and explain cause and effect e. compare and contrast f. make predictions g. make inferences h. evaluate the accuracy of the information i. identify and interpret author's idea and purpose j. identify problems and solutions	3
		Writing	3
		Apply a writing process in composing text	3
	W.1.a.5	Writing Process - Follow a writing process to a. use a prewriting strategy b. generate a draft c. reread, revise for audience and purpose, ideas and content, organization and sentence structure, and word choice (refer to W2A, W2B, W2C, W2D) d. edit for conventions (refer to W2E)	3
	W.2	Compose well-developed text	2
	W.2.a.5	Audience and purpose -Compose text a. showing awareness of audience b. in a format appropriate to audience and purpose	3
	W.2.b.5	Ideas and Content- Compose text with a. strong, controlling idea b. relevant, specific details	3
	W.2.c.5	Organization and Sentence Structure - Write text with a. a clear beginning, middle, and end b. a logical sequence of events c. evidence of paragraphing d. sentence variety	2
	W.2.d.5	Word Choice - Compose text using a. words that are specific, accurate, and suited to the topic b. writing techniques, such as sensory detail and purposeful dialogue	2
	W.2.e.5	Conventions - In written text a. capitalize titles and proper nouns b. use comma in compound sentences c. use apostrophe in singular possessives, and proper punctuation in titles with assistance d. use correct verb tense and subject/verb agreement e. use correct spelling of simple compounds, homophones, contractions and words with affixes f. use standard spelling, classroom resources, including dictionary, to edit for correct spelling	1
	W.3	Write effectively in various forms and types of writing	3
	W.3.a.5	Forms/Types/Modes of Writing - Compose a variety of texts, a. narrative, descriptive, expository, and/or persuasive texts, using appropriate text features b. selecting and using an appropriate format c. including a summary (narrative or informational)	3

Table A-28. Consensus DOK Ratings by GLE for Communication Arts, Grade 6

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
R		Reading	2
R.1		Develop and apply skills and strategies to the reading process	3

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
R.2	R.1.e.6	Vocabulary - Develop vocabulary through text, using a. roots and affixes b. context clues c. glossary, dictionary and thesaurus	2
	R.1.h.6	Post-Reading - Apply post-reading skills to demonstrate comprehension of text: a. answer basic comprehension questions b. identify and explain the relationship between the main idea and supporting details c. make predictions f. draw conclusions g. analyze h. paraphrase i. summarize	3
	R.1.i.6	Making Connections - Compare, contrast and analyze connections: a. text to text (information and relationships in various fiction and non-fiction works)	3
		Develop and apply skills and strategies to comprehend, analyze and evaluate fiction, poetry and drama from a variety of cultures and times	2
	R.2.a.6	Text Features - Use grade level text to a. interpret and analyze information in title b. recognize and interpret the text features of fiction, poetry and drama	2
	R.2.b.6	Literary Techniques - Identify and explain examples of sensory details, figurative language, and basic literary techniques in text, emphasizing a. onomatopoeia b. alliteration c. idiom d. analyze literary techniques previously introduced	2
	R.2.c.6	Literary Elements - Use details from text to a. demonstrate comprehension skills previously introduced b. identify plot, including problem/conflict, climax, and resolution c. analyze the influence of setting on characters and plot d. explain cause and effect e. identify point of view f. identify author's viewpoint/perspective g. identify the problem-solving processes of characters h. evaluate the effectiveness of solutions	3
R.3		Develop and apply skills and strategies to comprehend, analyze and evaluate nonfiction (such as biographies, newspapers, technical manuals) from a variety of cultures and times	2
	R.3.a.6	Text Features - a. Identify and explain text features in biography and autobiography b. Analyze text features to clarify meaning, emphasizing newspapers and magazines	2
	R.3.b.6	Literary Techniques - Identify and explain examples of sensory details, figurative language, and basic literary techniques in text, emphasizing a. onomatopoeia b. alliteration c. idiom d. analyze literary techniques previously introduced	2
	R.3.c.6	Text Structures - Use details from text to a. demonstrate comprehension skills previously introduced b. paraphrase author's stated ideas c. make predictions d. make inferences e. evaluate the accuracy of the information f. sequence events g. compare and contrast h. identify point of view i. determine and/or compare authors' viewpoints j. identify and explain cause and effect k. identify problems solving processes and explain the effectiveness of solutions l. analyze two or more texts	3
W		Writing	3
W.1		Apply a writing process in composing text	4
	W.1.a.6	Writing Process - Follow a writing process to a. use appropriate pre-writing strategies b. generate a draft c. reread, revise for audience and purpose, ideas and content, organization and sentence structure, and word choice (refer to W2A, W2B, W2C, W2D) d. edit for conventions (refer to W2E)	4

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
W.2		Compose well-developed text	3
	W.2.a.6	Audience and purpose - Compose text a. showing awareness of audience b. choosing a form appropriate to topic and specific audience	3
	W.2.b.6	Ideas and Content - Compose text with a. strong controlling idea b. relevant, specific details	2
	W.2.c.6	Organization and Sentence Structure - Compose text with a. a clear, beginning, middle, and end b. a logical sequence of events c. appropriate paragraphing d. a variety of sentence structures, including simple and compound	3
	W.2.d.6	Word Choice - Compose text using a. precise and vivid language b. writing techniques, such as figurative language, sensory detail, and purposeful dialogue	3
	W.2.e.6	Conventions - In written text a. capitalize proper adjectives, appropriate words in dialogue with assistance b. use comma in compound sentences c. use apostrophe in irregular and plural possessives, quotation marks in dialogue, with assistance d. punctuate prepositional phrases and appositives correctly e. use standard spelling, classroom resources, including dictionary, to edit for correct spelling	1
W.3		Write effectively in various forms and types of writing	3
	W.3.a.6	Forms/Types/Modes of Writing - Compose a variety of texts, a. using narrative, descriptive, expository, and/or persuasive features b. including a summary (narrative or informational)	3

Table A-29. Consensus DOK Ratings by GLE for Communication Arts, Grade 7

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
R		Reading	2
R.1		Develop and apply skills and strategies to the reading process	3
	R.1.e.7	Vocabulary - Develop vocabulary through text, using a. roots and affixes b. context clues c. glossary, dictionary and thesaurus	2
	R.1.h.7	Post-Reading - Apply post-reading skills to demonstrate comprehension of text: a. answer basic comprehension questions b. identify and explain the relationship between the main idea and supporting details c. make predictions f. draw conclusions g. analyze h. paraphrase i. summarize	3
	R.1.i.7	Making Connections - Compare, contrast and analyze connections: a. text to text (information and relationships in various fiction and non-fiction works)	3
R.2		Develop and apply skills and strategies to comprehend, analyze and evaluate fiction, poetry and drama from a variety of cultures and times	2
	R.2.a.7	Text Features - Use grade level text to a. interpret and analyze information in title b. recognize and interpret the text features of fiction, poetry and drama	2

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
R.3	R.2.b.7	Literary Techniques - Identify and explain examples of sensory details, figurative language, and basic literary techniques in text, emphasizing a. hyperbole b. imagery c. propaganda d. analyze literary techniques previously introduced	2
	R.2.c.7	Literary Elements - Use details from text to a. demonstrate comprehension skills previously introduced b. identify plot and sub-plot, mood, flashback, theme and types of conflict c. analyze cause and effect d. identify and explain point of view e. identify and explain author's viewpoint/perspective f. evaluate the problem-solving processes of characters f. evaluate the effectiveness of solutions	3
		Develop and apply skills and strategies to comprehend, analyze and evaluate nonfiction (such as biographies, newspapers, technical manuals) from a variety of cultures and times	2
	R.3.a.7	Text Features - Explain and analyze text features to clarify meaning, emphasizing consumer texts	2
	R.3.b.7	Literary Techniques - Identify and explain examples of sensory details, figurative language, and basic literary techniques in text, emphasizing a. hyperbole b. imagery c. propaganda d. analyze literary techniques previously introduced	2
	R.3.c.7	Text Structures - Use details from text to a. demonstrate comprehension of skills previously introduced b. summarize author's ideas c. make predictions d. make inferences e. evaluate the accuracy of the information f. sequence events g. compare and contrast h. identify and explain point of view i. determine and/or compare authros' viewpoints j. identify and explain cause and effect k. identify problem solving processes and explain the effectiveness of solutions l. analyze two or more texts	3
W		Writing	3
W.1		Apply a writing process in composing text	4
	W.1.a.7	Writing Process - Follow a writing process to a. use appropriate prewriting strategies as needed b. generate a draft c. reread, revise for audience and purpose, ideas and content, organization and sentence structure, and word choice (refer to W2A, W2B, W2C, W2D) d. edit for conventions (refer to W2E)	4
W.2	W.2	Compose well-developed text	3
	W.2.a.7	Audience and purpose - Compose text a. showing awareness of audience b. choosing a form appropriate to topic and specific audience	3
	W.2.b.7	Ideas and Content - Compose text with a. strong, controlling idea b. relevant, specific details	2
	W.2.c.7	Organization and Sentence Structure - Compose text with a. an effective beginning, middle, and end b. a logical order c. appropriate paragraphing d. a variety of sentence structures, including complex sentences e. cohesive devices, especially transition	3
	W.2.d.7	Word Choice - Compose text using a. precise and vivid language b. writing techniques, such as figurative language, sensory detail and purposeful dialogue	3
	W.2.e.7	Conventions - In written text a. capitalize within dialogue b. use commas and quotation marks in dialogue, and semi-colon in compound sentences c. use correct agreement of pronoun and antecedent, and consistent verb tense d. use standard spelling,	1

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
W.3		classroom resources, including dictionary, to edit for correct spelling	3
	W.3.a.7	Write effectively in various forms and types of writing Forms/Types/Modes of Writing Compose a variety of texts, a. using narrative, descriptive, expository, and/or persuasive features b. including a summary c. responding to literature	3

Table A-30. Consensus DOK Ratings by GLE for Communication Arts, Grade 8

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
R		Reading	3
R.1		Develop and apply skills and strategies to the reading process	3
	R.1.e.8	Vocabulary - Develop vocabulary through text, using a. roots and affixes b. context clues c. glossary, dictionary and thesaurus	2
	R.1.h.8	Post-Reading - Apply post-reading skills to demonstrate comprehension of text: a. answer basic comprehension questions b. identify and explain the relationship between the main idea and supporting details c. make predictions f. draw conclusions g. analyze h. paraphrase i. summarize	3
	R.1.i.8	Making Connections - Compare, contrast and analyze connections: a. text to text (information and relationships in various fiction and non-fiction works)	3
R.2		Develop and apply skills and strategies to comprehend, analyze and evaluate fiction, poetry and drama from a variety of cultures and times	2
R.2.a.8	R.2.a.8	Text Features - Use grade level text to a. interpret and analyze information in title b. recognize and interpret the text features of fiction, poetry and drama	2
R.2.b.8	R.2.b.8	Literary Techniques - Identify and explain examples of sensory details, figurative language, and basic literary techniques in text, emphasizing a. jargon b. dialect c. slang d. symbolism e. analyze literary techniques previously introduced	2
	R.2.c.8	Literary Elements - Use details from text to a. demonstrate comprehension skills previously introduced b. identify and explain flashback, mood and theme c. analyze point of view d. analyze author's viewpoint/perspective e. determine how an incident foreshadows a future event f. interpret behaviors, motives, and consequences of characters' actions g. evaluate problem-solving processes of characters h. evaluate effectiveness of solutions	3
R.3		Develop and apply skills and strategies to comprehend, analyze and evaluate nonfiction (such as biographies, newspapers, technical manuals) from a variety of cultures and times	3
	R.3.a.8	Text Features - Explain, analyze and evaluate the author's use of text features to clarify meaning	3
	R.3.b.8	Literary Techniques - Identify and explain examples of sensory details, figurative language, and basic literary techniques in text, emphasizing a. jargon b. dialect c. slang d. symbolism e. analyze	2

Strand, Big Idea	Strand, Big Idea, GLE	Description	DOK
	R.3.c.8	literary techniques previously introduced Text Structures - Use details from text to a. demonstrate comprehension skills previously introduced b. evaluate adequacy of evidence presented by author c. determine author's purpose based on text analysis d. compare and contrast e. determine the importance of information f. analyze point of view g. determine author's viewpoints h. identify problem solving processes and explain effectiveness of solutions i. determine importance of information j. analyze word choice and connotation k. analyze organizational effectiveness l. accuracy of information	3
W	W	Writing	3
W.1		Apply a writing process in composing text	4
	W.1.a.8	Writing Process - Follow a writing process to: a. use appropriate prewriting strategies as needed b. generate a draft c. reread, revise for audience and purpose, ideas and content, organization and sentence structure, and word choice (refer to W2A, w2B, W2C, W2K)d. edit for conventions (refer to W2E)	4
W.2		Compose well-developed text	3
	W.2.a.8	Audience and purpose - Compose text a. showing awareness of audience b. choosing a form and point of view appropriate to purpose and audience	3
	W.2.b.8	Ideas and Content - Compose text with a. strong controlling idea b. relevant specific details c. complex ideas d. freshness of thought	3
	W.2.c.8	Organization and Sentence Structure - Compose text with a. an effective beginning, middle, and end b. a logical order c. effective paragraphing d. a variety of sentence structures, including compound-complex sentences e. cohesive devices, including transitions, repetition, pronoun antecedent, and parallel structure	3
	W.2.d.8	Word Choice - Compose text using a. precise and vivid language b. writing techniques such as figurative language, sensory detail and purposeful dialogue	3
	W.2.e.8	Conventions - In written text a. use conventions of capitalization, b. use colon to introduce lists c. use correct pronoun case d. use dictionary, spell-check and other resources to edit for correct spelling	1
W.3		Write effectively in various forms and types of writing	3
	W.3.a.8	Forms/Types/Modes of Writing - Compose a variety of texts, a. using narrative, descriptive, expository, and/or persuasive features b. in various formats, including workplace communication (e.g., business letter with a correctly addressed envelope, email communications) c. including summary d. including literature response	3

Appendix B

MAP Mathematics: Detailed Statistical Results

In Appendix B, we present the full alignment results on the Mathematics 2010 and 2011 test forms. These alignment results include: (a) the four Webb measures, (b) consensus DOK ratings by GLE, (d) item DOK ratings per reviewer, and (e) items matched to GLEs.

Webb Alignment Indicators

The following tables include complete statistical results on the Webb alignment indicators, including means and standard deviations per strand for each grade-level MAP test for Communication Arts.

Categorical Concurrence

We present the categorical concurrence results for grades 3 through 8 of the MAP Math 2010 and 2011 test forms. Each table includes the target number of items from the test blueprint; the mean number of items matched by panelists; the standard deviation among panelists' ratings; and, the final alignment conclusion (Yes or No). The bottom row indicates the percentage of strands that met the minimum alignment criterion. Note that the total mean items matched may exceed the number of items on the assessment because raters could match items to more than one strand.

Table B-1. Categorical Concurrence for Math 2010 and 2011 Test Forms, Grade 3: Mean Number Items per Strand

Title of Strand	Target # Items from Blueprint	2010 Test Form			2011 Test Form		
		Mean Items Matched	Standard Deviation	At Least Six Items per Strand	Mean Items Matched	Standard Deviation	At Least Six Items per Strand
Numbers and Operations	19-23	15.71	2.81	Y	17.33	1.89	Y
Algebraic Relationships	11-13	11.29	2.19	Y	11.67	1.80	Y
Geometric and Spatial Relationships	10-12	10.86	2.29	Y	11.33	0.94	Y
Measurement	5-7	9.43	1.18	Y	10.33	1.25	Y
Data and Probability	13-15	6.57	1.76	Y	8.67	1.25	Y
Total	61 ^a	53.86	7.51		59.33	3.04	
Percent of strands with at least 6 items				100%	100%		

^a Specific item totals for 2010 and 2011 test forms from Test Specifications.

Table B-2. Categorical Concurrence for Math 2010 and 2011 Test Forms, Grade 4: Mean Number Items per Strand

Title of Strand	Target # Items from Blueprint	2010 Test Form			2011 Test Form		
		Mean Items Matched	Standard Deviation	At Least Six Items per Strand	Mean Items Matched	Standard Deviation	At Least Six Items per Strand
Numbers and Operations	23-28	18.43	3.02	Y	18.57	2.97	Y
Algebraic Relationships	10-12	19.14	3.48	Y	17.71	5.77	Y
Geometric and Spatial Relationships	13-15	10.71	2.05	Y	10.14	0.99	Y
Measurement	6-8	12.86	1.12	Y	13.14	1.12	Y
Data and Probability	13-15	7.71	4.13	Y	7.71	6.82	Y
Total	68 ^a	68.86	6.03		67.29	5.26	
Percent of strands with at least 6 items				100%	100%		

^a Specific item totals for 2010 and 2011 test forms from Test Specifications.

Table B-3. Categorical Concurrence for Math 2010 and 2011 Test Forms, Grade 5: Mean Number Items per Strand

Title of Strand	Target # Items from Blueprint	2010 Test Form			2011 Test Form		
		Mean Items Matched	Standard Deviation	At Least Six Items per Strand	Mean Items Matched	Standard Deviation	At Least Six Items per Strand
Numbers and Operations	16-20	15.57	3.54	Y	14.00	3.63	Y
Algebraic Relationships	10-12	14.29	1.98	Y	15.00	2.00	Y
Geometric and Spatial Relationships	10-12	10.57	0.49	Y	11.00	0.76	Y
Measurement	10-12	8.86	1.25	Y	8.86	0.83	Y
Data and Probability	14-17	9.14	1.12	Y	10.86	1.96	Y
Total	68 ^a	58.43	3.11		59.71	3.19	
Percent of strands with at least 6 items				100%	100%		

^a Specific item totals for 2010 and 2011 test forms from Test Specifications.

Table B-4. Categorical Concurrence for Math 2010 and 2011 Test Forms, Grade 6: Mean Number Items per Strand

Title of Strand	Target # Items from Blueprint	2010 Test Form			2011 Test Form		
		Mean Items Matched	Standard Deviation	At Least Six Items per Strand	Mean Items Matched	Standard Deviation	At Least Six Items per Strand
Numbers and Operations	17-21	18.29	0.88	Y	17.00	0.93	Y
Algebraic Relationships	8-10	12.86	1.25	Y	12.86	0.35	Y
Geometric and Spatial Relationships	8-10	8.57	1.84	Y	8.00	0.00	Y
Measurement	14-18	8.57	0.73	Y	9.00	0.53	Y
Data and Probability	11-13	13.43	0.49	Y	14.43	0.49	Y
Total	63 ^a	61.71	0.70		61.29	0.88	
Percent of strands with at least 6 items				100%	100%		

^a Specific item totals for 2010 and 2011 test forms from Test Specifications.

Table B-5. Categorical Concurrence for Math 2010 and 2011 Test Forms, Grade 7: Mean Number Items per Strand

Title of Strand	Target # Items from Blueprint	2010 Test Form			2011 Test Form		
		Mean Items Matched	Standard Deviation	At Least Six Items per Strand	Mean Items Matched	Standard Deviation	At Least Six Items per Strand
Numbers and Operations	14-17	15.71	1.11	Y	15.71	0.45	Y
Algebraic Relationships	11-13	19.43	1.40	Y	18.00	0.00	Y
Geometric and Spatial Relationships	8-10	8.29	0.49	Y	9.00	0.53	Y
Measurement	10-12	6.86	0.38	Y	11.14	0.35	Y
Data and Probability	18-22	9.57	0.98	Y	10.29	0.45	Y
Total	62 ^a	59.86	0.89		64.14	0.35	
Percent of strands with at least 6 items				80%	100%		

^a Specific item totals for 2010 and 2011 test forms from Test Specifications.

Table B-6. Categorical Concurrence for Math 2010 and 2011 Test Forms, Grade 8: Mean Number Items per Strand

Title of Strand	Target # Items from Blueprint	2010 Test Form			2011 Test Form		
		Mean Items Matched	Standard Deviation	At Least Six Items per Strand	Mean Items Matched	Standard Deviation	At Least Six Items per Strand
Numbers and Operations	6-8	13.14	1.46	Y	11.71	1.28	Y
Algebraic Relationships	15-19	20.43	1.29	Y	20.29	0.45	Y
Geometric and Spatial Relationships	6-8	15.57	0.73	Y	16.43	0.90	Y
Measurement	13-15	5.86	0.83	Y	6.29	0.45	Y
Data and Probability	22-26	13.00	0.53	Y	13.00	0.00	Y
Total	62 ^a	68.00	0.96		67.71	0.70	
Percent of strands with at least 6 items				100%	100%		

^a Specific item totals for 2010 and 2011 test forms from Test Specifications.

Depth-of-Knowledge Consistency

Tables B-7 through B-12 include the depth-of-knowledge (DOK) consistency results for grades 3 through 8 of the MAP Math 2010 and 2011 test forms. The tables present the results of the comparison between the depth-of-knowledge expected in the GLEs and the depth-of-knowledge assessed by items. The tables include the mean percentage of items rated as below, at the same level, or above the DOK level of the GLEs along with the corresponding standard deviations. GLEs with at least 50% of items at the same (or above) DOK level met the minimum criterion.

Table B-7. DOK Consistency for Math 2010 and 2011 Test Forms, Grade 3: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

	2010 Form								2011 Form								
	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	
		% Items Below		% Items Same		% Items Above				% Items Below		% Items Same		% Items Above			
	M	S.D.	M	S.D.	M	S.D.		M	S.D.	M	S.D.	M	S.D.				
Numbers and Operations	15.71	29	0.40	67	0.39	3	0.11	Y	17.33	25	0.37	69	0.36	6	0.13	Y	
Algebraic Relationships	11.29	13	0.25	83	0.30	4	0.19	Y	11.67	12	0.28	80	0.33	8	0.18	Y	
Geometric and Spatial Relationships	10.86	23	0.31	73	0.29	4	0.09	Y	11.33	21	0.33	76	0.34	3	0.08	Y	
Measurement	9.43	15	0.30	79	0.32	5	0.16	Y	10.33	16	0.30	82	0.30	2	0.07	Y	
Data and Probability	6.57	11	0.12	89	0.12	0	0.00	Y	8.67	23	0.26	74	0.25	3	0.07	Y	
Percent of strands with 50% of item DOK at or above objective DOK:								100%	Percent of strands with 50% of item DOK at or above objective DOK:								100%

Table B-8. DOK Consistency for Math 2010 and 2011 Test Forms, Grade 4: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

	2010 Form								2011 Form								
	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	
		% Items Below	% Items Same		% Items Above		% Items Below			% Items Same		% Items Above					
	M	S.D.	M	S.D.	M	S.D.		M	S.D.	M	S.D.	M	S.D.				
Numbers and Operations	18.43	8	0.22	81	0.30	11	0.23	Y	18.57	14	0.34	77	0.35	9	0.18	Y	
Algebraic Relationships	19.14	21	0.33	79	0.33	0	0.00	Y	17.71	26	0.38	70	0.39	4	0.14	Y	
Geometric and Spatial Relationships	10.71	16	0.26	73	0.35	11	0.29	Y	10.14	22	0.32	78	0.32	0	0.00	Y	
Measurement	12.86	18	0.33	75	0.37	6	0.21	Y	13.14	21	0.35	76	0.37	3	0.17	Y	
Data and Probability	7.71	19	0.34	81	0.34	0	0.00	Y	7.71	10	0.15	90	0.15	0	0.00	Y	
Percent of strands with 50% of item DOK at or above objective DOK:								100%	Percent of strands with 50% of item DOK at or above objective DOK:								100%

Table B-9. DOK Consistency for Math 2010 and 2011 Test Forms, Grade 5: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

	2010 Form								2011 Form								
	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	
		% Items Below		% Items Same		% Items Above				% Items Below		% Items Same		% Items Above			
	M	S.D.	M	S.D.	M	S.D.		M	S.D.	M	S.D.	M	S.D.				
Numbers and Operations	15.57	21	0.26	79	0.26	0	0.00	Y	14	23	0.28	77	0.28	0	0.00	Y	
Algebraic Relationships	14.29	17	0.30	83	0.30	0	0.00	Y	15	13	0.18	87	0.19	1	0.03	Y	
Geometric and Spatial Relationships	10.57	30	0.39	68	0.38	2	0.10	Y	11	27	0.40	73	0.40	0	0.00	Y	
Measurement	8.86	0	0.00	86	0.19	14	0.19	Y	8.86	0	0.00	90	0.17	10	0.17	Y	
Data and Probability	9.14	46	0.37	54	0.37	0	0.00	Y	10.86	32	0.39	67	0.39	1	0.05	Y	
Percent of strands with 50% of item DOK at or above objective DOK:								100%	Percent of strands with 50% of item DOK at or above objective DOK:								100%

Table B-10. DOK Consistency for Math 2010 and 2011 Test Forms, Grade 6: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

	2010 Form								2011 Form								
	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	
		% Items Below	% Items Same		% Items Above		% Items Below			% Items Same		% Items Above					
	M	S.D.	M	S.D.	M	S.D.		M	S.D.	M	S.D.	M	S.D.				
Numbers and Operations	18.29	28	0.39	70	0.40	2	0.10	Y	17.00	36	0.43	62	0.42	3	0.10	Y	
Algebraic Relationships	12.86	28	0.35	69	0.34	3	0.11	Y	12.86	26	0.35	74	0.35	0	0.00	Y	
Geometric and Spatial Relationships	8.57	33	0.40	67	0.40	0	0.00	Y	8.00	19	0.30	81	0.30	0	0.00	Y	
Measurement	8.57	34	0.44	48	0.39	18	0.29	Y	9.00	45	0.42	36	0.28	19	0.27	Y	
Data and Probability	13.43	62	0.43	34	0.39	5	0.16	Y	14.43	53	0.48	44	0.45	3	0.08	Y	
Percent of strands with 50% of item DOK at or above objective DOK:								100%	Percent of strands with 50% of item DOK at or above objective DOK:								100%

Table B-11. DOK Consistency for Math 2010 and 2011 Test Forms, Grade 7: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

	2010 Form								2011 Form							
	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met
		% Items Below	% Items Same		% Items Above		% Items Below			% Items Same		% Items Above				
M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.			
Numbers and Operations	15.71	36	0.07	63	0.09	1	0.03	Y	15.71	8	0.23	70	0.28	21	0.25	Y
Algebraic Relationships	19.43	48	0.11	46	0.15	5	0.07	Y	18	32	0.43	68	0.43	0	0.00	Y
Geometric and Spatial Relationships	8.29	8	0.11	44	0.14	48	0.13	* Y	9	30	0.41	70	0.41	0	0.00	Y
Measurement	6.86	25	0.04	70	0.07	4	0.05	Y	11.14	9	0.25	58	0.44	33	0.43	Y
Data and Probability	9.57	36	0.07	63	0.09	1	0.03	Y	10.29	37	0.48	58	0.49	5	0.21	Y

Percent of strands with 50% of item DOK at or above objective

DOK: 100%

Percent of strands with 50% of item DOK

at or above objective DOK: 100%

* NOTE: This result meets the minimum Webb criterion; however, 48% of items were rated as assessing students above the cognitive level expected in the GLEs. This outcome may require review to determine if a disproportionate number of items require students to demonstrate knowledge above the GLEs.

Table B-12. DOK Consistency for Math 2010 and 2011 Test Forms, Grade 8: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

	2010 Form								2011 Form								
	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	
		% Items Below	% Items Same		% Items Above		% Items Below			% Items Same		% Items Above					
M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.				
Numbers and Operations	13.14	29	0.27	71	0.27	0	0.00	Y	11.71	26	0.27	74	0.27	0	0.00	Y	
Algebraic Relationships	20.43	23	0.34	75	0.35	2	0.10	Y	20.29	7	0.18	85	0.26	9	0.17	Y	
Geometric and Spatial Relationships	15.57	24	0.35	76	0.35	0	0.00	Y	16.43	25	0.41	59	0.47	16	0.36	Y	
Measurement	5.86	46	0.30	54	0.30	0	0.00	Y	6.29	51	0.11	49	0.11	0	0.00	Y	
Data and Probability	13.00	55	0.45	38	0.42	8	0.23	N	13.00	70	0.41	30	0.41	0	0.00	N	
Percent of strands with 50% of item DOK at or above objective DOK:								80%	Percent of strands with 50% of item DOK at or above objective DOK:								80%

Range-of-Knowledge Correspondence

We present the range-of-knowledge correspondence results for grades 3 through 8 of the MAP Math 2010 and 2011 test forms. The tables include the mean number, standard deviation, and percentage of GLEs by content strand. For acceptable range-of-knowledge correspondence, a minimum of 50% of content GLEs within each strand should be matched to at least one item.

Table B-13. Range-of-Knowledge for Math 2010 and 2011 Test Forms, Grade 3: Mean Percent of GLEs per Strand Linked with Items

Title of Strand	2010 Test Form							2011 Test Form							
	Number of GLEs	Mean Items per Strand	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met	Mean Items per Strand	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met				
			GLEs with At Least One Item	M				S.D.	GLEs with At Least One Item			M	S.D.		
Numbers and Operations	6	15.71	5.57	0.49	91	0.08	Y	17.33	5.83	0.37	95	0.07	Y		
Algebraic Relationships	4	11.29	3.71	0.45	90	0.12	Y	11.67	4.00	0.58	96	0.09	Y		
Geometric and Spatial Relationships	3	10.86	3.14	0.35	96	0.09	Y	11.33	3.33	0.47	100	0.00	Y		
Measurement	3	9.43	3.14	0.35	96	0.09	Y	10.33	3.33	0.47	100	0.00	Y		
Data and Probability	1	6.57	1.00	0.00	100	0.00	Y	8.67	1.00	0.00	100	0.00	Y		
Percentage of strands with 50% of GLEs linked to at least one item							100%	Percentage of strands with 50% of GLEs linked to at least one item							100%

Table B-14. Range-of-Knowledge for Math 2010 and 2011 Test Forms, Grade 4: Mean Percent of GLEs per Strand Linked with Items

Title of Strand	Number of GLEs	2010 Test Form						2011 Test Form					
		Mean Items per Strand	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met	Mean Items per Strand	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met		
			GLEs with At Least One Item	S.D.				GLEs with At Least One Item	S.D.				
Numbers and Operations	7	18.43	6.57	0.49	90	6	Y	18.57	6.57	0.49	90	0.06	Y
Algebraic Relationships	4	19.14	3.71	0.45	93	11	Y	17.71	3.71	0.45	93	0.11	Y
Geometric and Spatial Relationships	3	10.71	3.14	0.35	100	0	Y	10.14	3.00	0.00	100	0.00	Y
Measurement	4	12.86	4.43	0.73	100	0	Y	13.14	4.57	0.90	100	0.00	Y
Data and Probability	2	7.71	2.14	0.35	100	0	Y	7.71	2.00	0.53	93	0.17	Y
Percentage of strands with 50% of GLEs linked to at least one item							100%	Percentage of strands with 50% of GLEs linked to at least one item					100%

Table B-15. Range-of-Knowledge for Math 2010 and 2011 Test Forms, Grade 5: Mean Percent of GLEs per Strand Linked with Items

Title of Strand	Number of GLEs	2010 Test Form						2011 Test Form					
		Mean Items per Strand	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met	Mean Items per Strand	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met		
			GLEs with At Least One Item	S.D.				GLEs with At Least One Item	S.D.				
Numbers and Operations	5	15.57	4.71	0.45	92	0.09	Y	14.00	4.00	0.76	78	0.13	Y
Algebraic Relationships	4	14.29	3.43	0.49	86	0.12	Y	15.00	3.29	0.88	82	0.22	Y
Geometric and Spatial Relationships	3	10.57	3.57	0.73	100	0.00	Y	11.00	3.57	0.73	100	0.00	Y
Measurement	3	8.86	2.29	0.45	69	0.04	Y	8.86	3.00	0.53	95	0.12	Y
Data and Probability	3	9.14	3.00	0.00	100	0.00	Y	10.86	3.00	0.00	100	0.00	Y
Percentage of strands with 50% of GLEs linked to at least one item							100%	Percentage of strands with 50% of GLEs linked to at least one item					100%

Table B-16. Range-of-Knowledge for Math 2010 and 2011 Test Forms, Grade 6: Mean Percent of GLEs per Strand Linked with Items

Title of Strand	2010 Test Form							2011 Test Form					
	Number of GLEs	Mean Items per Strand	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met	Range of GLEs						
			GLEs with At Least One Item	M			S.D.	Mean Items per Strand	GLEs with At Least One Item	% of Total GLEs per Strand	Range-of-Knowledge Target Met		
Numbers and Operations	7	18.29	5.86	0.35	84	0.05	Y	17.00	5.86	0.83	82	0.10	Y
Algebraic Relationships	4	12.86	4.57	0.49	100	0.00	Y	12.86	4.71	0.45	100	0.00	Y
Geometric and Spatial Relationships	3	8.57	3.43	0.49	100	0.00	Y	8.00	3.43	0.49	100	0.00	Y
Measurement	3	8.57	3.00	0.00	100	0.00	Y	9.00	3.00	0.00	100	0.00	Y
Data and Probability	6	13.43	6.00	0.00	100	0.00	Y	14.43	6.00	0.00	100	0.00	Y
Percentage of strands with 50% of GLEs linked to at least one item							100%	Percentage of strands with 50% of GLEs linked to at least one item					100%

Table B-17. Range-of-Knowledge for Math 2010 and 2011 Test Forms, Grade 7: Mean Percent of GLEs per Strand Linked with Items

Title of Strand	2010 Test Form							2011 Test Form					
	Number of GLEs	Mean Items per Strand	Range of GLEs				Range-of-Knowledge Target Met	Mean Items per Strand	Range of GLEs				Range-of-Knowledge Target Met
			GLEs with At Least One Item	% of Total GLEs per Strand	M	S.D.			GLEs with At Least One Item	% of Total GLEs per Strand	M	S.D.	
Numbers and Operations	5	15.71	3.71	0.49	74	0.10	Y	15.71	4.57	0.49	78	0.07	Y
Algebraic Relationships	8	19.43	7.00	0.00	100	0.00	Y	18.00	8.00	0.00	100	0.00	Y
Geometric and Spatial Relationships	4	8.29	3.29	0.49	82	0.12	Y	9.00	4.00	0.53	82	0.07	Y
Measurement	5	6.86	3.00	0.00	100	0.00	Y	11.14	5.00	0.00	100	0.00	Y
Data and Probability	4	9.57	2.71	0.49	68	0.12	Y	10.29	3.14	0.35	76	0.02	Y
Percentage of strands with 50% of GLEs linked to at least one item							100%	Percentage of strands with 50% of GLEs linked to at least one item					100%

Table B-18. Range-of-Knowledge for Math 2010 and 2011 Test Forms, Grade 8: Mean Percent of GLEs per Strand Linked with Items

Title of Strand	2010 Test Form							2011 Test Form							
	Number of GLEs	Mean Items per Strand	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met	Range of GLEs		% of Total GLEs per Strand	Range-of-Knowledge Target Met					
			GLEs with At Least One Item	M			S.D.	GLEs with At Least One Item			M	S.D.			
Numbers and Operations	3	13.14	3.00	0.00	96	0.09	Y	11.71	3.00	0.00	96	0.09	Y		
Algebraic Relationships	8	20.43	7.00	0.00	88	0.00	Y	20.29	5.86	0.35	84	0.05	Y		
Geometric and Spatial Relationships	6	15.57	5.29	0.45	88	0.08	Y	16.43	6.00	0.00	94	0.07	Y		
Measurement	3	5.86	2.00	0.00	67	0.00	Y	6.29	2.00	0.00	67	0.00	Y		
Data and Probability	5	13.00	5.71	0.45	100	0.00	Y	13.00	5.71	0.45	100	0.00	Y		
Percentage of strands with 50% of GLEs linked to at least one item							100%	Percentage of strands with 50% of GLEs linked to at least one item							100%

Balance-of-Knowledge Representation

The results for Balance-of-Knowledge representation for grades 3 through 8 of the MAP test for Math are presented below. The tables also include the percentage of items linked to each strand. The minimum acceptable balance index is 0.70 on a scale of 0 to 1.

Table B-19. Balance-of-Knowledge Representation for Math 2010 and 2011 Test forms, Grade 3: Mean Balance Index per Strand

Title of Strand	2010 Test Form								2011 Test Form								
	GLEs per Strand	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation				Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation					
					Mean Balance Index	S.D.	Balance Index Target Met	Mean Balance Index				S.D.	Balance Index Target Met				
		M	M	M	S.D.	M	S.D.		M	M	M	S.D.	M	S.D.			
Numbers and Operations	6	5.57	15.71	29	0.03	0.81	0.05	Y	17.33	5.83	29	0.03	0.82	0.03	Y		
Algebraic Relationships	4	3.71	11.29	21	0.03	0.79	0.05	Y	11.67	4.00	20	0.02	0.73	0.06	Y		
Geometric and Spatial Relationships	3	3.14	10.86	20	0.03	0.86	0.05	Y	11.33	3.33	19	0.01	0.82	0.08	Y		
Measurement	3	3.14	9.43	18	0.01	0.76	0.08	Y	10.33	3.33	17	0.02	0.81	0.04	Y		
Data and Probability	1	1.00	6.57	12	0.03	1.00	0.00	Y	8.67	1.00	15	0.02	1.00	0.00	Y		
		Percentage of standards with a balance of representation index of 0.70 or greater							100%	Percentage of standards with a balance of representation index of 0.70 or greater							100%

Table B-20. Balance-of-Knowledge Representation for Math 2010 and 2011 Test forms, Grade 4: Mean Balance Index per Strand

Title of Strand	2010 Test Form								2011 Test Form								
	GLEs per Strand	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation			Balance Index Target Met	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation			Balance Index Target Met		
					Mean Balance Index	S.D.						Mean Balance Index	S.D.				
Numbers and Operations	7.29	6.57	18.43	27	0.03	0.82	0.06	Y	6.57	18.57	27	0.03	0.75	0.05	Y		
Algebraic Relationships	4	3.71	19.14	28	0.05	0.75	0.11	Y	3.71	17.71	27	0.09	0.67	0.05	N		
Geometric and Spatial Relationships	3.14	3.14	10.71	16	0.03	0.81	0.07	Y	3	10.14	15	0.02	0.83	0.05	Y		
Measurement	4.43	4.43	12.86	19	0.02	0.75	0.02	Y	4.57	13.14	20	0.01	0.79	0.06	Y		
Data and Probability	2.14	2.14	7.71	11	0.05	0.78	0.16	Y	2	7.71	11	0.09	0.87	0.10	Y		
Percentage of standards with a balance of representation index of 0.70 or greater								100%	Percentage of standards with a balance of representation index of 0.70 or greater								80%

Table B-21. Balance-of-Knowledge Representation for Math 2010 and 2011 Test forms, Grade 5: Mean Balance Index per Strand

Title of Strand	2010 Test Form								2011 Test Form										
	GLEs per Strand	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand		Balance-of-Knowledge Representation		Balance Index Target Met	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand		Balance-of-Knowledge Representation		Balance Index Target Met				
						Mean Balance Index	S.D.						Mean Balance Index	S.D.					
Numbers and Operations	5	4.71	15.57	26	5	0.78	0.07	Y	4	14	23	5	0.86	0.05	Y				
Algebraic Relationships	4	3.43	14.29	25	4	0.82	0.07	Y	3.29	15	25	4	0.80	0.06	Y				
Geometric and Spatial Relationships	3	3.57	10.57	18	1	0.87	0.05	Y	3.57	11	18	1	0.83	0.06	Y				
Measurement	3	2.29	8.86	15	2	0.85	0.13	Y	3	8.86	15	2	0.75	0.07	Y				
Data and Probability	3	3	9.14	16	2	0.92	0.02	Y	3	10.86	18	3	0.88	0.08	Y				
		Percentage of standards with a balance of representation index of 0.70 or greater							100%			Percentage of standards with a balance of representation index of 0.70 or greater							100%

Table B-22. Balance-of-Knowledge Representation for Math 2010 and 2011 Test forms, Grade 6: Mean Balance Index per Strand

Title of Strand	2010 Test Form								2011 Test Form								
	GLEs per Strand	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation				Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation					
					Mean Balance Index	S.D.	Balance Index Target Met	Y/N				Mean Balance Index	S.D.	Balance Index Target Met	Y/N		
Numbers and Operations	7	5.86	18.29	30	1	0.60	0.03	N	5.86	17	28	1	0.65	0.03	N		
Algebraic Relationships	4	4.57	12.86	21	2	0.74	0.04	Y	4.71	12.86	21	1	0.77	0.03	Y		
Geometric and Spatial Relationships	3	3.43	8.57	14	3	0.77	0.07	Y	3.43	8	13	0	0.90	0.02	Y		
Measurement	3	3	8.57	14	1	0.87	0.05	Y	3	9	15	1	0.78	0.01	Y		
Data and Probability	6	6	13.43	22	1	0.80	0.02	Y	6	14.43	24	1	0.78	0.01	Y		
		Percentage of standards with a balance of representation index of 0.70 or greater							80%	Percentage of standards with a balance of representation index of 0.70 or greater							80%

Table B-23. Balance-of-Knowledge Representation for Math 2010 and 2011 Test forms, Grade 7: Mean Balance Index per Strand

Title of Strand	2010 Test Form								2011 Test Form								
	GLEs per Strand	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation			Balance Index Target Met	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation			Balance Index Target Met		
					Mean Balance Index	S.D.						Mean Balance Index	S.D.				
Numbers and Operations	5	3.71	15.71	26	0.02	0.67	0.04	Y	4.57	15.71	25	0.01	0.66	0.05	N		
Algebraic Relationships	8	7.00	19.43	32	0.00	0.72	0.05	Y	8	18	28	0.00	0.70	0.04	Y		
Geometric and Spatial Relationships	4	3.29	8.29	14	0.01	0.79	0.04	Y	4	9	14	0.01	0.81	0.03	Y		
Measurement	5	3.00	6.86	11	0.01	0.82	0.03	Y	5	11.14	17	0.01	0.71	0.05	Y		
Data and Probability	4	2.71	9.57	16	0.02	0.68	0.02	Y	3.14	10.29	16	0.01	0.64	0.02	N		
		59.86Percentage of standards with a balance of representation index of 0.70 or greater							100%	Percentage of standards with a balance of representation index of 0.70 or greater							100%

Table B-24. Balance-of-Knowledge Representation for Math 2010 and 2011 Test forms, Grade 8: Mean Balance Index per Strand

Title of Strand	2010 Test Form								2011 Test Form								
	GLEs per Strand	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation		Mean Balance Index	Balance Index Target Met	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation		Mean Balance Index	Balance Index Target Met		
					M	S.D.						M	S.D.				
Numbers and Operations	3.14	3	13.14	19	2	0.75	0.02	Y	3	11.71	17	2	0.75	0.01	Y		
Algebraic Relationships	8	7	20.43	30	2	0.73	0.04	Y	5.86	20.29	30	1	0.65	0.05	N		
Geometric and Spatial Relationships	6	5.29	15.57	23	1	0.77	0.04	Y	6	16.43	24	1	0.73	0.02	Y		
Measurement	3	2	5.86	9	1	0.80	0.10	Y	2	6.29	9	1	0.86	0.04	Y		
Data and Probability	5.71	5.71	13	19	1	0.71	0.02	Y	5.71	13	19	0	0.64	0.00	N		
		Percentage of standards with a balance of representation index of 0.70 or greater							100%	Percentage of standards with a balance of representation index of 0.70 or greater							60%

Consensus DOK Ratings on GLEs

Tables B-25 through B-30 present DOK ratings established through group consensus for each Math GLE based on the Grade Level Expectations 2.0. Column 1 lists the Strand letter along with the Substrand number, while Column 2 lists the full code for each GLE (Strand letter, Substrand number, and specific GLE letter and grade level). Column 3 includes the titles and content descriptions corresponding with the GLEs. Column 4 indicates the DOK rating assigned to the GLE by the group.

Table B-25. Consensus DOK Ratings by GLE for Math, Grade 3

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
N		Numbers and Operations	2
N.1		Understand numbers, ways of representing numbers, relationships among numbers and number systems	1
	N.1.a.3	Read, write and compare numbers - read, write and compare whole numbers up to 10,000	1
	N.1.c.3	Compose and decompose numbers - recognize equivalent representations for the same number and generate them by decomposing and composing numbers including expanded notation	1
	N.1.d.3	Classify and describe numeric relationships - classify numbers by their characteristics, including odd and even	2
N.3		Compute fluently and make reasonable estimates	2
	N.3.b.3	Develop and demonstrate fluency - use strategies to develop fluency with basic number relationships (9 X 9) of multiplication and division	1
N.3	N.3.c.3	Compute problems - apply and describe the strategy used to compute up to 3-digit addition or subtraction problems	2
	N.3.d.3	Estimate and justify solutions - estimate and justify sums and differences of whole numbers	2
A		Algebraic Relationships	2
A.1		Understand patterns, relations and functions	2
	A.1.a.3	Recognize and extend patterns - extend geometric (shapes) and numeric patterns to find the next term	2
	A.1.b.3	Create and analyze patterns - represent patterns using words, tables or graphs	2
A.2		Represent and analyze mathematical situations and structures using algebraic symbols	2
	A.2.a.3	Represent mathematical situations - using all operations, represent a mathematical situation as an expression or number sentence	2
	A.2.b.3	Describe and use mathematical manipulation - use the commutative, distributive and associative properties for basic facts of whole numbers	1
G		Geometric and Spatial Relationships	2
G.1		Analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships	2
	G.1.a.3	Describe and use geometric relationships - compare and analyze 2-dimensional shapes by describing their attributes (circle, rectangle, rhombus, trapezoid, triangle)	2

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
G.3		Apply transformations and use symmetry to analyze mathematical situations	2
	G.3.a.3	Use transformations on objects - determine if two objects are congruent through a slide, flip or turn	2
	G.3.c.3	Use symmetry - identify lines of symmetry in polygons	1
M		Measurement	1
M.1		Understand measurable attributes of objects and the units, systems and processes of measurement	2
	M.1.c.3	Tell and use units of time - tell time to the nearest five minutes	1
	M.1.d.3	Count and compute money - determine change from \$5.00 and add and subtract money values to \$5.00	2
M.2		Apply appropriate techniques, tools and formulas to determine measurements	1
	M.2.c.3	Apply geometric measurements - determine the perimeter of polygons	1
D		Data and Probability	2
D.1		Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them	2
	D.1.c.3	Represent and interpret data - read and interpret information from line plots and graphs (bar, line, pictorial)	2

Table B-26. Consensus DOK Ratings by GLE for Math, Grade 4

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
N		Numbers and Operations	2
N.1		Understand numbers, ways of representing numbers, relationships among numbers and number systems	1
	N.1.a.4	Read, write and compare numbers - read, write and compare and whole numbers less than 100,000	1
	N.1.c.4	Compose and decompose numbers - recognize equivalent representations for the same number and generate them by decomposing and composing numbers	1
	N.1.d.4	Classify and describe numeric relationships - classify and describe numbers by their characteristics, including odd, even, multiples and factors	2
N.2		Understand meanings of operations and how they relate to one another	2
	N.2.b.4	Describe effects of operations - describe the effects of multiplying and dividing whole numbers as well as the relationship between the two operations	2

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
N.3		Compute fluently and make reasonable estimates	2
	N.3.b.4	Develop and demonstrate fluency - demonstrate fluency with basic number relationships (12 X 12) of multiplication and related division facts	1
	N.3.c.4	Compute problems - apply and describe the strategy used to compute a given multiplication of 2-digit by 2-digit numbers and related division facts	2
	N.3.d.4	Estimate and justify solutions - estimate and justify products of whole numbers	2
A		Algebraic Relationships	2
A.1		Understand patterns, relations and functions	2
	A.1.a.4	Recognize and extend patterns - describe geometric and numeric patterns	2
	A.1.b.4	Create and analyze patterns - analyze patterns using words, tables and graphs	2
A.2		Represent and analyze mathematical situations and structures using algebraic symbols	2
	A.2.a.4	Represent mathematical situations -using all operations, represent a mathematical situation as an expression or number sentence	2
	A.2.b.4	Describe and use mathematical manipulation - use the commutative, distributive and associative properties of addition and multiplication for multidigit numbers	2
G		Geometric and Spatial Relationships	2
G.1		Analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships	2
	G.1.a.4	Describe and use geometric relationships - name and identify properties of 1-, 2-, and 3-dimensional shapes and describe the attributes of 2- and 3-dimensional shapes using appropriate geometric vocabulary (rectangular prism, cylinder, pyramid, sp	2
G.3		Apply transformations and use symmetry to analyze mathematical situations	2
	G.3.a.4	Use transformations on objects - predict the results of sliding/ translating, flipping/ reflecting or turning/ rotating around the center point of a polygon	2
	G.3.c.4	Use symmetry - create a figure with multiple lines of symmetry and identify the lines of symmetry	2
M		Measurement	2
M.1		Understand measurable attributes of objects and the units, systems and processes of measurement	1
	M.1.b.4	Identify equivalent measures - identify equivalent linear measures within a system of measurement	1
	M.1.c.4	Tell and use units of time - tell time to the nearest minute	1
	M.1.d.4	Count and compute money - determine change from \$10.00 and add and subtract money values to \$10.00	2

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
M.2		Apply appropriate techniques, tools and formulas to determine measurements	3
	M.2.c.4	Apply geometric measurements - determine and justify areas of polygons and non-polygonal regions imposed on a rectangular grid	3
D		Data and Probability	2
D.1		Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them	2
	D.1.a.4	Formulate questions - collect data using observations, surveys and experiments	2
	D.1.c.4	Represent and interpret data - create tables or graphs to represent categorical and numerical data (including line plots)	2

Table B-27. Consensus DOK Ratings by GLE for Math, Grade 5

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
N		Numbers and Operations	2
N.1		Understand numbers, ways of representing numbers, relationships among numbers and number systems	2
	N.1.b.5	Represent and use rational numbers - recognize and generate equivalent forms of commonly used fractions and decimals	2
N.2		Understand meanings of operations and how they relate to one another	2
	N.2.a.5	Represent operations - represent and recognize division using various models, including quotative and partitive	2
N.3		Compute fluently and make reasonable estimates	2
	N.3.b.5	Develop and demonstrate fluency - demonstrate fluency with efficient procedures for adding and subtracting decimals and fractions (with unlike denominators) and division of whole numbers	2
	N.3.c.5	Compute problems - apply and describe the strategy used to compute a given division problem up to a 3- digit by 2-digit and addition and subtraction of fractions and decimals	2
	N.3.d.5	Estimate and justify solutions - estimate and justify products, and quotients of whole numbers and sums differences of decimals and fractions	2
A		Algebraic Relationships	2
A.1		Understand patterns, relations and functions	2
	A.1.a.5	Recognize and extend patterns - make and describe generalizations about geometric and numeric patterns	2
	A.1.b.5	Create and analyze patterns - represent and analyze patterns using words, tables and graphs	2
A.2		Represent and analyze mathematical situations and structures using algebraic symbols	2

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
A.3	A.2.a.5	Represent mathematical situations - using all operations, represent a mathematical situation as an expression or number sentence using a letter or symbol	2
		Use mathematical models to represent and understand quantitative relationships	3
	A.3.a.5	Use mathematical models - model problem situations and draw conclusions, using representations such as graphs, tables or number sentence	3
G		Geometric and Spatial Relationships	2
G.1		Analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships	3
	G.1.c.5	Compose and decompose shapes - predict and justify the results of subdividing, combining and transforming shapes	3
G.3		Apply transformations and use symmetry to analyze mathematical situations	1
	G.3.c.5	Use symmetry - identify polygons and designs with rotational symmetry	1
G.4		Use visualization, spatial reasoning and geometric modeling to solve problems	2
	G.4.a.5	Recognize and draw three-dimensional representations - given a net of a prism or cylinder, identify the 3-dimensional shape	2
M		Measurement	1
M.1		Understand measurable attributes of objects and the units, systems and processes of measurement	1
	M.1.b.5	Identify equivalent measures - identify the equivalent weights and equivalent capacities within a system of measurement	1
M.2		Apply appropriate techniques, tools and formulas to determine measurements	2
	M.2.c.5	Apply geometric measurements - determine volume by finding the total number of the same size units needed to fill a space without gaps or overlaps	2
	M.2.e.5	Use relationships within a measurement system - convert from one unit to another within a system of linear measurement (customary and metric)	1
D		Data and Probability	3
D.1		Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them	3
	D.1.a.5	Formulate questions - evaluate data-collection methods	3
D.2		Select and use appropriate statistical methods to analyze data	2
	D.2.a.5	Describe and analyze data - compare related data sets	2
D.3		Develop and evaluate inferences and predictions that are based on data	3
	D.3.a.5	Develop and evaluate inferences - given a set of data make and justify predictions	3

Table B-28. Consensus DOK Ratings by GLE for Math, Grade 6

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
N		Numbers and Operations	1
N.1		Understand numbers, ways of representing numbers, relationships among numbers and number systems	1
	N.1.a.6	Read, write and compare numbers - apply and understand whole numbers to millions, fractions and decimals to the thousandths (including location on the number line)	2
	N.1.b.6	Represent and use rational numbers - recognize and generate equivalent forms of fractions, decimals and benchmark percents	1
N.2		Understand meanings of operations and how they relate to one another	2
	N.2.b.6	Describe effects of operations - describe the effects of multiplication and division on fractions and decimals	2
	N.2.d.6	Apply operations on real and complex numbers - identify square and cubic numbers and determine whole number roots and cubes	1
N.3		Compute fluently and make reasonable estimates	2
	N.3.c.6	Compute problems - multiply and divide positive rational numbers	1
	N.3.e.6	Use proportional reasoning - solve problems using ratios and rates	2
A		Algebraic Relationships	2
A.1		Understand patterns, relations and functions	2
	A.1.b.6	Create and analyze patterns - represent and describe patterns with tables, graphs, pictures, symbolic rules or words	2
A.2		Represent and analyze mathematical situations and structures using algebraic symbols	2
	A.2.a.6	Represent mathematical situations - use symbolic algebra to represent unknown quantities in expressions or equations and solve one-step equations	2
	A.2.b.6	Describe and use mathematical manipulation - use the commutative, distributive and associative properties to generate equivalent forms for simple algebraic expressions	1
A.3		Use mathematical models to represent and understand quantitative relationships	2
	A.3.a.6	Use mathematical models - model and solve problems, using multiple representations such as graphs, tables, expressions and one-step equations	2
G		Geometric and Spatial Relationships	2
G.1		Analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships	2
	G.1.a.6	Describe and use geometric relationships - identify similar and congruent shapes	2
G.2		Specify locations and describe spatial relationships using coordinate geometry and other representational systems	2
	G.2.a.6	Use coordinate systems - use coordinate systems to construct geometric shapes	2

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
G.4		Use visualization, spatial reasoning and geometric modeling to solve problems	2
	G.4.b.6	Draw and use visual models - draw or use visual models to represent and solve problems	2
M		Measurement	2
M.1		Understand measurable attributes of objects and the units, systems and processes of measurement	2
	M.1.a.6	Determine unit of measurement - identify and justify the unit of measure for area and volume (customary and metric)	2
M.2		Apply appropriate techniques, tools and formulas to determine measurements	2
	M.2.c.6	Apply geometric measurements - solve problems involving the area or perimeter of polygons	2
	M.2.e.6	Use relationships within a measurement system - convert from one unit to another within a system of measurement (mass and weight)	1
D		Data and Probability	2
D.1		Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them	4
	D.1.a.6	Formulate questions - formulate questions, design studies and collect data about a characteristic	4
	D.1.c.6	Represent and interpret data - interpret circle graphs; create and interpret stem-and-leaf plots	2
D.2		Select and use appropriate statistical methods to analyze data	1
	D.2.a.6	Describe and analyze data - find the range and measures of center, including median, mode and mean	1
D.3		Develop and evaluate inferences and predictions that are based on data	3
	D.3.a.6	Develop and evaluate inferences - use observations about differences between 2 samples to make conjectures about the populations from which the samples were taken	3
D.4		Understand and apply basic concepts of probability	2
	D.4.a.6	Apply basic concepts of probability - use a model (diagrams, list, sample space, or area model) to illustrate the possible outcomes of an event	2

Table B-29. Consensus DOK Ratings by GLE for Math, Grade 7

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
N		Numbers and Operations	1
N.1		Understand numbers, ways of representing numbers, relationships among numbers and number systems	1
	N.1.a.7	Read, write and compare numbers - compare and order all positive rational numbers and find their approximate location on a number line	1
	N.1.b.7	Represent and use rational numbers - recognize and generate equivalent forms of fractions, decimals and percents	1
N.2		Understand meanings of operations and how they relate to one another	1
	N.2.c.7	Apply properties of operations - apply properties of operations (including order of operations) to positive rational numbers and integers	1
N.3		Compute fluently and make reasonable estimates	2
	N.3.c.7	Compute problems - apply all operations on rational numbers including integers	1
	N.3.e.7	Use proportional reasoning - solve problems involving proportions, such as scaling and finding equivalent ratios	2
A		Algebraic Relationships	2
A.1		Understand patterns, relations and functions	2
	A.1.b.7	Create and analyze patterns - analyze patterns represented graphically or numerically with words or symbolic rules, including recursive notation	2
	A.1.c.7	Classify objects and representations - compare and contrast various forms of representations of patterns	2
	A.1.d.7	Identify and compare functions - identify functions as linear or nonlinear from tables, graphs or equations	2
A.2		Represent and analyze mathematical situations and structures using algebraic symbols	2
	A.2.a.7	Represent mathematical situations - use symbolic algebra to represent unknown quantities in expressions or equations and solve linear equations with one variable	2
	A.2.b.7	Describe and use mathematical manipulation - use properties to generate equivalent forms for simple algebraic expressions that include positive rationals and integers	1
A.3		Use mathematical models to represent and understand quantitative relationships	2
	A.3.a.7	Use mathematical models - model and solve problems, using multiple representations such as graphs, tables, expressions, and linear equations	2
A.4		Analyze change in various contexts	3
	A.4.a.7	Analyze change - compare situations with constant or varying rates of change	3
G		Geometric and Spatial Relationships	2
G.1		Analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships	2

Strand. Substrand	Strand. Substrand. GLE	Description	DOK
G.2	G.1.b.7	Apply geometric relationships - describe relationships between corresponding sides, corresponding angles and corresponding perimeters of similar polygons	2
		Specify locations and describe spatial relationships using coordinate geometry and other representational systems	2
G.3	G.2.a.7	Use coordinate systems - use coordinate geometry to construct and identify geometric shapes in the coordinate plane using their properties	2
		Apply transformations and use symmetry to analyze mathematical situations	2
G.4	G.3.b.7	Use transformations on functions - describe the relationship between the scale factor and the perimeter of the image using a dilation (contractions- magnifications; stretching/shrinking)	2
		Use visualization, spatial reasoning and geometric modeling to solve problems	2
	G.4.b.7	Draw and use visual models - draw or use visual models to represent and solve problem	2
M		Measurement	1
M.1		Understand measurable attributes of objects and the units, systems and processes of measurement	1
	M.1.b.7	Identify equivalent measures - identify the equivalent area and volume measures within a system of measurement (e.g., sq ft. to sq in, m ³ to c m ³)	1
M.2		Apply appropriate techniques, tools and formulas to determine measurements	2
	M.2.c.7	Apply geometric measurements - solve problems involving circumference and/or area of a circle and surface area/volume of a rectangular or triangular prism, or cylinder	2
	M.2.e.7	Use relationships within a measurement system - convert from one unit to another within a system of measurement (capacity) and convert square or cubic units within the same system of measurement	1
D		Data and Probability	2
D.1		Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them	2
	D.1.c.7	Represent and interpret data - select, create and use appropriate graphical representation of data, including circle graphs, histograms	2
D.2		Select and use appropriate statistical methods to analyze data	2
	D.2.a.7	Describe and analyze data - find, use and interpret measures of center and spread, including ranges	2
D.3		Develop and evaluate inferences and predictions that are based on data	3
	D.3.a.7	Develop and evaluate inferences - use observations about differences between samples to make conjectures about the populations from which the samples were taken	3
D.4		Understand and apply basic concepts of probability	3
	D.4.a.7	Apply basic concepts of probability - use models to compute the probability of an event and make conjectures (based on theoretical probability) about the results of experiments	3

Table B-30. Consensus DOK Ratings by GLE for Math, Grade 8

Strand. Substrand	Strand. . Substrand. GLE	Description	DOK
N		Numbers and Operations	2
N.1		Understand numbers, ways of representing numbers, relationships among numbers and number systems	2
	N.1.b.8	Represent and use rational numbers - use fractions, decimals and percents to solve problems	2
N.2		Understand meanings of operations and how they relate to one another	1
	N.2.c.8	Apply properties of operations - apply properties of operations to rational numbers, including order of operations and inverse operations	1
A		Algebraic Relationships	2
A.1		Understand patterns, relations and functions	2
	A.1.b.8	Create and analyze patterns - generalize patterns represented graphically or numerically with words or symbolic rules, using explicit notation	2
	A.1.c.8	Classify objects and representations - compare and contrast various forms of representations of patterns	2
	A.1.d.8	Identify and compare functions - identify functions as linear or nonlinear from tables, graphs or equations	2
A.2		Represent and analyze mathematical situations and structures using algebraic symbols	2
	A.2.a.8	Represent mathematical situations - use symbolic algebra to represent and solve problems that involve linear relationships	2
	A.2.b.8	Describe and use mathematical manipulation - use properties to generate equivalent forms for simple algebraic expressions that include all rationals	1
A.3		Use mathematical models to represent and understand quantitative relationships	2
	A.3.a.8	Use mathematical models - model and solve problems, using multiple representations such as graphs, tables, and linear equations	2
A.4		Analyze change in various contexts	2
	A.4.a.8	Analyze change - analyze the nature of changes (including slope and intercepts) in quantities in linear relationships	2
G		Geometric and Spatial Relationships	2
G.2		Specify locations and describe spatial relationships using coordinate geometry and other representational systems	2
	G.2.a.8	Use coordinate systems - use coordinate geometry to analyze properties of right triangles and quadrilaterals (including the use of the Pythagorean Theorem)	2
G.3		Apply transformations and use symmetry to analyze mathematical situations	2
	G.3.a.8	Use transformations on objects - reposition shapes under formal transformations, such as reflection, rotation and translation	2
	G.3.b.8	Use transformations on functions - describe the relationship between the scale factor and the area of the image using a dilation (stretching/shrinking)	2

Strand. Substrand	Strand . Substrand. GLE	Description	DOK
G.4		Use visualization, spatial reasoning and geometric modeling to solve problems	2
	G.4.a.8	Recognize and draw three-dimensional representations - create isometric drawings from a given net plan	2
	G.4.b.8	Draw and use visual models - draw or use visual models to represent and solve problems	2
M		Measurement	2
M.2		Apply appropriate techniques, tools and formulas to determine measurements	2
	M.2.b.8	Use angle measurement - solve problems of angle measure, including those involving triangles and parallel lines cut by a transversal	2
	M.2.d.8	Analyze precision - analyze precision and accuracy in measurement situations and determine number of significant digits	2
D		Data and Probability	3
D.1		Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them	2
	D.1.c.8	Represent and interpret data - select, create and use appropriate graphical representation of data (including scatter plots) and box plots (box and whiskers)	2
D.2		Select and use appropriate statistical methods to analyze data	3
	D.2.a.8	Describe and analyze data - find, use and interpret measures of center, outliers and spread, including range and interquartile range	2
	D.2.b.8	Compare data representations - compare different representations of the same data and evaluate how well each representation shows important aspects of the data	3
D.3		Develop and evaluate inferences and predictions that are based on data	3
	D.3.a.8	Develop and evaluate inferences - make conjectures about possible relationships between 2 characteristics of a sample on the basis of scatter plots of the data and approximate lines of fit	3

Item DOK per Reviewer for 2010 and 2011 Test Forms

Tables B-31 through B-36 present the DOK ratings per item (listed by item ID) given by each reviewer. We list results for each test side-by-side; however, we remind the reader that some items between forms differ, as noted by unique item IDs. Column 1 lists the item ID number (no leading zeros are included), while subsequent columns include DOK ratings per reviewer (R = reviewer).

Table B-31. Item DOK per Reviewer and Item ID Number for Math 2010 and 2011 Test Forms, Grade 3

2010 Form								2011 Form						
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R7
29	1	1	1	1	1	1	1	303	1	1	1	1	1	1
161	2	2	2	2	3	2	1	715	2	2	2	2	1	1
301	1	2	2	2	2	2	2	823	1	1	1	1	1	1
941	1	2	1	1	2	1	1	931	1	2	1	1	2	2
479042	1	1	2	1	1	1	1	479042	1	2	1	2	2	2
479143	1	1	1	1	1	1	1	479143	1	1	1	1	1	1
479145	2	2	2	2	2	2	2	479145	1	2	1	2	2	2
479149	2	2	2	2	2	1	2	479149	1	1	1	1	1	1
479151	2	2	2	2	2	1	2	479151	2	2	2	2	2	2
479161	1	1	1	1	2	1	2	479161	1	1	1	1	1	2
479167	1	2	1	1	1	1	1	479167	1	2	4	2	2	2
479169	1	1	1	1	1	1	1	479169	1	2	2	2	2	2
479175	2	2	1	1	2	2	2	479175	2	1	1	1	1	1
479196	2	2	2	1	2	1	2	479196	1	2	2	2	2	2
479222	2	2	2	2	2	1	2	479222	1	2	1	2	1	1
479224	2	2	2	2	2	1	2	479224	1	2	2	1	2	2
479296	2	2	2	2	2	2	1	479296	1	2	2	2	2	2
479298	2	2	1	1	1	1	1	479298	2	1	1	1	1	1
479308	1	1	1	1	1	1	1	479308	2	1	1	1	1	1
479314	1	1	1	1	1	2	1	479314	1	2	2	1	2	2
479332	1	1	1	1	1	2	1	479332	1	1	1	1	1	1
479338	2	2	2	2	2	2	2	479338	1	1	1	1	1	1
479340	1	1	1	1	1	1	1	479340	2	2	2	1	2	2
479345	2	2	2	2	2	1	2	479345	1	1	1	1	1	1
479359	2	2	2	2	2	2	2	479359	2	2	2	2	2	2
479361	2	1	1	1	1	1	1	479361	2	2	1	2	2	2
479363	2	2	2	2	2	2	2	479363	1	1	1	1	1	1
479375	2	2	1	2	2	1	1	479375	2	2	1	2	2	1
479385	1	1	1	1	1	1	1	479385	2	1	1	1	1	1
481453	4	4	4	4	4	4	4	481453	4	4	4	4	4	4

Missouri Assessment Program (MAP)

2010 Form								2011 Form						
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R7
481493	1	1	1	1	2	1	1	481493	1	1	1	1	2	1
481505	1	1	4	1	1	1	1	481505	1	1	4	1	1	1
483887	2	2	2	1	1	2	2	483887	2	2	2	1	1	2
483933	2	1	2	1	1	2	2	483933	2	1	2	1	1	2
612891	1	1	1	1	1	1	1	612901	1	1	1	1	1	1
612899	1	1	1	1	1	1	1	612907	1	1	1	1	1	1
612913	4	4	4	4	4	4	4	612969	4	4	4	4	4	4
612927	1	1	1	1	1	1	1	612975	1	1	1	1	1	1
612943	1	2	1	2	2	1	2	612977	1	2	1	2	2	2
612961	2	1	1	1	1	1	1	613019	2	1	1	1	1	1
612975	4	4	4	4	4	4	4	613027	4	4	4	4	4	4
612989	2	2	2	1	2	2	2	613045	1	2	2	1	2	2
613013	1	2	1	1	1	1	1	909711	1	2	1	1	1	1
613019	1	2	1	1	2	1	2	909717	1	2	1	1	2	2
613033	1	1	1	1	1	1	1	909731	1	1	1	1	1	1
613049	2	2	1	2	2	2	2	909835	2	2	1	2	2	2
909731	2	2	1	1	1	1	1	909841	2	2	1	1	1	1
909831	2	2	1	1	2	2	2	909923	2	2	1	1	2	2
909923	2	2	2	1	2	2	2	909929	1	2	2	1	2	2
909929	4	4	4	4	4	4	4	1027215	2	4	4	4	4	4
1027227	2	2	1	1	2	1	2	1027225	2	2	1	1	2	2
1027233	2	2	2	1	2	2	2	1027253	2	2	2	1	2	2
1027247	2	2	2	2	2	1	2	1027263	2	2	2	2	2	2
1027257	2	2	2	2	2	2	2	1027287	1	2	2	2	2	2
1027267	4	4	4	4	4	4	4	1133030	4	4	4	4	4	4
1027275	4	4	4	4	4	4	4	1133038	4	4	4	4	4	4
1027285	2	2	2	2	2	2	2	1133050	3	2	2	2	2	2
1027297	2	2	2	2	1	2	2	1133052	1	3	2	2	2	2
1133034	2		2	2	2	2	2	1133064	3	3	2	1	2	2
1133062	2		2	1	2	2	2	1133086	3	2	2	2	2	2
1133090	2		2	4	4	4	2	1133110	3	2	2	2	2	2

NOTE: Reviewer 6 (R6) was not included in results on the 2011 form due to multiple missing ratings.

Table B-32. Item DOK per Reviewer and Item ID Number for Math 2010 and 2011 Test Forms, Grade 4

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
129	1	1	1	1	1	1	1	137	1	1	1	1	1	1	2
250	2	2	2	2	2	1	2	284	2	3	2	2	3	2	3
258	2	2	2	2	2	1	2	286	1	2	2	2	2	2	2
281	2	2	1	2	1	1	1	366	1	2	2	2	2	2	2
387	1	1	1	1	1	1	1	475	2	2	1	2	2	2	2
479157	2	2	2	2	2	1	2	479157	1	1	1	1	1	1	1
479163	2	1	1	2	2	1	2	479163	2	2	2	2	2	2	2
479171	2	2	2	2	2	2	2	479171	1	2	1	1	2	2	2
479316	2	2	2	2	2	2	2	479316	1	2	2	2	1	2	2
479326	2	2	2	2	2	2	2	479326	2	2	1	2	2	2	2
479711	1	1	1	1	1	1	1	479711	2	2	2	2	2	2	2
481579	1	2	2	1	2	1	2	481579	2	2	1	2	2	2	2
481581	1	2	1	2	2	2	2	481581	1	1	1	1	1	1	1
481585	2	2	2	2	2	2	2	481585	2	2	2	1	2	1	1
481605	2	2	2	2	2	2	2	481605	2	2	2	2	2	2	2
481609	2	2	1	2	2	2	2	481609	3	3	3	3	3	3	3
481617	3	3	3	3	3	3	3	481617	2	2	2	2	2	2	2
481621	2	2	2	2	2	2	2	481621	2	2	2	2	1	2	2
481635	2	2	1	2	2	1	2	481635	2	2	1	1	2	2	2
481641	2	2	1	2	2	2	2	481641	2	2	2	1	2	2	2
481647	1	2	2	2	2	2	2	481647	1	1	1	1	1	1	1
483835	1	1	1	1	1	1	1	483835	2	2	2	1	2	2	2
483843	2	2	2	2	2	1	2	483843	2	2	2	2	2	2	2
483845	2	2	1	2	2	2	2	483845	2	2	1	2	2	2	2
483853	2	2	2	2	2	2	2	483853	1	1	1	1	1	1	1
483855	3	3	3	3	3	2	3	483855	1	1	1	1	1	1	1
483867	2	2	1	1	2	1	1	483867	1	2	1	1	1	1	1
483873	2	2	2	2	2	2	2	483873	2	2	1	1	2	2	2
483879	1	2	2	2	1	2	2	483879	2	2	1	2	1	2	1
483881	2	2	2	2	2	2	2	483881	2	2	2	2	1	2	2
483885	2	2	2	1	2	2	2	483885	2	2	2	1	2	2	2
483889	2	2	2	2	2	2	2	483889	1	2	2	2	2	2	2
483891	2	2	1	1	1	1	2	483891	1	2	1	1	1	1	2
483897	2	2	1	2	2	1	2	483897	2	2	1	2	2	1	2
483911	2	2	1	1	2	1	2	483911	2	2	1	1	2	1	2
483919	2	2	2	1	2	1	2	483919	2	2	2	1	2	1	2

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
483927	4	4	4	4	4	4	4	483927	4	4	4	4	4	4	4
612959	1	2	1	1	1	1	2	613131	1	2	1	1	1	1	2
613115	2	1	1	2	1	1	2	613163	2	1	1	2	1	1	2
613117	2	2	2	1	2	1	2	613175	2	2	2	1	2	1	2
613149	1	1	1	1	1	1	1	613244	1	1	1	1	1	1	1
613155	1	1	1	2	2	1	1	613293	1	1	1	2	2	1	1
613159	1	2	1	2	2	1	2	613295	1	2	1	2	2	1	2
613211	4	4	4	4	4	4	4	910157	4	4	4	4	4	4	4
613244	4	4	4	4	4	4	4	910169	4	4	4	4	4	4	4
613262	1	2	1	1	1	1	1	910171	1	2	1	1	1	1	1
613266	1	1	1	1	2	1	1	910175	1	1	1	1	2	1	1
613293	1	1	1	1	1	1	1	910183	1	1	1	1	1	1	1
613311	2	1	1	2	1	2	1	910229	2	1	1	2	1	2	1
613315	1	2	2	1	2	1	2	910312	1	2	2	1	2	1	2
613426	4	4	4	4	4	4	4	910330	4	4	1	4	4	4	4
613440	2	2	2	2	2	2	2	910425	2	2	2	2	2	2	2
614965	4	4	4	4	4	4	4	910441	4	4	4	4	4	4	4
909772	1	1	1	1	1	2	1	1028208	1	1	4	1	1	2	1
910149	2	2	2	1	2	2	2	1028226	2	2	2	1	2	2	2
910207	2	2	2	1	2	2	2	1028248	2	2	2	1	2	2	2
910251	1	2	1	2	2	2	1	1133190	2	2	1	2	2	2	2
910316	1	2	1	1	2	1	2	1133204	1	2	2	1	2	1	2
910330	1	2	1	1	2	1	2	1133206	1	2	1	1	2	1	2
910451	2	2	2	1	2	1	1	1133208	2	2	2	1	2	1	1
1028184	1	1	1	1	1	1	1	1133218	1	1	1	1	1	1	1
1028206	1	2	1	1	2	1	2	1133220	1	2	1	1	2	1	2
1028232	4	4	4	4	4	4	4	1133222	4	4	4	4	4	4	4
1028238	2	3	2	3	3	3	3	1133224	2	3	3	2	2	2	2
1028244	2	3	1	1	2	1	1	1133232	2	1	2	1	2	1	1
1133226	2	2	2	2	2	2	2	1133246	2	2	1	2	2	2	2
1133260	2	2	2	2	2	2	2	1133250	2	3	3	2	3	2	3
1133266	2	3	2	2	2	2	2	1133272	2	2	1	2	2	2	2

Table B-33. Item DOK per Reviewer and Item ID Number for Math 2010 and 2011 Test Forms, Grade 5

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
267	2	2	2	2	2	2	3	3	2	2	2	2	2	2	3
271	1	1	1	1	2	1	1	813	1	1	1	1	2	1	1
422	2	2	2	1	2	2	2	929	2	2	1	2	2	2	2
935	1	1	1	1	1	1	1	933	1	1	1	1	1	1	1
479452	2	2	2	3	1	2	1	479452	3	2	2	3	3	1	3
479454	2	2	2	2	2	2	2	479454	2	3	2	2	2	2	2
479456	2	2	2	2	2	1	2	479456	3	3	2	3	1	1	1
479462	1	1	1	1	1	1	1	479462	1	1	1	1	1	1	1
479466	1	1	1	1	1	1	1	479466	2	2	2	2	2	1	2
479470	2	2	2	2	2	2	2	479470	2	2	2	3	2	2	3
479481	2	2	2	2	2	2	2	479481	1	2	1	1	2	1	2
479485	2	2	2	2	2	1	2	479485	2	2	2	2	2	1	2
479487	1	1	1	1	1	1	1	479487	1	1	1	1	1	1	1
479493	1	1	1	1	1	1	1	479493	1	1	1	1	1	1	1
479495	2	2	2	2	2	2	2	479495	3	3	2	3	3	2	3
479501	2	2	2	2	3	2	2	479501	2	2	2	2	2	2	3
479507	2	2	1	2	2	1	3	479507	2	2	1	2	2	1	2
479509	2	2	2	2	2	2	2	479509	2	2	2	2	2	2	2
479511	1	1	1	1	1	1	1	479511	2	3	2	2	3	2	3
479519	2	2	2	2	2	2	2	479519	1	1	1	1	1	1	1
479521	3	2	2	3	3	1	2	479521	2	2	2	2	1	2	2
479537	2	2	2	1	2	2	2	479537	2	3	2	3	3	2	3
479545	2	2	2	2	2	2	2	479545	2	2	2	2	2	2	2
479549	3	2	2	3	3	2	2	479549	2	2	2	3	2	2	3
479643	1	1	1	1	1	1	1	479643	2	2	2	2	2	2	3
479645	3	3	2	3	3	2	2	479645	2	2	2	3	2	2	2
479655	1	2	2	2	1	2	2	479655	2	3	2	2	2	2	2
479689	2	2	3	2	2	2	2	479689	2	2	2	2	2	2	2
479695	1	1	1	1	1	1	1	479695	2	2	2	3	3	2	3
479715	2	2	2	2	2	2	2	479715	1	1	1	1	1	1	1
479723	1	1	1	1	1	1	1	479723	1	1	1	1	1	1	1
479725	2	2	2	2	2	2	2	479725	2	2	1	2	1	2	2
479733	1	2	2	1	1	1	2	479733	1	2	2	1	1	1	2
481597	1	2	1	1	1	2	2	481597	1	2	1	1	1	2	2
483871	1	2	1	1	1	1	2	483871	1	2	1	1	1	4	2
483893	2	2	2	2	1	1	2	483893	2	2	2	2	1	4	2

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
613125	4	4	2	4	4	4	4	613264	4	4	4	4	4	4	4
613337	2	2	2	2	2	2	2	613343	2	2	2	2	2	2	2
613339	4	4	4	4	4	4	4	911772	4	2	4	4	4	4	4
613369	2	2	1	1	2	2	1	911780	2	2	1	1	2	2	1
613383	1	1	1	1	1	1	1	911790	1	2	1	2	1	4	2
613405	4	4	4	4	4	4	4	911828	4	4	4	4	4	4	4
613535	4	4	4	4	4	4	4	911864	4	4	4	4	4	4	4
910201	4	4	4	4	4	4	4	911882	4	4	4	4	4	4	4
911796	4	4	4	4	4	4	4	911892	4	4	4	4	4	4	4
911798	2	2	2	1	2	2	2	911896	2	2	2	1	2	2	2
911802	4	4	4	4	4	4	4	911926	4	4	4	4	4	4	4
911828	1	1	1	1	1	2	1	911950	1	1	1	1	1	2	1
911850	1	2	2	2	2	2	2	911983	2	2	2	2	2	2	2
911864	2	2	2	1	2	2	3	911987	2	2	2	1	2	2	3
911926	2	3	2	2	2	2	2	911991	2	3	2	2	2	2	2
911942	1	1	1	1	1	1	1	911995	1	1	1	1	1	4	1
911950	2	1	2	1	2	1	2	912005	2	1	2	1	2	1	2
911968	1	2	2	1	1	2	2	912029	1	2	2	1	1	2	2
911981	2	2	2	2	2	2	3	912927	2	2	2	2	2	2	3
912019	1	2	2	1	1	1	2	912937	1	2	2	1	1	1	2
1028252	2	2	1	1	2	1	1	1028402	2	2	1	1	2	4	1
1028442	4	4	4	4	4	4	4	1028406	4	2	4	4	4	4	4
1028462	4	4	4	4	4	4	4	1028418	4	4	4	4	4	4	4
1028476	1	2	1	2	2	2	2	1028430	2	2	1	2	2	2	2
1133832	4	4	4	4	4	4	4	1133830	4	4	4	4	4	4	4
1133846	2	2	2	2	2	1	1	1133854	2	2	2	2	2	1	1
1133848	2	2	2	2	2	1	2	1133870	2	2	2	2	2	1	2
1133862	2	2	2	1	2	1	2	1133880	2	2	2	1	2	1	2
1133868	1	2	2	2	1	1	2	1133884	2	2	2	2	2	2	2
1133872	2	2	3	2	2	2	2	1133888	3	3	2	3	3	2	3
1133890	3	3	2	3	3	2	3	1133892	3	2	3	3	3	3	2
1133904	2	2	2	2	2	2	2	1133910	2	1	1	2	1	2	3

Table B-34. Item DOK per Reviewer and Item ID Number for Math 2010 and 2011 Test Forms, Grade 6

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
7	2	2	2	2	2	2	1	109	1	1	1	1	1	1	1
79	2	1	2	2	2	1	1	321	2	2	2	2	2	1	2
319	2	1	1	1	1	1	2	339	2	2	2	2	2	2	2
331	1	1	1	1	1	1	2	967	1	1	1	1	1	1	1
479657	2	2	2	2	2	2	2	479657	1	1	1	1	1	1	1
479685	1	1	1	1	1	1	1	479685	1	1	1	1	1	1	1
479821	1	1	1	1	1	1	1	479821	2	2	2	2	2	2	2
479825	2	2	2	2	1	1	2	479825	1	1	1	1	1	1	1
479837	2	2	2	2	2	2	2	479837	1	1	1	1	1	1	1
479847	2	2	2	2	1	2	2	479845	2	2	2	2	2	1	1
479847	1	1	1	1	2	1	1	479847	2	2	2	2	2	2	2
479855	2	2	2	2	2	2	2	479855	2	2	2	2	2	2	2
479859	1	1	1	1	1	1	1	479859	2	2	2	2	2	2	2
479877	2	2	1	1	2	2	1	479877	2	2	2	2	2	2	2
479879	2	2	2	2	2	2	2	479879	2	2	1	2	2	1	2
479885	1	2	1	1	1	1	2	479885	1	1	1	1	1	1	1
479887	1	2	2	1	1	1	1	479887	2	2	2	2	2	2	2
479891	2	2	2	2	2	2	2	479891	1	2	2	1	1	1	1
479893	2	2	1	2	2	1	1	479893	2	2	2	2	2	2	2
479895	2	2	2	2	1	2	2	479895	2	2	2	2	2	2	2
479911	2	2	2	2	2	2	3	479911	2	2	2	2	2	2	2
479999	2	2	2	2	2	2	2	479999	1	1	1	1	1	1	1
480001	2	2	1	2	2	2	2	480001	2	2	2	2	2	2	2
480007	1	1	1	1	1	1	1	480007	2	2	2	2	2	2	2
480013	2	2	1	2	2	1	1	480013	2	2	2	2	2	2	2
480015	2	1	1	1	1	1	1	480015	2	2	2	2	2	2	1
480023	2	2	1	1	1	1	2	480023	2	2	2	2	2	2	2
480025	1	1	2	1	1	1	1	480025	1	1	1	1	1	1	1
480027	2	2	2	2	2	2	2	480027	2	2	2	2	2	2	2
480031	1	1	1	1	1	1	2	480031	1	1	1	1	1	1	2
480039	1	1	1	1	1	1	2	480039	1	1	1	1	1	1	1
480067	1	2	2	1	2	2	2	480067	1	2	2	1	2	2	2
480081	1	2	1	2	2	2	1	480081	1	2	1	2	2	2	1
480085	2	2	2	2	2	2	2	480085	1	1	1	1	1	1	1
480095	2	1	2	1	1	2	2	480095	2	1	1	2	2	2	1
613493	2	2	2	2	2	2	2	613397	2	2	2	2	2	2	2

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
613515	2	2	1	1	2	2	2	613416	2	2	1	1	2	2	2
^a 613517								613452	1	1	1	1	1	1	1
613525	2	2	1	2	2	2	2	613609	2	2	2	2	2	2	2
613537	1	2	1	1	2	2	2	912194	1	2	1	1	2	2	2
613545								912841	1	1	1	1	1	1	1
613569	2	2	1	2	1	2	2	912845	2	2	1	2	1	2	2
613583	1	2	1	1	1	1	1	912859	1	1	1	1	1	1	1
613615	2	2	2	2	2	2	2	912905	2	2	2	2	2	2	2
613651	2	1	2	1	1	1	2	912931	2	1	2	1	1	1	2
613671	1	1	1	1	1	1	1	912951	1	1	1	1	1	1	1
912887	1	1	1	1	1	1	1	912973	1	1	1	1	1	1	1
912951	2	2	2	2	2	2	2	912993	2	2	2	2	2	2	2
912995	2	2	2	1	2	1	2	913013	2	2	2	1	2	1	2
913015	1	2	2	2	2	2	1	913015	1	2	2	2	2	2	1
913045	2	2	2	2	2	2	2	913045	2	2	2	2	2	2	2
913061	2	2	2	2	2	2	2	1028458	2	2	2	2	2	2	2
1031236	2	2	2	2	2	2	2	1028470	2	2	2	2	2	2	2
1031282	2	2	2	2	2	2	2	1031260	2	2	2	2	2	2	2
1031284	1	1	1	1	1	1	1	1031272	1	1	1	1	1	1	1
1134728								1031300	1	1	1	1	1	1	1
1134730								1134752	1	1	1	1	1	1	1
1134734	2	1	1	1	2	1	2	1134764	2	1	1	1	2	1	2
1134744	1	1	1	1	1	1	1	1134786	1	1	1	1	1	1	1
1134746	2	2	2	2	2	2	2	1134790	2	2	2	2	2	2	2
1134754	3	2	2	3	2	2	3	1134794	2	2	2	2	2	2	2
1134758	2	2	2	2	2	2	3	1134796	2	2	2	2	2	2	2
1134774	2	2	2	2	2	1	2	1134808	1	2	1	2	2	2	2

^a Shaded cells indicate no ratings by any reviewer. These items were not included in the test form by the test developer.

Table B-35. Item DOK per Reviewer and Item ID Number for Math 2010 and 2011 Test Forms, Grade 7

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
179	2	2	2	2	2	2	2	66	2	2	2	2	2	2	2
191	2	2	2	2	2	2	2	187	2	2	2	2	2	2	2
911	2	2	2	2	2	2	2	200	2	2	2	2	2	2	2
974	2	2	2	2	2	2	2	323	2	2	2	2	2	2	2
479819	2	2	2	2	2	1	1	479819	2	2	2	2	2	1	1
479849	2	2	2	2	2	2	2	479849	2	2	2	2	2	2	2
479915	2	2	2	2	2	1	1	479915	2	2	2	2	2	1	1
480005	2	1	2	2	2	1	2	480005	2	1	2	2	2	1	2
480071	1	2	2	2	2	1	1	480071	1	2	2	2	2	1	1
480179	2	2	2	2	2	2	2	480179	2	2	2	2	2	2	2
480191	2	2	2	2	1	1	1	480191	2	2	2	2	1	1	1
480199	2	2	2	2	2	1	2	480199	2	2	2	2	2	1	2
480203	2	2	2	2	2	2	2	480203	2	2	2	2	2	2	2
480205	2	2	2	2	2	2	2	480205	2	2	2	2	2	2	2
480207	2	2	2	2	1	1	1	480207	2	2	2	2	1	1	1
480210	2	2	2	2	1	2	2	480210	2	2	2	2	1	2	2
480214	2	2	2	2	2	2	2	480214	2	2	2	2	2	2	2
480228	2	2	2	2	3	2	2	480228	2	2	2	2	3	2	2
480236	2	2	2	2	2	2	2	480236	2	2	2	2	2	2	2
480240	2	2	2	2	1	2	2	480240	2	2	2	2	1	2	2
480256	1	1	2	1	2	1	2	480256	1	1	2	1	2	1	2
480258	2	2	2	2	2	2	2	480258	2	2	2	2	2	2	2
480260	1	1	1	1	1	1	1	480260	1	1	1	1	1	1	1
480266	1	2	2	2	1	1	1	480266	1	2	2	2	1	1	1
480270	1	2	1	2	2	2	2	480270	1	2	1	2	2	2	2
480272	2	2	2	2	3	2	2	480272	2	2	2	2	3	2	2
480276	1	1	1	1	1	1	2	480276	1	1	1	1	1	1	2
480278	1	1	1	1	1	1	1	480278	1	1	1	1	1	1	1
480364	2	2	2	2	1	1	1	480364	2	2	2	2	1	1	1
480390	1	1	1	1	1	1	1	480390	1	1	1	1	1	1	1
480434	1	1	1	1	1	1	1	480434	1	1	1	1	1	1	1
480438	1	1	1	1	1	1	1	480438	1	1	1	1	1	1	1
480452	2	2	2	2	1	1	2	480452	2	2	2	2	1	1	2
480560	2	2	2	2	2	2	2	480560	2	2	2	2	2	2	2
480743	2	2	2	2	1	1	2	480743	2	2	2	2	1	1	2
480755	2	2	2	2	1	2	1	480755	2	2	2	2	1	2	1

Missouri Assessment Program (MAP)

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
613533	2	2	2	1	1	2	1	613767	2	2	2	1	1	2	1
613641	1	1	1	1	1	1	1	613787	1	1	1	1	1	1	1
613643	1	1	1	1	1	1	1	613793	1	1	1	1	1	1	1
613709	1	1	1	1	1	1	1	613990	1	1	1	1	1	1	1
613711	2	2	1	1	1	2	2	912042	2	2	1	1	1	2	2
613715	2	2	2	2	2	2	2	912050	2	2	2	2	2	2	2
613723	1	1	1	1	1	1	1	912098	1	1	1	1	1	1	1
613733	2	2	2	2	2	2	2	912110	2	2	2	2	2	2	2
613747	2	2	1	2	2	2	2	912114	2	2	1	2	2	2	2
613761	2	2	2	2	2	2	2	912126	2	2	2	2	2	2	2
613769	2	2	2	2	2	2	2	912140	2	2	2	2	2	2	2
613777	2	2	2	2	2	2	2	912154	2	2	2	2	2	2	2
613787	2	2	2	2	1	1	2	912268	2	2	2	2	1	1	2
613793	2	2	1	2	2	1	2	912289	2	2	1	2	2	1	2
613845	1	1	1	1	1	1	1	912308	1	1	1	1	1	1	1
613889	2	2	2	2	2	2	2	912318	2	2	2	2	2	2	2
613918	1	1	1	1	1	1	1	912832	1	1	1	1	1	1	1
912176	1	1	1	1	1	1	1	1031244	1	1	1	1	1	1	1
912184	2	2	2	2	1	2	2	1032103	2	2	2	2	1	2	2
912268	2	2	2	2	2	2	2	1032111	2	2	2	2	2	2	2
1032105	2	1	2	2	2	1	2	1032119	2	1	2	2	2	1	2
1032107	2	2	2	2	2	2	2	1032143	2	2	2	2	2	2	2
1032141	2	2	2	2	2	2	2	1032157	2	2	2	2	2	2	2
1032145	2	2	2	2	2	2	2	1137062	2	2	2	2	2	2	2
1032169	2	2	2	2	2	3	2	1137076	2	2	2	2	2	3	2
1137070	2	2	2	2	2	2	2	1137103	2	2	2	2	2	2	2

Table B-36. Item DOK per Reviewer and Item ID Number for Math 2010 and 2011 Test Forms, Grade 8

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
421	2	2	2	2	2	2	2	551	1	1	1	1	1	1	1
533	2	2	2	2	2	2	2	596	2	2	2	2	2	2	2
783	2	2	2	2	2	1	2	636	2	2	2	2	2	2	2
857	2	2	2	2	2	2	2	741	2	2	2	2	2	2	2
893	2	2	2	2	2	1	2	793	1	2	2	2	2	1	2
480220	2	2	2	2	2	2	2	480220	2	2	2	2	2	2	2
480244	2	2	2	2	2	2	2	480244	2	2	2	2	2	2	2
480250	1	1	1	1	1	1	1	480250	2	2	2	2	2	2	2
480546	2	2	2	2	2	2	2	480546	2	2	2	2	2	2	2
480548	1	2	2	2	2	2	2	480548	2	2	2	2	2	2	2
480554	1	1	1	1	1	1	1	480554	2	2	2	2	2	2	2
480574	3	2	2	2	2	2	2	480574	2	1	2	1	1	1	2
480576	2	2	2	2	2	2	2	480576	1	1	1	1	1	1	1
480584	1	2	1	2	2	1	1	480584	1	1	1	1	1	1	1
480622	2	2	2	2	2	2	2	480622	2	2	2	2	2	1	1
480636	1	1	1	1	2	1	1	480636	2	2	2	2	2	2	2
480722	1	2	2	2	2	2	2	480722	2	2	2	2	2	2	2
480726	1	2	2	2	2	1	2	480726	2	2	2	2	2	2	2
480734	2	2	2	2	2	2	2	480734	2	2	2	2	2	2	2
480745	2	2	2	2	2	1	1	480745	2	2	2	2	2	2	2
480759	2	2	2	2	2	2	2	480759	2	2	2	2	2	2	2
480761	2	2	2	2	2	1	2	480761	2	2	2	2	2	2	2
480763	2	2	2	2	2	2	2	480763	2	2	2	2	2	2	2
480767	1	1	1	2	1	1	1	480767	1	2	2	2	2	1	1
480777	2	1	2	1	1	1	2	480777	2	2	2	2	2	2	2
480779	1	1	1	2	2	1	1	480779	2	2	2	2	2	2	2
480781	2	2	2	2	2	2	2	480781	2	2	2	2	2	2	2
480791	2	2	2	2	2	2	2	480791	2	2	2	2	2	2	2
480793	1	2	2	2	2	1	1	480793	2	2	2	2	2	2	2
480797	2	2	2	2	2	2	2	480797	2	2	2	2	2	2	2
480799	2	2	2	2	2	2	2	480799	2	2	2	2	2	2	2
480801	1	1	1	1	1	1	1	480801	1	1	1	1	1	1	1
480805	2	1	2	1	1	1	1	480805	2	1	2	1	1	1	1
480811	2	1	2	2	2	1	1	480811	2	2	2	2	2	1	1
480813	1	1	1	1	1	1	1	480813	1	1	1	1	1	1	1
480815	2	1	2	2	2	1	1	480815	2	1	2	2	2	1	1

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
613831	1	1	1	1	1	1	1	613693	2	1	1	1	1	1	1
613843	2	1	2	1	1	1	2	613873	2	1	2	1	1	1	2
613875	2	2	2	1	2	1	2	613954	2	2	2	1	2	1	2
613895	1	1	1	1	1	1	1	613978	1	1	1	1	1	1	1
613930	1	1	1	1	1	1	1	914482	1	1	1	1	1	1	1
613938	2	1	2	2	2	1	1	914490	2	2	2	2	2	1	2
613948	2	2	2	2	2	2	2	914494	2	2	2	2	2	2	2
613954	1	2	2	2	2	1	2	914500	1	2	2	2	2	1	2
613968	1	1	1	1	1	1	1	914512	1	1	1	1	1	1	1
912138	1	1	1	1	1	1	1	914543	1	1	1	1	1	1	1
914539	2	2	2	2	2	1	2	914616	2	2	2	2	2	1	2
914543	1	1	1	1	1	1	1	914632	1	1	1	1	1	1	1
914642	2	2	2	2	2	1	2	914638	2	2	2	2	2	1	2
914644	2	2	2	1	1	2	2	914758	2	2	2	1	1	2	2
914648	2	2	2	2	2	2	2	1032722	2	2	2	2	2	2	2
914760	2	2	2	2	2	2	2	1032748	2	2	2	2	2	2	2
1032710	2	2	2	2	2	2	2	1032778	2	2	2	2	2	2	2
1032714	1	1	1	1	1	2	1	1137908	1	1	1	1	1	2	1
1032726	2	2	2	2	2	2	2	1137914	2	2	2	2	2	2	2
1032782	2	2	2	2	2	2	2	1137982	2	2	2	2	2	2	2
1032786	2	2	2	2	2	2	2	1137984	2	2	2	2	2	2	2
1137972	2	2	2	2	2	2	2	1137996	2	2	2	2	2	2	2
1137974	2	2	2	2	2	2	2	1138000	2	2	2	2	2	2	2
1137976	2	3	2	3	3	2	3	1138002	3	3	3	3	3	3	3
1137992	2	2	2	2	2	2	2	1138014	3	3	3	3	3	3	3
1137998	2	2	2	2	2	2	2	1138016	2	2	2	2	2	2	2
1138004	2	2	2	2	2	2	2	1138020	2	2	2	2	2	2	2
1138034	2	3	3	3	3	3	3	1138032	1	1	1	1	1	1	1

Items per GLE for Math 2010 and 2011 Test Forms

Tables B-37 and B-48 list those items matched to each Math GLE. Column 1 presents the GLE by code (see Tables B-25 through B-30 for descriptions). The remaining colored columns list items by sequential item number along with the number of reviewers who assigned the GLE to the item. For example, item number 11 (row 4 below) was matched to the GLE coded as N.1.c.3 by 6 reviewers (11:6). The legend above the list of GLEs and items explains the color-coding with green representing low agreement among reviewers (i.e., 1 reviewer assigned item to GLE), yellow representing moderate agreement (i.e., 3 reviewers assigned item to this GLE), and red representing high agreement (i.e., all 7 reviewers assigned item to GLE).

Table B-37. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2010 Test Form, Grade 3

Low		Medium		High							
1		3		7							
N											
N.1											
N.1.a.3	4:1	20:4	28:1	35:1	36:3	39:4					
N.1.c.3	11:6	12:5	19:1	20:1	29:1	35:1	36:3	43:1	47:1	60:1	
N.1.d.3	4:5	36:1	48:4	51:1							
N.3	47:1										
N.3.b.3	31:5	32:6	33:2	53:3	58:1						
N.3.c.3	7:6	12:1	29:6	31:1	40:7	43:4	44:4				
N.3.d.3	42:5	47:4	61:3								
A											
A.1	52:1										
A.1.a.3	15:5	22:3	25:5	53:2							
A.1.b.3	8:2	9:6	19:2	22:3	25:1	48:4	52:6	53:1			
A.2											
A.2.a.3	14:6	17:1	21:1	33:5	43:2	44:1	51:6	59:5			
A.2.b.3	19:4	60:1									
G											
G.1	45:2										
G.1.a.3	3:1	13:6	16:3	24:1	28:5	45:3	57:7	58:1			
G.3											
G.3.a.3	3:5	10:1	16:3	24:5	27:5	28:1					
G.3.c.3	6:7	10:6	21:5	27:1	38:7						
M											
M.1	35:2										
M.1.c.3	1:7	23:5	26:1								
M.1.d.3	2:7	17:6	18:2	23:1	34:7	42:3	59:1	60:4			
M.2											
M.2.c.3	5:6	18:4	26:5								
D											
D.1											
D.1.c.3	8:4	15:1	20:1	31:1	35:3	39:3	44:2	46:7	49:7	54:7	58:5

Table B-38. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2011 Test Form, Grade 3

Low	Medium			High								
1	3			7								
N												
N.1												
N.1.a.3	5:1	15:3	20:1	28:1	36:2	39:3	61:1					
N.1.c.3	19:1	24:6	35:1	36:3	43:1	47:1						
N.1.d.3	4:5	7:1	36:1	48:4	51:1							
N.3	47:1											
N.3.b.3	13:6	31:4	32:5	33:2	53:2							
N.3.c.3	16:5	29:6	31:1	40:6	43:4	44:3	58:2					
N.3.d.3	42:4	47:3	61:5									
A												
A.1	52:1											
A.1.a.3	5:5	20:6	23:5	53:2	59:5							
A.1.b.3	23:1	25:1	48:3	52:5	53:1	59:1						
A.2												
A.2.a.3	9:6	16:1	33:4	43:1	44:1	50:1	51:5	58:1	60:1			
A.2.b.3	19:5											
G												
G.1	45:2											
G.1.a.3	26:1	28:4	45:2	57:6								
G.3												
G.3.a.3	3:2	11:5	14:6	17:6	26:4	28:1						
G.3.c.3	3:4	6:6	10:6	21:6	26:1	38:6						
M												
M.1	35:2											
M.1.c.3	1:6	27:6										
M.1.d.3	2:6	7:5	34:6	42:3	60:5							
M.2												
M.2.c.3	8:6	18:6	22:6									
D												
D.1												
D.1.c.3	4:1	12:6	15:3	25:5	31:1	35:3	39:3	44:2	46:6	49:6	54:6	58:5

Table B-39. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2010 Test Form, Grade 4

Low		Medium		High									
1		3											
N													
N.1	46:1	48:1	60:1										
N.1.a.4	1:6	41:4	57:2	61:2	62:1								
N.1.c.4	1:1	4:4	31:1	40:1	41:2	46:2	48:1	50:1	58:1	60:1	61:5	65:5	
N.1.d.4	6:7	24:6	31:6										
N.2													
N.2.b.4	4:1	10:1	14:1	15:1	35:1	40:2	49:1	65:2					
N.3													
N.3.b.4	6:1	12:4	17:1	27:5	31:2	35:1	39:2	40:2	43:1	49:2			
N.3.c.4	12:2	16:1	27:1	30:1	33:1	39:5	49:2						
N.3.d.4	18:7	26:2	32:6	36:1									
A													
A.1													
A.1.a.4	3:6	9:2	23:6	43:6	52:4	66:3							
A.1.b.4	3:1	9:4	16:1	20:1	43:1	52:2	55:2	56:2	57:1	62:1	66:3		
A.2													
A.2.a.4	4:2	10:6	12:2	15:4	22:1	23:1	24:1	27:2	28:5	30:5	32:2	33:1	34:1
	35:5	36:6	40:1	48:1	50:6	55:2	56:2	58:6	60:2	62:3			
A.2.b.4	15:1	16:5	20:6	28:2	30:1								
G													
G.1	68:1												
G.1.a.4	2:7	8:1	19:7	25:6	42:5	47:1	54:1	59:7	64:1				
G.3													
G.3.a.4	8:6	13:7	21:7										
G.3.c.4	68:7												
M													
M.1	54:1												
M.1.b.4	5:7	22:6	26:1	33:1	54:2	64:1							
M.1.c.4	11:7												
M.1.d.4	14:6	29:7	38:7										
M.2	47:2	54:1											
M.2.c.4	17:7	22:1	23:1	24:1	25:1	26:6	47:1	64:5					
D	62:1												
D.1													
D.1.a.4	7:7	34:5											
D.1.c.4	9:2	34:1	52:1	55:4	56:4	57:5	60:3	62:1	64:1	66:1	67:7		

Table B-40. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2011 Test Form, Grade 4

Low		Medium		High									
1		3		7									
N													
N.1	46:1	48:1	60:1										
N.1.a.4	1:5	41:4	57:2	61:2	62:1	65:5	68:3						
N.1.c.4	25:1	27:5	29:3	40:1	41:2	46:2	48:1	50:1	58:1	60:1	61:5		
N.1.d.4	19:6												
N.2													
N.2.b.4	7:2	14:1	19:1	35:1	40:2	49:1	51:1						
N.3													
N.3.b.4	3:1	8:1	11:1	14:3	16:1	20:1	22:1	25:6	39:2	40:2	43:1	49:2	
N.3.c.4	7:1	14:1	23:1	31:1	33:1	39:5	49:2						
N.3.d.4	11:6	23:6	31:6	32:6	36:1								
A													
A.1													
A.1.a.4	1:1	3:3	17:3	22:1	43:6	52:4	64:2						
A.1.b.4	3:2	17:4	22:1	43:1	52:2	55:2	56:2	57:1	62:1	64:4			
A.2													
A.2.a.4	7:5	14:3	20:6	22:4	27:1	29:3	32:2	33:1	34:1	35:5	36:6	40:1	48:1
	50:6	55:2	56:2	58:6	60:2	62:3							
A.2.b.4	8:6												
G													
G.1													
G.1.a.4	5:7	42:5	47:1	48:1	54:1	59:7	66:7						
G.3													
G.3.a.4	12:7	15:7	24:7										
G.3.c.4	10:7	28:7											
M													
M.1	47:1	54:1											
M.1.b.4	6:7	21:7	26:7	33:1	54:2								
M.1.c.4	13:7												
M.1.d.4	9:7	18:7	30:7	38:7									
M.2	47:1	54:1											
M.2.c.4	2:7	16:7	47:1	67:7									
D	62:1												
D.1													
D.1.a.4	4:7	34:6	35:1	56:2	64:1								
D.1.c.4	1:1	3:1	17:1	52:1	55:4	56:2	57:5	60:3	62:1	64:1	65:1	68:4	

Table B-41. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2010 Test Form, Grade 5

Low		Medium		High											
1		3													
N															
N.1	57:1	64:1													
N.1.b.5	11:7	60:7	63:7												
N.2															
N.2.a.5	18:1	57:1	64:5	66:1	68:2										
N.3															
N.3.b.5	15:7	27:1	30:1	33:4	34:4	38:1	54:4	56:4							
N.3.c.5	27:6	33:4	34:4	35:1	36:1	37:1	38:6	53:1	54:2	64:1	65:1	68:4			
N.3.d.5	5:1	30:6	35:1	36:1	56:1										
A															
A.1															
A.1.a.5	6:4	10:2	23:6	49:5	53:1										
A.1.b.5	6:3	10:3	22:1	23:1	36:1	49:2	50:1	51:1	65:1	66:4					
A.2															
A.2.a.5	2:1	10:2	12:7	18:5	20:6	36:1	38:1	46:7	55:5	56:3	62:5	65:1	66:1		
A.3															
A.3.a.5	10:1	18:1	20:1	31:1	55:2	62:2	66:1	68:1							
G															
G.1	40:3														
G.1.c.5	1:1	3:7	40:3	48:1	67:7										
G.3	48:1														
G.3.c.5	8:7	13:7	25:7	48:3											
G.4															
G.4.a.5	1:6	17:7	32:7												
M															
M.1	52:1														
M.1.b.5	2:1	4:7	9:7	14:5	29:4	52:3	53:5								
M.2	3:1														
M.2.c.5															
M.2.e.5	2:6	14:2	19:7	29:3	65:5										
D															
D.1															
D.1.a.5	7:7	21:7	24:7												
D.2															
D.2.a.5	16:5	22:6	26:3	50:1	51:5										
D.3															
D.3.a.5	5:5	16:2	26:4	28:6	50:5	51:1									

Table B-42. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2011 Test Form, Grade 5

Low		Medium		High
1		3		7
N				
N.1	57:1	64:1		
N.1.b.5	11:7	21:5	41:1	58:1
N.2				
N.2.a.5	22:1	38:1	57:1	64:5
N.3				
N.3.b.5	32:1	33:4	34:4	38:1
N.3.c.5	28:5	32:6	33:4	34:4
N.3.d.5	35:1	36:1		
A				
A.1				
A.1.a.5	3:7	6:2	9:6	18:4
A.1.b.5	18:3	36:1	49:2	50:1
A.2				
A.2.a.5	2:1	12:7	16:6	25:3
A.3				
A.3.a.5	6:1	16:1	25:1	55:2
G				
G.1	40:3	41:1		
G.1.c.5	1:1	7:4	9:1	23:2
G.3	48:1			
G.3.c.5	7:3	14:7	20:7	30:6
G.4				
G.4.a.5	1:6	17:7	23:5	
M				
M.1	52:1			
M.1.b.5	2:1	4:7	8:6	13:5
M.2				
M.2.c.5	26:6			
M.2.e.5	2:6	8:1	13:2	31:7
D				
D.1				
D.1.a.5	5:6	10:7	19:6	
D.2				
D.2.a.5	6:3	19:1	22:1	27:7
D.3				
D.3.a.5	5:1	6:1	15:7	22:5

Table B-43. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2010 Test Form, Grade 6

Low		Medium		High									
1		3		7									
N													
N.1													
N.1.a.6	59:7												
N.1.b.6	55:7												
N.2													
N.2.b.6													
N.2.d.6	4:6												
N.3	46:6	49:6	50:7										
N.3.c.6	31:7	32:2	47:7										
N.3.e.6	1:6	14:7	15:7	25:7	29:7	32:4	36:7	42:5	43:1	48:7	49:1	60:7	
A													
A.1													
A.1.b.6	5:6	22:7	30:7	58:7	62:7	63:1							
A.2	33:4												
A.2.a.6	33:2	35:6	43:6										
A.2.b.6	11:7	24:7											
A.3													
A.3.a.6	23:6	32:1	33:1	34:7									
G													
G.1	37:3												
G.1.a.6	45:7	46:1											
G.2													
G.2.a.6	1:1	2:1	3:1	4:1	5:1	10:7	27:7	63:6					
G.4													
G.4.b.6	9:7	37:4	44:7										
M													
M.1													
M.1.a.6	3:6	13:7											
M.2													
M.2.c.6	2:6	61:7											
M.2.e.6	6:7	17:7	28:7	40:6									
D													
D.1	51:7	52:7	53:5	54:7									
D.1.a.6	18:7												
D.1.c.6	12:7	19:7	20:7										
D.2													
D.2.a.6	7:7	16:7	53:4										
D.3													
D.3.a.6	21:7	23:1											
D.4													
D.4.a.6	8:7	26:7											

Table B-44. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2011 Test Form, Grade 6

Low		Medium		High				
1		3		7				
N	50:1							
N.1								
N.1.a.6	59:7							
N.1.b.6	55:7							
N.2								
N.2.b.6	1:4							
N.2.d.6	46:1							
N.3	46:6	49:7	50:6					
N.3.c.6	1:3	31:7	32:2	47:7	62:1			
N.3.e.6	11:7	24:6	29:7	32:5	36:7	42:6	48:7	60:7
A								
A.1								
A.1.b.6	30:7	58:7	62:3					
A.2	33:5							
A.2.a.6	10:6	13:2	17:7	33:2	35:7	43:7	62:2	
A.2.b.6	4:7	6:7						
A.3								
A.3.a.6	10:1	12:6	13:5	62:2				
G								
G.1	37:3							
G.1.a.6	3:7	45:7						
G.2								
G.2.a.6	21:7	63:7						
G.4								
G.4.b.6	14:7	37:4	44:7					
M								
M.1								
M.1.a.6	16:7							
M.2								
M.2.c.6	8:7	23:7	24:1	26:7				
M.2.e.6	18:7	28:7	40:6	61:7				
D								
D.1	51:7	52:7	53:5	54:7				
D.1.a.6	25:7							
D.1.c.6	2:7	7:7	20:7					
D.2								
D.2.a.6	5:7	9:7	12:1	22:7	53:4			
D.3								
D.3.a.6	19:7							
D.4								
D.4.a.6	15:7	27:7						

Table B-45. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2010 Test Form, Grade 7

Low		Medium		High
1		5		7

GLEs_Matched	Item Number and Frequency of Reviewers
A1b7	49:6
A1b7	60:7
A1b7	62:2
A1c7	1:7
A1c7	19:7
A1d7	9:7
A1d7	22:7
A2a7	3:7
A2a7	15:7
A2a7	17:7
A2a7	24:2
A2a7	31:6
A2a7	50:6
A2a7	57:7
A2a7	58:1
A2b7	6:7
A2b7	13:7
A3a7	24:5
A3a7	25:5
A3a7	50:1
A4	46:7
A4a7	8:7
A4a7	18:7
A4a7	26:4
D1c7	11:7
D1c7	42:6
D1c7	43:1
D1c7	44:7
D1c7	45:7
D1c7	47:7
D1c7	56:7
D1c7	58:6
D2a7	62:5
D4a7	14:7
D4a7	20:7
G1	40:7
G1	41:1
G1	43:6
G1	54:7
G1b7	4:7
G1b7	61:7

GLEs_Matched	Item Number and Frequency of Reviewers
G2a7	21:7
G2a7	55:7
G3b7	12:7
G4b7	25:2
M1	39:6
M1b7	2:7
M1b7	5:7
M2c7	10:7
M2c7	23:7
M2e7	16:7
M2e7	59:7
N1b7	7:7
N1b7	53:7
N2c7	28:5
N3	36:7
N3	37:7
N3	41:1
N3c7	27:7
N3c7	28:2
N3c7	29:5
N3c7	30:7
N3c7	31:1
N3c7	32:7
N3c7	33:7
N3c7	34:7
N3c7	35:7
N3c7	41:5
N3c7	42:1
N3c7	51:7
N3e7	26:3
N3e7	29:2
N3e7	48:7
N3e7	49:1
No Item on Test Form	38:7
No Item on Test Form	39:7
No Item on Test Form	52:7

NOTE: The format of this table differs from other Math grade level results due to software output problems.

Table B-46. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2011 Test Form, Grade 7

Low		Medium		High							
1		3		7							
N											
N.1											
N.1.a.7											
N.1.b.7	6:7	9:5	53:7								
N.2											
N.2.c.7	28:5	36:1									
N.3	36:6	37:6	41:1								
N.3.c.7	27:7	28:2	29:5	30:7	32:7	33:7	34:7	35:7	41:6	51:7	
N.3.e.7	29:2	37:1	48:7								
A.1											
A.1.b.7	10:7	49:7									
A.1.c.7	19:7										
A.1.d.7	1:7	12:7									
A.2											
A.2.a.7	8:7	14:7	17:7	31:6	50:6	57:7	60:7				
A.2.b.7	23:7	31:1									
A.3											
A.3.a.7	5:7	50:1									
A.4	46:7										
A.4.a.7	18:7	26:7									
G											
G.1	40:6	43:6	54:6								
G.1.b.7	7:7	62:7									
G.2											
G.2.a.7	25:6	40:1	43:1	54:1	55:7						
G.3											
G.3.b.7	4:7										
G.4											
G.4.b.7	22:1										
M											
M.1	39:7										
M.1.b.7	2:7	11:4	15:4								
M.2	3:7	22:3	48:1								
M.2.c.7	21:7	22:3									
M.2.e.7	11:3	15:3	16:7	24:7	25:1	59:7					
D											
D.1											
D.1.c.7	13:7	42:7	44:7	45:7	47:7	56:7	58:7				
D.2											
D.2.a.7	61:7										
D.3											
D.3.a.7											
D.4	9:1										
D.4.a.7	9:1	20:7									

Table B-47. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2010 Test Form, Grade 8

Low		Medium		High				
1		3		7				
N	31:2	32:7	33:7	36:7	53:7	56:7	57:1	61:2
N.1	41:1							
N.1.b.8	21:3	29:7	34:7	40:7	42:5	49:7	59:6	
N.2								
N.2.c.8	41:6	42:1						
A								
A.1								
A.1.b.8	1:7	20:7	28:6	42:1	43:4	55:7	61:5	
A.1.c.8	6:7							
A.1.d.8								
A.2	14:7							
A.2.a.8	3:7	8:7	22:7	43:1	44:2	45:6	47:7	
A.2.b.8	16:7	24:7						
A.3								
A.3.a.8	9:6	18:1	28:1	43:2	44:5	45:1		
A.4								
A.4.a.8	10:7	18:6	26:7					
G	15:1	19:1	37:7	38:6				
G.2								
G.2.a.8	4:7	15:6	19:6	25:7				
G.3								
G.3.a.8	39:7	50:7	62:7					
G.3.b.8	2:7	13:7	23:7	31:5	51:5			
G.4								
G.4.a.8	17:7							
G.4.b.8	9:1	38:1						
M								
M.2	21:4	48:7	51:2					
M.2.b.8	11:7	27:7	63:7					
M.2.d.8								
D	30:7							
D.1								
D.1.c.8	57:6	58:7	59:1					
D.2								
D.2.a.8	5:7	52:2	60:7					
D.2.b.8	12:7	64:7						
D.3	52:5							
D.3.a.8	7:7							

Table B-48. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Math 2011 Test Form, Grade 8

Low		Medium		High								
1		3		7								
N	31:2	32:6	33:6	36:7	53:7	56:7						
N.1	41:1											
N.1.b.8	29:6	34:7	40:7	42:6	49:7	59:7						
N.2												
N.2.c.8	41:6											
A												
A.1												
A.1.b.8	7:7	20:7	42:1	43:4	55:7							
A.1.c.8	9:7											
A.1.d.8												
A.2												
A.2.a.8	1:7	5:4	11:3	16:7	19:7	22:7	28:5	29:1	44:2	45:7	47:7	61:7
A.2.b.8	13:7	24:7	43:1									
A.3												
A.3.a.8	5:3	11:4	43:2	44:5								
A.4												
A.4.a.8	26:7	28:2										
G	37:7	38:6										
G.2												
G.2.a.8	12:7											
G.3												
G.3.a.8	18:7	39:7	50:7	63:7								
G.3.b.8	8:7	23:7	31:5	51:5								
G.4	27:3											
G.4.a.8	27:4											
G.4.b.8	38:1	60:7										
M												
M.2	3:7	48:7	51:2									
M.2.b.8	4:7	15:7	64:7									
M.2.d.8												
D	30:7											
D.1												
D.1.c.8	6:7	10:7	17:7	21:7	57:7	58:7						
D.2												
D.2.a.8	14:7	52:2	62:7									
D.2.b.8	25:7											
D.3	52:5											
D.3.a.8	2:7											

Appendix C

MAP Science: Detailed Statistical Results

In Appendix C, we present the full alignment results on the Science 2010 and 2011 test forms. These alignment results include: (a) the four Webb measures, (b) consensus DOK ratings by GLE, (d) item DOK ratings per reviewer, and (e) items matched to GLEs.

Webb Alignment Indicators

The following tables include complete statistical results on the Webb alignment indicators, including means and standard deviations per strand for each grade-level MAP test for Communication Arts.

Categorical Concurrence

We present the categorical concurrence results for grades 3 through 8 of the MAP Math 2010 and 2011 test forms. Each table includes the target number of items from the test blueprint; the mean number of items matched by panelists; Each table includes: the target number of items from the test blueprint; the mean number of items matched by panelists; the standard deviation among panelists' ratings; and, the final alignment conclusion (Yes or No). The bottom row indicates the percentage of strands that met the minimum alignment criterion. Note that the total mean items matched may exceed the number of items on the assessment, as raters were able to match items to more than one strand.

Table C-1. Categorical Concurrence for Science 2010 and 2011 Test Forms, Grade 5: Mean Number Items per Strand

Title of Strand	Target # Items from Blueprint	2010 Test Form			2011 Test Form		
		Mean Items Matched	Standard Deviation	At Least One Item per Strand	Mean Items Matched	Standard Deviation	At Least One Item per Strand
Matter and Energy	10-12	11.14	1.81	Y	12.86	4.78	Y
Force and Motion	7-9	7.71	0.70	Y	4.71	1.50	N
Living Organisms	7-9	7.14	0.99	Y	6.71	2.43	Y
Ecology	8-10	8.86	0.99	Y	9.14	3.02	Y
Earth Systems	9-11	10.86	1.73	Y	11.86	3.58	Y
Universe	8-10	8.00	0.00	Y	5.71	2.21	N
Scientific Inquiry	19-23	23.86	2.03	Y	20.71	6.55	Y
Science and Technology	6-8	5.29	0.88	N	5.71	1.25	N
Total	63 ^a 64 ^b	82.86	1.55		77.41	3.17	
Percent of strands with at least 6 items				88%	63%		

Table C-2. Categorical Concurrence for Science 2010 and 2011 Test Forms, Grade 8: Mean Number Items per Strand

Title of Strand	Target # Items from Blueprint	2010 Test Form			2011 Test Form		
		Mean Items Matched	Standard Deviation	At Least One Item per Strand	Mean Items Matched	Standard Deviation	At Least One Item per Strand
Matter and Energy	11-13	8.86	0.90	Y	13.17	0.37	Y
Force and Motion	6-8	6.14	0.69	Y	3.00	0.00	N
Living Organisms	10-12	5.43	0.79	N	12.50	0.76	Y
Ecology	7-9	5.57	0.79	N	6.00	0.58	Y
Earth Systems	11-13	8.43	1.13	Y	13.33	0.75	Y
Universe	8-10	6.86	0.38	Y	7.83	0.37	Y
Scientific Inquiry	23-28	19.57	0.79	Y	26.33	1.11	Y
Science and Technology	5-7	3.14	0.69	N	6.83	0.37	Y
Total	65 ^a 64 ^b	64.00	0.77		89.00	0.54	
Percent of strands with at least 6 items				63%	88%		

Depth-of-Knowledge Consistency

Tables C-3 and C-4 include the depth-of-knowledge (DOK) consistency results for grades 5 and 8 of the MAP test for Science. The tables present the results of the comparison between the depth-of-knowledge expected in the GLEs and the depth-of-knowledge assessed by items. The tables include the mean percentage of items rated as below, at the same level, or above the DOK level of the GLEs along with the corresponding standard deviations. GLEs with at least 50% of items at the same (or above) DOK level met the minimum criterion.

Table C-3. DOK Consistency for Science 2010 and 2011 Test Forms, Grade 5: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

	2010 Form								2011 Form								
	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	
		% Items Below	% Items Same	% Items Above	M	S.D.	M			S.D.	% Items Below	% Items Same	% Items Above	M	S.D.		M
Matter and Energy	11.14	19	0.38	56	0.47	25	0.41	Y	12.86	22	0.07	66	0.08	12	0.06	Y	
Force and Motion	7.71	21	0.40	26	0.44	53	0.50	* Y	4.71	0	0.00	64	0.21	36	0.21	Y	
Living Organisms	7.14	9	0.29	83	0.36	7	0.25	Y	6.71	2	0.06	90	0.09	7	0.09	Y	
Ecology	8.86	21	0.39	60	0.48	19	0.38	Y	9.14	29	0.08	63	0.11	8	0.08	Y	
Earth Systems	10.86	24	0.41	68	0.44	8	0.25	Y	11.86	25	0.08	70	0.11	6	0.07	Y	
Universe	8.00	0	0.00	74	0.44	26	0.44	Y	5.71	21	0.06	66	0.15	13	0.17	Y	
Scientific Inquiry	23.86	33	0.42	51	0.47	16	0.34	Y	20.71	61	0.09	31	0.08	8	0.03	N	
Science and Technology	5.29	46	0.46	24	0.35	30	0.43	* Y	5.71	47	0.09	24	0.14	30	0.16	* Y	
Percent of strands with 50% of item DOK at or above objective DOK:								100%	Percent of strands with 50% of item DOK at or above objective DOK:								88%

* NOTE: These results meet the minimum Webb criterion; however, only about 25% of items were rated as assessing students at the same cognitive level expected in the GLEs. This outcome may require review to determine if a disproportionate number of items require students to demonstrate knowledge above the GLEs.

Table C-4. DOK Consistency for Science 2010 and 2011 Test Forms, Grade 8: Mean Percent of Items with DOK Below, At, and Above DOK Level of GLEs

	2010 Form								2011 Form								
	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with GLEs						DOK Consistency Target Met	
		% Items Below	% Items Same		% Items Above		% Items Below			% Items Same		% Items Above					
	M	S.D.	M	S.D.	M	S.D.		M	S.D.	M	S.D.	M	S.D.				
Matter and Energy	8.86	42	0.07	45	0.07	12	0.03	N	13.17	62	0.48	29	0.45	9	0.29	N	
Force and Motion	6.14	41	0.20	53	0.15	6	0.10	Y	3	18	0.38	71	0.46	12	0.32	Y	
Living Organisms	5.43	15	0.13	72	0.15	13	0.22	Y	12.5	33	0.47	38	0.49	29	0.45	N	
Ecology	5.57	55	0.14	45	0.14	0	0.00	N	6	58	0.49	30	0.46	12	0.32	N	
Earth Systems	8.43	48	0.10	24	0.12	28	0.09	N	13.33	57	0.47	39	0.46	5	0.20	N	
Universe	6.86	55	0.11	34	0.09	10	0.14	N	7.83	70	0.46	22	0.40	8	0.24	N	
Scientific Inquiry	19.57	19	0.07	65	0.08	16	0.06	Y	26.33	14	0.34	74	0.40	12	0.28	Y	
Science and Technology	3.14	79	0.39	21	0.39	0	0.00	N	6.83	68	0.44	32	0.44	0	0.00	N	
Percent of strands with 50% of item DOK at or above objective DOK:								38%	Percent of strands with 50% of item DOK at or above objective DOK:								25%

Range-of-Knowledge Correspondence

The results for Range-of-Knowledge correspondence for grades 3 through 8 of the MAP test for Science are presented below. The tables include the mean number, standard deviation, and percentage of GLEs by content strand. For acceptable range-of-knowledge correspondence, a minimum of 50% of content GLEs within each strand should be matched to at least one item.

Table C-5. Range-of-Knowledge for Science 2010 and 2011 Test Forms, Grade 5: Mean Percent of GLEs per Strand Linked with Items

Title of Strand	2010 Test Form							2011 Test Form						
	Number of GLEs	Mean Items per Strand	GLEs with At Least One Item		% of Total GLEs per Strand		Range-of-Knowledge Target Met	Mean Items per Strand	GLEs with At Least One Item	% of Total GLEs per Strand		Range-of-Knowledge Target Met		
			M	S.D.	M	S.D.				M	S.D.			
Matter and Energy	32	11.14	7.29	0.70	23	0.02	N	12.86	8.00	0.58	25	0.02	N	
Force and Motion	18	7.71	4.86	0.35	27	0.02	N	4.71	4.00	0.00	22	0.00	N	
Living Organisms	13	7.14	4.57	0.49	35	0.04	N	6.71	3.71	0.76	29	0.06	N	
Ecology	15	8.86	5.14	0.35	34	0.02	N	9.14	4.29	0.49	29	0.03	N	
Earth Systems	22	10.86	7.86	0.64	36	0.03	N	11.86	9.29	0.95	84	0.09	Y	
Universe	16	8.00	3.86	0.35	24	0.02	N	5.71	3.86	0.38	24	0.02	N	
Scientific Inquiry	25	23.86	10.71	0.88	43	0.03	N	20.71	10.14	0.69	41	0.03	N	
Science and Technology	8	5.29	2.71	0.70	33	0.09	N	5.71	2.29	0.49	29	0.06	N	
Percentage of strands with 50% of GLEs linked to at least one item							0%	Percentage of strands with 50% of GLEs linked to at least one item					13%	

Table C-6. Range-of-Knowledge for Science 2010 and 2011 Test Forms, Grade 8: Mean Percent of GLEs per Strand Linked with Items

Title of Strand	2010 Test Form							2011 Test Form							
	Range of GLEs							Range of GLEs							
	Number of GLEs	Mean Items per Strand	GLEs with At Least One Item	% of Total GLEs per Strand		Range-of-Knowledge Target Met	Mean Items per Strand	GLEs with At Least One Item	% of Total GLEs per Strand		Range-of-Knowledge Target Met				
		M	S.D.	M	S.D.			M	S.D.	M	S.D.				
Matter and Energy	58	8.86	8.71	1.25	15	0.02	N	13.17	9.33	0.47	16	0.01	N		
Force and Motion	18	6.14	5.14	0.69	29	0.04	N	3.00	2.83	0.37	15	0.02	N		
Living Organisms	36	5.43	5.43	0.79	15	0.02	N	12.50	8.67	0.94	24	0.03	N		
Ecology	15	5.57	4.43	0.53	30	0.04	N	6.00	5.00	0.00	32	0.01	N		
Earth Systems	37	8.43	7.71	0.76	21	0.02	N	13.33	8.17	0.37	22	0.01	N		
Universe	27	6.86	5.43	0.53	20	0.02	N	7.83	5.00	0.00	19	0.00	N		
Scientific Inquiry	20	19.57	8.71	0.95	44	0.05	N	26.33	9.50	0.5	48	0.02	N		
Science and Technology	8	3.14	3.14	0.69	39	0.09	N	6.83	3.67	0.47	46	0.06	N		
Percentage of strands with 50% of GLEs linked to at least one item							0%	Percentage of strands with 50% of GLEs linked to at least one item							0%

Balance-of-Knowledge Representation

The results for Balance-of-Knowledge representation for grades 3 through 8 of the MAP test for Science are presented below. The tables also include the percentage of items linked to each strand. The minimum acceptable balance index is 0.70 on a scale of 0 to 1.

Table C-7. Balance-of-Knowledge Representation for Science 2010 and 2011 Test Forms, Grade 5: Mean Balance Index per Strand

Title of Strand	2010 Test Form								2011 Test Form								
	GLEs per Strand	Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation				Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	Balance-of-Knowledge Representation					
					Mean Balance Index	S.D.	Balance Index Target Met	Mean Balance Index				S.D.	Balance Index Target Met				
		M	M	M	S.D.	M	S.D.	Y	M	M	M	S.D.	M	S.D.	Y		
Matter and Energy	32	7.29	11.14	13	2	0.84	0.02	Y	8.00	12.86	17	0.06	0.81	0.03	Y		
Force and Motion	18	4.86	7.71	9	1	0.85	0.01	Y	4.00	4.71	6	0.02	0.87	0.01	Y		
Living Organisms	13	4.57	7.14	9	1	0.77	0.07	Y	3.71	6.71	9	0.03	0.78	0.04	Y		
Ecology	15	5.14	8.86	11	1	0.87	0.03	Y	4.29	9.14	12	0.04	0.83	0.03	Y		
Earth Systems	22	7.86	10.86	13	2	0.80	0.05	Y	9.29	11.86	15	0.05	0.81	0.02	Y		
Universe	16	3.86	8	10	0	0.86	0.03	Y	3.86	5.71	7	0.03	0.78	0.05	Y		
Scientific Inquiry	25	10.71	23.86	29	3	0.72	0.04	Y	10.14	20.71	27	0.08	0.70	0.04	Y		
Science and Technology	8	2.71	5.29	6	1	0.91	0.08	Y	2.29	5.71	7	0.02	0.89	0.05	Y		
		Percentage of standards with a balance of representation index of 0.70 or greater							100%	Percentage of standards with a balance of representation index of 0.70 or greater							80%

Table C-8. Balance-of-Knowledge Representation for Science 2010 and 2011 Test Forms, Grade 8: Mean Balance Index per Strand

Title of Strand	2010 Test Form								2011 Test Form								
	GLEs per Strand	Mean				Balance-of-Knowledge Representation			Mean GLEs Linked with Items	Mean				Balance-of-Knowledge Representation			
		Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	S.D.	Mean Balance Index	S.D.	Balance Index Target Met		Mean GLEs Linked with Items	Mean Items per Strand	Mean % of Items (of total) Linked to Strand	S.D.	Mean Balance Index	S.D.	Balance Index Target Met	
Matter and Energy	58	8.71	8.86	14	0.01	0.85	0.04	Y	9.33	13.17	15	0.00	0.81	0.02	Y		
Force and Motion	18	5.14	6.14	10	0.01	0.96	0.05	Y	2.83	3.00	3	0.00	0.97	0.06	Y		
Living Organisms	36	5.43	5.43	8	0.01	0.86	0.02	Y	8.67	12.50	14	0.01	0.84	0.02	Y		
Ecology	15	4.43	5.57	9	0.01	0.91	0.04	Y	5.00	6.00	7	0.01	0.87	0.07	Y		
Earth Systems	37	7.71	8.43	13	0.02	0.82	0.04	Y	8.17	13.33	15	0.01	0.79	0.02	Y		
Universe	27	5.43	6.86	11	0.01	0.78	0.04	Y	5.00	7.83	9	0.00	0.78	0.02	Y		
Scientific Inquiry	20	8.71	19.57	31	0.01	0.67	0.05	N	9.5	26.33	30	0.01	0.63	0.03	N		
Science and Technology	8	3.14	3.14	5	0.01	0.86	0.03	Y	3.67	6.83	8	0.00	0.84	0.06	Y		
Percentage of standards with a balance of representation index of 0.70 or greater								80%	Percentage of standards with a balance of representation index of 0.70 or greater								100%

Consensus DOK Ratings on GLEs

Tables C-9 and C-14 present DOK ratings established through group consensus for each Science GLE per grade level based on the Grade Level Expectations 2.0 for Math. Column 1 lists the Strand letter along with the Big Idea number under the Strand, while Column 2 lists the full code for each GLE (Strand, Big Idea, Substrand letter, and grade level). Column 3 includes the titles and content descriptions corresponding with the GLEs. Column 4 indicates the DOK rating assigned to the GLE by the group.

Table C-9. Science GLEs Matched to Items by Panelists, Grade 5

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ME		Strand 1. Matter and Energy	1
ME.1		Changes in properties and states of matter provide evidence of the atomic theory of matter	1
ME.1.A.		Objects, and the materials are made of, have properties that can be used to describe and classify them	2
	ME.1.A.4.a	Describe and compare the masses (the amount of matter in an object) of objects to the nearest gram using balances	2
	ME.1.A.4.b	Describe and compare the volumes (the amount of space an object occupies) of objects using a graduated cylinder	2
	ME.1.A.4.c	Recognize no two objects can occupy the same space at the same time (e.g., water level rises when an object substance, such as a rock, is placed in a quantity of water)	1
	ME.1.A.4.d	Classify types of materials (e.g., water, salt, sugar, iron filings, salt water) into "like" substances (materials that have specific physical properties) or mixtures of substances by using their characteristic properties	2
ME.1.B.		Properties of mixtures depend upon the concentrations, properties, and interactions of particles	1
	ME.1.B.4.a	Identify water as a solvent that dissolves materials (Do NOT assess the term solvent)	1
	ME.1.B.4.b	Observe and describe how mixtures are made by combining solids or liquids, or a combination of these	1
	ME.1.B.4.c	Distinguish between the components in a mixture/solution (e.g., trail mix, conglomerate rock, salad, soil, salt water)	1
	ME.1.B.4.d	Describe ways to separate the components of a mixture/solution by their properties (i.e., sorting, filtration, magnets, screening)	1
ME.1.C.		Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification	1
	ME.1.C.5.a	Recognize how changes in state (i.e., freezing/melting, condensation/evaporation/boiling) provide evidence that matter is made of particles too small to be seen	1
ME.1.D.		Physical changes in the state of matter that result from thermal changes can be explained by the Kinetic Theory of Matter	1
	ME.1.D.3.a	Compare the observable physical properties of solids, liquids, or gases (air) (i.e., visible vs. invisible, changes in shape, changes in the amount)	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
		of space occupied)	
	ME.1.D.3.b	Identify everyday objects/substances as solid, liquid, or gas (e.g., air, water)	1
	ME.1.D.3.c	Recognize water evaporates (liquid water changes into a gas as it moves into the air)	1
	ME.1.D.3.d	Measure and compare the temperature of water when it exists as a solid to its temperature when it exists as a liquid	2
	ME.1.D.3.e	Investigate and recognize water can change from a liquid to a solid (freeze), and back again to a liquid (melt), as the result of temperature changes	1
ME.1.D.3.f	ME.1.D.3.f	Describe the changes in the physical properties of water (i.e., shape, volume) when frozen or melted	1
ME.1.D.3.g	ME.1.D.3.g	Predict and investigate the effect of heat (thermal energy) (i.e., change in temperature, melting, evaporation) on objects and materials	2
ME.1.D.5.a	ME.1.D.5.a	Classify matter as a solid, a liquid, or a gas, as it exists at room temperature, using physical properties (i.e., volume, shape, ability to flow)	1
	ME.1.D.5.b	Predict the effect of heat (thermal energy) on the physical properties of water as it changes to and from a solid, liquid, or gas (i.e., freezes/melts, evaporates/condenses/boils)	2
ME.1.I.		Mass is conserved during any physical or chemical change	1
	ME.1.I.4.a	Recognize that the total mass of a material remains constant whether it is together, in parts, or in a different state	1
	ME.1.I.5.a	Recognize the mass of water remains constant as it changes state (as evidenced in a closed container)	1
ME.2.		Energy has a source, can be stored, and can be transferred but is conserved within a system	1
ME.2.A.		Forms of energy have a source, a means of transfer (work and heat), and a receiver	1
	ME.2.A.3.a	Identify sources of thermal energy (e.g., Sun, stove, fire, body) that can cause solids to change to liquids, and liquids to change to gas	1
	ME.2.A.4.b	Identify sources of light energy (e.g., Sun, bulbs, flames)	1
	ME.2.A.4.c	Recognize light transferred from the source to the receiver (eye) through space	1
	ME.2.A.4.d	Identify the three things (light source, object, and surface) necessary to produce a shadow	1
	ME.2.A.4.e	Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)	2
	ME.2.A.4.f	Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)	2
	ME.2.A.4.g	Classify materials as conductors or insulators of electricity when placed within a circuit (e.g., wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)	1

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
	ME.2.A.5.a	Recognize light transferred from the source to the receiver (eye) through space in straight lines	1
	ME.2.A.5.b	Recognize how an object (e.g., moon, mirror, objects in a room) can only be seen when light is reflected from that object to the receiver (eye)	1
ME.2.C.		Electromagnetic energy from the Sun (solar radiation) is a major source of energy on Earth	1
	ME.2.C.3.a	Recognize the Sun is primary source of light and food energy on Earth	1
	ME.2.C.5.a	Recognize the Sun as the primary source of energy for temperature change on Earth	1
ME.2.F.		Energy can be transferred within a system as the total amount of energy remains constant (i.e., Law of Conservation of Energy)	1
	ME.2.F.4.a	Identify the evidence of energy transformations (temperature change, light, sound, motion, and magnetic effects) that occur in electrical circuits	1
FM.		Strand 2. Force and Motion	1
FM.1.		The motion of an object is described by its change in position relative to another object or point	2
FM.1.A.		The motion of an object is described as a change in position, direction, and speed relative to another object (frame of reference)	2
	FM.1.A.4.a	Classify different types of motion [straight line, curved, vibrating (back and forth)]	1
	FM.1.A.4.b	Describe an object's motion in terms of distance and time	2
FM.2.		Forces affect motion	1
FM.2.A.		Forces are classified as either contact (pushes, pulls, friction, buoyancy) or non-contact forces (gravity, magnetism), that can be described in terms of direction and magnitude	2
	FM.2.A.4.a	Identify the forces acting on the motion of objects traveling in a straight line (specify that forces should be acting in the same line as the motion, provide examples)	1
	FM.2.A.4.b	Describe and compare forces(measured by a spring scale in Newton's) applied to objects in a single line	2
	FM.2.A.4.c	Recognize friction as a force that slows down or stops a moving object that is touching another object or surface	1
	FM.2.A.4.d	Compare the forces (measured by a spring scale in Newton's) required to overcome friction when an object moves over different surfaces (i.e., rough/smooth)	2
	FM.2.A.5.a	Identify the forces acting on a load and use a spring scale to measure the weight (resistance force) of the load	2
FM.2.B.		Every object exerts a gravitational force on every other object	1
	FM.2.B.4.a	Determine the gravitational pull of the Earth on an object (weight) using a spring scale	1
FM.2.D.		Newton's Laws of Motion explain the interaction of mass and forces, and are used to predict changes in motion	2
	FM.2.D.4.a	Recognize Observe that balanced forces do not affect an object's motion	1

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
	FM.2.D.4.b	Describe how unbalanced forces acting on an object changes its speed (faster/slower), direction of motion, or both	2
	FM.2.D.4.c	Predict how the change in speed of an object (i.e., faster/slower/remains the same) is affected by the amount of force applied to an object and the mass of the object	2
	FM.2.D.4.d	Predict the effects of an electrostatic force (static electricity) on the motion of objects (attract or repel)	1
	FM.2.D.4.e	Describe how friction affects the amount of force needed to do work over different surfaces or through different media	2
		Work transfers energy into and out of a mechanical system	1
	FM.2.F.5.a	Explain how work can be done on an object (force applied and distance moved) (No formula calculations at this level)	1
	FM.2.F.5.b	Identify the simple machines in common tools and household items	1
	FM.2.F.5.c	Compare the measures of effort force (measured using a spring scale to the nearest Newton) needed to lift a load with and without the use of simple machines	2
	FM.2.F.5.d	Recognize simple machines change the amount of effort force and/or direction of force	1
LO		Strand 3. Living Organisms	1
LO.1.		There is a fundamental unity underlying the diversity of all living organisms	1
LO.1.A.		Organisms have basic needs for survival	1
	LO.1.A.3.a	Describe the basic needs of most plants (i.e., air, water, light, nutrients, temperature)	1
LO.1.B.		Organisms progress through life cycles unique to different types of organisms	1
	LO.1.B.3.a	Recognize plants progress through life cycles of seed germination, growth, and development, reproduction and death.	1
	LO.1.B.3.b	Sequence and describe the stages in the life cycle of a flowering plant	1
LO.1.D.		Plants and animals have different structures that serve similar functions necessary for the survival of the organism	1
	LO.1.D.3.a	Identify the major organs (roots, stems, flowers, leaves) and their functions in vascular plants (e.g., absorption, transport, reproduction) (Do NOT assess the term vascular)	1
	LO.1.D.5.a	Compare structures (e.g., wings vs. fins vs. legs; gills vs. lungs; feathers vs. hair vs. scales) that serve similar functions for animals belonging to different vertebrate classes	2
	LO.1.D.5.b	Distinguish between plants (which use sunlight to make their own food) and animals (which must consume energy-rich food)	1
	LO.1.D.5.c	Classify animals as vertebrates or invertebrates	1
	LO.1.D.5.d	Classify vertebrate animals into classes (amphibians, birds, reptiles, mammals, fish) based on their characteristics	1
	LO.1.D.5.e	Identify plants or animals using simple dichotomous keys	1
LO.1.E.		Biological classifications are based on how organisms are related	1
	LO.1.E.5.a	Explain how similarities are the basis for classification	1

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
LO.2.		Living organisms carry out life processes in order to survive	1
LO.2.C.		Chromosomes are components of cells that occur in pairs and carry hereditary information from one cell to daughter cells and from parent to offspring during reproduction	1
	LO.2.C.3.a	Illustrate and trace the path of water and nutrients as they move through the transport system of a plant	1
	LO.2.C.5.a	Recognize the major life processes carried out by the major systems of plants and animals (e.g., support, reproductive, digestive, transport/circulatory, excretory, response)(DO NOT assess naming of organs within each system or explanation of the process	1
LO.3.		There is a genetic basis for the transfer of biological characteristics from one generation to the next through productive processes	2
LO.3.D.		There is heritable variation within every species of organism	2
	LO.3.D.3.a	Identify and relate the similarities and differences between plants and their offspring (i.e., seedlings)	2
EC.		Strand 4. Ecology	1
EC.1		Organisms are interdependent with one another with their environment	1
EC.1.A.		All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem	1
	EC.1.A.4.a	Identify the ways a specific organism may interact with other organisms or with the environment (e.g., pollination, shelter, seed dispersal, camouflage, migration, hibernation, defensive mechanism	1
	EC.1.A.4.b	Recognize different environments (i.e., pond forest, prairie) support the life of different types of plants and animals	1
EC.1.D.		The diversity of species within an ecosystem is affected by changes in the environment, which can be caused by other organisms or outside processes	1
	EC.1.D.4.a	Identify examples in Missouri where human activity has had beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/conservation of species, paving/restoring green space)	1
EC.2.		Matter and Energy flow through an ecosystem	1
EC.2.A.		As energy flows through the ecosystem, all organisms capture a portion of that energy and transform it to a form they can use	1
	EC.2.A.3.a	Identify sunlight as the primary source of energy plants use to produce their own food	1
	EC.2.A.3.b	Classify populations of organisms as producers or consumers by the role they serve in the ecosystem	1
	EC.2.A.3.c	Sequence the flow of energy through a food chain beginning with the Sun	1
	EC.2.A.3.d	Predict the possible effects of removing an organism from a food chain	2
	EC.2.A.4.a	Classify populations of organisms as producers , consumers, or decomposers by the role they serve in the ecosystem	1
	EC.2.A.4.b	Differentiate between the three types of consumers (herbivore,carnivore, omnivore)	1

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
EC.3.	EC.2.A.4.c	Categorize organisms as predator or prey in a given ecosystem	1
		Genetic variation sorted by the natural selection process explains evidence of biological evolution	2
EC.3.A.		Evidence for nature and rates of evolution can be found in anatomical and molecular characteristics of organisms and in the fossil record	2
	EC.3.A.4.a	Compare and contrast common fossils found in Missouri (i.e., trilobites, ferns, crinoids, gastropods, bivalves, fish, mastodons) to organisms present on Earth today	2
EC.3.C.		Natural selection is the process of sorting individuals based on their ability to survive and reproduce within their ecosystem	2
	EC.3.C.4.a	Identify specialized structures and describe how they help plants survive in their environment (e.g., root, cactus needles, thorns, winged seed, waxy leaves)	2
	EC.3.C.4.b	Identify specialized structures and senses and describe how they help animals survive in their environment (e.g., antennae, body covering, teeth, beaks, whiskers, appendages)	2
	EC.3.C.4.c	Recognize internal cues (e.g., hunger) and external cues (e.g., changes in the environment) that cause organisms to behave in certain ways (e.g., hunting, migration, hibernation)	1
	EC.3.C.4.d	Predict which plant or animal will be able to survive in a specific environment based on its special structures or behaviors.	2
ES.		Strand 5. Earth Systems	1
ES.1		Earth's systems (Geosphere, atmosphere, and hydrosphere) have common components and unique structures	1
ES.1.A.		The Earth's crust is composed of various materials, including soil, minerals, and rocks, with characteristic properties	2
	ES.1.A.4.a	Identify and describe the components of soil (e.g., plant roots and debris, bacteria, fungi, worms, types of rock) and its properties (e.g., odor, color, resistance to erosion, texture, fertility, relative grain size, absorption rate)	1
	ES.1.A.4.b	Compare the physical properties (i.e., size, shape, color, texture, layering, presence of fossils) of rocks (mixtures of different Earth materials, each with observable physical properties)	2
ES.1.B.		The hydrosphere is composed of water (a material with unique properties) and other materials	1
	ES.1.B.5.a	Classify major bodies of surface water (e.g., rivers, lakes, oceans, glaciers) as fresh or salt water, flowing or stationary, large or small, solid or liquid, surface or groundwater	1
ES.1.C.		The atmosphere (air) is composed of a mixture of gases, including water vapor, and minute particles	1
	ES.1.C.3.a	Recognize liquid water can change into a gas (vapor) in the air	1
	ES.1.C.3.b	Recognize clouds and fog are made of tiny droplets of water	1
	ES.1.C.3.c	Recognize air is a substance that surrounds us, takes up space, and moves around us as wind	1
	ES.1.C.5.a	Recognize the atmosphere is composed of a mixture of gases, water, and minute particles.	1
ES.2.	ES.2.	Earth's systems (Geosphere, atmosphere, and hydrosphere) interact with one another as they undergo change by common processes	1

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ES.2.A.		The Earth's materials and surface features are changed through a variety of external processes	1
	ES.2.A.4.a	Observe and describe the breakdown of plant and animal material into soil through decomposition processes (i.e., decay/rotting, composting, digestion)	1
	ES.2.A.4.b	Identify the major landforms/bodies of water on Earth (i.e., mountains, plains, river valleys, coastlines, canyons)	1
	ES.2.A.4.c	Describe how weathering agents (e.g., water, chemicals, temperature, wind, plants) cause surface changes that create and/or change Earth's surface materials and/or landforms/ bodies of water	1
	ES.2.A.4.d	Describe how erosion processes (i.e., action of gravity, waves, wind, rivers, glaciers) cause surface changes that create and/or change Earth's surface materials and/or landforms/ bodies of water	1
	ES.2.A.4.e	Relate the type of landform/water body to the process by which it was formed	2
ES.2.E.		Changes in the form of water as it moves through Earth's systems are described as the water cycle	1
	ES.2.E.3.a	Describe clouds and precipitation as forms of water	1
	ES.2.E.5.a	Describe and trace the path of water as it cycles through the hydrosphere, geosphere, and atmosphere (i.e., water cycle: evaporation, condensation, precipitation, surface run-off/ groundwater flow)	1
	ES.2.E.5.b	Identify the different forms water can take (e.g., snow, rain, sleet, fog, clouds, dew) as it moves through the water cycle	1
ES.2.F.		Climate is a description of average weather conditions in a given area due to the transfer of energy and matter through Earth's systems	3
	ES.2.F.5.a	Identify and use appropriate tools (i.e., thermometer, anemometer, wind vane, rain gauge, satellite images, weather maps) to collect weather data(i.e., temperature, wind speed and direction, precipitation, cloud type and cover.)	2
	ES.2.F.5.b	Recognize and summarize relationships between weather data (e.g., temperature and time of day, cloud cover and temperature, wind direction and temperature) collected over a period of time.	3
ES.3.		Human activity is dependent upon and affects Earth's resources and systems	2
ES.3.A.		Earth's materials are limited natural resource's affected by human activity	2
	ES.3.A.4.a	Identify the ways humans affect the erosion and deposition of Earth's materials (e.g., clearing of land, planting vegetation, paving land construction of new buildings)	1
	ES.3.A.4.b	Propose ways to solve simple environmental problems (e.g., recycling, composting, ways to decrease soil erosion) that result from human activity	2
	ES.3.A.5.a	Explain how major bodies of water are important natural resources for human activity(e.g., food recreation, habitat, irrigation, solvent, transportation)	2
	ES.3.A.5.b	Describe how human needs and activities (e.g., irrigation damming of rivers, waste management, sources of drinking water) have affected the quantity and quality of major bodies of fresh wate	3

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
	ES.3.A.5.c	Propose solutions to problems related to water quality and availability that result from human activity.	3
UN.		Strand 6. Universe	1
UN.1		The universe has observable properties and structure	1
UN.1.A.		The Earth, Sun, and Moon are part of a larger system that includes other planets and smaller celestial	1
	UN.1.A.3.a	Describe our Sun as a star because it provides light energy to the solar system	1
	UN.1.A.3.b	Recognize the moon is a reflector of light	1
	UN.1.A.5.a	Recognize the Earth is one of several planets within a solar system that orbits the Sun	1
	UN.1.A.5.b	Recognize the Moon orbits the Earth in about a month	1
	UN.1.A.5.c	Recognize planets look like stars and appear to move across the sky among the stars	1
UN.1.B.		The Earth has a composition and location suitable to sustain life	2
	UN.1.B.5.a	Describe physical features of the planet Earth that allows life to exist (e.g., air, water, temperature) and compare these to the physical features of the Sun, the Moon, and other planets	2
UN.2.		Regular and predictable motions of objects in the universe can be described and explained as the result of gravitational forces	1
UN.2.A.		The apparent position of the Sun and other stars, as seen from Earth, change in observable patterns	1
	UN.2.A.3.a	Illustrate and describe how the Sun appears to move slowly across the sky from east to west during the day	1
UN.2.B.		The apparent position of the moon, as seen from Earth, and its actual position relative to Earth change in observable patterns	1
	UN.2.B.3.a	Illustrate and describe how the Moon appears to move slowly across the sky from east to west during the day and/or night	1
	UN.2.B.3.b	Describe the pattern of change that can be observed in the Moon's appearance relative to time of day and month as it occurs over several months (do not assess moon phases)	2
UN.2.B.5.a	UN.2.B.5.a	Sequence images of the lit portion of the Moon seen from Earth as it cycles day-to-day in about a month in order of occurrence	1
UN.2.C.		The regular and predictable motions of the Earth and Moon relative to the Sun explain natural phenomena on Earth, such as day, month, year, shadows, moon phases, eclipses, tides, and seasons	1
	UN.2.C.3.a	Recognize there is a day/night cycle every 24 hours	1
	UN.2.C.3.b	Describe the changes in length and position (direction) of shadows from morning to midday to afternoon	1
	UN.2.C.3.c	Describe how the Sun's position in the sky changes the length and position of shadows	1
	UN.2.C.5.a	Recognize the Earth rotates once every 24 hours	1
	UN.2.C.5.b	Relate changes in the length and position of a shadow to the time of day and apparent position of Sun in sky, as determined by Earth's rotation	2
	UN.2.C.5.c	Relate the apparent motion of the Sun, Moon, and stars to the rotation of the Earth (Do not assess apparent motion of polar constellations)	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
IN.		Strand 7. Scientific Inquiry	2
IN.1.		Science understanding is developed through the use of science process skills, scientific knowledge, scientific investigation, reasoning, and critical thinking	2
IN.1.A.		Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation	2
	IN.1.A.3.a	Pose questions about objects, materials, organisms, and events in the environment	2
	IN.1.A.3.b	Plan and conduct a simple investigation (fair test) to answer a question	3
	IN.1.A.4.a	Formulate testable questions and explanations (hypotheses)	3
	IN.1.A.4.b	Recognize the characteristics of a fair and unbiased test	2
	IN.1.A.4.c	Conduct a fair test to answer a question	2
	IN.1.A.5.a	Formulate testable questions and explanations (hypotheses)	3
	IN.1.A.5.b	Recognize the characteristics of a fair and unbiased test	2
	IN.1.A.5.c	Conduct a fair test to answer a question	2
	IN.1.A.5.d	Make suggestions for reasonable improvements or extensions of a fair test	3
IN.1.B.		Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations	2
	IN.1.B.34.a	Make qualitative observations using the five senses	2
	IN.1.B.34.b	Make observations using simple tools and equipment (e.g., hand lenses, magnets, thermometers, metric rulers, balances, graduated cylinders)	1
	IN.1.B.34.c	Measure length to the nearest centimeter, mass using grams, temperature using degrees Celsius, volume using liters	1
	IN.1.B.34.d	Compare amounts/measurements	2
	IN.1.B.34.e	Judge whether measurements and computation of quantities are reasonable	2
	IN.1.B.5.a	Make qualitative observations using the five senses	2
	IN.1.B.5.b	Determine the appropriate tools and techniques to collect data	2
	IN.1.B.5.c	Use a variety of tools and equipment to gather data (e.g., hand lenses, magnets, thermometers, metric rulers, balances, graduated cylinders, spring scales)	1
	IN.1.B.5.d	Measure length to the nearest centimeter, mass to the nearest gram, volume to the nearest milliliter, temperature to the nearest degree Celsius, force/weight to the nearest Newton	1
	IN.1.B.5.e	Compare amounts/measurements	2
	IN.1.B.5.f	Judge whether measurements and computation of quantities are reasonable	2
IN.1.C.		Scientific inquiry includes evaluation of explanations (laws/principles, theories/models) in light of evidence (data) and scientific principles (understandings)	3
	IN.1.C.35.a	Use quantitative and qualitative data to support reasonable explanations	3
	IN.1.C.35.b	Use data as support for observed patterns and relationships, and to make predictions to be tested	3

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
IN.1.D.	IN.1.C.35.c	Evaluate the reasonableness of an explanation	3
	IN.1.C.35.d	Analyze whether evidence supports proposed explanations	3
ST.	IN.1.D.35.a	The nature of science relies upon communication of results and justification of explanations	2
		Communicate simple procedures and results of investigations and explanations through: oral presentations, drawings and maps, drawings and maps, data tables, graphs (bar, single line, pictograph), writings	2
ST.1.		Strand 8. Science and Technology	3
ST.1.A.		The nature of technology can advance, and is advanced by, science as it seeks to apply scientific knowledge in ways that meet human needs	2
ST.1.A.		Designed objects are used to do things better or more easily and to do some things that could not otherwise be done at all	3
	ST.1.A.3.a	Recognize some objects or materials (e.g., Sun, fire, ice, snow) occur in nature (natural objects); others (e.g., stoves, refrigerators, bulbs, candles, lanterns) have been designed and made by people to solve human problems and enhance the quality of life	1
	ST.1.A.4.a	Design and construct an electrical device, using materials and/or existing objects, that can be used to perform a task (Assess Locally)	3
	ST.1.A.5.a	Design and construct a machine, using materials and/or existing objects, that can be used to perform a task (Assess Locally)	3
ST.1.B.		Advances in technology often result in improved data collection and an increase in scientific information	2
ST.1.C.	ST.1.B.35.a	Describe how new technologies have helped scientists make better observations and measurements for investigations (e.g., telescopes, magnifiers, balances, microscopes, computers, stethoscopes, thermometers)	2
	ST.1.C.45.a	Technological solutions to problems often have drawbacks and benefits	2
ST.2.		Identify how the effects of inventions or technological advances (e.g., different types of light bulbs, semiconductors/integrated circuits and electronics, satellite imagery, robotics, communication, transportation, generation of energy, renewable material	2
ST.2.A.		Historical and cultural perspectives of scientific explanations help to improve understanding of the nature of science and how science knowledge and technology evolve over time	2
ST.2.A.		People of different gender and ethnicity have contributed to scientific discoveries and the invention of technological innovations	2
	ST.2.A.35.a	Research biographical information about various scientists and inventors from different gender and ethnic backgrounds, and describe how their work contributed to science and technology (Assess Locally)	2
ST.3.		Science and technology affect, and are affected by, society	3
ST.3.A.		People, alone or in groups, are always making discoveries about nature and inventing new ways to solve problems and get work done	3
	ST.3.A.35.a	Identify a question that was asked, or could be asked, or a problem that needed to be solved when given a brief scenario (fiction or nonfiction of individuals solving everyday problems or learning through discovery)	3

Table C-10. Science GLEs Matched to Items by Panelists, Grade 8

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ME		Strand 1. Matter and Energy	2
ME.1		Changes in properties and states of matter provide evidence of the atomic theory of matter	2
ME.1.A		Objects, and the materials are made of, have properties that can be used to describe and classify them	2
	ME.1.A.6.a	Recognize matter is anything that has mass and volume	1
	ME.1.A.6.b	Describe and compare the volumes (the amount of space an object occupies) of objects or substances directly, using a graduated cylinder, and/or indirectly, using displacement methods	2
	ME.1.A.6.c	Describe and compare the masses (amounts of matter) of objects to the nearest gram using a balance	2
	ME.1.A.6.d	Classify the types of matter in an object into pure substances or mixtures using their specific physical properties	2
	ME.1.A.8.a	Recognize elements (unique atoms) and compounds (molecules or crystals) are pure substances that have characteristic properties	1
	ME.1.A.8.b	Describe the physical and chemical properties (e.g., magnetic attraction, conductivity, melting point and boiling point, reactivity) of pure substances (elements or compounds) (e.g., copper wire, aluminum wire, iron, charcoal, sulfur, water, salt, sugar, sodium bicarbonate, galena, quartz, magnetite, pyrite) using appropriate senses and tools	2
ME.1.B.		Properties of mixtures depend upon the concentrations, properties, and interactions of particles	2
	ME.1.B.6.a	Describe properties of each component in a mixture/solution and their distinguishing properties (e.g., salt water, oil/vinegar, pond water, Kool-Aid)	2
	ME.1.B.6.b	Describe appropriate ways to separate components of different mixtures (sorting, evaporation, filtration, magnets, boiling, chromatography, screening)	2
	ME.1.B.6.c	Predict how various solids (soluble/insoluble) behave (e.g., dissolve, settle, float) when mixed with water	3
ME.1.C.		Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification	1
	ME.1.C.6.a	Recognize evidence (e.g., diffusion of food coloring in water, light reflecting off of dust particles in the air, condensation of water vapor by increased pressure or decreased temperature) that supports the theory that matter is composed of small particles (atoms, molecules) that are in constant, random motion	1
	ME.1.C.8.a	Describe evidence (e.g., diffusion of colored material into clear material such as water; light reflecting off of dust particles in air; changes in physical properties and reactivity such as gold hammered into foil, oil spreading on the surface of water, decay of organic matter, condensation of water vapor by increased pressure) that supports the theory that matter is composed of moving particles too small to be seen (atoms, molecules)	1
ME.1.D.		Physical changes in the state of matter that result from thermal changes can be explained by the Kinetic Theory of Matter	2
	ME.1.D.6.a	Describe the relationship between the change in the volume of water and changes in temperature as it relates to the properties of water (i.e., water expands and becomes less dense when frozen)	2
	ME.1.D.7.a	Describe the relationship between temperature and the movement of atmospheric gases (i.e., warm air rises due to expansion of the volume of gas, cool air sinks due to contraction of the volume of gas)	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ME.1.F.	ME.1.D.8.a	Using the Kinetic Theory model, illustrate and account for the physical properties (i.e., shape, volume, malleability, viscosity) of a solid, liquid, or gas in terms of the arrangement and motion of molecules in a substance	2
	ME.1.D.8.b	Use the Kinetic Theory model to explain changes in the volume, shape, and viscosity of materials in response to temperature changes during a phase change	2
	ME.1.D.8.c	Predict the effect of energy transfer on the physical properties of a substance as it changes to or from a solid, liquid, or gas (i.e., phase changes that occur during freezing, melting, evaporation, boiling, condensation)	2
ME.1.G	ME.1.F.8.a	The periodic table organizes the elements according to their atomic structure and chemical reactivity	2
	ME.1.F.8.a	Recognize more than 100 known elements (unique atoms) exist that may be combined in nature or by man to produce compounds that make up the living and nonliving substances in the environment (Do NOT assess memorization of the Periodic Table)	2
ME.1.I.	ME.1.G.6.a	Properties of objects and states of matter can change chemically and/or physically	2
	ME.1.G.6.a	Recognize and classify changes in matter as chemical and/or physical	2
	ME.1.G.6.b	Identify chemical changes (i.e., rusting, oxidation, burning, decomposition by acids, decaying, baking) in common objects (i.e., rocks such as limestone, minerals, wood, steel wool, plants) as a result of interactions with sources of energy or other matter that form new substances with different characteristic properties	2
ME.1.I.	ME.1.G.6.b	Identify physical changes in common objects (e.g., rocks, minerals, wood, water, steel wool, plants) and describe the processes which caused the change (e.g., weathering, erosion, cutting, dissolving)	2
	ME.1.I.6.a	Mass is conserved during any physical or chemical change	2
	ME.1.I.6.a	Demonstrate and provide evidence that mass is conserved during a physical change	2
ME.2	ME.1.I.7.a	Explain that the amount of matter remains constant while being recycled through the water cycle	1
	ME.1.I.8.a	Provide evidence that mass is conserved during a chemical change in a closed system (e.g., vinegar + baking soda, mold growing in a closed container, steel wool rusting)	2
	ME.1.I.8.b	Explain that the amount of matter remains constant while being recycled through the rock cycle	2
ME.2.A.	ME.1.I.8.c	Explain that the amount of matter remains constant while being recycled through food chains and food webs	2
	ME.2	Energy has a source, can be stored, and can be transferred but is conserved within a system	1
	ME.2.A.6.a	Forms of energy have a source, means of transfer (work,heat), and receiver	2
ME.2.A.	ME.2.A.6.a	Identify sources of visible light (e.g., the Sun and other stars, flint, bulb, flames, lightning)	1
	ME.2.A.6.b	Describe evidence (i.e., cannot bend around walls) that visible light travels in a straight line, using the appropriate tools (i.e., pinhole viewer, ray box, laser pointer)	2
	ME.2.A.6.c	Compare the reflection of visible light by various surfaces (i.e., mirror, smooth and rough surfaces, shiny and dull surfaces, Moon)	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ME.2.C.	ME.2.A.6.d	Compare the refraction of visible light passing through different transparent and translucent materials (e.g., prisms, water, a lens)	2
	ME.2.A.6.e.	Predict how different surfaces (transparent, translucent, opaque) and lenses (convex, concave) affect the behavior of visible light rays and the resulting image of an object	3
	ME.2.A.6.f.	Identify receivers of visible light energy (e.g., eye, photocell)	1
	ME.2.A.6.g.	Recognize that an object is “seen” only when the object emits or reflects light to the eye	1
	ME.2.A.6.h.	Recognize differences in wavelength and energy levels within that range of visible light that can be seen by the human eye are perceived as differences in color	2
	ME.2.A.6.i.	Describe how sound energy is transferred by wave-like disturbances that spread away from the source through a medium	1
	ME.2.A.6.j.	Predict how the properties of the medium (e.g., air, water, empty space, rock) affect the speed of different types of mechanical waves (i.e., earthquake, sound)	2
	ME.2.A.7.a	Recognize thermal energy as the random motion (kinetic energy) of molecules or atoms within a substance	1
	ME.2.A.7.b	Use the kinetic molecular model to explain changes in the temperature of a material	2
	ME.2.A.7.c	Recognize thermal energy is transferred as heat from warmer objects to cooler objects until both reach the same temperature (equilibrium)	1
	ME.2.A.7.d	Recognize the type of materials that transfer energy by conduction, convection, and/or radiation	1
	ME.2.A.7.e.	Describe how heat is transferred by conduction, convection, and radiation, and classify examples of each	2
	ME.2.A.7.f.	Classify common materials (e.g., wood, foam, plastic, glass, aluminum foil, soil, air, water) as conductors or insulators of thermal energy	1
	ME.2.A.7.g.	Predict the differences in temperature over time on different colored (black and white) objects placed under the same heat source	2
	ME.2.A.7.h.	Describe the interactions (i.e., repel, attract) of like and unlike charges (i.e., magnetic, static electric, electrical)	1
	ME.2.A.7.i.	Diagram and identify a complete electric circuit by using a source (battery), means of transfer (wires), and receiver (resistance bulbs, motors, fans)	2
	ME.2.A.7.j.	Observe and describe the evidence of energy transfer in a closed series circuit	2
	ME.2.A.7.k.	Describe the effects of resistance (number of receivers), amount of voltage (number of energy sources), and kind of transfer materials on the current being transferred through a circuit (e.g., brightness of light, speed of motor)	2
	ME.2.A.7.l.	Classify materials as conductors or insulators of electricity when placed within a circuit (e.g., wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)	1
	ME.2.A.7.m.	Diagram and distinguish between complete series and parallel circuits	2
	ME.2.A.7.n.	Identify advantages and disadvantages of series and parallel circuits	1
	ME.2.A.8.a	Recognize chemical energy is stored in chemical compounds (e.g., energy stored in and released from food molecules, batteries, nitrogen explosives, fireworks, organic fuels)	1
			Electromagnetic energy from the Sun (solar radiation) is a major source of energy on Earth

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ME.2.F.	ME.2.C.6.a	Recognize energy from the Sun is transferred to Earth in a range of wavelengths and energy levels, including visible light, infrared radiation, and ultraviolet radiation	1
	ME.2.C.6.b	Recognize the Sun is the source of almost all energy used to produce the food for living organisms	1
	ME.2.C.7.a	Identify solar radiation as the primary source of energy for weather phenomena	1
		Energy can be transferred within a system as the total amount of energy remains constant (i.e., Law of Conservation of Energy)	1
	ME.2.F.7.a	Identify the different energy transformations that occur between different systems (e.g., chemical energy in battery converted to electricity in circuit converted to light and heat from a bulb)	1
	ME.2.F.7.b	Recognize that, during an energy transformation, heat is often transferred from one object (system) to another because of a difference in temperature	1
	ME.2.F.7.c	Recognize energy is not lost but conserved as it is transferred and transformed	1
	ME.2.F.8.a	Identify the evidence of different energy transformations (e.g., explosion of light, heat, and sound, temperature change, electrical charge) that may occur as chemical energy is released during a chemical reaction	1
FM		Strand 2. Force and Motion	1
FM.1.		The motion of an object is described by its change in position relative to another object or point	1
FM.1.A.		The motion of an object is described as a change in position, direction, and speed relative to another object (frame of reference)	1
	FM.1.A.7.a	Describe the circular motion of a moving object as the result of a force acting toward the center	1
	FM.1.A.7.b	Classify different types of motion (e.g., straight line, projectile, circular, vibrational)	1
	FM.1.A.7.c	Given an object in motion, calculate its speed (distance/time)	1
	FM.1.A.7.d	Interpret a line graph representing an object's motion in terms of distance over time (speed) using metric units	2
FM.2.		Forces affect motion	1
FM.2.A.		Forces are classified as either contact (pushes, pulls, friction, buoyancy) or non-contact forces (gravity, magnetism), that can be described in terms of direction and magnitude	2
	FM.2.A.7.a	Identify and describe the types of forces acting on an object in motion, at rest, floating/sinking (i.e., type of force, direction, amount of force in Newtons)	2
	FM.2.A.7.b	Compare the forces acting on an object by using a spring scale to measure them to the nearest Newton	1
FM.2.B		Every object exerts a gravitational force on every other object	1
	FM.2.B.7.a	Recognize every object exerts a gravitational force of attraction on every other object	2
	FM.2.B.7.b	Recognize an object's weight is a measure of the gravitational force of a planet/moon acting on that object	1
FM.2.B.7.c	FM.2.B.7.c	Compare the amount of gravitational force acting between objects (which is dependent upon their masses and the distance between them)	1
FM.2.D		Newton's Laws of Motion explain the interaction of mass and forces, and are used to predict changes in motion	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
FM.2.F.	FM.2.D.7.a	Compare the effects of balanced and unbalanced forces (including magnetic, gravity, friction, push or pull) on an object's motion	2
	FM.2.D.7.b	Explain that when forces (including magnetic, gravity, friction, push or pull) are balanced, objects are at rest or their motion remains constant	2
	FM.2.D.7.c	Explain that a change in motion is the result of an unbalanced force acting upon an object	1
	FM.2.D.7.d	Explain how the acceleration of a moving object is affected by the amount of net force applied and the mass of the object	1
		Work transfers energy into and out of a mechanical system	1
	FM.2.F.7.a	Recognize examples of work being done on an object (force applied and distance moved in the direction of the applied force) with and without the use of simple machines	1
	FM.2.F.7.b	Calculate the amount of work done when a force is applied to an object over a distance $W = f \times d$	1
	FM.2.F.7.c	Explain how simple machines affect the amount of effort force, distance through which a force is applied, and/or direction of force while doing work	1
	FM.2.F.7.d	Recognize the amount of work output is never greater than the amount of work input, with or without the use of a simple machine	2
	FM.2.F.7.e.	Evaluate simple machine designs to determine which design requires the least amount of effort force and explain why	1
LO		Strand 3. Living Organisms	2
LO.1.		There is a fundamental unity underlying the diversity of all living organisms	1
LO.1.A		Organisms have basic needs for survival	2
	LO.1.A.6.a	Describe the common life processes necessary to the survival of organisms (i.e., growth, reproduction, life span, response to stimuli, energy use, exchange of gases, use of water, elimination of waste)	2
	LO.1.A.8.a	Recognize that most plants and animals require food and oxygen (needed to release the energy from that food)	1
LO.1.C.		Cells are the fundamental units of structure and function of all living things	1
	LO.1.C.6.b	Recognize all organisms are composed of cells, the fundamental units of life, which carry on all life processes	1
LO.1.D.		Plants and animals have different structures that serve similar functions necessary for the survival of the organism	2
	LO.1.D.8.a	Identify and contrast the structures of plants and animals that serve similar functions (e.g., taking in water and oxygen, support, response to stimuli, obtaining energy, circulation, digestion, excretion, reproduction)	2
LO.1.E.		Biological classifications are based on how organisms are related	1
	LO.1.E.6.a	Recognize most of the organisms on Earth are unicellular (e.g., bacteria, protists) and other organisms, including humans, are multicellular	1
	LO.1.E.6.b	Identify examples of unicellular (e.g., bacteria, some protists, fungi) and multicellular organisms (e.g., some fungi, plants, animals)	1
LO.2.		Living organisms carry out life processes in order to survive	2
LO.2.A.		The cell contains a set of structures called organelles that interact to carry out life processes through physical and chemical means	1
	LO.2.A.6.a	Compare and contrast the following plant and animal cell structures: cell membrane, nucleus, cell wall, chloroplast, and cytoplasm	2
	LO.2.A.6.b	Recognize the chloroplast as the cell structure where food is produced in plants and some unicellular organisms (e.g., algae, some protists)	1

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
LO.2.B.	LO.2.A.8.a	Recognize the cell membrane helps regulate the transfer of materials in and out of the cell	1
	LO.2.A.8.b	Recognize the function of the chloroplast is photosynthesis	1
		All living organisms have genetic material (DNA) that carries hereditary information	1
	LO.2.B.6.a	Recognize plants use energy from the Sun to produce food and oxygen through the process of photosynthesis	1
	LO.2.B.8.a	Recognize photosynthesis is a chemical change with reactants (water and carbon dioxide) and products (energy-rich sugar molecules and oxygen) that takes place in the presence of light and chlorophyll	1
	LO.2.B.8.b	Recognize oxygen is needed by all cells of most organisms for the release of energy from nutrient (sugar) molecules (Do NOT assess the term cellular respiration)	1
LO.2.C.	LO.2.B.8.c	Describe the importance of the transport and exchange of oxygen and carbon dioxide to the survival of the organism	1
		Chromosomes are components of cells that occur in pairs and carry hereditary information from one cell to daughter cells and from parent to offspring during reproduction	2
	LO.2.C.8.a	Identify and give examples of each level of organization (cell, tissue, organ, organ system) in multicellular organisms (plants, animals)	2
	LO.2.C.8.b	Illustrate and explain the path water and nutrients take as they move through the transport system of a plant	2
	LO.2.C.8.c	Explain the interactions between the circulatory and digestive systems as nutrients are processed by the digestive system, passed into the blood stream, and transported in and out of the cell, passes into the blood stream, and exits the body)	2
	LO.2.C.8.d	Compare and contrast the processes of mechanical and chemical digestion, and their role in providing materials necessary for survival of the cell and organism	2
	LO.2.C.8.e.	Identify the importance of the transport and exchange of nutrient and waste molecules to the survival of the cell and organism	2
	LO.2.C.8.f.	Explain the interactions between the circulatory and respiratory systems in exchanging oxygen and carbon dioxide between cells and the atmosphere (when oxygen enters the body, passes into the blood stream, and is transported into the cell; carbon dioxide	2
	LO.2.C.8.g.	Explain the interactions between the nervous and muscular systems when an organism responds to a stimulus	2
	LO.2.F.		Cellular activities and responses can maintain stability internally while external conditions are changing (homeostasis)
LO.2.F.8.a		Predict the response the body may take to maintain internal balance during an environmental change (e.g., shivering when cold, slowing metabolism when food supply decreases or when dehydrated, adrenaline rush when frightened)	2
LO.2.G.		Life processes can be disrupted by disease (intrinsic failures of the organ systems or by infection due to other organisms)	2
	LO.2.G.8.a	Explain the cause and effect of diseases (e.g., AIDS, cancer, diabetes, hypertension) on the human body (locally assessed)	2
	LO.2.G.8.b	Relate some common diseases (i.e., cold, influenza, strep throat, dysentery, fungal infections) to the organisms that cause them (bacteria, viruses, protists, fungi)	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
	LO.2.G.8.c	Differentiate between infectious and noninfectious diseases	2
	LO.2.G.8.d	Explain the role of antibiotics and vaccines in the treatment and prevention of diseases	2
LO.3.		There is a genetic basis for the transfer of biological characteristics from one generation to the next through productive processes	1
LO.3.A.	LO.3.A.	Reproduction can occur asexually or sexually	2
	LO.3.A.8.a	Compare and contrast the processes of asexual and sexual reproduction, including the type and number of cells involved (one body cell in asexual, two sex cells in sexual), and the number of gene sets (body cell has two sets, sex cells have one set each) p	2
	LO.3.A.8.b	Identify examples of asexual reproduction (i.e., plants budding, binary fission of single cell organisms)	1
	LO.3.A.8.c	Compare and contrast the reproductive mechanisms of classes of vertebrates (i.e., internal vs. external fertilization)	2
	LO.3.A.8.d	Recognize how flowering plants reproduce sexually	2
LO.3.C.		Chromosomes are components of cells that occur in pairs and carry hereditary information from one cell to daughter cells and from parent to offspring during reproduction	1
	LO.3.C.8.a	Identify chromosomes as cellular structures that occur in pairs that carry hereditary information in units called genes	1
	LO.3.C.8.b	Recognize when asexual reproduction occurs, the same genetic information found in the parent cell is copied and passed on to each new daughter cell (Assess only the concept – not the term or process of mitosis)	1
	LO.3.C.8.c	Recognize when sexual reproduction occurs, genetic material from both parents is passed on and combined to form the genetic code for the new organism (Assess only the concept – not the term or process of meiosis)	1
LO.3.D.		There is heritable variation within every species of organism	1
	LO.3.D.8.a	Recognize when asexual reproduction occurs, the daughter cell is identical to the parent cell (assuming no change in the parent genes)	1
	LO.3.D.8.b	Recognize when sexual reproduction occurs, the offspring is not identical to either parent due to the combining of the different genetic codes contained in each sex cell	1
EC.		Strand 4. Ecology	2
EC.1.		Organisms are interdependent with one another with their environment	2
EC.1.A.		All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem	2
	EC.1.A.6.a	Identify the biotic factors (populations of organisms) and abiotic factors (e.g., quantity of light and water, range of temperatures, soil composition) that make up an ecosystem	2
EC.1.B.		Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite	2
	EC.1.B.6.a	Identify populations within a community that are in competition with one another for resources	1
	EC.1.B.6.b	Recognize the factors that affect the number and types of organisms an ecosystem can support (e.g., food availability, abiotic factors such as quantity of light and water, temperature and temperature range, soil composition, disease, competitions from other organisms, predation)	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
EC.1.D.	EC.1.B.6.c	Predict the possible effects of changes in the number and types of organisms in an ecosystem on the populations of other organisms within that ecosystem	3
		The diversity of species within an ecosystem is affected by changes in the environment, which can be caused by other organisms or outside processes	3
	EC.1.D.6.a	Describe beneficial and harmful activities of organisms, including humans (e.g., deforestation, overpopulation, water and air pollution, global warming, restoration of natural environments, river bank/coastal stabilization, recycling, channelization, reintroduction of species, depletion of resources), and explain how these activities affect organisms within an ecosystem	2
	EC.1.D.6.b	Predict the impact (beneficial or harmful) of a natural environmental change (e.g., forest fire, flood, volcanic eruption, avalanche) on the organisms in an ecosystem	3
	EC.1.D.6.c	Describe possible solutions to potentially harmful environmental changes within an ecosystem	3
	EC.1.D.8.a	Explain the beneficial or detrimental impact that some organisms (i.e., viruses, bacteria, protists, fungi) may have on other organisms (e.g., diseases, antibiotics, breakdown of waste, fermentation)	2
EC.2.		Matter and Energy flow through an ecosystem	2
EC.2.A.		As energy flows through the ecosystem, all organisms capture a portion of that energy and transform it to a form they can use	3
	EC.2.A.6.a	Diagram and describe the transfer of energy in an aquatic food web and a land food web with reference to producers, consumers, decomposers, scavengers, and predator/prey relationships	3
	EC.2.A.6.b	Classify populations of unicellular and multicellular organisms as producers, consumers, and decomposers by the role they serve in the ecosystem	2
EC.2.B.		Matter is recycled through an ecosystem	1
EC.2.B.8.	EC.2.B.8.a	Illustrate the oxygen/carbon dioxide cycles (including the processes of photosynthesis and cellular respiration)	1
	EC.2.B.8.b	Describe the processes involved in the recycling of matter in the oxygen/carbon dioxide cycles	1
		Genetic variation sorted by the natural selection process explains evidence of biological evolution	2
EC.3.		Evidence for the nature and rates of evolution can be found in anatomical and molecular characteristics of organisms and in the fossil record	2
EC.3.A.		Identify fossils as evidence some types of organisms (e.g., dinosaurs, trilobites, mammoths, giant tree ferns) that once lived in the past, and have since become extinct, have similarities with and differences from organisms living today	2
	EC.3.A.6.a		2
EC.3.C.		Natural selection is the process of sorting individuals based on their ability to survive and reproduce within their ecosystem	3
	EC.3.C.6.a	Relate examples of adaptations (specialized structures or behaviors) within a species to its ability to survive in a specific environment (e.g., hollow bones/flight, hollow hair/insulation, dense root structure/compact soil, seeds/food, protection for plant embryo vs. spores, fins/movement in water)	1
	EC.3.C.6.b	Predict how certain adaptations, such as behavior, body structure, or coloration, may offer a survival advantage to an organism in a particular environment	3
ES.		Strand 5. Earth Systems	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ES.1.		Earth's systems (Geosphere, atmosphere, and hydrosphere) have common components and unique structures	2
ES.1.A.		The Earth's crust is composed of various materials, including soil, minerals, and rocks, with characteristic properties	2
	ES.1.A.6.a	Describe the components of soil and other factors that influence soil texture, fertility, and resistance to erosion (e.g., plant roots and debris, bacteria, fungi, worms, rodents)	2
	ES.1.A.8.a	Differentiate between minerals and rocks (which are composed of different kinds of minerals)	2
	ES.1.A.8.b	Describe the distinguishing properties that can be used to classify minerals (i.e., texture, smell, luster, hardness, crystal shape, streak, reaction to magnets and acids)	1
	ES.1.A.8.c	Describe the methods used to identify the distinguishing properties of minerals	1
	ES.1.A.8.d	Classify rocks as sedimentary, igneous, or metamorphic	2
ES.1.B.		The hydrosphere is composed of water (a material with unique properties) and other materials	2
	ES.1.B.6.b	Recognize the properties of water that make it an essential component of the Earth system (e.g., its ability to act as a solvent, its ability to remain as a liquid at most Earth temperatures)	2
ES.1.C.		The atmosphere (air) is composed of a mixture of gases, including water vapor, and minute particles	2
	ES.1.C.7.a	Describe the composition of the Earth's atmosphere (i.e., mixture of gases, water and minute particles) and how it circulates as air masses	2
	ES.1.C.7.b	Describe the role atmosphere (e.g., clouds, ozone) plays in precipitation, reflecting and filtering light from the Sun, and trapping heat energy emitted from the Earth's surface	2
ES.2.		Earth's systems (Geosphere, atmosphere, and hydrosphere) interact with one another as they undergo change by common processes	2
ES.2.A.		The Earth's materials and surface features are changed through a variety of external processes	2
	ES.2.A.6.a	Make inferences about the formation of sedimentary rocks from their physical properties (e.g., layering and the presence of fossils indicate sedimentation)	3
	ES.2.A.6.b	Explain how the formation of sedimentary rocks depends on weathering and erosion	2
	ES.2.A.6.c	Describe how weathering agents and erosional processes (i.e., force of water as it freezes or flows, expansion/contraction due to temperature, force of wind, force of plant roots, action of gravity, chemical decomposition) slowly cause surface changes that create and/or change landforms	2
	ES.2.A.6.d	Describe how the Earth's surface and surface materials can change abruptly through the activity of floods, rock/mudslides, or volcanoes	2
ES.2.B.		There are internal processes and sources of energy within the geosphere that cause changes in Earth's crustal plates	2
	ES.2.B.6.a	Identify events (earthquakes, volcanic eruptions) and the landforms created by them on the Earth's surface that occur at different plate boundaries	2
	ES.2.B.8.a	Explain convection currents are the result of uneven heating inside the mantle resulting in the melting of rock materials, convection of magma, eruption/flow of magma, and movement of crustal plates	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ES.2.C.	ES.2.B.8.b	Explain how rock layers are affected by the folding, breaking, and uplifting of rock layers due to plate motion	2
	ES.2.B.8.c	Describe how the movement of crustal plates can cause earthquakes and volcanic eruptions that can result in mountain building and trench formation	1
		Continual changes in Earth's materials and surface that result from internal and external processes are described by the rock cycle	2
	ES.2.C.8.a	Explain how heating and cooling in the mantle layer leads to the formation of metamorphic rocks and some igneous rocks	2
ES.2.D.	ES.2.C.8.b	Make inferences about the formation of igneous and metamorphic rocks from their physical properties (e.g., crystal size indicates rate of cooling, air pockets or glassy texture indicate volcanic activity)	2
	ES.2.C.8.c	Explain and diagram the external and internal processes of the rock cycle (e.g., weathering and erosion, sedimentation, compaction, heating, recrystallization, resurfacing due to forces that drive plate motion)	2
		Changes in the Earth over time can be inferred through rock and fossil evidence	2
	ES.2.D.6.a	Explain the types of fossils and the processes by which they are formed (i.e., replacement, mold and cast, preservation, trace)	2
ES.2.E.	ES.2.D.6.b	Use fossil evidence to make inferences about changes on Earth and in its environment (i.e., superposition of rock layers, similarities between fossils in different geographical locations, fossils of seashells indicate the area was once underwater)	3
	ES.2.D.8.a	Describe the methods used to estimate geologic time and the age of the Earth (e.g., techniques used to date rocks and rock layers, presence of fossils)	1
	ES.2.D.8.b	Use rock and fossil evidence to make inferences about the age, history, and changing life forms and environment of the Earth (i.e., changes in successive layers of sedimentary rock and the fossils contained within them, similarities between fossils in different geographic locations, similarities between fossils and organisms present today, fossils of organisms indicating changes in climate, fossils of extinct organisms)	2
		Changes in the form of water as it moves through Earth's systems are described as the water cycle	2
ES.2.F.	ES.2.E.7.a	Explain and trace the possible paths of water through the hydrosphere, geosphere, and atmosphere (i.e., the water cycle: evaporation, condensation, precipitation, surface run-off/ groundwater flow)	2
	ES.2.E.7.b	Relate the different forms water can take (i.e., snow, rain, sleet, fog, clouds, dew, humidity) as it moves through the water cycle to atmospheric conditions (i.e., temperature, pressure, wind direction and speed, humidity) at a given geographic location	2
	ES.2.E.7.c	Explain how thermal energy is transferred throughout the water cycle by the processes of convection, conduction, and radiation	2
		Climate is a description of average weather conditions in a given area due to the transfer of energy and matter through Earth's systems	2
	ES.2.F.7.a	Explain how the differences in surface temperature, due to the different heating and cooling rates of water and soil, affect the temperature and movement of the air above	2
	ES.2.F.7.b	Recognize the characteristics of air masses (i.e., high/low barometric pressure, temperature) and predict their effect on the weather in a given location	2
	ES.2.F.7.c	Identify weather conditions associated with cold fronts and warm fronts	1

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ES.3. ES.3.A.	ES.2.F.7.d	Identify factors that affect weather patterns in a particular region (e.g., proximity to large bodies of water, latitude, altitude, prevailing wind currents, amount of solar radiation, location with respect to mountain ranges)	1
	ES.2.F.7.e.	Collect and interpret weather data (e.g., cloud cover, precipitation, wind speed and direction) from weather instruments and maps to explain present day weather and to predict the next day's weather	2
	ES.2.F.7.f.	Recognize significant changes in temperature and barometric pressure may cause dramatic weather phenomena (i.e., severe thunderstorms, tornadoes, hurricanes)	1
		Human activity is dependent upon and affects Earth's resources and systems	2
		Earth's materials are limited natural resource's affected by human activity	2
	ES.3.A.6.a	Relate the comparative amounts of fresh water and salt water on the Earth to the availability of water as a resource for living organisms and human activity	2
	ES.3.A.6.b	Describe the affect of human activities (e.g., landfills, use of fertilizers and herbicides, farming, septic systems) on the quality of water	2
	ES.3.A.6.c	Analyze the ways humans affect the erosion and deposition of soil and rock materials (e.g., clearing of land, planting vegetation, paving land, construction of new buildings, building or removal of dams)	3
	ES.3.A.7.a	Distinguish between renewable (e.g., geothermal, hydroelectric) and nonrenewable (e.g., fossil fuel) energy sources	1
	ES.3.A.7.b	Provide examples of how the availability of fresh water for humans and other living organisms is dependent upon the water cycle	2
UN.		Strand 6. Universe	1
UN.1.		The universe has observable properties and structure	2
UN.1.A.		The Earth, Sun, and Moon are part of a larger system that includes other planets and smaller celestial	2
	UN.1.A.7.a	Classify celestial bodies in the solar system into categories: Sun, Moon, planets, and other small bodies (i.e., asteroids, comets, meteors), based on physical properties	2
	UN.1.A.7.b	Compare and contrast the size, composition, atmosphere, and surface of the planets (inner vs. outer) in our solar system and Earth's moon	2
	UN.1.A.7.c	Recognize the relative proximity of common celestial bodies (i.e., Sun, Moon, planets, smaller celestial bodies such as comets and meteors, other stars) in the sky to the Earth	1
UN.1.B.		The Earth has a composition and location suitable to sustain life	2
	UN.1.B.7.a	Describe how the Earth's placement in the solar system is favorable to sustain life (i.e., distance from the Sun, temperature, atmosphere)	2
	UN.1.B.7.b	Compare and contrast the characteristics of Earth that support life with the characteristics of other planets that are considered favorable or unfavorable to life (e.g., atmospheric gases, extremely high/low temperatures	2
UN.1.C.		Most of the information we know about the universe comes from the electromagnetic spectrum	2
	UN.1.C.7.a	Recognize stars are separated from one another by vast and different distances, which causes stars to appear smaller than the Sun	1
	UN.1.C.7.b	Compare the distance light travels from the Sun to Earth to the distance light travels from other stars to Earth using light years	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
UN.2.		Regular and predictable motions of objects in the universe can be described and explained as the result of gravitational forces	1
UN.2.A.		The apparent position of the Sun and other stars, as seen from Earth, change in observable patterns	1
	UN.2.A.7.a	Relate the apparent east-to-west changes in the positions of the Sun, other stars, and planets in the sky over the course of a day to Earth's counterclockwise rotation about its axis	2
	UN.2.A.7.b	Describe the pattern that can be observed in the changes in number of hours of visible sunlight, and the time and location of sunrise and sunset, throughout the year	1
	UN.2.A.7.c	Recognize, in the Northern Hemisphere, the Sun appears lower in the sky during the winter and higher in the sky during the summer	1
	UN.2.A.7.d	Recognize, in winter, the Sun appears to rise in the Southeast and set in the Southwest, accounting for a relatively short day length, and, in summer, the Sun appears to rise in the Northeast and set in the Northwest, accounting for a relatively long day length.	1
	UN.2.A.7.e.	Recognize the Sun is never directly overhead when observed from North America	1
UN.2.B		The apparent position of the moon, as seen from Earth, and its actual position relative to Earth change in observable patterns	1
	UN.2.B.7.a	Observe the change in time and location of Moon rise, Moon set, and the Moon's appearance relative to time of day and month over several months, and note the pattern in this change	2
	UN.2.B.7.b	Recognize the Moon rises later each day due to its revolution around the Earth in a counterclockwise direction	1
	UN.2.B.7.c	Recognize the Moon is in the sky for roughly 12 hours in a 24-hour period (i.e., if the Moon rises at about 6 P.M., it will set at about 6 A.M.)	1
	UN.2.B.7.d	Recognize that one half of the Moon is always facing the Sun and, therefore, one half of the Moon is always lit	1
	UN.2.B.7.e.	Relate the apparent change in the Moon's position in the sky as it appears to move east-to-west over the course of a day to Earth's counterclockwise rotation about its axis	2
	UN.2.B.7.f.	Describe how the appearance of the Moon that can be seen from Earth changes approximately every 28 days in an observable pattern (moon phases)	1
UN.2.C.		The regular and predictable motions of the Earth and Moon relative to the Sun explain natural phenomena on Earth, such as day, month, year, shadows, moon phases, eclipses, tides, and seasons	1
	UN.2.C.7.a	Illustrate and explain a day as the time it takes a planet to make a full rotation about its axis	1
	UN.2.C.7.b	Diagram the path (orbital ellipse) the Earth travels as it revolves around the Sun	1
	UN.2.C.7.c	Illustrate and explain a year as the time it takes a planet to revolve around the Sun	1
	UN.2.C.7.d	Explain the relationships between a planet's length of year (period of revolution) and its position in the solar system	1
	UN.2.C.7.e.	Recognize the phases of the moon are due to the relative positions of the Moon with respect to the Earth and Sun	2
	UN.2.C.7.f.	Relate the axial tilt and orbital position of the Earth as it revolves around the Sun to the intensity of sunlight falling on different parts of the Earth during different seasons	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
UN.2.D.		Gravity is a force of attraction between objects in the solar system that governs their motion	1
	UN.2.D.7.a	Describe how the Earth's gravity pulls any object on or near the Earth toward it (including natural and artificial satellites)	1
	UN.2.D.7.b	Describe how the planets' gravitational pull keeps satellites and moons in orbit around them	1
	UN.2.D.7.c	Describe how the Sun's gravitational pull holds the Earth and other planets in their orbits	1
IN.		Strand 7. Scientific Inquiry	2
IN.1.		Science understanding is developed through the use of science process skills, scientific knowledge, scientific investigation, reasoning, and critical thinking	2
IN.1.A.		Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation	2
	IN.1.A.68a	Formulate testable questions and hypotheses	2
	IN.1.A.68b	Recognize the importance of the independent variable, dependent variables, control of constants, and multiple trials to the design of a valid experiment	1
	IN.1.A.68c	Design and conduct a valid experiment	4
	IN.1.A.68d	Evaluate the design of an experiment and make suggestions for reasonable improvements or extensions of an experiment	3
	IN.1.A.68e	Recognize different kinds of questions suggest different kinds of scientific investigations (e.g., some involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve making observations in nature; some involve discovery of new objects and phenomena; some involve making models	2
	IN.1.A.78f	Acknowledge there is no fixed procedure called "the scientific method", but some investigations involve systematic observations, carefully collected and relevant evidence, logical reasoning, and imagination in developing hypotheses and other explanations	1
IN.1.B.		Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations	1
	IN.1.B.68a	Make qualitative observations using the five senses	1
	IN.1.B.68b	Determine the appropriate tools and techniques to collect data	2
	IN.1.B.68c	Use a variety of tools and equipment to gather data (e.g., microscopes, thermometers, computers, spring scales, balances, magnets, metric rulers, graduated cylinders, stopwatches)	1
	IN.1.B.68d	Measure length to the nearest millimeter, mass to the nearest gram, volume to the nearest milliliter, temperature to the nearest degree Celsius, force (weight) to the nearest Newton, time to the nearest second	1
	IN.1.B.68e	Compare amounts/measurements	2
	IN.1.B.68f	Judge whether measurements and computation of quantities are reasonable	3
	IN.1.B.78g	Calculate the range and average/mean of a set of data	1
IN.1.C.		Scientific inquiry includes evaluation of explanations (laws/principles, theories/models) in light of evidence (data) and scientific principles (understandings)	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
	IN.1.C.68a	Use quantitative and qualitative data as support for reasonable explanations (conclusions)	2
	IN.1.C.68b	Use data as support for observed patterns and relationships, and to make predictions to be tested	2
	IN.1.C.68c	Recognize the possible effects of errors in observations, measurements, and calculations on the formulation of explanations (conclusions)	2
	IN.1.C.68d	Evaluate the reasonableness of an explanation (conclusion)	3
	IN.1.C.68e	Analyze whether evidence (data) and scientific principles support proposed explanations (hypotheses, laws, theories)	2
	IN.1.C.78a	Use quantitative and qualitative data as support for reasonable explanations (conclusions)	2
IN.1.D.		The nature of science relies upon communication of results and justification of explanations	2
	IN.1.D.68a	Communicate the procedures and results of investigations and explanations through: oral presentations, drawings and maps, data tables (allowing for the recording and analysis of data relevant to the experiment, such as independent and dependent variable)	2
ST.		Strand 8. Science and Technology	2
ST.1.		The nature of technology can advance, and is advanced by, science as it seeks to apply scientific knowledge in ways that meet human needs	2
ST.1.A.		Designed objects are used to do things better or more easily and to do some things that could not otherwise be done at all	2
	ST.1.A.68a	Explain how technological improvements, such as those developed for use in space exploration, the military, or medicine, have led to the invention of new products that may improve lives here on Earth (e.g., new materials, freeze-dried foods, infrared goggles)	2
ST.1.B.		Advances in technology often result in improved data collection and an increase in scientific information	2
	ST.1.B.68a	Identify the link between technological developments and the scientific discoveries made possible through their development (e.g., Hubble telescope and stellar evolution, composition and structure of the universe; the electron microscope and cell organelle)	2
ST.1.C.		Technological solutions to problems often have drawbacks as well as benefits	2
	ST.1.C.68a	Describe how technological solutions to problems (e.g., storm water runoff, fiber optics, windmills, efficient car design, electronic trains without conductors, sonar, robotics, Hubble telescope) can have both benefits and drawbacks (e.g., design constraints)	2
ST.2.		Historical and cultural perspectives of scientific explanations help to improve understanding of the nature of science and how science knowledge and technology evolve over time	2
ST.2.A.		People of different gender and ethnicity have contributed to scientific discoveries and the invention of technological innovations	2
ST.2.B.		Scientific theories are developed based on the body of knowledge that exists at any particular time and must be rigorously questioned and tested for validity	2
	ST.2.B.68a	Recognize the difficulty science innovators experience as they attempt to break through accepted ideas (hypotheses, laws, theories) of their time to reach conclusions that may lead to changes in those ideas and serve to advance scientific understanding (e.g., Darwin, Copernicus, Newton)	2

Strand. Big Idea	Strand. Big Idea. Substrand. GLE	Description	DOK
ST.3. ST.3.B.	ST.2.B.68b	Recognize explanations have changed over time as a result of new evidence	1
		Science and technology affect, and are affected by, society	3
	ST.3.B.68a	Social, political, economic, ethical and environmental factors strongly influence, and are influenced by, the direction of progress of science and technology	3
		Describe ways in which science and society influence one another (e.g., scientific knowledge and the procedures used by scientists influence the way many individuals in society think about themselves, others, and the environment; societal challenges often	2
ST.3.B.68b	Identify and evaluate the physical, social, economic, and/or environmental problems that may be overcome using science and technology (e.g., the need for alternative fuels, human travel in space, AIDS)	3	

Item DOK per Reviewer for Science 2010 and 2011 Test Forms

Tables C-11 and C-12 present the DOK ratings per item (listed by item ID) given by each reviewer. We list results for each test side-by-side; however, we remind the reader that some items between forms differ, as noted by unique item IDs. Column 1 lists the item ID number (no leading zeros are included), while subsequent columns include DOK ratings per reviewer (R = reviewer).

Table C-11. Item DOK per Reviewer by Item ID Number for Science 2010 and 2011 Test Forms, Grade 5

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
110455	1	1	1	1	1	1	1	110435	1	1	1	1	1	1	1
110591	1	1	1	1	2	1	1	110465	1	1	1	1	1	1	1
110601	1	1	1	1	1	1	1	110469	1	1	1	1	1	1	1
110611	1	1	1	1	1	1	1	110668	1	1	1	1	1	1	1
110710	1	1	1	1	1	1	1	110680	1	1	1	1	1	1	1
110740	2	2	2	2	2	2	2	110684	2	2	2	2	2	2	2
110773	1	1	1	1	1	1	1	110700	1	1	1	1	1	1	1
110825	2	2	2	2	1	2	2	110710	2	2	2	2	2	2	2
110829	1	1	1	1	1	1	1	110726	1	1	1	1	1	1	1
110870	1	1	1	1	1	1	1	110773	1	1	1	1	1	1	1
110900	1	1	1	1	1	1	1	110803	1	1	1	1	1	1	1
110930	1	1	1	1	1	1	1	110813	1	1	1	1	1	1	1
111056	1	1	1	1	1	1	1	110829	1	1	1	1	1	1	1
111076	1	2	2	1	1	1	1	110882	1	1	1	1	1	1	1
111080	1	1	1	1	1	1	1	110894	2	2	2	2	2	2	2
111112	2	2	2	2	2	2	2	111056	1	1	1	1	1	1	1
113445	1	1	1	1	1	1	1	111078	2	1	2	2	1	2	2
113491	2	1	2	2	1	2	2	111080	2	1	1	1	1	1	1
113503	1	1	1	1	1	1	1	113573	1	1	1	1	1	1	1
113573	1	1	1	1	1	1	1	113786	1	1	1	1	1	1	1
479552	1	1	1	1	1	1	1	479552	2	1	1	2	1	1	1
479570	2	1	1	2	1	1	1	479570	1	1	2	2	2	1	1
479574	1	1	2	2	2	1	1	479574	1	1	1	1	1	1	2
479584	1	1	1	1	1	1	1	479584	1	1	1	1	1	1	1
479586	2	2	2	2	2	2	2	479586	1	2	2	2	2	1	1
479590	1	1	1	2	1	1	1	479590	2	2	2	2	2	2	2
479602	1	1	1	1	2	1	1	479602	1	1	1	1	2	1	1
479618	1	1	1	1	1	1	1	479618	1	1	1	1	1	1	1
479626	1	2	2	2	2	1	1	479626	1	1	1	1	1	1	1
479739	1	1	1	1	1	1	1	479739	1	1	1	1	1	1	1

2010 Form								2011 Form							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
479745	1	1	1	1	1	1	1	479745	1	1	1	1	1	1	1
479751	1	1	1	1	1	1	1	479751	2	2	2	2	2	2	2
479753	1	1	1	1	1	1	1	479753	1	2	2	2	1	1	1
479757	1	1	1	1	1	1	1	479789	1	2	1	1	2	2	1
479789	1	1	1	1	1	1	1	479791	1	2	1	1	2	1	1
479791	2	2	2	2	2	2	2	479793	2	2	2	2	2	2	1
479793	1	1	1	1	2	1	1	481715	1	1	1	1	1	1	1
481715	1	2	1	1	2	2	1	481719	1	1	1	1	1	1	1
481719	1	1	1	1	1	2	1	483941	1	1	1	1	1	1	1
483941	2	2	2	2	2	2	2	483945	1	1	1	1	1	1	1
483945	1	1	1	2	2	1	1	483963	1	1	1	1	2	1	1
483963	1	1	1	1	2	1	1	483993	1	2	1	1	1	1	1
483993	1	2	2	2	2	2	1	769383	1	1	2	2	1	1	1
769287	1	2	1	1	2	1	1	769727	1	2	1	1	2	1	1
769365	1	2	2	3	2	1	1	769729	1	2	2	3	1	2	1
1028724	2	2	2	3	2	1	1	769731	1	1	1	1	1	1	1
1028726	2	3	2	2	2	3	2	769733	1	2	1	1	1	1	1
1028734	1	2	1	3	2	1	1	769735	1	3	1	3	2	1	2
1028738	1	2	1	3	1	1	2	769737	1	3	1	2	1	2	1
1028746	2	3	3	3	3	3	3	769739	1	3	2	2	1	1	1
1028756	3	3	2	3	2	3	2	769741	1	2	1	1	2	2	2
1028758	1	2	2	3	2	2	3	769743	1	2	1	3	2	2	3
1028762	1	1	1	1	2	1	1	769779	2	2	1	2	2	2	2
1028770	2	3	1	3	1	2	1	769801	1	2	1	1	1	2	2
1028772	1	3	2	3	2	1	1	1028742	1	1	1	1	1	1	1
1028778	1	2	1	3	2	1	2	1028748	1	1	1	1	1	2	1
1028806	1	1	2	1	1	1	1	1028750	2	2	2	2	2	2	1
1028808	2	2	2	1	2	2	3	1028752	2	2	2	2	2	2	2
1028810	2	2	2	2	2	1	1	1028754	2	2	2	3	2	2	2
1028830	3	2	3	3	2	2	2	1028764	2	2	2	3	2	2	2
1028836	3	2	3	3	3	3	2	1028766	2	2	2	2	2	2	2
1028838	3	2	2	3	3	3	1	1028768	2	3	3	3	3	3	3
1028840	3	3	3	3	3	3	3	1028776	3	3	3	3	3	3	3
1028842	3	3	3	3	3	3	2	1028780	1	1	1	1	1	1	1

Table C-12. Item DOK per Reviewer by Item ID Number for Science 2010 and 2011 Test Forms, Grade 8

2010 Form								2011 Form						
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R7
113692	1	1	1	1	2	1	2	113658	1	1	1	1	1	1
113700	1	1	1	1	1	1	1	113692	1	1	1	1	1	3
113882	1	1	1	1	1	1	1	113700	1	1	1	1	1	1
115959	1	1	1	1	1	1	1	113782	1	1	1	1	1	1
116007	2	2	2	2	2	2	2	113882	1	1	1	1	2	3
116029	2	2	2	2	2	2	1	115953	1	1	1	1	1	1
116049	1	1	1	1	1	2	1	115959	1	1	1	1	1	2
116163	1	1	1	1	1	2	1	116049	1	1	1	1	1	1
116179	1	1	1	1	1	1	2	116057	2	2	2	2	2	2
116242	1	1	1	1	1	1	1	116133	1	1	1	2	1	1
116246	1	1	1	1	1	1	2	116163	2	2	2	2	1	3
116248	1	1	1	1	1	1	3	116165	2	2	2	2	1	1
116250	1	1	1	1	1	1	1	116171	1	1	1	1	1	2
116252	1	1	1	1	1	1	2	116179	1	1	1	1	1	1
116264	1	1	1	2	1	1	2	116356	1	1	1	2	1	2
116266	2	2	2	2	2	2	2	116360	1	1	1	1	1	2
116268	1	1	1	1	1	1	1	116380	2	2	2	2	2	2
116284	2	2	2	1	2	2	2	116398	1	1	1	1	1	3
116316	1	1	1	1	1	1	2	116460	1	1	1	1	1	3
116350	1	1	1	2	1	1	1	116954	1	1	1	1	1	1
116352	2	2	1	2	2	2	1	480659	1	1	1	1	2	3
116356	1	1	1	1	1	1	2	480661	1	1	1	1	1	2
116360	1	1	1	1	2	1	2	480663	1	1	1	1	2	2
116368	1	1	1	1	1	1	2	480665	1	1	1	1	1	1
116370	1	1	1	1	1	1	1	480667	1	1	1	1	1	1
116380	1	1	1	1	1	1	1	480671	1	1	1	1	1	1
116390	1	1	1	1	1	1	1	480673	1	1	1	1	1	1
116404	1	1	1	1	1	1	2	480681	1	1	1	1	1	1
116444	1	1	1	1	1	1	1	480685	1	1	1	1	1	1
116458	1	2	2	2	2	1	1	480687	1	1	1	1	1	1
116460	1	1	1	1	1	1	1	480701	1	1	1	1	2	2
116488	1	1	1	1	1	1	1	480705	1	1	1	1	1	3
116504	1	1	1	1	1	2	2	480828	2	2	1	2	2	1
116506	1	1	1	1	1	1	1	480830	1	1	1	1	1	1
116512	1	2	2	2	2	2	2	480852	1	1	1	2	1	1
480659	1	1	1	1	1	1	1	480856	1	1	1	1	1	1
480665	1	1	1	1	1	1	1	480866	1	1	1	1	1	1
480673	1	1	1	1	1	2	1	480870	1	1	1	1	1	2
480830	2	2	2	2	2	2	2	480872	1	1	1	1	1	1
480856	1	1	1	1	1	1	2	480874	2	2	2	2	2	2
480872	1	1	1	1	2	1	2	480880	1	1	1	1	2	1
480900	1	1	1	1	1	1	2	480900	1	1	1	1	1	1
480902	1	1	1	1	1	1	1	480902	1	1	1	1	1	1
769409	2	2	2	3	2	2	1	769437	2	2	2	2	2	2
769423	1	1	1	1	1	1	2	769445	2	2	2	2	2	2

2010 Form								2011 Form						
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R7
769475	3	3	3	3	2	3	2	769473	1	2	2	1	1	2
769479	2	2	2	2	2	2	2	769489	2	2	2	2	2	2
769493	1	1	1	1	1	1	1	769491	1	2	2	1	1	1
769509	1	2	2	2	2	2	2	769495	2	2	2	2	1	3
769923	2	3	2	3	1	3	2	769499	2	2	2	2	2	2
1032840	2	2	2	2	2	2	2	769537	2	2	2	2	2	2
1032872	1	2	2	2	2	2	2	769901	2	2	2	2	2	2
1032886	1	2	2	2	2	2	2	769939	2	2	2	1	2	2
1032888	2	2	2	2	2	2	2	1032848	2	2	2	2	2	2
1032890	1	1	2	2	1	1	2	1032868	1	2	2	2	1	1
1032898	1	1	2	2	2	1	2	1032932	1	1	1	1	2	2
1032908	1	2	2	2	1	2	2	1032934	1	2	2	2	2	2
1032910	2	2	2	2	2	2	2	1032936	1	1	1	1	1	1
1032914	2	2	2	2	2	2	2	1032938	1	1	2	2	2	2
1032918	2	1	1	1	2	1	2	1032942	1	1	1	2	2	1
1032920	2	1	1	2	2	1	2	1032944	2	2	2	2	2	2
1032922	2	2	2	2	2	2	2	1032950	2	2	2	2	2	2
1032926	2	2	2	2	2	2	2	1032952	1	1	2	1	2	1
1032928	1	2	2	2	2	1	2	1032954	2	2	2	2	2	2
1032930	2	2	2	2	2	2	1							

Items per GLE for Science 2010 and 2011 Test Forms

Tables C-13 through C-16 list those items matched to each Science GLE. Column 1 presents the GLE by code (see Tables C-11 and C-12 for descriptions). The remaining colored columns list items by sequential item number along with the number of reviewers who assigned the GLE to the item. For example, item number 45 (row 7 below) was matched to the GLE coded as ME.1.A.4.d by 2 reviewers (45:2). The legend above the list of GLEs and items explains the color-coding with green representing low agreement among reviewers (i.e., 1 reviewer assigned item to GLE), yellow representing moderate agreement (i.e., 3 reviewers assigned item to this GLE), and red representing high agreement (i.e., all 7 reviewers assigned item to GLE). Note that the blanks for many GLEs indicate that these content expectations were not linked to any items by reviewers.

Table C-13. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Science 2010 Test Form, Grade 5

Low		Medium		High
1		3		7
ME				
ME.1				
ME.1.A.				
ME.1.A.4.a	44:1			
ME.1.A.4.b				
ME.1.A.4.c				
ME.1.A.4.d	45:2	54:1		
ME.1.B.				
ME.1.B.4.a				
ME.1.B.4.b				
ME.1.B.4.c				
ME.1.B.4.d	54:5			
ME.1.C.				
ME.1.C.5.a	4:1	56:1		
ME.1.D.				
ME.1.D.3.a	42:2			
ME.1.D.3.b	42:1			
ME.1.D.3.c				
ME.1.D.3.d				
ME.1.D.3.e				
ME.1.D.3.f				
ME.1.D.3.g	20:7	38:1		
ME.1.D.5.a	42:4			
ME.1.D.5.b				
ME.1.I.				
ME.1.I.4.a	56:4			
ME.1.I.5.a	56:2			
ME.2.				
ME.2.A.				
ME.2.A.3.a				
ME.2.A.4.b	18:1			

ME.2.A.4.c	
ME.2.A.4.d	
ME.2.A.4.e	
ME.2.A.4.f	
ME.2.A.4.g	14:7
ME.2.A.5.a	
ME.2.A.5.b	15:7 18:6
ME.2.C.	
ME.2.C.3.a	
ME.2.C.5.a	4:6 21:3
ME.2.F.	
ME.2.F.4.a	
FM.	
FM.1.	
FM.1.A.	
FM.1.A.4.a	44:6
FM.1.A.4.b	
FM.2.	
FM.2.A.	28:7
FM.2.A.4.a	
FM.2.A.4.b	
FM.2.A.4.c	
FM.2.A.4.d	
FM.2.A.5.a	
FM.2.B.	
FM.2.B.4.a	
FM.2.D.	
FM.2.D.4.a	36:7
FM.2.D.4.b	
FM.2.D.4.c	47:7
FM.2.D.4.d	
FM.2.D.4.e	
FM.2.F.	
FM.2.F.5.a	
FM.2.F.5.b	
FM.2.F.5.c	
FM.2.F.5.d	51:7
LO	
LO.1.	
LO.1.A.	
LO.1.A.3.a	
LO.1.B.	
LO.1.B.3.a	
LO.1.B.3.b	
LO.1.D.	
LO.1.D.3.a	34:4
LO.1.D.5.a	32:1 48:4
LO.1.D.5.b	27:7
LO.1.D.5.c	
LO.1.D.5.d	1:7 19:7 26:4 48:1
LO.1.D.5.e	

LO.1.E.		
LO.1.E.5.a	32:6	
LO.2.		
LO.2.C.		
LO.2.C.3.a		
LO.2.C.5.a	26:4	
LO.3.		
LO.3.D.		
LO.3.D.3.a		
EC.		
EC.1		
EC.1.A.		
EC.1.A.4.a	7:7	34:6
EC.1.A.4.b	34:1	
EC.1.D.		
EC.1.D.4.a		
EC.2.		
EC.2.A.		
EC.2.A.3.a	46:1	
EC.2.A.3.b	55:2	
EC.2.A.3.c	11:7	
EC.2.A.3.d	46:6	
EC.2.A.4.a	55:5	
EC.2.A.4.b		
EC.2.A.4.c		
EC.3.		
EC.3.A.		
EC.3.A.4.a		
EC.3.C.		
EC.3.C.4.a		
EC.3.C.4.b	10:7	48:3
EC.3.C.4.c		
EC.3.C.4.d		
ES.		
ES.1		
ES.1.A.		
ES.1.A.4.a		
ES.1.A.4.b		
ES.1.B.		
ES.1.B.5.a	41:6	
ES.1.C.		
ES.1.C.3.a	37:7	
ES.1.C.3.b		
ES.1.C.3.c		
ES.1.C.5.a	13:7	
ES.2.		
ES.2.A.		
ES.2.A.4.a	39:6	55:1
ES.2.A.4.b		
ES.2.A.4.c	23:1	
ES.2.A.4.d	23:1	

ES.2.A.4.e	23:5	41:1	
ES.2.E.			
ES.2.E.3.a			
ES.2.E.5.a	21:6	53:7	
ES.2.E.5.b			
ES.2.F.			
ES.2.F.5.a	38:1		
ES.2.F.5.b	38:5	50:3	
ES.3.			
ES.3.A.			
ES.3.A.4.a			
ES.3.A.4.b	31:7	39:1	
ES.3.A.5.a			
ES.3.A.5.b			
ES.3.A.5.c			
UN.			
UN.1			
UN.1.A.			
UN.1.A.3.a	35:7		
UN.1.A.3.b			
UN.1.A.5.a	9:7	24:7	30:7
UN.1.A.5.b			
UN.1.A.5.c			
UN.1.B.			
UN.1.B.5.a			
UN.2.			
UN.2.A.			
UN.2.A.3.a	45:1	49:6	
UN.2.B.			
UN.2.B.3.a			
UN.2.B.3.b	52:3		
UN.2.B.5.a	52:3		
UN.2.C.			
UN.2.C.3.a			
UN.2.C.3.b			
UN.2.C.3.c			
UN.2.C.5.a			
UN.2.C.5.b			
UN.2.C.5.c	49:1		
IN.			
IN.1.			
IN.1.A.			
IN.1.A.3.a			
IN.1.A.3.b	61:1		
IN.1.A.4.a	61:1	62:1	
IN.1.A.4.b			
IN.1.A.4.c			
IN.1.A.5.a	61:5	62:5	
IN.1.A.5.b	17:7	63:6	
IN.1.A.5.c	54:1	63:1	
IN.1.A.5.d			

IN.1.B.								
IN.1.B.34.a								
IN.1.B.34.b	28:1	33:5						
IN.1.B.34.c	33:1	57:4						
IN.1.B.34.d	33:1							
IN.1.B.34.e								
IN.1.B.5.a								
IN.1.B.5.b								
IN.1.B.5.c	8:7	16:1	25:1					
IN.1.B.5.d	57:3							
IN.1.B.5.e	16:5	25:1						
IN.1.B.5.f	22:7							
IN.1.C.	60:1							
IN.1.C.35.a	6:5	16:1	25:5	50:2	52:1	59:7	60:5	
IN.1.C.35.b	50:2	60:1	62:1	64:6				
IN.1.C.35.c	6:1							
IN.1.C.35.d	6:1	64:1						
IN.1.D.								
IN.1.D.35.a	3:7	58:7						
ST.								
ST.1.								
ST.1.A.	45:1							
ST.1.A.3.a	40:7	43:1	45:3					
ST.1.A.4.a								
ST.1.A.5.a								
ST.1.B.								
ST.1.B.35.a	2:6	5:6	33:1	43:3				
ST.1.C.								
ST.1.C.45.a	43:3							
ST.2.								
ST.2.A.								
ST.2.A.35.a								
ST.3.								
ST.3.A.								
ST.3.A.35.a	2:1	5:1						
ST.3.A.35.b								

Table C-14. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Science 2011 Test Form, Grade 5

Low		Medium		High
1		3		7

GLEs_Matched	Item Number and Frequency of Reviewers
EC1A	39:1
EC1D4a	39:1
EC2A3a	48:1
EC2A3d	38:1
EC2A4a	39:1
ES1C5a	13:1
ES2A4a	24:1
ES2A4c	22:1
ES2A4d	22:1
ES2F5a	34:1
ES3A5b	51:1
ES3A5c	51:1
FM2D4b	32:1
FM2F5d	46:1
IN1A3a	26:1
IN1A4a	26:1
IN1A5a	60:1
IN1B5b	60:1
IN1B5c	15:1
IN1B5e	61:1
IN1C35a	23:1
IN1C35a	61:1
IN1C35d	6:1
LO1D5a	18:1
LO1D5b	18:1
LO1D5b	37:1
ME1D3b	41:1
ME1D3g	34:1
ME2A4g	14:1
ME2A5a	45:1
ME2C5a	20:1
ST1C45a	44:1
ST1C45a	50:1
UN2B3b	45:1
UN2C5b	49:1
No match	12:1
No match	44:1
EC1A4a	30:2
EC2A3b	38:2
ES2E5b	33:2
IN1C35a	59:2
ME1D3a	41:2

GLEs_Matched	Item Number and Frequency of Reviewers
EC1A4a	29:3
ES2A4a	31:3
IN1A5c	25:3
UN1A	40:3
EC2A3c	39:4
EC2A4a	38:4
ES1A4a	31:4
IN1A3b	25:4
LO1D3a	29:4
ME1D5a	41:4
UN1B5a	40:4
EC3C4b	30:5
ES1C3b	33:5
ES2A4e	22:5
ES2F5b	34:5
ES3A5a	51:5
IN1A5a	26:5
IN1A5b	60:5
IN1C35b	59:5
IN1C35b	61:5
LO1D5d	18:5
ST1A3a	44:5
UN2B3a	45:5
EC2A3c	48:6
ES1C3c	24:6
ES1C5a	12:6
ES2E5a	20:6
FM2D4a	32:6
FM2F5b	46:6
IN1B5e	15:6
IN1C35a	6:6
LO1B3a	37:6
ME2A4g	13:6
ME2A5b	14:6
ST1A3a	50:6
UN1A5a	23:6
UN1A5c	49:6
EC1A4a	7:7
EC2A3c	11:7
EC3C4b	10:7
ES2A4d	42:7
ES3A5c	53:7
FM2A4a	54:7
FM2A4c	47:7
IN1A5a	62:7
IN1A5a	63:7
IN1A5b	16:7
IN1A5b	64:7

GLEs_Matched	Item Number and Frequency of Reviewers
IN1B5b	56:7
IN1B5c	8:7
IN1B5f	21:7
IN1C35b	58:7
IN1D35a	3:7
IN1D35a	57:7
LO1D5d	1:7
LO1D5d	55:7
LO1D5e	43:7
ME1D3b	35:7
ME1D3g	19:7
ME1D5b	27:7
ME2A4e	52:7
ME2A4g	28:7
ME2A5b	17:7
ME2C5a	4:7
ST1A3a	36:7
ST1B35a	2:7
ST1B35a	5:7
UN1A5a	9:7

NOTE: The format of this table differs from other Math grade level results due to software output problems.

Table C-15. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Science 2010 Test Form, Grade 8

Low		Medium		High
1		3		7

GLEs_Matched	Item Number and Frequency of Reviewers
EC1A	46:1
EC1A6a	41:1
EC1B6b	18:1
EC1B6b	37:1
EC1B6b	41:1
EC1D6b	36:1
EC2A6a	37:1
EC3A6a	29:1
ES2F7a	36:1
ES2F7d	3:1
FM2A	9:1
FM2B7b	7:1
FM2B7c	38:1
FM2D	17:1
FM2D	24:1
FM2D7a	23:1
FM2D7a	39:1
IN1A68a	22:1
IN1A68a	61:1
IN1A68a	64:1
IN1A68a	65:1
IN1A68b	5:1
IN1A68b	8:1
IN1A68c	26:1
IN1A68c	59:1
IN1A68e	10:1
IN1B68b	52:1
IN1B68b	58:1
IN1B68b	61:1
IN1B68c	47:1
IN1C	19:1
IN1C68b	63:1
IN1C68b	65:1
IN1C78a	1:1
IN1C78a	14:1
IN1C78a	57:1
IN1C78a	58:1
IN1D68a	1:1
LO2B6a	18:1
LO2B8c	56:1
ME1A	2:1
ME2A6b	4:1
ME2A6e	28:1
ME2A7a	9:1
ME2A7g	40:1

GLEs_Matched	Item Number and Frequency of Reviewers
ST1C68a	16:1
ST1C68a	51:1
ST3B68b	19:1
ST3B68b	51:1
UN1A7a	31:1
UN2B7c	55:1
UN2C	53:1
UN2C7b	20:1
UN2D7c	55:1
EC1D6a	42:2
IN1A68a	60:2
IN1B68c	8:2
LO2C8f	56:2
LO2G8d	49:2
ME2A7j	40:2
UN2A7c	53:2
ST1A	34:3
IN1B68b	8:4
LO2B8b	56:4
ME2A7i	40:4
ST1A68a	34:4
UN2C7f	53:4
EC1D6a	18:5
EC2A6b	37:5
ES1C7b	42:5
ES2E7a	36:5
ES3A7a	51:5
FM2A7a	9:5
IN1A68b	60:5
IN1A68b	61:5
IN1D68a	58:5
IN1D68a	65:5
LO2B6a	41:5
LO2C8b	1:5
LO2G8b	49:5
ST1C68a	19:5
UN2D7b	55:5
EC1B6c	46:6
EC3C6a	29:6
FM2D	39:6
FM2D7b	7:6
FM2D7b	23:6
FM2F7c	38:6
IN1A68a	10:6
IN1A68a	63:6
IN1A68b	64:6
IN1B68c	26:6
IN1B78g	14:6
IN1B78g	57:6
IN1C68b	5:6

GLEs_Matched	Item Number and Frequency of Reviewers
IN1C68c	59:6
IN1C78a	16:6
IN1D68a	22:6
LO2A8b	17:6
ME1A6a	2:6
ME1A6b	52:6
ME1A6c	47:6
ME2A6d	28:6
ME2A6e	4:6
ST3B68a	24:6
UN1A7b	31:6
UN2C7f	3:6
UN2C7f	20:6
EC2A6b	13:7
ES2B6a	25:7
ES2D6b	11:7
ES2D8a	12:7
ES2F	21:7
ES3A6b	50:7
ES3A7a	44:7
FM1A7c	45:7
IN1A68b	62:7
IN1C68b	35:7
IN1C78a	6:7
IN1C78a	30:7
LO2B8a	48:7
ME1G6b	33:7
ME2A6i	27:7
ME2F7a	54:7
No item found	15:7
UN1A7a	32:7
UN1A7c	43:7

Table C-16. Items (by Sequential Item Number) Assigned to GLEs by Reviewers (max N=7) for Science 2011 Test Form, Grade 8

Low		Medium		High
1		5		7

ME	
ME.1	
ME.1.A	20:6
ME.1.A.6.a	
ME.1.A.6.b	50:6
ME.1.A.6.c	
ME.1.A.6.d	
ME.1.A.8.a	
ME.1.A.8.b	37:1
ME.1.B.	
ME.1.B.6.a	
ME.1.B.6.b	
ME.1.B.6.c	
ME.1.C.	
ME.1.C.6.a	
ME.1.C.8.a	
ME.1.D.	
ME.1.D.6.a	
ME.1.D.7.a	
ME.1.D.8.a	12:1 36:6 37:1
ME.1.D.8.b	
ME.1.D.8.c	
ME.1.F.	
ME.1.F.8.a	
ME.1.G	
ME.1.G.6.a	
ME.1.G.6.b	31:6 37:4
ME.1.G.6.c	
ME.1.I.	
ME.1.I.6.a	
ME.1.I.7.a	
ME.1.I.8.a	
ME.1.I.8.b	
ME.1.I.8.c	
ME.2	
ME.2.A.	
ME.2.A.6.a	53:1
ME.2.A.6.b	
ME.2.A.6.c	39:6
ME.2.A.6.d	7:1 53:1
ME.2.A.6.e.	7:5 53:4
ME.2.A.6.f.	
ME.2.A.6.g.	
ME.2.A.6.h.	
ME.2.A.6.i.	4:6

ME.2.A.6.j.		
ME.2.A.7.a		
ME.2.A.7.b		
ME.2.A.7.c	12:4	
ME.2.A.7.d		
ME.2.A.7.e.		
ME.2.A.7.f.	12:1	
ME.2.A.7.g.	42:1	
ME.2.A.7.h.		
ME.2.A.7.i.	42:4	43:1
ME.2.A.7.j.	42:1	
ME.2.A.7.k.		
ME.2.A.7.l.		
ME.2.A.7.m.		
ME.2.A.7.n.		
ME.2.A.8.a		
ME.2.C.		
ME.2.C.6.a		
ME.2.C.6.b		
ME.2.C.7.a		
ME.2.F.		
ME.2.F.7.a		
ME.2.F.7.b		
ME.2.F.7.c		
ME.2.F.8.a		
FM		
FM.1.		
FM.1.A.		
FM.1.A.7.a		
FM.1.A.7.b		
FM.1.A.7.c		
FM.1.A.7.d		
FM.2.		
FM.2.A.		
FM.2.A.7.a	22:4	40:1
FM.2.A.7.b		
FM.2.B.		
FM.2.B.7.a		
FM.2.B.7.b		
FM.2.B.7.c		
FM.2.D	40:4	
FM.2.D.7.a	40:1	
FM.2.D.7.b		
FM.2.D.7.c	21:1	22:1
FM.2.D.7.d	22:1	
FM.2.F.		
FM.2.F.7.a		
FM.2.F.7.b		
FM.2.F.7.c	21:5	
FM.2.F.7.d		
FM.2.F.7.e.		

LO		
LO.1.		
LO.1.A		
LO.1.A.6.a		
LO.1.A.8.a		
LO.1.C.		
LO.1.C.6.b	45:1	
LO.1.D.		
LO.1.D.8.a		
LO.1.E.		
LO.1.E.6.a		
LO.1.E.6.b		
LO.2.		
LO.2.A.	8:1	
LO.2.A.6.a	8:4	
LO.2.A.6.b		
LO.2.A.8.a	54:6	
LO.2.A.8.b	54:6	
LO.2.B.	8:1	16:6
LO.2.B.6.a		
LO.2.B.8.a		
LO.2.B.8.b		
LO.2.B.8.c		
LO.2.C.	6:3	
LO.2.C.8.a		
LO.2.C.8.b	19:1	
LO.2.C.8.c		
LO.2.C.8.d		
LO.2.C.8.e.		
LO.2.C.8.f.		
LO.2.C.8.g.		
LO.2.F.		
LO.2.F.8.a		
LO.2.G.		
LO.2.G.8.a	35:6	
LO.2.G.8.b	19:1	
LO.2.G.8.c		
LO.2.G.8.d		
LO.3.		
LO.3.A.		
LO.3.A.8.a	14:1	
LO.3.A.8.b	19:4	
LO.3.A.8.c	48:5	
LO.3.A.8.d		
LO.3.C.		
LO.3.C.8.a	6:3	14:2
LO.3.C.8.b	48:1	
LO.3.C.8.c		
LO.3.D.		
LO.3.D.8.a	14:3	15:1
LO.3.D.8.b		

EC.				
EC.1.				
EC.1.A.				
EC.1.A.6.a	24:6			
EC.1.B.				
EC.1.B.6.a				
EC.1.B.6.b				
EC.1.B.6.c				
EC.1.D.				
EC.1.D.6.a	41:6			
EC.1.D.6.b				
EC.1.D.6.c				
EC.1.D.8.a				
EC.2.				
EC.2.A.				
EC.2.A.6.a	28:1			
EC.2.A.6.b	11:1	28:5	32:6	
EC.2.B.	5:5			
EC.2.B.8.a				
EC.2.B.8.b				
EC.3.				
EC.3.A.				
EC.3.A.6.a				
EC.3.C.				
EC.3.C.6.a	10:6			
EC.3.C.6.b				
ES.				
ES.1.				
ES.1.A.				
ES.1.A.6.a				
ES.1.A.8.a				
ES.1.A.8.b				
ES.1.A.8.c				
ES.1.A.8.d				
ES.1.B.				
ES.1.B.6.b	51:6			
ES.1.C.				
ES.1.C.7.a	52:1			
ES.1.C.7.b	41:6			
ES.2.				
ES.2.A.				
ES.2.A.6.a				
ES.2.A.6.b				
ES.2.A.6.c	1:1	2:1	38:6	51:6
ES.2.A.6.d				
ES.2.B.	5:1			
ES.2.B.6.a	2:5			
ES.2.B.8.a				
ES.2.B.8.b				
ES.2.B.8.c				
ES.2.C.				

ES.2.C.8.a		
ES.2.C.8.b		
ES.2.C.8.c		
ES.2.D.		
ES.2.D.6.a		
ES.2.D.6.b		
ES.2.D.8.a		
ES.2.D.8.b		
ES.2.E.		
ES.2.E.7.a	18:6	29:5
ES.2.E.7.b		
ES.2.E.7.c		
ES.2.F.		
ES.2.F.7.a	52:5	
ES.2.F.7.b	23:4	
ES.2.F.7.c	23:2	
ES.2.F.7.d		
ES.2.F.7.e.		
ES.2.F.7.f.		
ES.3.		
ES.3.A.		
ES.3.A.6.a		
ES.3.A.6.b	34:6	
ES.3.A.6.c		
ES.3.A.7.a		
ES.3.A.7.b	29:1	
UN.		
UN.1.		
UN.1.A.		
UN.1.A.7.a	30:6	55:1
UN.1.A.7.b	25:6	
UN.1.A.7.c	43:5	55:5
UN.1.B.		
UN.1.B.7.a		
UN.1.B.7.b	46:6	
UN.1.C.		
UN.1.C.7.a		
UN.1.C.7.b		
UN.2.		
UN.2.A.		
UN.2.A.7.a		
UN.2.A.7.b		
UN.2.A.7.c		
UN.2.A.7.d		
UN.2.A.7.e.		
UN.2.B		
UN.2.B.7.a		
UN.2.B.7.b		
UN.2.B.7.c		
UN.2.B.7.d		
UN.2.B.7.e.		

UN.2.B.7.f.								
UN.2.C.								
UN.2.C.7.a								
UN.2.C.7.b								
UN.2.C.7.c								
UN.2.C.7.d								
UN.2.C.7.e.								
UN.2.C.7.f.	27:6							
UN.2.D.								
UN.2.D.7.a								
UN.2.D.7.b								
UN.2.D.7.c								
IN.								
IN.1.								
IN.1.A.								
IN.1.A.68a	62:6							
IN.1.A.68b	15:5	17:5	33:1	57:5	58:4	59:6	63:6	
IN.1.A.68c	58:1							
IN.1.A.68d	17:1							
IN.1.A.68e								
IN.1.A.78f								
IN.1.B.								
IN.1.B.68a								
IN.1.B.68b	56:5	57:1	58:1	61:1				
IN.1.B.68c	3:6							
IN.1.B.68d	13:6							
IN.1.B.68e								
IN.1.B.68f								
IN.1.B.78g	60:6							
IN.1.C.								
IN.1.C.68a	47:2							
IN.1.C.68b	33:5	47:1						
IN.1.C.68c								
IN.1.C.68d								
IN.1.C.68e								
IN.1.C.78a	9:6	11:5	47:3	49:6				
IN.1.D.								
IN.1.D.68a	61:5	64:6						
ST.								
ST.1.								
ST.1.A.								
ST.1.A.68a	26:6							
ST.1.B.								
ST.1.B.68a	45:5							
ST.1.C.								
ST.1.C.68a								
ST.2.								
ST.2.A.								
ST.2.A.68a								
ST.2.B.								
ST.2.B.68a								

ST.2.B.68b				
ST.3.				
ST.3.B.				
ST.3.B.68a	1:5	35:6	44:1	56:1
ST.3.B.68b	44:5			

Appendix D Panelist Comments on MAP Test Items

Tables D-1 through D-28 present panelists' comments on the individual items of the MAP tests per content area and grade level form. To maintain test security, no individual item identifiers are included.

Table D-1. Reviewer Comments on Communication Arts 2010 Test Form, Grade 3

Table D-2. Reviewer Comments on Communication Arts 2011 Test Form, Grade 3

Table D-3. Reviewer Comments on Communication Arts 2010 Test Form, Grade 4

Table D-4. Reviewer Comments on Communication Arts 2011 Test Form, Grade 4

Table D-5. Reviewer Comments on Communication Arts 2010 Test Form, Grade 5

Table D-6. Reviewer Comments on Communication Arts 2011 Test Form, Grade 5

Table D-7. Reviewer Comments on Communication Arts 2010 Test Form, Grade 6

Table D-8. Reviewer Comments on Communication Arts 2011 Test Form, Grade 6

Table D-9. Reviewer Comments on Communication Art 2010 Test Form, Grade 7

Table D-10. Reviewer Comments on Communication Art 2011 Test Form, Grade 7

Table D-11. Reviewer Comments on Communication Arts 2010 Test Form, Grade 8

Table D-12. Reviewer Comments on Communication Arts 2011 Test Form, Grade 8

Table D-13. Reviewer Comments on Mathematics 2010 Test Form, Grade 3

Table D-14. Reviewer Comments on Mathematics 2011 Test Form, Grade 3

Table D-15. Reviewer Comments on Mathematics 2010 Test Form, Grade 4

Table D-16. Reviewer Comments on Mathematics 2011 Test Form, Grade 4

Table D-17. Reviewer Comments on Mathematics 2010 Test Form, Grade 5

Table D-18. Reviewer Comments on Mathematics 2011 Test Form, Grade 5

Table D-19. Reviewer Comments on Mathematics 2010 Test Form, Grade 6

Table D-20. Reviewer Comments on Mathematics 2011 Test Form, Grade 6

Table D-21. Reviewer Comments on Mathematics 2010 Test Form, Grade 7

Table D-22. Reviewer Comments on Mathematics 2011 Test Form, Grade 7

Table D-23. Reviewer Comments on Mathematics 2010 Test Form, Grade 8

Table D-24. Reviewer Comments on Mathematics 2011 Test Form, Grade 8

Table D-25. Reviewer Comments on Science 2010 Test Form, Grade 5

Table D-26. Reviewer Comments on Science 2011 Test Form, Grade 5

Table D-27. Reviewer Comments on Science 2010 Test Form, Grade 8

Table D-28. Reviewer Comments on Science 2011 Test Form, Grade 8

Appendix E

Sample Alignment Review Materials

Panelists received the following instruction sheet as a reference guide corresponding with verbal instructions from group leaders and HumRRO facilitators.

Reviewer Instructions on Alignment Tasks

- Step 1** - Reviewers register on WAT with assistance from Group Leaders and HumRRO facilitators.

What you need: (1) Group ID number, (2) Group Title, (3) Study Start Date and End Date

What to do: (a) Obtain the above information from the Group Leader.
 (b) Go to: <http://wat.wceruw.org/index.aspx>
 (c) Click 'login' on top menu bar.
 (d) Click 'Registration page' (middle of page).
 (e) Follow instructions per page.

- Step 2** - Group begins DOK review of lowest grade level standards:

- ✓ Individually (reviewers enter in WAT)
- ✓ Consensus (group leader enters in WAT)

What you need: (1) DOK Definitions, (2) Printed GLEs, (3) 2007 DOK Ratings, (4) WAT – Part I review

What to do: (a) Independent Ratings: Determine your rating for grade-level GLE. Compare your rating to previous year ratings and make a decision if discrepant. Enter a single rating from 1-4 next to each grade-level GLE listed. When finished with a page, click 'Save' at bottom.
 (b) Consensus Ratings: Group Leader will facilitate review and discussion of ratings for each GLE. Focus on discrepant ratings. If group cannot come to full consensus, adopt the rating of the majority. Group Leader will enter consensus DOKs.

- Step 3** - Group begins individual item ratings for corresponding grade level test form (start with Form 1) in WAT.

- ✓ Load test form from CD for viewing on left-hand computer.
- ✓ Enter WAT ratings on right-hand computer.

What you need: (1) DOK Definitions, (2) Printed GLEs, (3) Electronic (PDF) test forms on CD, (4) NCEO Considerations handout,

(5) WAT – Part II review

- What to do:**
- (a) Open appropriate test form on CD.
 - (b) Open Part II review on WAT, and select appropriate study.
 - (c) For each item, select item number, enter DOK level, and select GLE assessed by item. IF NEEDED, select a secondary objective/GLE, describe major flaws (if necessary) in Source of Challenge, and provide notes (further explanation on how item matches GLEs).
 - (d) Click 'Save' at the bottom of each page.

Step 4 – Repeat step 4 for Form 2.

Form 2 includes 7 unique items per grade in addition to the previously rated items. Only rate these new items on Form 2.

Step 5 – Adjudicate.

If Group Leader, or HumRRO facilitator, determines that ratings on some items are highly discrepant, group reviewers will be encouraged to review and discuss those items. Complete a debriefing survey per grade to develop summary alignment perspectives.

Step 6 – Repeat steps 3, 4, 5, and 6 for next grade level.

Final Task (Thursday)

- ✓ Evaluation Survey (individual)

Panelists received a reference guide for making DOK ratings. Each content area received a different reference guide specific to their content review.

Reading DOK Levels

The reading levels are based on Valencia and Wixson (2000, pp. 909-935). The writing levels were developed by Marshá Horton, Sharon O’Neal, and Phoebe Winter.

Reading Level 1. Level 1 requires students to receive or recite facts or to use simple skills or abilities. Oral reading that does not include analysis of the text, as well as basic comprehension of a text, is included. Items require only a shallow understanding of the text presented and often consist of verbatim recall from text, slight paraphrasing of specific details from the text, or simple understanding of a single word or phrase. Some examples that represent, but do not constitute all of, Level 1 performance are:

- Support ideas by reference to verbatim or only slightly paraphrased details from the text.
- Use a dictionary to find the meanings of words.
- Recognize figurative language in a reading passage.

Reading Level 2. Level 2 includes the engagement of some mental processing beyond recalling or reproducing a response; it requires both comprehension and subsequent processing of text or portions of text. Inter-sentence analysis of inference is required. Some important concepts are covered, but not in a complex way. Standards and items at this level may include words such as summarize, interpret, infer, classify, organize, collect, display, compare, and determine whether fact or opinion. Literal main ideas are stressed. A Level 2 assessment item may require students to apply skills and concepts that are covered in Level 1. However, items require closer understanding of text, possibly through the item’s paraphrasing of both the question and the answer. Some examples that represent, but do not constitute all of, Level 2 performance are:

Use context cues to identify the meaning of unfamiliar words, phrases, and expressions that could otherwise have multiple meanings.

- Predict a logical outcome based on information in a reading selection.
- Identify and summarize the major events in a narrative.

Reading Level 3. Deep knowledge becomes a greater focus at Level 3. Students are encouraged to go beyond the text; however, they are still required to show understanding of the ideas in the text. Students may be encouraged to explain, generalize, or connect ideas. Standards and items at Level 3 involve reasoning and planning. Students must be able to support their thinking. Items may involve abstract theme identification, inference across an entire passage, or students' application of prior knowledge. Items may also involve more superficial connections between texts. Some examples that represent, but do not constitute all of, Level 3 performance are:

Explain or recognize how the author's purpose affects the interpretation of a reading selection.

- Summarize information from multiple sources to address a specific topic.
- Analyze and describe the characteristics of various types of literature.

Reading Level 4. Higher-order thinking is central and knowledge is deep at Level 4. The standard or assessment item at this level will probably be an extended activity, with extended time provided for completing it. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require the application of significant conceptual understanding and higher-order thinking. Students take information from at least one passage of a text and are asked to apply this information to a new task. They may also be asked to develop hypotheses and perform complex analyses of the connections among texts. Some examples that represent, but do not constitute all of, Level 4 performance are:

- Analyze and synthesize information from multiple sources.
- Examine and explain alternative perspectives across a variety of sources.
- Describe and illustrate how common themes are found across texts from different cultures.

NOTE: Many on-demand assessment instruments will not include assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated so as to expect students to perform thinking at this level. On-demand assessments that do include tasks, products, or extended responses would be classified as Level 4 when the task or response requires evidence that the cognitive requirements have been met. [added October 2009_LRT]

Writing DOK Levels

Writing Level 1. Level 1 requires the student to write or recite simple facts. The focus of this writing or recitation is not on complex synthesis or analysis, but on basic ideas. The students are asked to list ideas or words, as in a brainstorming activity, prior to written composition; are engaged in a simple spelling or vocabulary assessment; or are asked to write simple sentences. Students are expected to write, speak, and edit using the conventions of Standard English. This includes using appropriate grammar, punctuation, capitalization, and spelling. Students demonstrate a basic understanding and appropriate use of such reference materials as a dictionary, thesaurus, or Web site. Some examples that represent, but do not constitute all of, Level 1 performance are:

- Use punctuation marks correctly.
- Identify Standard English grammatical structures, including the correct use of verb tenses.

Writing Level 2. Level 2 requires some mental processing. At this level, students are engaged in first-draft writing or brief extemporaneous speaking for a limited number of purposes and audiences. Students are expected to begin connecting ideas, using a simple organizational structure. For example, students may be engaged in note-taking, outlining, or simple summaries. Text may be limited to one paragraph. Some examples that represent, but do not constitute all of, Level 2 performance are:

- Construct or edit compound or complex sentences, with attention to correct use of phrases and clauses.
- Use simple organizational strategies to structure written work.
- Write summaries that contain the main idea of the reading selection and pertinent details.

Writing Level 3. Level 3 requires some higher-level mental processing. Students are engaged in developing compositions that include multiple paragraphs. These compositions may include complex sentence structure and may demonstrate some synthesis and analysis. Students show awareness of their audience and purpose through focus, organization, and the use of appropriate compositional elements. The use of appropriate compositional elements includes such things as addressing chronological order in a narrative, or including supporting facts and details in an informational report. At this stage, students are engaged in editing and revising to improve the quality of the composition. Some examples that represent, but do not constitute all of, Level 3 performance are:

- Support ideas with details and examples.
- Use voice appropriate to the purpose and audience.
- Edit writing to produce a logical progression of ideas.

Writing Level 4. Higher-level thinking is central to Level 4. The standard at this level is a multi-paragraph composition that demonstrates the ability to synthesize and analyze complex ideas or themes. There is evidence of a deep awareness of purpose and audience. For example,

informational papers include hypotheses and supporting evidence. Students are expected to create compositions that demonstrate a distinct voice and that stimulate the reader or listener to consider new perspectives on the addressed ideas and themes. An example that represents, but does not constitute all of, Level 4 performance is:

- Write an analysis of two selections, identifying the common theme and generating a purpose that is appropriate for both.

Examples Applied to Objectives and Assessment Items

i. Sample Language Arts Objectives

Use the language arts DOK levels on the previous pages to determine the DOK levels for the following five sample objectives. When you are finished, turn the page to see whether you agree with the way we coded these objectives! After this, try using the DOK levels on the sample language arts items in part ii.

Objective 1. Identify cause and effect, and understand main idea and purpose implied by text.

Objective 2. Recall elements and details of story structure, such as sequence of events, character, plot, and setting.

Objective 3. Evaluate the relative accuracy and usefulness of information from different sources.

Objective 4. Apply knowledge of grammar and usage, including, but not limited to, parts of speech, punctuation marks, sentence structure, verb tense, and clauses and phrases.

Objective 5. Locate, gather, analyze and evaluate written information for the purpose of drafting a reasoned report that supports and appropriately illustrates references and conclusions drawn from research.

DOK Levels of the Sample Language Arts Objectives

Objective 1. Level 2. Students demonstrate their ability to do more than simply recall an explicitly stated main point. Here, students show basic reasoning skills (generally, understanding why something happens, or summarizing the main points) as they select a statement that best captures the informational emphasis of the article.

Objective 2. Level 1. Students recall specific information from the text.

Objective 3. Level 3. Students must understand a variety of kinds of texts, make inferences across entire passages, and demonstrate the ability to evaluate information according to various criteria. Students must be able to support their thinking.

Objective 4. Level 2. While using correct punctuation is generally a Level 1 activity, correct usage of clauses and phrases is a more complex activity. The range of activities for this objective then makes it a Level 2.

Objective 5. Level 4. Students must gather and analyze information over time, reasoning and supporting their conclusions. The prolonged nature of this research project, given its focus on higher-level analysis, make it a Level 4 objective.

ii. Sample Language Arts Items

Now try coding some sample assessment items using the reading DOK levels. Most reading assessment items correspond with reading passages, and so there is one reading passage and sample test items here for each of two grade levels. After you are finished coding the items for both passages, read our “answers” on the following page.

Grade 4

The River
by Yetti Frenkel

1 "Sh," whispered Elisa. "I think she's coming!"

2 Elisa and Cory stifled their giggles and crouched behind the pine tree. Peeping out through the snow-covered branches, the children held their breath and listened for the tinkle of Minnie's collar as the old dog tried to find their hiding place. It was usually the hound's favorite game, but today the only sounds the children heard were the wind whistling softly across the frozen snow and ice cracking on the river.

3 Cory shivered with cold. "I wonder where she is," he said. "I hope she isn't off chasing a deer."

4 Elisa snorted. "Minnie's too lame for that. I bet she went home to wait where it's nice and warm."

5 Cory looked doubtful. "She wouldn't go home without us," he said. "Maybe she got ahead, and we didn't notice. Let's go to the bridge and see if she's there."

6 They started down the trail at a quick pace, glad to be moving again. The bare branches of the trees rattled forlornly as they tramped through the frozen snow.

7 Elisa struggled hard to keep up with her older brother. "Wouldn't it be easier to walk on the ice on the river?" she called to him.

8 Cory slowed his pace and waited for her to catch up. "It's too dangerous," he said. "The water is still flowing underneath, and the ice is thin. We might fall through." He held out a mittened hand. "I'll help you."

9 "No, thanks," said Elisa stubbornly. "I can keep up." But she was secretly glad when Cory walked beside her until they reached the bridge.

10 The old wooden bridge spanned the widest part of the river. In summer they often came here to fish or lie in the sun, but now it was a desolate, wind-swept place. They could hear the water gurgling softly beneath the ice as they looked out over the railing, hoping to glimpse Minnie walking along the bank.

11 Cory cupped his hands to his mouth and called, "Minnie, Min-nie!" His voice echoed back to him from the lonely woods. "I don't see her, Elisa. Do you?" he asked.

12 Just then Elisa gave a startled cry, and Cory turned sharply to see Minnie ten feet from shore. The old dog had fallen through the ice and was paddling in desperate circles.

13 "Hang on, Minnie, I'm coming!" Cory cried, racing toward the river. Elisa was already ahead of him, pulling off her coat, scarf, and mittens, ready to plunge in and save her dog. Blinded by tears, she stumbled out onto the ice.

14 Cory caught up with her and pulled her back. "Do you want to drown yourself?" he shouted. His face was white as he held out the warm clothes she'd dropped. "Put these back on and let me think of something." He looked grimly at the river.

15 Elisa sobbed as she struggled into her coat. "You can save her, can't you, Cory? She won't die, will she?"

16 "Of course not," he said, wishing he felt as confident as he was trying to sound.

17 The sight of her masters had given Minnie new hope, and she managed to get her front paws up on the ice. She scratched and clawed frantically at the slippery surface, but her hind legs were too arthritic to be of much help. For a moment her frightened brown eyes met Cory's, then she slipped back into the icy water and began wearily swimming once more.

18 Cory searched the bank until he found a long, twisted branch. Holding it firmly, he maneuvered the end until he had it hooked under Minnie's collar. "C'mon, girl," he said to the tired dog. She heaved her front paws onto the ice and struggled desperately while he tried to help her by pulling on the branch. But frost and moisture had made the wood brittle, and it snapped almost immediately. Once more Minnie struck out swimming, but now her head was barely above the surface of the water.

19 A terrible thought crossed Cory's mind - Minnie was going to drown before their eyes. It's not fair, he thought. Why doesn't someone come along to help us? He scanned the woods for a game warden or hunter, but saw no one. The woods were dark and silent, waiting. "I don't know what to do," he said, frightened.

20 "I know what to do," cried Elisa. "I'm going to help her!"

21 Once again Cory grabbed his sister's arm to prevent her from going out onto the ice. She bit and kicked at him like a small fury as tears of frustration ran down her cheeks.

22 "Listen to me!" yelled Cory. "I thought of something, but I need your help." Elisa wiped the tears from her face. "I'm going to lie down on the ice and try to crawl to Minnie. You lie down behind me and hold my ankles. Don't let go, no matter what, and don't stand up. Understand?" Elisa nodded, sniffing.

23 Cory lay on the ice so that his weight would be distributed more evenly and there would be less chance of breaking through. He felt Elisa's hands close around his ankles. As he inched his way forward, he could hear the water rushing beneath the ice. A few feet in front of him was the deep green hole where the dog had broken through. Cory's heart pounded with fear, but he bit his lip and kept going. At last he reached the edge of the hole and threw his arms around Minnie's neck. It felt reassuring to have a hold on her, but he soon realized that there was little else he

could do. The ice was slippery, and every time he tried to pull her out, he began to slide forward himself.

24 "Have you got her?" called Elisa anxiously.

25 "Yes," Cory yelled over his shoulder, "but I can't" - Before he could explain, he found himself being pulled back across the ice with Minnie in his arms. He looked around in amazement, expecting to see a big man with a broad grin standing behind him, but there was only his sturdy little sister, laughing and crawling over the ice to throw her arms around the shivering dog. "How did you ever do that?" cried Cory. "You're not that strong!" Then as Minnie, tail wagging wildly, began to lick his face, he saw what had happened.

26 Elisa had put her wool coat down on the ice to protect her from the cold. The warmth of her body lying on the top of it had made the wool fibers stick firmly to the ice so that when she pulled on Cory's legs, he slipped across the surface to her as easily as a cork popping from a bottle.

27 Cory grinned in admiration. "You sure are one smart little sister!" he said, tousling her hair. He took off his plaid shirt and dried Minnie with it. "It's a good thing we were all together today," he said to the old dog softly as he rubbed her lopsided ears. She wagged her tail in agreement, and the three hurried toward the warmth of home without looking back.

(Includes NAEP-Released Test Items)

1. How might the story have ended differently if Elisa had not put her wool coat on the ice? Explain why.

2. The main problem Cory faced was

- A) convincing Elisa to keep her coat on
- B) finding a good hiding place from Minnie
- C) getting across the ice with Elisa before dark
- D) pulling Minnie out of the icy waters

-
3. In paragraph 3, Cory hoped that Minnie had not
- A) fallen in the river
 - B) gotten lost in the forest
 - C) gone off to chase a deer
 - D) returned to the house
4. Which of the following statements would the author be most likely to agree with?
- A) He who fears something gives it power over him.
 - B) Two minds are better than one.
 - C) Older means wiser.
 - D) Great minds think alike.
5. In paragraph 19, Cory became upset at the thought that
- A) Minnie had run away
 - B) his parents would be upset with him for not going straight home
 - C) Elisa was in danger
 - D) Minnie could drown
6. When Cory found out what had happened to Minnie, he
- A) blamed Elisa for not watching Minnie
 - B) told Elisa not to try to get Minnie by herself
 - C) sent Elisa home to get help for Minnie
 - D) warned Elisa that Minnie might die.
7. Which of the following is an antonym for ‘crouched’ in the first paragraph?
- A) squatted
 - B) searched
 - C) leaped
 - D) accepted
8. This story could best be described as a
- A) modern-day fairy tale
 - B) mystery with a moral
 - C) real-life adventure
 - D) science-fiction piece

9. Which of the following is not a problem Cory faced in the passage?

- A) preventing Elisa from going out onto the ice
- B) helping Elisa look for Minnie
- C) pulling Minnie out of the icy water
- D) getting across the ice with Elisa before dark

10. The purpose of this story might most closely be described as

- A) Challenging the idea that brothers and sisters always fight
- B) Describing an unexpected struggle one family encountered
- C) Proving that dogs are ‘a man’s best friend’
- D) Identifying the danger of walking on thin ice

Grade 10

My Watch
An Instructive Little Tale
by Mark Twain

1 My beautiful new watch had run eighteen months without losing or gaining, and without breaking any part of its machinery or stopping. I had come to believe it infallible in its judgments about the time of day, and to consider its anatomy imperishable. But at last, one night, I let it run down. I grieved about it as if it were a recognized messenger and forerunner of calamity. But by and by I cheered up, set the watch by guess.

2 Next day I stepped into the chief jeweler's to set it by the exact time, and the head of the establishment took it out of my hand and proceeded to set it for me. Then he said, "She is four minutes slow—regulator wants pushing up."

3 I tried to stop him—tried to make him understand that the watch kept perfect time. But no; all this human cabbage could see was that the watch was four minutes slow, and the regulator *must* be pushed up a little; and so, while I danced around him in anguish, and implored him to let the watch alone, he calmly and cruelly did the shameful deed.

4 My watch began to gain. It gained faster and faster day by day. Within the week it sickened to a raging fever, and its pulse went up to a hundred and fifty in the shade. At the end of two months it had left all the timepieces of the town far in the rear, and was a fraction over thirteen days ahead of the almanac. It was away into November enjoying the snow, while the October leaves were still turning. It hurried up house rent, bills payable, and such things, in such a ruinous way that I could not abide it. I took it to the watchmaker to be regulated.

5 After being cleaned and oiled, and regulated, my watch slowed down to that degree that it ticked like a tolling bell. I began to be left by trains, I failed all appointments, I got to missing my dinner. I went to a watchmaker again.

6 He took the watch all to pieces while I waited, and then said the barrel was "swelled." He said he could reduce it in three days. After this the watch averaged well, but nothing more. For half a day it would go like the very mischief, and keep up such a barking and wheezing and whooping and sneezing and snorting, that I could not hear myself think for the disturbance; and as long as it held out there was not a watch in the land that stood any chance against it. But the rest of the day it would keep on slowing down and fooling along until all the clocks it had left behind caught up again. So at last, at the end of twenty-four hours, it would trot up to the judges' stand all right and just in time. It would show a fair and square average, and no man could say it had done more or less than its duty. But a correct average is only a mild virtue in a watch, and I took this instrument to another watchmaker.

7 He said the king-bolt was broken. He repaired the king-bolt, but what the watch gained in one way it lost in another. It would run awhile and then stop awhile, and then run awhile again, and

so on, using its own discretion about the intervals. And every time it went off it kicked back like a musket. I padded my breast for a few days, but finally took the watch to another watchmaker.

8 He picked it all to pieces, and turned the ruin over and over under his glass; and then he said there appeared to be something the matter with the hair-trigger. He fixed it, and gave it a fresh start. It did well now, except that always at ten minutes to ten the hands would shut together like a pair of scissors, and from that time forth they would travel together. The oldest man in the world could not make head or tail of the time of day by such a watch, and so I went again to have the thing repaired.

9 This person said that the crystal had got bent, and that the mainspring was not straight. He also remarked that part of the works needed half-soling. He made these things all right, and then my timepiece performed unexceptionably, save that now and then, after working along quietly for nearly eight hours, everything inside would let go all of a sudden and begin to buzz like a bee, and the hands would straightway begin to spin round and round so fast that their individuality was lost completely, and they simply seemed a delicate spider's web over the face of the watch. She would reel off the next twenty-four hours in six or seven minutes, and then stop with a bang.

10 I went with a heavy heart to one more watchmaker, and looked on while he took her to pieces. Then I prepared to cross-question him rigidly, for this thing was getting serious. The watch had cost two hundred dollars originally, and I seemed to have paid out two or three thousand for repairs.

11 While I waited and looked on I presently recognized in this watchmaker an old acquaintance—a steamboat engineer of other days, and not a good engineer, either. He examined all the parts carefully, just as the other watchmakers had done, and then delivered his verdict with the same confidence of manner.

12 He said: “She makes too much steam—you want to hang the monkey-wrench on the safety-valve!”

13 My uncle William used to say that a good horse was a good horse until it had run away once, and that a good watch was a good watch until the repairers got a chance at it.

(includes California Released Test Items)

11) Which of the following words would be the best substitution for the word ‘infallible’ in the first paragraph?

- A reliable
- B uncertain
- C disloyal
- D hardy

12. In the last paragraph, the narrator references what his uncle William said in order to show that

- A the narrator will pay more money for his next watch.
- B watches are as difficult to maintain as horses.
- C the narrator is ready to quit trying to have the watch fixed.
- D the narrator’s uncle has also tried to fix the watch.

13. The narrator’s tone in paragraph 10 can best be described as

- A) regretful
- B) confused
- C) hopeful
- D) nervous

14. What literary device is the narrator using when he says, “Within the week it sickened to a raging fever, and its pulse went up to a hundred and fifty in the shade”?

- A repetition
- B symbolism
- C irony
- D personification

15. Throughout this passage, the narrator references periods of time in order to

- A identify the historical period in which the narrator lived.
- B justify the narrator’s lack of timeliness.
- C illustrate the narrator’s desire to learn watch repair.
- D emphasize the magnitude of the narrator’s ordeal.

16. One of the main ideas expressed in the passage is that

- A it is important to use the proper tools when doing repairs
- B some problems are made worse with tampering
- C prevention is the key to solving most problems
- D watches contain a lot of hidden parts

17. One indication that this was *not* written in recent times is the comparison of the watch to a

- A bee
- B musket.
- C spider's web.
- D phonograph

18. Consider the following sentence:

I had come to believe it infallible in its judgments about the time of day, and to consider its anatomy imperishable.

If the narrator were to delete this sentence, the essay would primarily lose

- A specific descriptive material
- B an understatement of important information
- C detail providing a logical transition
- D foreshadowing of conflict

19. The narrator refers to a former acquaintance in order to

- A explain why the narrator asked an acquaintance to repair the watch
- B offer important background about the narrator's life
- C give an example of how much repairers charge
- D question that watchmaker's skill

20. Which of the following would the narrator be most likely to agree with?

- A People don't fix watches like they used to.
- B It's not important to know the exact time.
- C Family members sometimes offer good advice.
- D It's a bad idea to try to get things repaired.

DOK Levels for the Language Arts Sample Assessment Items

Grade 4

- 1) Level 3. This item requires comprehending the text, reasoning, and supporting thinking.
- 2) Level 2. This item requires comprehension of the text in order to identify a main point.
- 3) Level 1. This item asks students to refer to a particular detail in the text.
- 4) Level 3. Students must connect ideas and make an inference about the author's position.
- 5) Level 1. This item asks the reader to recall a detail from a specific paragraph.
- 6) Level 2. This item requires students to comprehend the general ideas and sequence of the text, and to identify main points in the narrative.
- 7) Level 1. This item asks students to demonstrate knowledge of grade-level appropriate vocabulary.
- 8) Level 2. This item requires students to generally comprehend the article in order to identify the type of literary form with which the story corresponds. While the item refers to characteristics of various literary forms (as in Level 3), finding the correct answer does not require students to analyze or describe with deeper knowledge either the story itself or the literary forms.
- 9) Level 1. This item requires verbatim recall from the text.
- 10) Level 3. This item requires an understanding of the text that includes recognizing the author's purpose in telling the story.

Grade 10

- 11) Level 2. The reader must use context clues to determine the intended meaning of a word.
- 12) Level 3. This item asks readers to make an inference about the narrator's purpose in the last paragraph, based on the tone and examples in the article.
- 13) Level 2. The reader is asked to comprehend the tone of the article, making an inference from only that paragraph.
- 14) Level 1. This item asks the reader to recognize or identify figurative language/types of literary devices.
- 15) Level 3. The reader is asked to determine the author's purpose.

- 16) Level 2. The reader is asked to determine the main idea.
- 17) Level 3. The reader is asked to go beyond the text while still understanding ideas in the text. The reader must recognize when and how literary devices are used in the story to compare the watch to other objects and must draw on outside knowledge about which objects are in contemporary use.
- 18) Level 3. This item requires a higher level of reasoning as readers must consider both the author's purpose and how the story might change without the sentence.
- 19) Level 2. _____
- 20) Level 3. This item requires readers to show understanding of the text in order to generalize about the narrator's sentiments beyond the text.

Mathematics DOK Levels

Level 1 (Recall) includes the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula. That is, in mathematics, a one-step, well-defined, and straight algorithmic procedure should be included at this lowest level. Other key words that signify Level 1 include “identify,” “recall,” “recognize,” “use,” and “measure.” Verbs such as “describe” and “explain” could be classified at different levels, depending on what is to be described and explained.

Level 2 (Skill/Concept) includes the engagement of some mental processing beyond an habitual response. A Level 2 assessment item requires students to make some decisions as to how to approach the problem or activity, whereas Level 1 requires students to demonstrate a rote response, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps. Keywords that generally distinguish a Level 2 item include “classify,” “organize,” “estimate,” “make observations,” “collect and display data,” and “compare data.” These actions imply more than one step. For example, to compare data requires first identifying characteristics of objects or phenomena and then grouping or ordering the objects. Some action verbs, such as “explain,” “describe,” or “interpret,” could be classified at different levels depending on the object of the action. For example, interpreting information from a simple graph, or reading information from the graph, also are at Level 2. Interpreting information from a complex graph that requires some decisions on what features of the graph need to be considered and how information from the graph can be aggregated is at Level 3. Level 2 activities are not limited only to number skills, but may involve visualization skills and probability skills. Other Level 2 activities include noticing or describing non-trivial patterns, explaining the purpose and use of experimental procedures; carrying out experimental procedures; making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is at Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning. An activity, however, that has more than one possible answer and requires students to justify the response they give would most likely be at Level 3.

Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and deciding which concepts to apply in order to solve a complex problem.

Level 4 (Extended Thinking) requires complex reasoning, planning, developing, and thinking, most likely over an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to

take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2. However, if the student is to conduct a river study that requires taking into consideration a number of variables, this would be a Level 4. At Level 4, the cognitive demands of the task should be high and the work should be very complex. Students should be required to make several connections—relate ideas *within* the content area or *among* content areas—and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level. Level 4 activities include designing *and* conducting experiments and projects; developing and proving conjectures, making connections between a finding and related concepts and phenomena; combining and synthesizing ideas into new concepts; and critiquing experimental designs.

NOTE: Many on-demand assessment instruments will not include assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated so as to expect students to perform thinking at this level. On-demand assessments that do include tasks, products, or extended responses would be classified as Level 4 when the task or response requires evidence that the cognitive requirements have been met. *[added October 2009_LRT]*

Examples Applied to Objectives and Assessment Items

i. Sample Mathematics Objectives

Use the mathematics DOK levels on the previous pages to determine the DOK levels for the following five sample objectives. When you are finished, turn the page to see whether you agree with the way *we* coded these objectives! Then try using the DOK levels on the 13 sample mathematics items in Part ii.

Objective 1. Read, write, and compare decimals in scientific notation.

Objective 2. (Grade 8) Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of results.

Objective 3. (Grade 8, from the NEAP Mathematics Framework): Design a statistical experiment to study a problem and communicate the outcomes.

Objective 4. Compute with numbers (that is, add, subtract, multiply, divide).

Objective 5. Construct two-dimensional patterns for three-dimensional models, such as cylinders and cones.

DOK Levels of the Sample Mathematics Objectives

Objective 1. This objective is an example of Level 1. The highest demand for students to successfully meet this expectation requires them to use recall and use a routine method to convert a decimal to scientific notation.

Objective 2. This objective is an example of Level 3. The expectation expressed in this objective is that students will not only solve a two-step linear equation, but will also interpret the solution and verify the results. This will require students to do some reasoning in order to interpret the solution and could be fairly complex, depending on the context. If students were only required to solve linear equations and verify solutions, then the expectation would be Level 2.

Objective 3. To plan a statistical experiment, a student must define the problem and develop a procedure for solving it. This requires that the student identify the correct statistical model, apply the model to data, and communicate the outcome of the selected model. The student must interpret findings and make reasonable and rationed inferences from obtained data. This represents complex, multistep reasoning and reflects a Level 4 task.

Objective 4. This objective requires students to conduct basic calculations. This is Level 1 because it involves routine processing and involves a one-step process.

Objective 5. This objective is an example of Level 2. Although recognizing and drawing a two-dimensional pattern, or a regular cylinder, is expected to be routine (Level 1), building a three-dimensional model would not be as routine. It would require at least two steps: first, recognizing the shape and, second, drawing a two-dimensional object to reflect the shape in three dimensions.

ii. Sample Mathematics Assessment Items

Now try coding some sample assessment items using the Mathematics DOK Levels. Sample items, for three different grade levels. After you are finished coding these, read our “Answers” on the following page.

The following five items are from Grade 4 mathematics assessments:

1)

The class went on a field trip. The students left school at 9:00 a.m. They returned to school at 1:30 p.m. How long were they gone?

- A 8 hr 30 min
- B 8 hr
- C 4 hr 30 min
- D 4 hr

2)

Sam, Tetsuo, and Kim each own some baseball cards that Ted is willing to trade them for. Here is what they are worth:

<u>Sam's cards:</u>		<u>Tetsuo's cards:</u>		<u>Kim's cards:</u>	
Bret Boone	\$0.80	Sammy Sosa	\$1.30	Randy Johnson	\$0.70
Andres Galarraga	\$0.40	Greg Maddux	\$1.00	Barry Bonds	\$2.30
Mark McGuire	\$1.50				

Ted will trade his Alex Rodriguez card for \$6.75 worth of cards. What is the best trade that Sam, Tetsuo, and Kim can make for Ted's Alex Rodriguez card?

What trade could Sam, Tetsuo, and Kim offer Ted that would be the most fair between Sam, Tetsuo, and Kim?

Explain your thinking and show all your work.

3)

Bill lives on the side of the street with even-numbered addresses. Which addresses below would be found on Bill's side of the street?

- A 1020, 1022, 1024
- B 2021, 2023, 2025
- C 3168, 3169, 3170
- D 4167, 4168, 4170

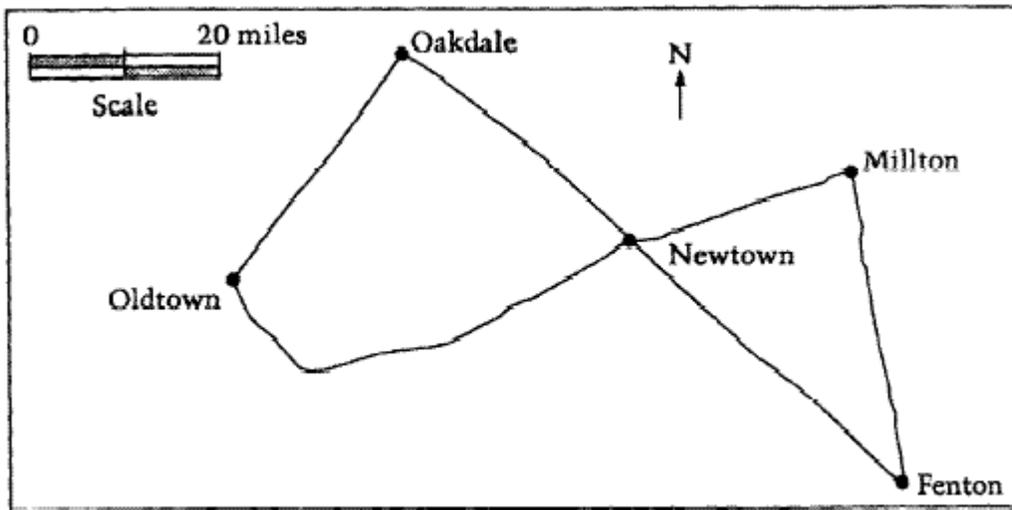
4)

Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.

Laura wanted to enter the number 8375 into her calculator. By mistake, she entered the number 8275. Without clearing the calculator, how could she correct her mistake?

Without clearing the calculator, how could she correct her mistake another way?

5)



Based on the map above, about how many miles is the shortest route from Oakdale to Fenton?

- A) 100
- B) 70
- C) 40
- D) 20

The following five items are from Grade 8 assessments:

6)

From any vertex of a 4-sided polygon, 1 diagonal can be drawn.
From any vertex of a 5-sided polygon, 2 diagonals can be drawn.
From any vertex of a 6-sided polygon, 3 diagonals can be drawn.
From any vertex of a 7-sided polygon, 4 diagonals can be drawn.

How many diagonals can be drawn from any vertex of a 20-sided polygon?

7)

A triangle has 0 diagonals, a quadrilateral has 2 diagonals, a pentagon has 5 diagonals, and a hexagon has 9 diagonals. If the pattern continues, how many diagonals will an octagon have?

Sides	3	4	5	6
Diagonals	0	2	5	9

- A 11
- B 14
- C 18
- D 20

8)

In which set are the numbers equivalent?

- A $\frac{1}{3}$, $\frac{3}{27}$, 33%
- B 0.090, 90%, 0.90
- C 88%, $\frac{88}{100}$, $\frac{22}{25}$
- D 0.66%, $\frac{2}{3}$, 66.7%

9)

The school newspaper conducted a survey about which ingredient was most preferred as a pizza topping. This graph appeared in the newspaper article.

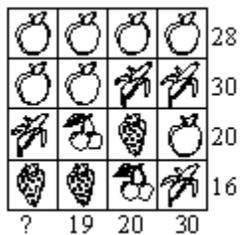


What information would best help you determine the number of people surveyed who preferred sausage?

- A number of people surveyed and type of survey used
- B type of survey used and ages of people surveyed
- C percent values shown on chart and number of people surveyed
- D ages of people surveyed and percent values shown on chart

10)

Look at the drawing. The numbers alongside each column and row are the total of the values of the symbols within each column and row. What should replace the question mark?



- A. 23
- B. 25
- C. 28
- D. 30
- E. 32

The following five items are from Grade 11 assessments:

11) Which of the following is NOT true for any value of x ?

- A** $x < x^2 < x^3$
B $x^3 < x < x^2$
C $x^2 < x < x^3$
D $x < x^3 < x^2$
E $x^3 < x^2 < x$

12)

Players A and B are playing a game. On a table between them is a stack of n pennies. First, Player A removes either one or two pennies from the stack. Then Player B removes either one or two pennies from the stack. They alternate in this way until no pennies remain. The loser is the player who removes the last penny from the stack.

If they start the game with 5 pennies in the stack, how many pennies should Player A take from the stack on her first turn? Why?

If the game starts with 7 pennies in the stack, would you rather be Player A or B? Why?

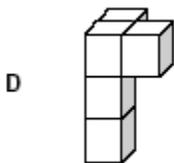
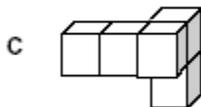
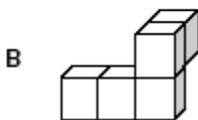
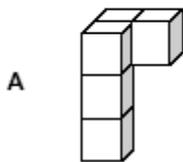
For what values of n , if any, is it best to be player A?

For what values of n , if any, is it best to be player B?

Explain and justify your answers.

13)

Which pentacube is not congruent to the others?



14)

One plan for a state income tax requires those persons with income of \$10,000 or less to pay no tax and those persons with income greater than \$10,000 to pay a tax of 6 percent only on the part of their income that exceeds \$10,000.

A person's effective tax rate is defined as the percent of total income that is paid in tax.

Based on this definition, could any person's effective tax rate be 5 percent? Could it be 6 percent? Explain your answer. Include examples if necessary to justify your conclusions.

15)

$$S = a/b + c/d$$

If $0 < a < b < c < d$ in the equation above, then the greatest increase in S would result from adding 1 to the value of which variable?

- (A) a
- (B) b
- (C) c
- (D) d
- (E) *There is not enough information to know for certain.*

DOK Levels for the Mathematics Sample Assessment Items

Grade 4 Items:

- 1) Level 2. The choices offered indicate that this item is intended to identify students who would simply subtract 9 minus 1 to get an 8. More than one step is required here. The students must first recognize the difference between a.m. and p.m. and make some decisions about how to make this into a subtraction problem, then do the subtraction.
- 2) Level 4. This is a complex open-ended problem requiring students “to make several connections and apply one approach among many.” It requires the students to plan and organize, and to weigh solutions based on different kinds of criteria. Students should be allowed at least 20 minutes for this problem, which is an extended period of time for a test item.
- 3) Level 1. Students only need to be able to recognize even numbers.
- 4) Level 3. “An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3.” Since there are multiple possible approaches to this problem, the student must make strategic decisions about how to proceed, which is more cognitively complex than simply applying a set procedure or skill.
- 5) Level 2. This measurement item requires only a little analysis of the map itself, since the route in question is a straight line. If the line was not straight, then this item would require estimation and perhaps even calculation, making it Level 3. As it is, because students have to determine the length of the straight line and use the scale, these are considered more than one step and the DOK level is a 2.

Grade 8 Items:

- 6) Level 1. The first thing to note is that this is not really a geometry item. Rather, it simply requires students to notice an easy, routine pattern. DOK levels are difficult to assign for many pattern-recognition problems, because they depend on how routine the pattern is. This particular pattern is immediately recognizable and requires no processing, but a more complex pattern could make this item Level 2 or even Level 3.
- 7) Level 2. This item is included in order to contrast it with the previous one. Pattern recognition is required, but the non-routine nature of this pattern brings this up to a higher DOK level. Some analysis and generalization is required in order to understand and extend this pattern.
- 8) Level 2. There are a number of different concepts and procedures that can be used for this problem, rather than just one obvious, simple one. Students must not only be able to *identify* different representations of rational numbers (Level 1), but also to *manipulate* and *compare* these representations (Level 2). This means that numerous interdependent and non-trivial steps are

involved here. However, this does not require any conjecturing, planning, abstracting, or explaining, so it is not Level 3.

This item demonstrates the importance of knowing whether calculators are allowed on the examinations or not. If a calculator were allowed on this examination, this would clearly be Level 1, instead of Level 2.

9) Level 2. This is an example of how a problem that is multiple choice can reduce its DOK level. If the multiple choices were removed here and the problem were left open-ended, it would be Level 3. But here the student need only weigh the options against one another, easily discarding “type of survey used” and “ages of people surveyed” as bogeys. So they can easily determine that C is immediately better than A or D, without even having to think analytically or creatively about why percent values shown or number of people surveyed would be important information to know.

10) Level 3. This item can be approached through a number of viable strategies: pattern recognition, guess-and-check, algebra, etc. This freedom means that the student must make choices and assumptions. Furthermore, no matter what strategy she employs, she must keep track of a complex logical chain. The multiple choices provided do not make this task any less complex.

Grade 11 Items:

11) Level 3. This is another example of an item that is at Level 3 without being open-ended. This item requires generalization, reasoning, and hypothesis testing, involving some creativity in choosing examples that test the hypotheses.

12) Level 4. This problem requires students to form game strategies, create data, notice number patterns, and justify how and why those patterns arise. It involves inductive, deductive, and strategic reasoning over an extended period of time, perhaps 30 minutes. This may even be a problem best done in pairs or groups within a testing environment.

13) Level 2. This item is not Level 1 because it is not routine, nor does it focus on a memorized definition or procedure. In fact, it involves numerous steps, because it requires students to compare several different pairs of shapes before arriving at the correct answer. For these reasons, many spatial reasoning items are Level 2.

Note that this may be coded as a source-of-challenge item, because choice C seems to be drawn in a misleading way.

14) Level 3. This item gives the student a new definition and asks her to reason using it. In order to ascertain whether the student really understands the asymptotic behavior that makes a 6% effective rate impossible, this item *must* be open-ended. This is why most Level 3 items are open-response items, because the complexity of thinking they require the students to display could not be displayed using multiple choices.

15) Level 3. If a multiple-choice item is Level 3, often it is because the multiple choices do not constrain or guide the possible solutions. The choices here allow for *all* possible responses to this item, including the response that the problem cannot be solved. This gives such an item the character of an open-ended item, even though it is not one.

Science DOK Levels

Please note that, in science, “knowledge” can refer both to content knowledge and knowledge of scientific processes. This meaning of knowledge is consistent with the *National Science Education Standards* (NSES), which terms “Science as Inquiry” as its first Content Standard.

Level 1 (Recall and Reproduction) requires the recall of information, such as a fact, definition, term, or a simple procedure, as well as performance of a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. A “simple” procedure is well defined and typically involves only one step. Verbs such as “identify,” “recall,” “recognize,” “use,” “calculate,” and “measure” generally represent cognitive work at the recall and reproduction level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as “describe” and “explain” could be classified at different DOK levels, depending on the complexity of what is to be described and explained.

A student answering a Level 1 item either knows the answer or does not: that is, the item does not need to be “figured out” or “solved.” In other words, if the knowledge necessary to answer an item automatically provides the answer to it, then the item is at Level 1. If the knowledge needed to answer the item is not automatically provided in the stem, the item is at least at Level 2. Some examples that represent, but do not constitute all of, Level 1 performance are:

- Recall or recognize a fact, term, or property.
- Represent in words or diagrams a scientific concept or relationship.
- Provide or recognize a standard scientific representation for simple phenomenon.
- Perform a routine procedure, such as measuring length.

Level 2 (Skills and Concepts) includes the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is **more complex** than in Level 1. Items require students to make some decisions as to how to approach the question or problem. Keywords that generally distinguish a Level 2 item include “classify,” “organize,” “estimate,” “make observations,” “collect and display data,” and “compare data.” These actions imply **more than one step**. For example, to compare data requires first identifying characteristics of the objects or phenomena and then grouping or ordering the objects. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts. Some action verbs, such as “explain,” “describe,” or “interpret,” could be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a simple graph, requiring reading information from the graph, is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered and how information from the graph can be aggregated, is at Level 3. Some examples that represent, but do not constitute all of, Level 2 performance, are:

- Specify and explain the relationship between facts, terms, properties, or variables.

- Describe and explain examples and non-examples of science concepts.
- Select a procedure according to specified criteria and perform it.
- Formulate a routine problem, given data and conditions.
- Organize, represent, and interpret data.

Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are complex and abstract. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems. Some examples that represent, but do not constitute all of Level 3 performance, are:

- Identify research questions and design investigations for a scientific problem.
- Solve non-routine problems.
- Develop a scientific model for a complex situation.
- Form conclusions from experimental data.

Level 4 (Extended Thinking) involves high cognitive demands and complexity. Students are required to make several connections—relate ideas within the content area or among content areas—and have to select or devise one approach among many alternatives to solve the problem. Many on-demand assessment instruments will not include any assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated in such a way as to expect students to perform extended thinking. “Develop generalizations of the results obtained and the strategies used and apply them to new problem situations,” is an example of a grade 8 objective that is a Level 4. Many, but not all, performance assessments and open-ended assessment activities requiring significant thought will be Level 4.

Level 4 requires complex reasoning, experimental design and planning, and probably will require an extended period of time either for the science investigation required by an objective, or for carrying out the multiple steps of an assessment item. However, the extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2 activity. However, if the student conducts a river study that requires taking into consideration a number of variables, this would be a Level 4. Some examples that represent, but do not constitute all of, a Level 4 performance are:

- Based on data provided from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables.
- Conduct an investigation, from specifying a problem to designing and carrying out an

experiment, to analyzing its data and forming conclusions.

NOTE: Many on-demand assessment instruments will not include assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated so as to expect students to perform thinking at this level. On-demand assessments that do include tasks, products, or extended responses would be classified as Level 4 when the task or response requires evidence that the cognitive requirements have been met. *[added October 2009 _LRT]*

Examples Applied to Science Objectives and Assessment Items

Sample Science Objectives

Use the science DOK levels on the previous pages to determine the DOK levels for the following five sample objectives. Except for the last, these objectives are for grade 8. When you are finished, turn the page to see whether you agree with the way we coded these objectives! Then try using the DOK levels on the 10 sample science items in Part ii.

Objective 1. Students should identify the structure and function of the major parts of animal and plant cells.

Objective 2. Students should design and conduct a science investigation in their home or community that involves data collection, display, and interpretation.

Objective 3. All students will analyze claims for their scientific merit and explain how scientists decide what constitutes scientific knowledge; show how science is related to other ways of knowing; show how science and technology affect our society; and show how people of diverse cultures have contributed to and influenced developments in science.

Objective 4. All students will measure and describe the things around us; explain what the world around us is made of; identify and describe forms of energy; and explain how electricity and magnetism interact with matter.

Objective 5. (Grade 10) Students should be able to explain the process of photosynthesis in detail.

DOK Levels of the Sample Science Objectives

Objective 1. Level 1. “Identifying” the cell parts and their functions only involves recalling and naming/labeling.

Objective 2. Level 4. This requires extended time and involves all of the major aspects of a scientific investigation. If the most involved type of activity that a scientist ever engages in is not a Level 4 activity, then what is?

Objective 3. Level 3. The activities described in this objective require synthesis of different kinds of information, analysis of information, and criticism based on scientific methodology, and deep explanation.

Objective 4. Level 2. It is difficult to determine the DOK level for an objective with many parts like this. Measuring and identifying are typically Level 1 activities, but describing and explaining can signify different levels. With the exception of the last phrase of this objective, the descriptions and explanations asked for here are of *things* rather than *processes*, explanations of *what* rather than *how*. However, “explain how electricity and magnetism interact with matter” could call for some synthesis of different kinds of information, which would signify a higher level of knowledge. On the other hand, the explanation asked for here could be quite simple, too. So parts of this objective are Level 1 and parts are Level 2. What should we do? In such a case, you should code the objective according to the *highest* depth of knowledge that it requires the student to display, even if this DOK level is only found in one part of the objective.

Objective 5. Level 2. Students here not only must recall simple definitions and terms, but must also be able to describe and explain a process. On the other hand, this does not require any strategic reasoning, such as using the process of photosynthesis to make sense of an observed phenomenon.

Sample Science Assessment Items

Now try coding some sample assessment items using the science DOK levels. There are six items for grade 8 and four for high school. After you are finished coding these, read our “answers” on the following page.

The following six items are from grade 8 assessments:

1)

Which group of organisms would all be found living in a tropical rain forest?

- A) Lizards, insects, cacti, kangaroos
- B) Vines, palm trees, tree frogs, monkeys
- C) Evergreens, moose, weasels, mink
- D) Lichens, mosses, caribou, polar bears

2) Make a graph of your heart rate as you walk in place for five minutes.

3)¹

The purpose of this task is to determine where, how high, and for what purpose (flood control, recreation, hydroelectric power, etc.) to build a dam. You will have a total of 45 minutes to complete this task. You may use up to 20 minutes to complete the group work, found on the first two pages of this form. When you finish the group activity, someone from your group should tell the facilitator. Then you may open this form and follow the directions inside by yourself.

Your group should have the following materials:

- Plastic model
- Clay
- Water in a pitcher
- Map
- Ruler
- Paper towels

Pencils (cont'd on next page)

GROUP ACTIVITY (cont'd from previous page)

1. Examine the model of the river valley as well as the map you have been provided. Using this information, discuss possible sites for a dam.
2. Use the clay to construct a dam on the model. With the water, test the impact of your dam on the nearby areas. Try different locations and dam heights based upon the dam's purpose. Record the different locations on the group's map. Record information from the trials in the chart on the next page.

Record information from your group's tests in this chart.

Site #	Location	Purpose	Impact

¹ [This item was contributed to the PALS (Performance Assessment Links in Science) website (<http://www.ctl.sri.com/pals/>) by the Kentucky Department of Education.]

Make sure that each group member's name appears on the map. One member of the group should insert the map into his or her response form when passing in the completed form.

When you are finished with the work on this page, one member of the group should tell the facilitator that your group has finished its group work. Then go on to the individual work. Remember that you must work alone on those pages. You may not discuss the questions or share information.

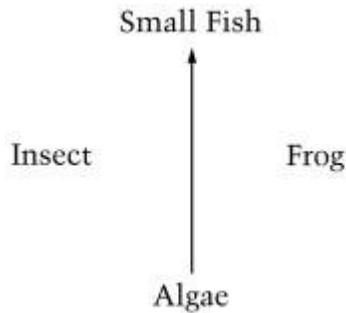
INDIVIDUAL ACTIVITY

3. After reviewing the work your group has done, where would you place the dam and how high would you make it? Why?
4. What social, environmental, and economic impacts would the location you chose for the dam have on the surrounding community?
5. Describe concerns you would include in an environmental impact statement for dam sites other than the one you selected in question 3.

Be sure one member of the group inserts the map inside his or her form for collection.

4) When operating, ordinary incandescent lightbulbs produce a lot of heat in addition to light. Fluorescent lightbulbs produce much less heat when operating. If you wanted to conserve electricity, which type of bulb should you use? Explain your answer.

5) You will now finish a diagram of a food web in the pond. The food web shows what eats what in the pond system. Draw arrows in the diagram below from each living thing to the things that eat it. (The first arrow is drawn for you.)



6) Suppose that a farmer near the pond sprayed crops with a pesticide to kill insects and that some of the spray washed into the pond. (This pesticide breaks down very slowly.) If several months later a biologist tested all the organisms in the pond system for the pesticide, which organism would most likely have the greatest concentration of the pesticide? Explain your answer.

The following six items are from High School assessments. The first two refer to this passage:

During the development of chemistry, many chemists attempted to explain the changes that occur when *combustible* (capable of burning) materials burn and metals corrode or rust. The following are two proposed theories.

Phlogiston Theory

According to this theory, combustible materials, such as wood, coal, or metal contain a massless "essence" or presence called phlogiston. When combustion occurs, the phlogiston is released from the combusting object and is absorbed by the air. For example, when a piece of wood is burned, phlogiston is released to the air and the wood is converted to ash. The ash is free of phlogiston and can no longer support combustion. Similarly, if a metal is heated, the phlogiston is lost to the air and the metal is converted into a nonmetallic, powdery substance called ash, or calx. The *corrosion* (changing of a substance by a chemical reaction) of metals, such as the rusting of iron (Fe), also involves the loss of phlogiston from the metal, but at a slower rate than burning. Rust can be turned back into metal by heating it in air with a substance rich in phlogiston, such as charcoal. A transfer of phlogiston from the charcoal to the rust converts the rust back to metal.

Oxygen Theory

According to this theory, burning and rusting involve an element called oxygen, which is found in the air. The complete combustion of a piece of wood involves the rapid reaction of the wood with oxygen gas (O_2) to produce carbon dioxide (CO_2), which is a nonflammable gas, and water (H_2O). The rusting of iron involves the slow reaction of iron with oxygen to produce iron oxides such as Fe_2O_3 . These iron oxides are known as rust. Heating rust with charcoal produces iron because the charcoal combines with the oxygen in the rust. In these transformations, there is a *conservation of mass* (the total mass of the reactants must equal the total mass of the products in a chemical reaction). In these reactions matter is neither created nor destroyed, but merely transformed.

7) According to the Phlogiston Theory, the gases collected from the complete burning of a piece of charcoal in air would be capable of:

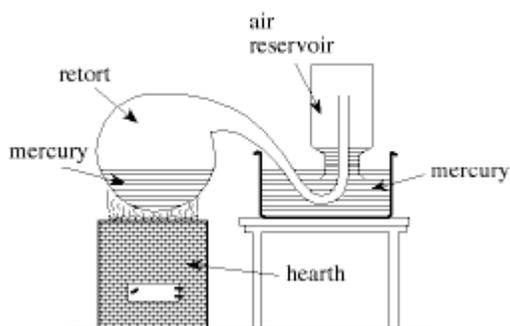
F. converting the ash from corroded tin back to tin metal.

G. supporting combustion of another piece of charcoal.

H. rusting iron.

J. converting wood ash into rust.

- 8) A chemist heated a sample of mercury for several days in the apparatus shown below. As the experiment proceeded, the mercury in the retort became covered with a red powder, and the volume of mercury increased in the air reservoir. The remaining material in the reservoir would not support combustion. Which of the following theories is supported by the results of this experiment?



- A.** The Phlogiston Theory, because the red powder resembled an ash
- B.** The Phlogiston Theory, because the air in the reservoir could not support combustion and therefore did not contain oxygen
- C.** The Oxygen Theory, because the mercury level dropped in the air reservoir indicating increased oxygen content
- D.** The Oxygen Theory, because the mercury level rose in the air reservoir indicating decreased oxygen content

The following sample high school assessment items do not use the above passages.

- 9) A scientist synthesizes a new drug. She wants to test its effectiveness in stopping the growth of cancerous tumors. She decides to conduct a series of experiments on laboratory mice to test her hypothesis.

What should she do?

- Give half the mice the drug, the other half none, and compare their tumor rates.
- Give the drug to all mice, but only to half every other day, and record tumor rates.
- Double the dosage to all mice each day until tumors start to disappear.
- Give the drug only to those mice who have tumors and record their weights.

10) The results of one of her experiments are shown in the table below:

Average tumor size in millimeters by dosage and days of treatment

	Days of Treatment						
Dosage	1	7	14	21	28	35	42
150mg	5	6	8	11	13	15	18
300mg	5	5	6	7	7	9	10
600mg	5	5	4	4	5	4	3

What can she conclude from these results?

- The effectiveness of the drug over time depends on the size of the dosage.
- The drug is effective over time regardless of the size of the dosage.
- The size of the dosage affects tumor size regardless of the length of time.
- The drug is ineffective regardless of the dosage or length of time.

11) What is the process called which plants use to manufacture sugar from sunlight?

12) In a laboratory experiment using spectrophotometry, an enzyme is combined with its substrate at time zero. The absorbance of the resulting solution is measured at five-minute intervals. In this procedure, an increase in absorbance is related to the amount of product formed during the reaction. The experiment is conducted using three preparations as shown in the table below.

Enzyme preparation	Absorbance				
	0 min	5 min	10 min	15 min	20 min
I. 3 mL enzyme, 2 mL substrate, pH 5	0.0	0.22	0.33	0.38	0.37
II. 3 mL boiled enzyme, 2 mL substrate, pH 5	0.0	0.06	0.04	0.03	0.04
III. 3 mL enzyme, 2 mL substrate, pH 6	0.0	0.32	0.37	0.36	0.38

The most likely reason for the failure of the absorbance to increase significantly after 10 minutes in preparation III is that

- the reaction is thermodynamically impossible at pH 6
- the enzyme is not active at this pH
- a pH of 6 prevents color development beyond an absorbance of 0.38
- the enzyme is degraded more rapidly at pH 6 than it is at pH 5
- most of the substrate was digested during the first 10 minutes

DOK Levels for the Science Sample Assessment Items

Grade 8 Items:

- 1) Level 1. This item assesses “the recall of information such as a fact or definition.”
- 2) Level 2. This item has several steps and requires some decision making. Students must decide appropriate intervals for measuring pulse and procedures for graphing data. “Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.”
- 3) Level 4. An example in the Level 4 definition is “Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analyzing its data and forming conclusions.” This item requires students to perform the breadth of activities an actual scientist would perform and demands extended time and thought.
- 4) Level 3. If this did not require an explanation, it would be Level 1. But here students must explain the complex connection between electrical consumption and production of heat in order receive full credit. “In most instances, requiring students to explain their thinking is at Level 3.”
- 5) Level 1. Even though this item has multiple steps, the steps are not interrelated and do not increase the item’s cognitive demands. Each step involves only recall.
- 6) Level 3. Explaining a simple and short answer can be Level 2, but the explanation required here is much more involved. The rubric requires giving full credit only if the student response “names the highest animal on the food chain, the heron, as having the greatest concentration of the pesticide.” In addition, the response must demonstrate an understanding of biological magnification by explaining that the heron accumulates the greatest concentration of the pesticide from the fish it eats because the fish have accumulated the pesticides from the organisms they have eaten.”

High School Items:

- 7) Level 3. Although it is uncommon, it is possible for a multiple choice item to be at Level 3. This item employs demanding reasoning, because it requires the student to make a complex inference based on an unfamiliar theory.
- 8) Level 3. Like the previous item, this involves making complex inferences from two conflicting theories. This non-routine problem also requires “drawing conclusions from observations” and “explaining phenomena in terms of concepts.”

- 9) Level 2. Students must at least apply knowledge of controlled-experiment design to this situation, or derive it from the choices offered.
- 10) Level 2. If this item was open-ended, asking what conclusions could be drawn from the data and why, then it would be Level 3. Here the student only needs to check which of the presented solutions is most reasonable, which requires no decision-making or creativity.
- 11) Level 1.
- 12) Level 3. This is another example of a multiple-choice item that is still Level 3, this time due to the complexity of the presented situation. Students must compare the interaction of two dependent variables and interpret the data in light of a complex body of interrelated concepts.

Panelists rated the depth-of-knowledge level of the Missouri GLEs electronically into the WAT. The content of the GLEs was extracted exactly from the full Grade Level Expectations 2.0 document with the exception of locally assessed standards (not included). The graphic below demonstrates the format of the rating form on computer screen. Only a portion of the coded standards is replicated below for Grade 3 Communication Arts as an example.

The screenshot shows a web browser window with the following address: <http://wat.wceruw.org/Reports/GroupConsensus.aspx?&standardid=2421&studyID=4021>. The page content includes a navigation menu (HOME, ABOUT, LOGIN, TUTORIAL, REVIEW, REPORTS, CONTACTS) and a table of standards.

Level	Description	DOK
R	Reading	2
R.1	Develop and apply skills and strategies to the reading process	3
R.1.e.3	Vocabulary - Develop vocabulary through text, using a. root words b. synonyms and antonyms c. context clues d. glossary e. dictionary, with assistance	2
R.1.h.3	Post-Reading - Apply post-reading skills to demonstrate comprehension of text: a. answer basic comprehension questions b. identify and explain the relationship between the main idea and supporting details b. identify cause and effect c. make predictions c. 3 make predictions f. draw conclusions g. analyze h. paraphrase i. summarize	3
R.1.1.3	Making Connections - Identify and explain relevant connections between a. text to text (text ideas --- information and relationships in various fiction and non-fiction works--compare and contrast)	3
R.2	Develop and apply skills and strategies to comprehend, analyze and evaluate fiction, poetry and drama from a variety of cultures and times	2
R.2.a.3	Text Features - Use grade level text to (a)locate and apply information in title, table of contents and glossary (b)locate and recognize the text features of fiction, poetry and drama	1
R.2.b.3	Literary Techniques - Identify and explain examples of sensory details, sound devices, and figurative language in text along with basic literary techniques	2
R.2.c.3	Literary Elements - Use details from text to a. demonstrate comprehension skills previously introduced b. make inferences c. compare and contrast d. identify cause and effect e. identify the narrator f. identify events from the beginning, middle and end g. identify author's purpose h. identify settings, character traits, and problems and solutions	2
R.3	Develop and apply skills and strategies to comprehend, analyze and evaluate nonfiction (such as biographies, newspapers, technical manuals) from a variety of cultures and times	2
R.3.a.3	Text Features - Locate and interpret key information in illustrations, title, chapter headings, table of contents, glossary, charts, diagrams, graphs, captions and maps	2
R.3.b.3	Literary Techniques - Identify and/or explain examples of sensory details, sound devices, and figurative language in text along with basic literary techniques	2
R.3.c.3	Text Structures - Use details from text to a. demonstrate comprehension skills previously introduced b. answer questions c. explain main idea and supporting details d. sequence events e. identify simple cause and effect f. draw conclusions g. compare and contrast h. make inferences i. identify author's purpose for writing text j. identify problems and solutions	2
W	Writing	3
W.1	Apply a writing process in composing text	3
W.1.a.3	Writing Process - Follow a writing process to a. independently use a simple pre-writing strategy b. generate a draft c. reread and revise work for audience and purpose, ideas and content, organization and sentence structure, and word choice (refer to W2A, W2B, W2C, W2D) d. edit for conventions (refer to W2E)	3
W.2	Compose well-developed text	2
W.2.a.3	Audience and purpose - Compose text (a) showing awareness of audience (b) in a format appropriate to audience and purpose	3

Panelists rated individual MAP items electronically using the WAT. The format of the rating form was identical for each grade span and content area. The graphic below demonstrates the format of the rating form on computer screen.

