

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

Leslie R. Taylor  
Norman L. Webb, subcontractor  
Milton E. Koger  
Lisa E. Koger  
Arthur A. Thacker

*Prepared for:* Missouri Department of Elementary and Secondary Education  
205 Jefferson Street  
P. O. Box 480  
Jefferson City, Missouri 65102

*Prepared under:* Contract No: C308004001-002

December 28, 2009



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

**Leslie R. Taylor  
Norman L. Webb, subcontractor  
Milton E. Koger  
Lisa E. Koger  
Arthur A. Thacker**

*Prepared for:* Missouri Department of Elementary and Secondary Education  
205 Jefferson Street  
P. O. Box 480  
Jefferson City, Missouri 65102

*Prepared under:* Contract No: C308004001-002

December 28, 2009

**MISSOURI ASSESSMENT PROGRAM (EOC):  
ALIGNMENT FORMS VALIDATION STUDY**

**TABLE OF CONTENTS**

<b>Appendix A EOC English II: Detailed Statistical Results</b> .....	<b>1</b>
Webb Alignment Indicators .....	1
<i>Categorical Concurrence</i> .....	1
<i>Depth-of-Knowledge Consistency</i> .....	2
<i>Range-of-Knowledge Correspondence</i> .....	3
<i>Balance-of-Knowledge Representation</i> .....	4
Consensus DOK Ratings on CLEs .....	5
DOK per Reviewer for 2009 Test Forms 1 and 2.....	8
Items per CLE for English II 2009 Test Forms 1 and 2 (Summer) .....	10
<b>Appendix B EOC Algebra I: Detailed Statistical Results</b> .....	<b>1</b>
Webb Alignment Indicators .....	1
<i>Categorical Concurrence</i> .....	1
<i>Depth-of-Knowledge Consistency</i> .....	2
<i>Range-of-Knowledge Correspondence</i> .....	3
<i>Balance-of-Knowledge Representation</i> .....	4
Consensus DOK Ratings on CLEs .....	5
DOK per Reviewer for 2009 Test Forms 1 and 2.....	7
Items per CLE for Algebra I 2009 Test Forms 1 and 2.....	9
<b>Appendix C EOC Biology: Detailed Statistical Results</b> .....	<b>1</b>
Webb Alignment Indicators .....	1
<i>Depth-of-Knowledge Consistency</i> .....	2
<i>Range-of-Knowledge Correspondence</i> .....	3
<i>Balance-of-Knowledge Representation</i> .....	4
Consensus DOK Ratings on CLEs .....	5
Item DOK per Reviewer for Biology 2009 Test Forms 1 and 2 .....	11
Items per CLE for Biology 2009 Test Forms 1 and 2 .....	13
<b>Appendix D Panelist Comments on EOC Test Items</b> .....	<b>17</b>
English II .....	17
<i>English II Test Form 1</i> .....	17
<i>English II Test Form 2</i> .....	19
Algebra I .....	21
<i>Algebra I EOC Test Form 1</i> .....	21
<i>Algebra I EOC Test Form 2</i> .....	23
Biology .....	26
<i>Biology EOC Test Form 1</i> .....	26
<i>Biology EOC Test Form 2</i> .....	28
<b>Appendix E Sample Alignment Review Materials</b> .....	<b>1</b>

English .....	1
<i>Reading DOK Levels</i> .....	1
<i>Writing DOK Levels</i> .....	3
<i>Examples Applied to Objectives and Assessment Items</i> .....	5
Algebra I .....	18
<i>DOK Levels</i> .....	18
<i>Examples Applied to Objectives and Assessment Items</i> .....	20
Biology .....	32
<i>Biology DOK Levels</i> .....	32
<i>Examples Applied to Biology Objectives and Assessment Items</i> .....	35

**List of Tables**

Table A-1. Categorical Concurrence for English II 2009 Test Forms 1 and 2: Mean Number Items per Strand .....	1
Table A-2. Consensus DOK Ratings by CLE for English II 2009 Test Forms 1 and 2 ....	2
Table A-3. Range-of-Knowledge for English II 2009 Test Forms 1 and 2: Mean Percent of CLEs per Strand Linked with Items .....	3
Table A-4. Balance-of-Knowledge Representation for English II 2009 Test Forms 1 and 2: Mean Balance Index per Strand .....	4
Table A-5. Group Consensus Missouri English II EOC 2009-2010 without Locally Assessed GLEs, Language Arts, Grade 10 .....	5
Table A-6. Item DOK per Reviewer and Item ID Number for English II 2009 EOC Test Forms 1 and 2 .....	8
Table A-7. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=6) for English II Test Form 1 (Spring).....	10
Table A-8. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=6) for English II Test Form 2 (Summer).....	12
Table B-1. Categorical Concurrence for Algebra I 2009 Test Forms 1 and 2: Mean Number Items per Strand .....	1
Table B-2. DOK Consistency for Algebra I 2009 Test Forms 1 and 2: Mean Percent of Items with DOK Below, At, and Above DOK Level of CLEs .....	2
Table B-3. Range-of-Knowledge for Algebra I 2009 Test Forms 1 and 2: Mean Percent of CLEs per Strand Linked with Items .....	3
Table B-4. Balance-of-Knowledge Representation for Algebra I 2009 Test Forms 1 and 2: Mean Balance Index per Strand .....	4
Table B-5. Consensus DOK Ratings by CLE for Algebra I.....	5
Table B-6. Item DOK per Reviewer and Item ID Number for Algebra I 2009 Test Forms 1 and 2, Grade 3.....	7
Table B-7. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=7) for Algebra I Test Form 1 (Spring) .....	9
Table B-8. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=7) for Algebra I Test Form 2 (Summer), .....	11
Table C-1. Categorical Concurrence for Biology 2009 Test Forms 1 (Spring 2009) and 2 (Summer 2009): Mean Number Items per Strand.....	1

Table C-2. DOK Consistency for Biology 2009 Test Forms 1 and 2: Mean Percent of Items with DOK Below, At, and Above DOK Level of CLEs .....	2
Table C-3. Range-of-Knowledge for Biology 2009 Test Forms 1 (Spring) and 2 (Summer): Mean Percent of CLEs per Strand Linked with Items .....	3
Table C-4. Balance-of-Knowledge Representation for Biology 2009 Test Forms 1 (Spring) and 2 (Summer): Mean Balance Index per Strand.....	4
Table C-5. Consensus DOK Ratings by CLE for Biology .....	5
Table C-6. Item DOK per Reviewer by Item ID Number for Biology 2009 Test Forms 1 (Spring 2009) and 2 (Summer 2009).....	11
Table C-7. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=7) for Biology Test Form 1 (Spring 2009).....	13
Table C-8. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=7) for Biology Test Form 2 (Summer 2009).....	15
Table D-1. Reviewer Comments on English II Test Form 1 (Spring 2009).....	17
Table D-2. Debriefing Summary on English II Test Form 1 (Spring 2009) .....	17
Table D-3. Reviewer Comments on English II Test Form 2 (Summer 2009).....	19
Table D-4. Debriefing Summary on English II Test Form 2 (Summer 2009) .....	19
Table D-5. Reviewer Comments on Algebra I Test Form 1 (Spring 2009) .....	21
Table D-6. Debriefing Summary on Algebra I Test Form 1 (Spring 2009).....	22
Table D-7. Reviewer Comments on Algebra I Test Form 2 (Summer 2009).....	23
Table D-8. Debriefing Summary on Algebra I Test Form 2 (Summer 2009).....	24
Table D-9. Reviewer Comments on Biology Test Form 1 (Spring 2009).....	26
Table D-10. Debriefing Summary on Algebra I Test Form 1 (Spring 2009).....	26
Table D-11. Reviewer Comments on Biology Test Form 2 (Summer 2009).....	28
Table D-12. Debriefing Summary on Algebra I Test Form 2 (Summer 2009).....	28

## Appendix A EOC English II: Detailed Statistical Results

In Appendix A, we present the full alignment results on the English II 2009 Test Forms 1 and 2. These alignment results include: (a) the four Webb measures, (b) consensus DOK ratings by CLE, (c) item DOK ratings per reviewer, and (d) items matched to course-level expectations (CLEs).

### *Webb Alignment Indicators*

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

#### **Categorical Concurrence**

We present the categorical concurrence results for the high school EOC English II 2009 Test Forms 1 and 2. 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 English II 2009 Test Forms 1 and 2: Mean Number Items per Strand***

Title of Strand	Test Form 1 (Spring)			Test Form 2 (Summer)		
	Mean Items Matched	Standard Deviation	At Least One Item per Strand	Mean Items Matched	Standard Deviation	At Least One Item per Strand
Reading	30.17	0.69	YES	30.17	0.37	YES
Writing	17	0.58	YES	17	0	YES
Total	47.17	0.37		47.17	0.37	
			100%			100%

### Depth-of-Knowledge Consistency

The depth-of-knowledge (DOK) consistency results for the high school EOC test for English II are presented below. The table presents the results of the comparison between the DOK expected in the CLEs and the depth of knowledge assessed by items. The table includes the mean percentage of items rated below, at the same level, or above the DOK level of the CLEs, along with the corresponding standard deviations. CLEs with at least 50% of items at the same (or above) DOK level met the minimum criterion.

**Table A-2. Consensus DOK Ratings by CLE for English II 2009 Test Forms 1 and 2**

Title of Strand	Test Form 1 (Spring)								Test Form 2 (Summer)								
	Mean Items per Strand	Depth-of-Knowledge Consistency with CLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with CLEs						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.		
Reading	30.17	51	43	42	39	7	19	WEAK	30.17	40	41	45	39	14	30	YES	
Writing	17	13	28	87	28	0	0	YES	17	13	30	87	30	0	0	YES	
Percent of strands with 50% of item DOK at or above objective								50%	Percent of strands with 50% of item DOK at or above objective DOK:								100%

### Range-of-Knowledge Correspondence

The results for range-of-knowledge correspondence for the high school EOC test for English II are presented below. The table includes the mean number, standard deviation, and percentage of CLEs by content strand. For acceptable range-of-knowledge correspondence, a minimum of 50% of content CLEs within each strand should be matched to at least one item.

**Table A-3. Range-of-Knowledge for English II 2009 Test Forms 1 and 2: Mean Percent of CLEs per Strand Linked with Items**

Title of Strand	Number of CLEs	Mean Items per Strand	Test Form 1 (Spring)				Test Form 2 (Summer)								
			Range of CLEs				Range of CLEs								
			CLEs with At Least One Item	% of Total CLEs per Strand	Range-of-Knowledge Target Met	Mean	CLEs with At Least One Item	% of Total CLEs per Strand	Range-of-Knowledge Target Met	Mean					
		M	S.D.	M	S.D.			M	S.D.	M	S.D.				
Reading	9	30.17	8.83	0.37	98	4	YES	30.17	8.83	0.37	98	4	YES		
Writing	7	17	4	0	57	0	YES	17	4	0	57	0	YES		
Percentage of strands with 50% of CLEs linked to at least one item							100%	Percentage of strands with 50% of CLEs linked to at least one item							100%

**Balance-of-Knowledge Representation**

The results for balance-of-knowledge representation for the high school EOC test for English II are presented below. The table also includes the percentage of items linked to each strand. The minimum acceptable balance index is 70 out of 100.

**Table A-4. Balance-of-Knowledge Representation for English II 2009 Test Forms 1 and 2: Mean Balance Index per Strand**

Title of Strand	Test Form 1 (Spring)								Test Form 2 (Summer)												
	CLEs per Strand	Mean CLEs Linked with Items M	Mean Items per Strand M	Mean % of Items (of total) Linked to Strand M S.D.	Balance-of-Knowledge Representation		Balance Index Target Met	Mean	CLEs Linked with Items M	Mean Items per Strand M	Mean % of Items (of total) Linked to Strand M S.D.	Balance-of-Knowledge Representation		Balance Index Target Met							
					Mean Balance Index M	S.D.						Mean Balance Index M	S.D.								
Reading	9	8.83	30.17	64	1	0.79	0.02	YES	8.83	30.17	64	0	0.75	0.03	YES						
Writing	7	4	17	36	1	0.96	0.02	YES	4	17	36	0	0.96	0	YES						
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%	

### **Consensus DOK Ratings on CLEs**

Table A-5 presents DOK ratings established through group consensus for each English II CLE based on the CLEs 2.0. Column 1 lists the Strand letter along with the substrand number, while Column 2 lists the full code for each CLE (strand letter, substrand number, and specific CLE letter and grade level). Column 3 includes the titles and content descriptions corresponding with the CLEs. Column 4 indicates the DOK rating assigned to the CLE by the group.

**Table A-5. Group Consensus Missouri English II EOC 2009-2010 without Locally Assessed Grade-Level Expectations (GLEs), Language Arts, Grade 10**

Strand, Substrand	Strand, Substrand, CLE	Description	DOK
R.		READING	3
R.1		Develop and apply skills and strategies to the reading process	3
	R.1.E	Vocabulary	2
	R.1.E.1	Develop vocabulary through text, using a. roots and affixes b. context clues c. glossary, dictionary and thesaurus	2
	R.1.H	Post-Reading	3
	R.1.H.1	Apply post-reading skills to comprehend, interpret, analyze, and evaluate text: a. identify and explain the relationship between the main idea and supporting details c. reflect d. draw conclusions e. paraphrase f. summarize	3
	R.1.I	Making Connections	3
	R.1.I.1	Making Connections: Compare, contrast, analyze and evaluate 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	Text Features	2
	R.2.A.1	Analyze and evaluate the text features in grade-level text	2
	R.2.B	Literary Techniques	2
	R.2.B.1	Identify and, explain literary techniques, in text emphasizing a. understatement b. parallelism c. allusion d. analogy e. analyze and evaluate literary techniques previously introduced	2
	R.2.C	Literary Elements	3

**Table A-5. Group Consensus Missouri English II EOC 2009-2010 without Locally Assessed Grade-Level Expectations (GLEs), Language Arts, Grade 10**

Strand, Substrand	Strand, Substrand, CLE	Description	DOK
	R.2.C.1	Use details from text(s) to a. demonstrate comprehension skills previously introduced b. analyze character, plot, setting, point of view c. analyze the development of a theme across genres d. identify and analyze tone	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	Text Features	3
	R.3.A.1	Explain, analyze and evaluate the author's use of text features to clarify meaning	3
	R.3.B	Literary Techniques	2
	R.3.B.1	Identify, explain, and analyze literary techniques in non-fiction, emphasizing a. understatement b. parallelism c. allusion d. analogy and e. figurative language and sound devices previously introduced	2
	R.3.C	Text Structures	3
	R.3.C.1	Use details from informational and persuasive text(s) to a. analyze and evaluate the organizational patterns b. identify and analyze faulty reasoning and unfounded inferences c. evaluate proposed solutions d. evaluate for accuracy and adequacy of evidence e. evaluate effect of tone on the overall meaning of work f. analyze and evaluate point of view g. analyze and evaluate author's viewpoint/perspective h. demonstrate comprehension skills previously introduced	3
W.		WRITING	3
W.1		Apply a writing process in composing text	3
	W.1.A	Writing Process	3
	W.1.A.1	Apply a writing process to write effectively in various forms and types of writing (W3A)	3
W.2		Compose well-developed text	3
	W.2.A	Audience and purpose	3
	W.2.A.1	Compose text a. showing awareness of audience b. choosing a form and point of view appropriate to purpose and audience	3
	W.2.B	Ideas and Content	3
	W.2.B.1	Compose text with: a. strong controlling idea b. relevant specific details	3

**Table A-5. Group Consensus Missouri English II EOC 2009-2010 without Locally Assessed Grade-Level Expectations (GLEs), Language Arts, Grade 10**

Strand, Substrand	Strand, Substrand, CLE	Description	DOK
		c. complex ideas d. freshness of thought	
	W.2.C	Organization and Sentence Structure	3
	W.2.C.1	Compose text with a. effective beginning, middle, and end b. a logical order c. effective paragraphing d. cohesive devices e. varied sentence structure f. clarity of expression g. active voice	3
	W.2.D	Word Choice	3
	W.2.D.1	Compose text using a. precise and vivid language b. writing techniques such as imagery, humor, voice, and figurative language	3
	W.2.E	Conventions	2
	W.2.E.1	In written text apply a. conventions of capitalization b. conventions of punctuation c. standard usage	2
W.3		Write effectively in various forms and types of writing	3
	W.3.A	Forms/Types/Modes of Writing	3
	W.3.A.1	Compose a variety of texts, a. using narrative, descriptive, expository, and/or persuasive features b. in various formats, including workplace communication c. including summary d. including literary analysis e. including reflective writing	3

***DOK per Reviewer for 2009 Test Forms 1 and 2***

Table A-6 presents 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 differ between forms, 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 A-6. Item DOK per Reviewer and Item ID Number for English II 2009 EOC Test Forms 1 and 2***

Item ID	Test Form 1 (Spring)						Item ID	Test Form 2 (Summer)					
	R1	R2	R3	R4	R5	R6		R1	R2	R3	R4	R5	R6
1	2	2	2	2	2	2	1	2	2	2	2	2	2
2	1	1	1	1	1	1	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	2	2	2	2	2	2
4	2	2	2	2	2	2	4	3	2	2	3	3	3
5	2	2	2	2	2	2	5	2	2	2	2	2	2
6	3	3	3	3	3	3	6	3	3	3	3	3	3
7	2	2	1	2	2	2	7	2	2	2	2	2	2
8	3	2	3	2	3	3	8	2	3	2	3	3	3
9	2	2	2	2	2	2	9	2	2	2	3	2	3
10	2	2	2	2	2	2	10	1	1	1	2	1	1
11	2	3	2	2	2	2	11	2	2	3	2	1	1
12	3	3	3	3	3	3	12	2	3	2	2	3	2
13							13						
14							14						
15							15						
16							16						
17							17						
18							18						
19							19						
20							20						
21							21						
22							22						
23							23						
24	3	3	3	3	2	3	24						
25	2	2	3	2	2	2	25	2	2	1	2	2	2
26	3	2	3	3	3	2	26	2	3	2	3	3	3
27	3	2	2	2	2	2	27	2	3	2	3	3	2
28	2	2	2	2	2	2	28	2	2	2	3	3	3
29	3	3	3	3	3	3	29	3	3	2	3	2	3
30	2	2	3	2	2	2	30	2	3	2	3	3	3
31	2	1	1	1	2	1	31	2	2	2	3	2	3
32	2	2	2	2	2	1	32	2	2	2	3	3	2
33	1	1	1	1	1	1	33	2	2	3	3	2	2
34	2	2	2	2	2	2	34	3	3	2	3	3	3
35	2	1	1	2	1	1	35	3	3	2	3	3	3
36	2	2	2	2	2	2	36	2	2	2	3	2	2
37	3	3	3	3	2	3	37	2	2	2	2	1	1
38	2	2	3	3	2	3	38	2	2	3	3	3	2
39	3	3	3	3	3	3	39	1	1	1	1	2	1

40	2	2	1	2	1	1
41	2	3	3	3	3	3
42						
43	1	1	2	2	2	1
44	2	1	2	2	2	1
45	1	1	2	2	2	1
46	1	1	2	2	2	1
47	2	2	1	2	2	1
48	3	3	3	3	3	3

---

Intraclass Correlation: 0.9439  
Pairwise Comparison: 0.7444

---

40	2	3	2	3	2	2
41	3	3	2	2	2	1
42	3	3	2	3	2	2
43	1	1	1	2	2	1
44	1	1	1	2	2	1
45	2	2	2	2	2	2
46	1	1	1	2	2	1
47	1	1	1	2	2	1
48	3	3	3	3	3	3

---

Intraclass Correlation: 0.8916  
Pairwise Comparison: 0.6

---

**Items per CLE for English II 2009 Test Forms 1 (Spring) and 2 (Summer)**

Tables A-7 (Test Form 1) and A-8 (Test Form 2) list those items matched to each Algebra I CLE. Column 1 presents the CLE by code (see Table A-5 for descriptions). The remaining colored columns list items by sequential item number along with the number of reviewers who assigned the CLE to the item. For example, item number 1 (row 4 below) was matched to the CLE coded as R.1.E.1 by 6 reviewers (1:6), and item number 7 (the second red box) was also matched by 6 reviewers (7:6). The legend above the list of CLEs and items explains the color-coding with green representing low agreement among reviewers (i.e., 1 reviewer assigned item to CLE), yellow representing moderate agreement (i.e., 3 reviewers assigned item to this CLE), and red representing high agreement (i.e., all 6 reviewers assigned item to CLE).

**Table A-7. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=6) for English II Test Form 1 (Spring)**

Low	Medium	High									
1	3	6									
R.											
R.1											
R.1.E											
R.1.E.1	1:6	7:6	36:6								
R.1.H											
R.1.H.1	4:6	10:6	27:6	28:6	41:1						
R.1.I											
R.1.I.1	30:5										
R.2											
R.2.A											
R.2.A.1	2:6										
R.2.B											
R.2.B.1	5:5	25:6	26:6	29:6							
R.2.C											
R.2.C.1	3:5	6:6	24:6								
R.3											
R.3.A											
R.3.A.1	31:6	35:5	40:6								
R.3.B.											
R.3.B.1	9:6	33:6	38:6	47:2							
R.3.C											
R.3.C.1	3:1	8:6	11:6	12:6	30:1	32:6	34:6	35:1	37:6	39:6	41:5
W.											
W.1											
W.1.A											

W.1.A.1	
W.2	
W.2.A	
W.2.A.1	
W.2.B	
W.2.B.1	5:1   48:6
W.2.C	
W.2.C.1	47:1   48:6
W.2.D	
W.2.D.1	48:6
W.2.E	
W.2.E.1	43:6   44:6   45:6   46:6   47:4
W.3	
W.3.A	
W.3.A.1	

**Table A-8. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=6) for English II Test Form 2 (Summer)**

		Medium		High
	1	3		6
R.				
R.1				
R.1.E				
R.1.E.1	1:6	4:1	7:6	9:1
R.1.H				
R.1.H.1	2:6	5:4	10:5	11:2
R.1.I				
R.1.I.1	28:1	41:5	42:4	
R.2				
R.2.A				
R.2.A.1	34:2	39:6		
R.2.B				
R.2.B.1	4:5	33:5	38:6	
R.2.C				
R.2.C.1	2:1	3:6	5:2	6:6
R.3				
R.3.A				
R.3.A.1	8:5	10:1	27:5	28:2
R.3.B				
R.3.B.1	9:4	29:5		
R.3.C				
R.3.C.1	8:1	9:1	11:4	12:2
W.				
W.1				
W.1.A				

W.1.A.1	
W.2	
W.2.A	
W.2.A.1	
W.2.B	
W.2.B.1	48:6
W.2.C	
W.2.C.1	48:6
W.2.D	
W.2.D.1	48:6
W.2.E	
W.2.E.1	43:6   44:6   45:6   46:6   47:6
W.3	
W.3.A	
W.3.A.1	



## Appendix B EOC Algebra I: Detailed Statistical Results

In Appendix B, we present the full alignment results on the Algebra I 2009 Test Forms 1 (Spring) and 2 (Summer). These alignment results include: (a) the four Webb measures, (b) consensus DOK ratings by CLE, (c) item DOK ratings per reviewer, and (d) items matched to course-level expectations (CLEs).

### *Webb Alignment Indicators*

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

#### **Categorical Concurrence**

We present the categorical concurrence results for the high school EOC Algebra I 2009 Test Forms 1 (Spring) and 2 (Summer). 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 Algebra I 2009 Test Forms 1 and 2: Mean Number Items per Strand***

Title of Strand	Test Form 1 (Spring)			Test Form 2 (Summer)			
	Mean Items Matched	Standard Deviation	At Least One Item per Strand	Mean Items Matched	Standard Deviation	At Least One Item per Strand	
Number and Operations		1.75	YES	7.29	0.45	YES	
Algebraic Relationships	25.57	1.59	YES	25.43	1.99	YES	
Data and Probability	7.57	0.49	YES	8.57	2.32	YES	
Total	8.29	41.43		41.29	1.98		
Percent of strands with at least 6 items			100%				100%

**Depth-of-Knowledge Consistency**

Table B-2 includes the depth-of-knowledge (DOK) consistency results for the high school EOC Algebra I 2009 Test Forms 1 and 2. The tables present the results of the comparison between the DOK expected in the CLEs and the DOK assessed by items. The table includes the mean percentage of items rated below, at the same level, or above the DOK level of the CLEs, along with the corresponding standard deviations. CLEs with at least 50% of items at the same (or above) DOK level met the minimum criterion.

**Table B-2. DOK Consistency for Algebra I 2009 Test Forms 1 and 2: Mean Percent of Items with DOK Below, At, and Above DOK Level of CLEs**

Title of Strand	Test Form 1 (Spring)								Test Form 2 (Summer)								
	Mean Items per Strand	Depth-of-Knowledge Consistency with CLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with CLEs						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.		
Number and Operations	8.29	33	20	59	22	8	20	YES	7.29	59	23	41	23	0	0	WEAK	
Algebraic Relationships	25.57	33	35	60	38	7	25	YES	25.43	52	42	43	40	5	18	WEAK	
Data and Probability	7.57	37	43	63	43	0	0	YES	8.57	50	46	50	46	0	0	YES	
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								33%

## Range-of-Knowledge Correspondence

In Table B-3, we present the range-of-knowledge correspondence results for the high school EOC Algebra I 2009 Test Forms 1 and 2. The table includes the mean number, standard deviation, and percentage of CLEs by content strand. For acceptable range-of-knowledge correspondence, a minimum of 50% of content CLEs within each strand should be matched to at least one item.

**Table B-3. Range-of-Knowledge for Algebra I 2009 Test Forms 1 and 2: Mean Percent of CLEs per Strand Linked with Items**

Title of Strand	Number of CLEs	Mean Items per Strand	Test Form 1 (Spring)				Range-of-Knowledge Target Met	Mean Items per Strand	Test Form 2 (Summer)				Range-of-Knowledge Target Met		
			Range of CLEs						Range of CLEs						
			CLEs with At Least One Item		% of Total CLEs per Strand				CLEs with At Least One Item		% of Total CLEs per Strand				
M	S.D.	M	S.D.	M	S.D.	M	S.D.								
Number and Operations	2	8.29	2	0	100	0	YES	7.29	2	0	100	0	YES		
Algebraic Relationships	10	25.57	9.14	0.64	91	6	YES	25.43	9	0.76	90	8	YES		
Data and Probability	5.71	7.57	4.57	0.73	80	8	YES	8.57	4.71	0.45	82	2	YES		
Percentage of strands with 50% of CLEs linked to at least one item							100%	Percentage of strands with 50% of CLEs linked to at least one item							100%

**Balance-of-Knowledge Representation**

The results for balance-of-knowledge representation for the high school EOC test for Algebra I are presented below. The table also includes 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-4. Balance-of-Knowledge Representation for Algebra I 2009 Test Forms 1 and 2: Mean Balance Index per Strand**

Title of Strand	Test Form 1 (Spring)								Test Form 2 (Summer)							
	CLEs per Strand	Mean CLEs Linked with Items M	Mean Items per Strand M	Mean % of Items (of total) Linked to Strand		Balance-of-Knowledge Representation		Balance Index Target Met	Mean	CLEs Linked with Items M	Mean Items per Strand M	Mean % of Items (of total) Linked to Strand		Balance-of-Knowledge Representation		Balance Index Target Met
				M	S.D.	M	S.D.					M	S.D.	M	S.D.	
Number and Operations	2	2	8.29	20	2	0.92	0.04	YES	2	7.29	18	1	0.81	0.04	YES	
Algebraic Relationships	10	9.14	25.57	62	2	0.78	0.04	YES	9	25.43	62	5	0.72	0.02	YES	
Data and Probability	5.71	4.57	7.57	18	1	0.86	0.03	YES	4.71	8.57	21	5	0.80	0.07	YES	
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%

### **Consensus DOK Ratings on CLEs**

Table B-5 presents DOK ratings established through group consensus for each Algebra I CLE based on the CLE 2.0. Column 1 lists the strand letter along with the substrand number, while Column 2 lists the full code for each CLE (strand letter, substrand number, and specific CLE letter and grade level). Column 3 includes the titles and content descriptions corresponding with the CLEs. Column 4 indicates the DOK rating assigned to the CLE by the group.

**Table B-5. Consensus DOK Ratings by CLE for Algebra I**

Strand, Substrand	Strand, Substrand, CLE	Description	DOK
N		Number and Operations	2
N.1		Understand numbers, ways of representing numbers, relationships among numbers and number systems	2
	N.1.A	Read, write and compare numbers	2
	N.1.A.1	compare and order rational and irrational numbers, including finding their approximate locations on a number line	2
	N.1.B	Represent and use rational numbers	2
	N.1.B.1	use real numbers and various models, drawing, etc. to solve problems	2
A		Algebraic Relationships	2
	A.1	Understand patterns, relations and functions	2
	A.1.B	Create and analyze patterns	2
	A.1.B.1	generalize patterns using explicitly or recursively defined functions	2
	A.1.C	Classify objects and representations	2
	A.1.C.1	compare and contrast various forms of representations of patterns	2
	A.1.D	Identify and compare functions	2
	A.1.D.1	understand and compare the properties of linear and nonlinear functions	2
	A.1.E	Describe the effects of parameter changes	2
	A.1.E.1	describe the effects of parameter changes on linear, exponential growth/decay and quadratic functions including intercepts	2
A.2		Represent and analyze mathematical situations and structures using algebraic symbols	2
	A.2.A	Represent mathematical situations	2
	A.2.A.1	use symbolic algebra to represent and solve problems that involve linear and quadratic relationships, including equations and inequalities	2
	A.2.B	Describe and use mathematical manipulation	2
	A.2.B.1	describe and use algebraic manipulations, including factoring and	2

Strand, Substrand	Strand, Substrand, CLE	Description	DOK
		rules of integer exponents and apply properties of exponents (including order of operations) to simplify expressions	
	A.2.C	Utilize equivalent forms	2
	A.2.C.1	use and solve equivalent forms of equations (linear, absolute value, and quadratic)	2
	A.2.D	Utilize systems	2
	A.2.D.1	use and solve systems of linear equations or inequalities with 2 variables	2
A.3		Use mathematical models to represent and understand quantitative relationships	2
	A.3.A	Use mathematical models	2
	A.3.A.1	identify quantitative relationships and determine the type(s) of functions that might model the situation to solve the problem	2
	A.4	Analyze change in various contexts	2
	A.4.A	Analyze change	2
	A.4.A.1	analyze linear and quadratic functions by investigating rates of change, intercepts and zeros	2
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	3
	D.1.A	Formulate questions	3
	D.1.A.1	formulate questions and collect data about a characteristic which include sample spaces and distributions	3
	D.1.C	Represent and interpret data	2
	D.1.C.1	select and use appropriate graphical representation of data and given one-variable quantitative data, display the distribution and describe its shape	2
D.2		Select and use appropriate statistical methods to analyze data	2
	D.2.A	Describe and analyze data	2
	D.2.A.1	apply statistical measures of center to solve problems	2
	D.2.C	Represent data algebraically	2
	D.2.C.1	given a scatterplot, determine an equation for a line of best fit	2
D.3		Develop and evaluate inferences and predictions that are based on data	3
	D.3.A	Develop and evaluate inferences	3
	D.3.A.1	make conjectures about possible relationships between 2 characteristics of a sample on the basis of scatter plots of the data	3

### ***DOK per Reviewer for 2009 Test Forms 1 and 2***

Table B-6 presents 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 differ between forms, 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-6. Item DOK per Reviewer and Item ID Number for Algebra I 2009 Test Forms 1 and 2, Grade 3***

Test Form 1 (Spring)								Test Form 2 (Summer)							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
1	2	2	2	2	2	2	2	1	1	1	2	1	2	2	2
2	2	2	1	2	2	1	2	2	2	2	1	2	1	1	2
3	2	1	1	2	2	1	1	3	1	1	1	2	1	1	1
4	2	2	2	2	2	2	2	4	1	1	1	1	2	1	1
5	1	1	1	1	1	1	1	5	1	1	1	1	1	1	1
6								6							
7								7							
8								8							
9								9							
10	1	1	1	1	1	1	1	10	1	1	1	1	1	1	1
11	2	2	2	2	1	1	2	11	1	1	1	1	1	1	1
12	1	1	1	2	1	1	2	12	1	1	1	1	1	1	1
13	1	1	1	2	1	1	1	13	1	1	1	1	1	1	1
14	2	2	2	2	2	2	2	14	1	2	2	1	2	1	1
15	2	2	2	2	2	2	2	15	2	2	2	2	1	1	1
16	1	1	1	1	1	1	1	16	1	1	1	1	1	1	1
17	2	2	2	2	2	2	2	17	2	2	2	2	2	2	2
18	2	2	2	2	2	2	2	18	2	2	2	2	2	2	2
19	2	2	2	2	2	2	2	19	1	1	1	1	2	1	1
20	2	2	2	2	2	2	2	20	1	1	1	1	1	1	1
21	1	1	1	1	2	1	1	21	2	2	2	2	2	2	2
22								22							
23								23							
24								24							
25								25							
26	1	2	2	2	2	1	2	26	1	2	2	2	1	2	2
27	1	1	1	1	2	1	2	27	1	1	1	1	1	1	1
28	2	2	2	2	2	2	2	28	2	1	1	2	1	1	1
29	1	1	1	1	1	1	2	29	2	2	2	2	2	2	2
30	1	1	1	2	2	1	1	30	2	2	2	2	1	2	2
31	1	2	2	2	2	2	2	31	2	2	2	2	1	1	1
32	2	2	2	2	2	2	2	32	2	2	2	2	2	2	2
33	2	2	2	2	2	2	2	33	1	2	2	2	2	1	1
34	2	2	2	2	2	1	2	34	1	1	1	2	2	2	2
35	1	1	1	1	1	1	1	35	2	1	1	2	2	1	1
36	2	2	2	2	2	1	2	36	2	2	2	2	2	2	2
37	1	2	2	2	2	1	1	37	2	2	2	2	1	2	2
38	1	1	1	2	2	2	2	38	1	1	1	1	1	2	2

Missouri Assessment Program (EOC)

---

39								39							
40								40							
41								41							
42								42							
43	2	2	2	2	2	2	2	43	2	2	2	2	2	1	2
44	2	2	2	2	2	1	1	44	2	1	1	2	2	1	1
45	2	2	2	2	2	2	2	45	1	2	2	2	2	1	2
46	2	2	2	2	2	2	2	46	2	2	2	2	2	2	2
47	2	2	2	2	2	2	2	47	2	2	2	2	2	2	1
48	2	3	3	2	2	2	3	48	2	3	3	2	2	2	3
49								49							

### Items per CLE for Algebra I 2009 Test Forms 1 and 2

Tables B-7 and B-8 list those items matched to each Algebra I CLE. Column 1 presents the CLE by code (see Tables B-5 for descriptions). The remaining colored columns list items by sequential item number along with the number of reviewers who assigned the CLE to the item. For example, item number 16 (row 4 below) was matched to the CLE coded as N.1.A.1 by 7 reviewers (16:7). The legend above the list of CLEs and items explains the color-coding with green representing low agreement among reviewers (i.e., 1 reviewer assigned item to CLE), yellow representing moderate agreement (i.e., 3 reviewers assigned item to this CLE), and red representing high agreement (i.e., all 7 reviewers assigned item to CLE).

**Table B-7. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=7) for Algebra I Test Form 1 (Spring)**

Low		Medium		High				
1		3		7				
N								
N.1								
N.1.A								
N.1.A.1	16:7	18:7	26:7	34:7				
N.1.B								
N.1.B.1	4:2	20:5	21:7	32:1	44:7	48:2		
A								
A.1								
A.1.B								
A.1.B.1	2:7	19:1						
A.1.C								
A.1.C.1	19:6	28:6	33:6	47:3				
A.1.D								
A.1.D.1	30:6	31:1	47:2	48:6				
A.1.E								
A.1.E.1	10:7	13:6	31:6					
A.2								
A.2.A								
A.2.A.1	3:5	20:3	28:1	29:1	30:1	32:5	33:1	38:1
A.2.B								
A.2.B.1	5:7	12:7	29:6	38:6	46:7			
A.2.C								
A.2.C.1	3:2	48:3						
A.2.D								
A.2.D.1	14:7	32:1	37:7					
A.3								
A.3.A								
A.3.A.1	17:1	35:7	45:7					
A.4								
A.4.A								
A.4.A.1	13:1	47:2						

D	4:5
D.1	
D.1.A	
D.1.A.1	15:1
D.1.C	
D.1.C.1	43:5
D.2	
D.2.A	
D.2.A.1	11:7   15:6   43:2
D.2.C	
D.2.C.1	27:7   36:7
D.3	
D.3.A	
D.3.A.1	1:7   17:6

**Table B-8. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=7) for Algebra I Test Form 2 (Summer),**

Low		Medium		High
1		3		7
N				
N.1				
N.1.A				
N.1.A.1	14:7	20:7	33:7	36:7 44:7
N.1.B				
N.1.B.1	1:2	10:2	27:7	29:3 43:2
A				
A.1				
A.1.B				
A.1.B.1	12:6	19:7		
A.1.C				
A.1.C.1	16:7	47:2		
A.1.D				
A.1.D.1	5:5	11:6	21:6	32:2 38:4
A.1.E				
A.1.E.1	3:7			
A.2				
A.2.A				
A.2.A.1	4:4	15:7	26:6	30:7 37:7 48:4
A.2.B				
A.2.B.1	1:5	10:5	12:1	34:7 45:7
A.2.C				
A.2.C.1	4:3	46:3		
A.2.D				
A.2.D.1	17:7	26:1	29:4	48:5
A.3				
A.3.A				
A.3.A.1	5:2	11:1		
A.4				
A.4.A				
A.4.A.1	21:1	32:5	38:3	46:4
D	43:5			
D.1				
D.1.A				
D.1.A.1				
D.1.C				
D.1.C.1	28:7	47:5	48:2	
D.2				
D.2.A				
D.2.A.1	2:7	18:7		
D.2.C				
D.2.C.1	35:7			
D.3				
D.3.A				
D.3.A.1	13:7	31:7		



## Appendix C EOC Biology: Detailed Statistical Results

In Appendix C, we present the full alignment results on the Biology 2009 Test Forms 1 and 2. These alignment results include: (a) the four Webb measures, (b) consensus DOK ratings by CLE, (c) item DOK ratings per reviewer, and (d) items matched to CLEs.

### *Webb Alignment Indicators*

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

#### **Categorical Concurrence**

We present the categorical concurrence results for the high school EOC Algebra I 2009 Test Forms 1 and 2. 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 Biology 2009 Test Forms 1 (Spring) and 2 (Summer): Mean Number Items per Strand***

Title of Strand	Test Form 1 (Spring)			Test Form 2 (Summer)		
	Mean Items Matched	Standard Deviation	At Least One Item per Strand	Mean Items Matched	Standard Deviation	At Least One Item per Strand
Living Organisms	22.14	0.35	YES	20.86	0.35	YES
Ecology	12.57	0.49	YES	14.29	0.70	YES
Scientific Inquiry	20.43	0.73	YES	20	0	YES
Total	55.14	0.83		55.14	0.35	
Percent of strands with at least 6 items			100%	100%		

## Depth-of-Knowledge Consistency

Table C-2 includes the depth-of-knowledge (DOK) consistency results for grades 5 and 8 of the EOC test for Biology. The table presents the results of the comparison between the DOK expected in the CLEs and the DOK assessed by items. The table includes the mean percentage of items rated below, at the same level, or above the DOK level of the CLEs, along with the corresponding standard deviations. CLEs with at least 50% of items at the same (or above) DOK level met the minimum criterion.

**Table C-2. DOK Consistency for Biology 2009 Test Forms 1 and 2: Mean Percent of Items with DOK Below, At, and Above DOK Level of CLEs**

Title of Strand	Test Form 1 (Spring)								Test Form 2 (Summer)								
	Mean Items per Strand	Depth-of-Knowledge Consistency with CLEs						DOK Consistency Target Met	Mean Items per Strand	Depth-of-Knowledge Consistency with CLEs						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.				
Living Organisms	22.14	52	47	45	45	3	14	WEAK	20.86	52	47	48	47	0	0	WEAK	
Ecology	12.57	44	46	54	46	2	13	YES	14.29	30	38	67	38	3	13	YES	
Scientific Inquiry	20.43	55	44	42	44	2	15	WEAK	20	69	42	31	42	0	0	WEAK	
Percent of strands with 50% of item DOK at or above objective DOK								33%	Percent of strands with 50% of item DOK at or above objective DOK								33%

## Range-of-Knowledge Correspondence

The results for range-of-knowledge correspondence for the high school EOC test for Biology are presented below. The table includes the mean number, standard deviation, and percentage of CLEs by content strand. For acceptable range-of-knowledge correspondence, a minimum of 50% of content CLEs within each strand should be matched to at least one item.

**Table C-3. Range-of-Knowledge for Biology 2009 Test Forms 1 (Spring) and 2 (Summer): Mean Percent of CLEs per Strand Linked with Items**

Title of Strand	Number of CLEs	Test Form 1 (Spring)						Test Form 2 (Summer)						
		Mean Items per Strand	Range of CLEs				Range-of-Knowledge Target Met	Mean Items per Strand	Range of CLEs				Range-of-Knowledge Target Met	
			CLEs with At Least One Item		% of Total CLEs per Strand				CLEs with At Least One Item		% of Total CLEs per Strand			
			M	S.D.	M	S.D.			M	S.D.	M	S.D.		
Living Organisms	17.29	22.14	14.86	0.99	86	5	YES	20.86	14.14	0.99	86	5	YES	
Ecology	9.57	12.57	9	0.76	94	7	YES	14.29	7.57	1.29	94	7	YES	
Scientific Inquiry	15	20.43	6.29	0.70	42	5	WEAK	20	5.57	0.90	42	5	WEAK	
Percentage of strands with 50% of CLEs linked to at least one item							67%	Percentage of strands with 50% of CLEs linked to at least one item						67%

### Balance-of-Knowledge Representation

The results for balance-of-knowledge representation for the high school EOC test for Biology are presented below. The table also includes 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-4. Balance-of-Knowledge Representation for Biology 2009 Test Forms 1 (Spring) and 2 (Summer): Mean Balance Index per Strand**

Title of Strand	Test Form 1 (Spring)								Test Form 2 (Summer)							
	CLEs per Strand	Mean CLEs Linked with Items		Mean % of Items (of total) Linked to Strand		Balance-of-Knowledge Representation		Balance Index	Balance Index Target Met	Mean CLEs Linked with Items	Mean CLEs Linked with Items		Mean % of Items (of total) Linked to Strand		Balance-of-Knowledge Representation	
		M	M	M	S.D.	M	S.D.				M	M	M	S.D.	M	S.D.
Living Organisms	17.29	14.86	22.14	40	1	0.81	0.02	YES	14.86	14.86	38	1	0.81	0.01	YES	
Ecology	9.57	9	12.57	23	1	0.81	0.03	YES	9	9	26	1	0.77	0.05	YES	
Scientific Inquiry	15	6.29	20.43	37	1	0.83	0.04	YES	6.29	6.29	36	0	0.85	0.06	YES	
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%	

### **Consensus DOK Ratings on CLEs**

Table C-5 presents DOK ratings established through group consensus for each Biology CLE per grade level based on the CLEs 2.0 for Algebra I. Column 1 lists the strand letter along with the big idea number under the strand, while Column 2 lists the full code for each CLE (strand, big idea, substrand letter, and grade level). Column 3 includes the titles and content descriptions corresponding with the CLEs. Column 4 indicates the DOK rating assigned to the CLE by the group.

**Table C-5. Consensus DOK Ratings by CLE for Biology**

Strand. Big Idea	Strand. Big Idea. Substrand. CLE	Description	DOK
3		Characteristic and Interactions of Living Organisms	2
3.1		There is a fundamental unity underlying the diversity of all living organisms	2
	3.1.B	Organisms progress through life cycles unique to different types of organisms	1
	3.1.B.a	Recognize cells both increase in number and differentiate, becoming specialized in structure and function, during and after embryonic development	1
	3.1.C	Cells are the fundamental units of structure and function of all living things	2
	3.1.C.b	Describe the structure of cell parts (e.g., cell wall, cell membrane, cytoplasm, nucleus, chloroplast, mitochondrion, ribosome, vacuole) found in different types of cells (e.g., bacterial, plant, skin, nerve, blood, muscle) and the functions they perform (e.g., structural support, transport of materials, storage of genetic information, photosynthesis and respiration, synthesis of new molecules, waste disposal) that are necessary to the survival of the cell and organism	2
3.2		Living organisms carry out life processes in order to survive	2
	3.2.A	The cell contains a set of structures called organelles that interact to carry out life processes through physical and chemical means	2
	3.2.A.c	Explain physical and chemical interactions that occur between organelles (e.g. nucleus, cell membrane, chloroplast, mitochondrion, ribosome) as they carry out life processes	2
	3.2.B	Photosynthesis and cellular respiration are complementary processes necessary to the survival of most organisms on Earth	2
	3.2.B.a	Explain the interrelationship between the processes of photosynthesis and cellular respiration (e.g., recycling of oxygen	2

Strand. Big Idea	Strand. Big Idea. Substrand. CLE	Description	DOK
		and carbon dioxide), comparing and contrasting photosynthesis and cellular respiration reactions (Do NOT assess intermediate reactions)	
	3.2.B.b	Determine what factors affect the processes of photosynthesis and cellular respiration (i.e., light intensity, availability of reactants, temperature)	2
	3.2.F	Cellular activities and responses can maintain stability internally while external conditions are changing (homeostasis)	2
	3.2.F.a	Explain the significance of the selectively permeable membrane to the transport of molecules	2
	3.2.F.b	Predict the movement of molecules across a selectively permeable membrane (i.e., diffusion, osmosis, active transport) needed for a cell to maintain homeostasis given concentration gradients and different sizes of molecules	2
	3.2.F.c	Explain how water is important to cells (e.g., is a buffer for body temperature, provides soluble environment for chemical reactions, serves as a reactant in chemical reactions, provides hydration that maintains cell turgidity, maintains protein shape)	2
3.3		There is a genetic basis for the transfer of biological characteristics from one generation to the next through reproductive processes	2
	3.3.B	All living organisms have genetic material (DNA) that carries hereditary information	1
	3.3.B.a	Describe the chemical and structural properties of DNA (e.g., DNA is a large polymer formed from linked subunits of four kinds of nitrogen bases; genetic information is encoded in genes based on the sequence of subunits; each DNA molecule in a cell forms a single chromosome) (Assess the concepts – NOT memorization of nitrogen base pairs)	1
	3.3.B.b	Recognize that DNA codes for proteins, which are expressed as the heritable characteristics of an organism.	1
	3.3.B.e	Identify possible external causes (e.g., heat, radiation, certain chemicals) and effects of DNA mutations (e.g., altered proteins which may affect chemical reactions and structural development)	2
	3.3.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
	3.3.C.a	Recognize the chromosomes of daughter cells, formed through the processes of asexual reproduction and mitosis, the formation of somatic (body) cells in multicellular organisms, are identical to the chromosomes of the parent cell	1
	3.3.C.b	Recognize that during meiosis, the formation of sex cells, chromosomes are reduced to half the number present in the parent cell	1

Strand. Big Idea	Strand. Big Idea. Substrand. CLE	Description	DOK
	3.3.C.c	Explain how fertilization restores the diploid number of chromosomes	2
	3.3.D	There is heritable variation within every species of organism	2
	3.3.D.a	Describe the advantages and disadvantages of asexual and sexual reproduction with regard to variation within a population	2
	3.3.E	The pattern of inheritance for many traits can be predicted by using the principles of Mendelian genetics	2
	3.3.E.a	Explain how genotypes (heterozygous and homozygous) contribute to phenotypic variation within a species	2
	3.3.E.b	Predict the probability of the occurrence of specific traits, including sex-linked traits, in an offspring by using a monohybrid cross.	2
4		Changes in Ecosystems and Interactions of Organisms with their Environments	2
4.1		Organisms are interdependent with one another and with their environment	2
	4.1.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
	4.1.A.a	Explain the nature of interactions between organisms in predator/prey relationships and different symbiotic relationships (i.e., mutualism, commensalism, parasitism)	1
	4.1.A.b	Explain how cooperative (e.g., symbiotic) and competitive (e.g., predator/prey) relationships help maintain balance within an ecosystem	2
	4.1.B	Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite	2
	4.1.B.a	Identify and explain the limiting factors (biotic and abiotic) that may affect the carrying capacity of a population within an ecosystem	2
	4.1.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	2
	4.1.D.a	Predict the impact (beneficial or harmful) a natural environmental event (e.g., forest fire, flood, volcanic eruption, avalanche) or human caused change (e.g., acid rain, global warming, pollution, deforestation, introduction of an exotic species) may have on the diversity of different species in an ecosystem Predict the impact (beneficial or harmful) a natural or human caused environmental event (e.g., forest fire, flood, volcanic eruption, avalanche, acid rain, global warming, pollution, deforestation, introduction of an exotic species) may have on the	2

Strand. Big Idea	Strand. Big Idea. Substrand. CLE	Description	DOK
		biodiversity of a community	
4.2		Matter and energy flow through the ecosystem	2
	4.2.A	As energy flows through the ecosystem, all organisms capture a portion of that energy and transform it to a form they can use	2
	4.2.A.c	Predict how the use and flow of energy will be altered due to changes in a food web	2
4.3		Genetic variation sorted by the natural selection process explains evidence of biological evolution	2
	4.3.B	Reproduction is essential to the continuation of every species	2
	4.3.B.b	Explain the importance of reproduction to the survival of a species (i.e., the failure of a species to reproduce will lead to extinction of that species)	2
	4.3.C	Natural selection is the process of sorting individuals based on their ability to survive and reproduce within their ecosystem	2
	4.3.C.a	Identify examples of adaptations that may have resulted from variations favored by natural selection (e.g., long-necked giraffes, long-eared jack rabbits) and describe how that variation may have provided populations an advantage for survival	2
	4.3.C.c	Explain how environmental factors (e.g., habitat loss, climate change, pollution, introduction of non-native species) can be agents of natural selection	2
7		Scientific Inquiry	3
7.1		Science understanding is developed through the use of science process skills, scientific knowledge, scientific investigation, reasoning, and critical thinking	3
	7.1.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	3
	7.1.A.a	Formulate testable questions and hypotheses	3
	7.1.A.b	Analyzing an experiment, identify the components (i.e., independent variable, dependent variables, control of constants, multiple trials) and explain their importance to the design of a valid experiment	3
	7.1.A.c	Design and conduct a valid experiment	4
	7.1.A.d	Recognize it is not always possible, for practical or ethical reasons, to control some conditions (e.g., when sampling or testing humans, when observing animal behaviors in nature)	2
	7.1.A.g	Evaluate the design of an experiment and make suggestions for	3

Strand. Big Idea	Strand. Big Idea. Substrand. CLE	Description	DOK
		reasonable improvements	
	7.1.B	Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations	2
	7.1.B.b	Measure length to the nearest millimeter, mass to the nearest gram, volume to the nearest milliliter, force (weight) to the nearest Newton, temperature to the nearest degree Celsius, time to the nearest second	1
	7.1.B.c	Determine the appropriate tools and techniques to collect, analyze, and interpret data	2
	7.1.B.d	Judge whether measurements and computation of quantities are reasonable	2
	7.1.B.e	Calculate the range, average/mean, percent, and ratios for sets of data	1
	7.1.C	Scientific inquiry includes evaluation of explanations (laws/principles, theories/models) in light of evidence (data) and scientific principles (understandings)	3
	7.1.C.a	Use quantitative and qualitative data as support for reasonable explanations (conclusions)	3
	7.1.C.b	Analyze experimental data to determine patterns, relationships, perspectives, and credibility of explanations (e.g., predict/extrapolate data, explain the relationship between the independent and dependent variable)	3
	7.1.C.c	Identify the possible effects of errors in observations, measurements, and calculations, on the validity and reliability of data and resultant explanations (conclusions)	3
	7.1.C.d	Analyze whether evidence (data) and scientific principles support proposed explanations (laws/principles, theories/models)	3
	7.1.D	The nature of science relies upon communication of results and justification of explanations	3
	7.1.D.a	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 variables, multiple trials, beginning and ending times or temperatures, derived quantities) ? graphs (bar, single, and multiple line) ? equations and writings	3
	7.1.D.c	Explain the importance of the public presentation of scientific	2

Strand. Big Idea	Strand. Big Idea. Substrand. CLE	Description	DOK
		work and supporting evidence to the scientific community (e.g., work and evidence must be critiqued, reviewed, and validated by peers; needed for subsequent investigations by peers; results can influence the decisions regarding future scientific work)	

### ***Item DOK per Reviewer for Biology 2009 Test Forms 1 and 2***

Table C-6 presents 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 differ between forms, 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-6. Item DOK per Reviewer by Item ID Number for Biology 2009 Test Forms 1 (Spring 2009) and 2 (Summer 2009)***

Test Form 1								Test Form 2							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	2	1	1	1	2	1	2	2	1	2	2	2
3	1	1	1	1	1	1	1	3	2	2	1	1	2	2	2
4	1	1	1	1	1	1	1	4	1	1	1	1	1	1	1
5	1	2	2	2	2	2	2	5	1	1	1	1	2	1	1
6								6							
7								7							
8								8							
9								9							
10	2	2	1	2	2	1	2	10	2	2	1	2	2	2	1
11	1	2	1	1	2	1	2	11	1	1	1	2	2	1	1
12	1	1	1	1	1	1	1	12	2	2	2	2	2	2	1
13	2	2	1	2	2	1	2	13	2	2	1	2	2	2	2
14	2	2	2	2	2	1	1	14	2	2	2	2	2	1	1
15	1	1	1	1	1	1	1	15	2	2	1	1	2	1	1
16	2	1	1	1	2	1	1	16	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	17	1	1	1	1	1	1	1
18	1	1	1	1	2	1	2	18	2	2	2	2	2	1	2
19	1	2	1	2	1	1	1	19	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	20	1	1	1	1	1	1	1
21	2	1	1	1	2	1	1	21	2	1	1	1	1	2	1
22								22							
23								23							
24								24							
25								25							
26	1	1	1	1	2	1	1	26	1	1	1	1	1	1	1
27	2	2	2	2	2	2	2	27	1	1	1	1	1	1	1
28	2	2	2	2	2	1	1	28	1	1	1	1	1	1	1
29	2	1	1	1	1	1	1	29	2	2	2	2	2	1	2

Test Form 1								Test Form 2							
Item ID	R1	R2	R3	R4	R5	R6	R7	Item ID	R1	R2	R3	R4	R5	R6	R7
30	2	2	2	2	2	2	2	30	1	1	1	1	1	1	1
31	1	1	1	1	1	1	1	31	1	1	1	1	1	2	1
32	2	2	1	2	2	2	1	32	1	1	1	1	1	1	1
33	1	1	1	2	2	1	1	33	2	1	2	2	2	2	1
34	2	2	1	1	1	1	1	34	2	2	1	2	2	2	1
35	2	2	1	2	2	1	1	35	2	2	1	2	2	2	1
36	1	1	1	1	1	1	1	36	1	1	1	1	1	1	1
37	1	1	1	1	2	1	1	37	2	2	1	2	2	2	1
38	2	2	2	1	1	2	1	38	2	2	2	2	2	1	1
39								39							
40								40							
41								41							
42								42							
43	2	2	1	2	2	1	1	43	2	2	2	2	2	2	1
44	1	1	1	1	1	1	1	44	1	1	1	1	1	1	1
45	1	1	1	1	1	1	1	45	1	1	1	1	1	1	1
46	1	2	1	1	1	1	1	46	2	1	1	2	1	2	1
47	1	1	1	1	2	2	1	47	2	2	1	2	2	2	1
48	2	2	2	2	2	2	3	48	2	2	2	2	2	2	1
49	2	2	2	2	2	2	2	49	2	2	2	2	2	2	1
50	2	2	2	2	2	2	2	50	2	2	2	2	2	2	2
51	2	2	2	3	2	2	2	51	2	2	3	2	2	2	2
52	2	2	3	3	3	2	2	52	2	2	2	3	3	2	2
53	2	3	3	3	3	2	2	53	2	2	3	2	3	3	3
54	2	3	3	3	3	2	2	54	2	2	3	2	3	3	2
55	2	3	3	2	3	3	3	55	3	3	3	3	3	3	3
56	3	3	3	2	3	3	3	56	2	3	3	3	3	3	3
57	2	3	3	3	3	3	3	57	2	2	3	2	3	2	2
58	2	3	2	3	3	2	2								

*Intraclass Correlation:* 0.9354  
*Pairwise Comparison:* 0.6977

*Intraclass Correlation:* 0.9402  
*Pairwise Comparison:* 0.7312

### Items per CLE for Biology 2009 Test Forms 1 and 2

Tables C-7 and C-8 list those items matched to each Biology CLE. Column 1 presents the CLE by code (see Tables C-5 for descriptions). The remaining colored columns list items by sequential item number along with the number of reviewers who assigned the CLE to the item. For example, item number 31 (row 4 below) was matched to the CLE coded as 3.1.B.a by 6 reviewers (31:6). The legend above the list of CLEs and items explains the color-coding with green representing low agreement among reviewers (i.e., 1 reviewer assigned item to CLE), yellow representing moderate agreement (i.e., 3 reviewers assigned item to this CLE), and red representing high agreement (i.e., all 7 reviewers assigned item to CLE). Note that the blanks for many CLEs indicate that these content expectations were not linked to any items by reviewers.

**Table C-7. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=7) for Biology Test Form 1 (Spring 2009)**

Low		Medium		High				
1		3		7				
3								
3.1								
3.1.B								
3.1.B.a	31:6							
3.1.C	36:1							
3.1.C.b	2:6	3:1	19:5	26:1	31:1	43:1	44:4	
3.2								
3.2.A								
3.2.A.c	19:2	44:2						
3.2.B								
3.2.B.a	29:7	34:1						
3.2.B.b	34:6	46:1	47:7					
3.2.F								
3.2.F.a	14:2	26:6						
3.2.F.b	14:5							
3.2.F.c	15:7							
3.3								
3.3.B								
3.3.B.a	4:7	5:1	20:2					
3.3.B.b	5:5	20:5						
3.3.B.e	37:7							
3.3.C	5:1							
3.3.C.a	12:7	36:6						
3.3.C.b	2:1	3:4						

3.3.C.c	3:2	44:1	45:6
3.3.D			
3.3.D.a	13:7	33:7	
3.3.E			
3.3.E.a	38:1		
3.3.E.b	28:7	38:6	
4	30:4		
4.1	18:7	30:1	
4.1.A			
4.1.A.a	11:1	32:1	45:1 46:6
4.1.A.b	1:6	11:1	32:6
4.1.B			
4.1.B.a	10:6	16:7	21:1
4.1.D			
4.1.D.a	10:1	21:6	30:1 35:2 43:6
4.2			
4.2.A			
4.2.A.c	35:5		
4.3			
4.3.B			
4.3.B.b	17:7		
4.3.C			
4.3.C.a	11:5		
4.3.C.c	27:7		
7			
7.1			
7.1.A			
7.1.A.a	48:6	55:7	56:7
7.1.A.b	49:7	50:7	52:7
7.1.A.c	48:1	57:6	58:1
7.1.A.d			
7.1.A.g	53:1		
7.1.B			
7.1.B.b	58:1		
7.1.B.c	51:1	58:1	
7.1.B.d			
7.1.B.e			
7.1.C			
7.1.C.a	54:2		
7.1.C.b	51:1	54:4	
7.1.C.c	53:7		
7.1.C.d	54:1		
7.1.D			

7.1.D.a	1:1	51:5	57:1	58:4
7.1.D.c				

**Table C-8. Items (by Sequential Item Number) Assigned to CLEs by Reviewers (max N=7) for Biology Test Form 2 (Summer 2009)**

Low		Medium		High
1		3		7
3				
3.1				
3.1.B				
3.1.B.a	45:2			
3.1.C				
3.1.C.b	27:7		32:7	
3.2				
3.2.A				
3.2.A.c	33:7			
3.2.B	28:1			
3.2.B.a	5:7		28:4	
3.2.B.b	1:7		28:2	35:7
3.2.F	43:1			
3.2.F.a				
3.2.F.b	18:7		30:6	44:7
3.2.F.c	20:7		30:1	
3.3				
3.3.B				
3.3.B.a	19:7			
3.3.B.b	4:7			
3.3.B.e	31:6			
3.3.C				
3.3.C.a	26:5		45:5	
3.3.C.b	17:1		26:1	36:7
3.3.C.c	17:6			
3.3.D				
3.3.D.a	46:7			
3.3.E				
3.3.E.a				
3.3.E.b	14:7		38:7	
4				
4.1	10:5			
4.1.A	21:3			
4.1.A.a	12:4		16:7	37:2

4.1.A.b	3:7	12:3	21:1	47:7
4.1.B				
4.1.B.a	10:1	11:7	21:1	
4.1.D				
4.1.D.a	13:5	15:4	21:2	29:2 34:6
4.2				
4.2.A				
4.2.A.c	26:1	29:5		
4.3	10:1			
4.3.B				
4.3.B.b	10:1	15:2		
4.3.C				
4.3.C.a	2:7	34:1	37:5	43:6
4.3.C.c	13:2	15:1	31:1	
7				
7.1				
7.1.A				
7.1.A.a	48:6	49:5		
7.1.A.b	48:1	49:2	50:7	57:7
7.1.A.c	56:6			
7.1.A.d				
7.1.A.g				
7.1.B				
7.1.B.b				
7.1.B.c	52:1			
7.1.B.d				
7.1.B.e				
7.1.C				
7.1.C.a	51:2	53:1	55:6	
7.1.C.b	51:4	52:1	53:6	54:7 55:1
7.1.C.c	51:1			
7.1.C.d				
7.1.D				
7.1.D.a	52:5	56:1		
7.1.D.c				

## Appendix D Panelist Comments on EOC Test Items

Tables D-1 through D-2 present panelists' comments on the individual items of the EOC tests, per content area form. To maintain test security, no individual item identifiers are included.

### *English II*

#### English II Test Form 1

***Table D-1. Reviewer Comments on English II Test Form 1 (Spring 2009)***

Item Number	Comments by Reviewer
4	This reviewer is concerned that the answer is more theme than summary.
6	Distractors tend to be more about theme than summarization.
24	None of the answer choices are correct. This is a serious problem.
27	A jewel case may also be defined as a cd/dvd case. This may be confusing to students.
29	The correct answer is not listed in the answer choices. "Character" is not the same as the narrator's "inner sentinel, my conscience, and my guide."

***Table D-2. Debriefing Summary on English II Test Form 1 (Spring 2009)***

**A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?**

- Need more items on R1I1 Making connections. Otherwise pretty good. No real paraphrasing items. On R2B1, need items on allusion, and evaluation of literary techniques. On R2C1 need more items on plot, setting and point of view. On R3B1 need same items as on R2B1, above. In R3C1 items on reasoning, proposed solutions, evaluation of point of view and perspective.
- No. In R2B1, understatement was not utilized. In R2C1, nothing was done with "analyze the development of theme across genres."
- Yes, to an extent. Missing: R.1.E.1 c: glossary, dictionary and thesaurus; R.1.H.1: reflect and paraphrase; R2.B.1: understatement, parallelism; R3.B.1: understatement, parallelism; R.3.C.1: faulty reasoning. etc., solutions.
- Not tested = R2B1 and R3B1 a. understatement, b. parallelism not tested in reading context. Not tested = R2C1 b. character, plot, setting. Overtested = Tone in R2C1 and R3C1. Not tested = R3C1 b and c.
- On R.1.I.1, more items should address this standard. On R.2.B.1, items included previous introduced topics as equally as the ones stated for the grade level. The rest of the items

seemed to cover the standards.

- Under standard R1H1, evaluating text was neglected as was identifying and explaining the relationship between the main idea and supporting details. I would also like to see more items covering R1I1 (text to text connections). I recall no items addressing understatement under literary techniques. I would like to see items concerning faulty reasoning, unfounded inferences, or accuracy and adequacy of evidence.

**B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?**

- Pretty good balance. I was impressed with the distribution across the three levels.
- Yes.
- Yes. For high school I expected Levels 2 and 3 and that is what I found; a substantial number of Level 3 and some Level 1 as well.
- Usually levels that fit the DESE indication, but sometimes lower by one level. Some level ones were not expected at this level.
- Some items, particularly those dealing with R.1.E.1 were difficult to determine the performance level. Most were somewhere between a level 1 and a level 2.
- I believe the second level took a back seat.

**C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?**

- Quite clear and easy to understand. It seems to me that things were clearer than on our last visit. They may have made some slight changes, or it may be that having all of the CLEs available helped.
- Many of the standards made reference to "previously introduced" concepts. Those items should be listed specifically in the standards to avoid confusion.
- Yes to both parts of the question.
- Yes, but the references to "and all skills, devices, techniques previously taught" just doesn't fit an End of Course test.
- With the standards R2B1 and R3B1 including expectations previously introduced in lower grades, it became difficult to differentiate the standard that was being tested. For example, jargon was used on one question, but was found in the grade 7 GLEs and not the grade 10 CLEs.
- Some items were not well written. There are comments from several of our group addressing those specific items.

**D. What is your general opinion of the alignment between the standards and assessment:**

- ii. Acceptable Alignment (3) : 50%
- iii. Needs slight improvement (2) : 33%
- iv. Needs major improvement (1) : 17%

## E. Comments

- Pretty fair passages. I think the state is making some good progress on their tests. Not a lot of wasted questions. Distribution seemed good given the relatively small number of items on the test.
- Did not have all previous grade levels available (2 copies only), and there were items that did address "comprehension skills previously introduced," a statement used in the document.
- Disagreement between out of state evaluators and in-state evaluators regarding level of W2E1 DOK levels. Out-of-state people think these are all level 1, in-state see this as level 2 application of conventions.
- This process has been enlightening.
- With this level of analysis, I believe the discrepancies will be easily remedied.

## English II Test Form 2

**Table D-3. Reviewer Comments on English II Test Form 2 (Summer 2009)**

Item Number	Comments by Reviewer
5	All of the distractors are weak.
24	Try for other answers besides "wonder". Perhaps a synonym for "variety" is closer to author's intent.
24	None of the distractors or the answer are good choices for tone. Kids don't use "wonder" in the way older adults know it. Get some up-to-date vocabulary and accurate word choices.
30	Font of second selection is hard to read; letters are too close to each other.
47	Parallelism is listed as a reading objective, but testing outside of the reading context. Either move Parallelism to the Writing CLEs or test in context of a reading passage.

**Table D-4. Debriefing Summary on English II Test Form 2 (Summer 2009)**

### A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- For R1E1, roots and affixes, glossary, dictionary, thesaurus. For R1h1 paraphrase and summary. All of R1I1. R2B1 allusion, understatement. R2C1: theme across genres, tone. R3B1 allusion. R3C1 faulty reasoning, proposed solutions, accuracy of evidence, effect of tone, author's perspective. In fairness, coverage not bad given number of items.
- Yes.
- Missing: R.1.H.1: reflect; R.2B.1 understatement, parallelism; R.2.C.1: tone; R.3.B.1 understatement and parallelism; R.3.C.1: faulty reasoning, etc., solutions accuracy of

evidence.

- No Understatement on R2B1 or R3B1. No Parallelism on R2B1 or R3B1 R3C1 = no questions on a, b, c.
- For R2C1, analyze the development of a theme. R1H1 seems to be a heavy focus.
- I felt that the items covered the standards well.

**B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?**

- Not quite as good as the Spring form. Fewer DOK 3s.
- Yes
- Yes. DOK 1, 2, and 3 were all used; I expected to find level 3 at this level and I did.
- More level 3s as expected on this test
- These items seemed to have more DOK levels which are appropriate.
- There were not as many DOK level 2 items in this form. This form needs more 2 and 3 level items.

**C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?**

- Good, very clear, fairly easy to work with.
- Yes.
- Yes.
- Yes, except for the CLEs that reference "and all items previously taught or introduced." This makes it impossible to cover everything. Hyperbole came up a few times on this test and it is a middle school GLE.
- Two questions were unclear in the wording of their distractors.
- Most standards were written well. There is a concern that poetry exists only with fiction descriptors. Poetry deserves its own standards apart from fiction or nonfiction.

**D. What is your general opinion of the alignment between the standards and assessment:**

- ii. Acceptable Alignment (3) : 50%
- iii. Needs slight improvement (3) : 50%

**E. Comments**

- Not quite as good a test as the spring form, in my opinion.
- Items seem to be more difficult in this test.

## *Algebra I*

### Algebra I EOC Test Form 1

**Table D-5. Reviewer Comments on Algebra I Test Form 1 (Spring 2009)**

Item Number	Comments by Reviewer
1	This is one example of poor distractors for this problem.
4	This is about using combinations, a data idea but not specified in the CLEs.
4	No CLE for the item.
4	There is no CLE in Algebra for combinations.
4	This is not a specific CLE.
4	CLE does not specify combinations or tree diagrams
14	This problem could also be standard A.2.A.1. It depends on how students would choose to solve it - one equation with one unknown or two equations with two unknowns.
20	This could be done multiple ways. It is unclear which way the writer intended it to be solved. Is this a system of equations (a2d1)? Is this simply using symbolic algebra (A2a1)?
20	The intent was probably algebraic here; however, algebra is not needed.
20	It could also be A.2.D.1 or even N.1.B.1 if the student chose to back-solve the problem.
28	The standards do not mention functional notation.
29	Functional notation is not specified in the standards.
29	Functional notation needs to be included in the CLE.
47	This is one example of poor distractors for this problem which leads to multiple CLEs.

**Table D-6. Debriefing Summary on Algebra I Test Form 1 (Spring 2009)**

**A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?**

- I felt that the Data and Probability standard was not covered as heavily as I was anticipating. In an algebra course it is somewhat expected.
- D1A1 is not represented very well.
- Yes...MOST of them.
- D1A1 has no questions associated with it, AND SHOULD NOT. This is virtually impossible to test at the multiple choice level. There probably ought to be another question or two for D1C1, though. I also feel the A3 and A4 competencies need more items.
- D.1.A.1 cannot really be assessed. A.4.A.1. is not represented in this particular test and is an important part of the algebra content. D.1.C.1 is also not represented either and should be.
- I would agree that most standards were covered or embedded within another standard.

**B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?**

- I feel that it covered items pretty well. I do feel that using equations to solve problems is hard to write a question that will not be solved by guess and check.
- Yes.
- Yes.
- I think there needs to be a few more DOK of "1" to make the assessment more balanced.
- I expected to see more A problems and less N problems.
- Yes, although I was expecting more items to be assessed at a higher level.

**C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?**

- I think the standards are at the appropriate level.
- No, not enough about functional notation as it applies to solving functions.
- Yes.
- Yes.....
- I think that in A.2.B.1 there should be a mention of functions.
- Yes.

**D. What is your general opinion of the alignment between the standards and assessment:**

- ii. Acceptable Alignment (5) : 71%
- iii. Needs slight improvement (2) : 29%

**E. Comments**

**Algebra I EOC Test Form 2****Table D-7. Reviewer Comments on Algebra I Test Form 2 (Summer 2009)**

Item Number	Comments by Reviewer
4	A.2.C.1 could also be used. Solving linear equations is not specifically contained in the standards.
29	The intent of this question is to test algebra, but the problem could easily be solved by back-solving and arithmetic.
43	Combinations are not specified in the CLEs.
43	The counting principle is not a specific GLE and needs to be put into the GLE if tested.
43	There is no CLE at this level that covers this concept.
43	There is no CLE that fits this. The CLEs lack anything referring to fundamental counting principles.
43	Combinations, Permutations, and Fundamental Counting Principle are not specific to a CLE.

**Table D-8. Debriefing Summary on Algebra I Test Form 2 (Summer 2009)**

**A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?**

- D1A1.
- I feel that some of the items were not covered as well as in the spring test. A3A1, A2C1 and D1A1 were never covered.
- No, there are many CLE's that are not represented. A2C1,A3A1, D1A1 have no questions.
- Assessment was acceptable in this area.
- The DATA standard is not well represented as a whole..... there are many NUMBER SENSE items here.....
- The N.1.A.1 and A.2.A.1 are over-represented and the A.3.A.1 and D.1.A.1 are under-represented. The numerical standards should not be the emphasis of the test.
- There is no place for combinations, permutations, and the counting principle in the Data and Probability strand.

**B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?**

- Yes.
- I expected the DOK to be higher; I found more DOK 1 than I expected. I do not think the standards were addressed at the same level as the spring test.
- No, almost all of these questions were DOK level 1. This was a much easier test than the spring test.
- The items did not cover the DOK well. There were far too many DOK's of "1" on this form of the test.....
- The number of items that had a DOK level of 1 seems exceptionally high for this level of student.
- I would expect higher DOK levels for this assessment. There were several level 1 items that could easily be bumped up to a 2 or 3.

**C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?**

- Several of the algebra items, especially the systems type problems could be answered by number work and not algebra.
- Except for testing the Counting Principle and this is not in the standards.
- Yes.
- I felt that this test was in many ways easier than the test given last spring. For appropriate comparisons to be made, all forms of the tests need to be more consistent in difficulty.
- Yes.
- Yes, the standards are okay but the questions on this particular test are significantly easier than those from the Spring 2009 test.
- Yes.

**D. What is your general opinion of the alignment between the standards and assessment:**

- ii. Acceptable Alignment (1) : 14%
- iii. Needs slight improvement (5) : 71%
- iv. Needs major improvement (1) : 14%

**E. Comments**

- The Summer exam is a lot easier than the Spring test. We either need to beef up the summer exam or water down the spring test.
- There are no CLEs for combinations and permutations at this level. It is unfair to include item questions covering this unless teachers are aware of this expectation. Summer 2009 test questions reviewed were much easier (less complex) than the Spring 2009 questions which makes it unfair to compare the data from the 2 sessions with one another.
- One of two situations occurred here. Either the Spring Form we looked at was too hard or the Summer Form was too easy. They were not parallel as far as the DOK's were assigned.....

## *Biology*

### **Biology EOC Test Form 1**

***Table D-9. Reviewer Comments on Biology Test Form 1 (Spring 2009)***

Item Number	Comments by Reviewer
30	This question is not Biology related. It takes a knowledge of Earth Science to arrive at the right answer. In addition, there can be multiple possible correct answers (A, C, or D) that have equal weight in being the "most likely" answer.
30	Possible multiple answers (A, C).

***Table D-10. Debriefing Summary on Algebra I Test Form 1 (Spring 2009)***

**A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?**

- Yes.
- Some very specific terms that were not stated in the Missouri GLEs were used and specific questions were asked about these terms. For example, the term "cytokinesis" was questioned specifically, yet the GLE did not mention the stages of mitosis and only required knowledge of chromosome numbers.
- The items covered most of the important topics of the standards.
- Yes.
- I believe that there were too many questions on the EOC regarding standard #4, especially 4.1. I noticed very few questions relating to 4.2 and 3.2.F.
- Yes, however the CLEs have very general descriptors of mitosis and meiosis and the test questions REPEATEDLY refer to cytokinesis specifically. Interpreting whether or not to instruct student on the specific names of the stages of the cellular processes is difficult to determine.
- No. The purpose of mitosis was not covered. Prediction of molecular movement across a membrane was not covered. Life cycles were not covered. Differential reproductive success was not addressed.

**B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?**

- Yes.
- Yes.
- There seemed to be an unusual number of DOK's at level 1.
- Yes.
- Yes.
- Yes.
- Yes, for those standards that had corresponding assessment pieces.

---

**C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?**

- Yes.
- Yes.
- Yes, the standards were written appropriately.
- Yes.
- There were terms used on the test that students will need to know that are not in the CLEs or the CLEs specifically says that it is not to be tested.
- Yes, we teach General Biology at the 10th grade level so the wording was appropriate for the average student. Rarely was there a question that was poorly written (i.e., number 45 for Session 1 Spring 2009 exam).
- Many standards are too vague. Information addressed is not at the high school level in many cases. Evolution, which is the underlying theme of all biology, was not assessed in that manner.

**D. What is your general opinion of the alignment between the standards and assessment:**

- ii. Acceptable Alignment (5) : 71%
- iii. Needs slight improvement (2) : 29%

**E. Comments**

- Where are life cycles, body systems, disease, prokaryotes, plants, fungi, etc? A one year high school biology course should include exposure to these items in order to produce a scientifically literate high school graduate.

**Biology EOC Test Form 2****Table D-11. Reviewer Comments on Biology Test Form 2 (Summer 2009)**

Item Number	Comments by Reviewer
2	Bacteria are not covered at all in CLEs.
10	There is no CLE on decrease of one sex of a population and impact on future populations.
10	Not a good question and does not match a specific GLE. Wording of answer "B" should be since "some" of the females cannot reproduce.
10	The item is too vague as to have the reviewer "dig into" a standard to find a fit.
10	Too generic, can't identify more specific CLE level.
10	Does not have enough information in the question to justify it going into a specific group.
10	The question emphasizes a change in population size and does not indicate anything about diversity, making it very difficult to select a primary standard/objective.
10	No CLE addresses this item.
12	What exactly is the specific difference between Standard 4.1.A.a and 4.1.A.b? Very difficult to choose between the 2.
21	Question has components that are both biotic and abiotic. Cannot distinguish any further.
21	The question is very general and having a question to select the WRONG answer is extremely misleading.
21	No CLE addresses climate change without including carrying capacity.
28	No CLEs for photosynthesis without comparing with cellular respiration.
32	Mitochondria do not 'release' energy. If that were the case, the cell would catch on fire! Mitochondria MAKE ATP, which is energy storage.
43	Myoglobin not covered in content standards.
43	Oxygen binding or other such biological processes not covered in CLEs. Myoglobin or diving responses, etc. not mentioned.
47	Again, too generic, not able to specify CLE.
47	Again, very little difference between 4.1.A.a and 4.1.A.b...
48	Answer given in stem of question.
49	Answer given in stem of question.

**Table D-12. Debriefing Summary on Algebra I Test Form 2 (Summer 2009)**

**A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?**

- Yes.
- Yes.
- Most of the items fit properly except that item #10 is not specific enough in the stem - the reviewer had to understand that differential reproduction (and survival) rates is one of the

four tenets of natural selection.

- Yes.
- Yes.
- Yes.
- No. Homeostasis, interactions between organelles, evolution as the underlying theme of biology.

**B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?**

- Yes.
- Yes.
- There were many DOKs at the Recall (1) level than the reviewer felt necessary for end-of-course assessment.
- Yes.
- Yes.
- Yes.
- No. Most items were DOK 1, only requiring recall of simple facts. Interpreting disparate data, drawing conclusions, making predictions were only addressed in the constructed response section.

**C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?**

- Yes.
- Yes.
- The standards were written appropriately.
- Some were not specific enough to be able to identify CLEs.
- Yes.
- Terminology is as expected.
- No, as most assessment items were recall-based. Too many environmental questions and not enough questions from other areas of biology. Nothing on prokaryotes, viruses, human disease, human body systems, plants, fungi, etc. I do not consider this a complete biology curriculum for the one exposure that most students get in biology. All biology is NOT environmental science. How can one understand the environment if one does not first understand the organisms that live in it?!

**D. What is your general opinion of the alignment between the standards and assessment:**

- ii. Acceptable Alignment (6) : 86%
- iii. Needs slight improvement (1) : 14%

### **E. Comments**

- Experimental design sections gave answers to the questions in the stems. Experimental design requires that a hypothesis be generated BEFORE an experiment can be designed or data collected.

---

## Appendix E

### Sample Alignment Review Materials

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

#### *English*

#### 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) Biology-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.

## *Algebra I*

### **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 Algebra I, 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 Algebra I Objectives

Use the Algebra I 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 Algebra I 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 Algebra I 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 Algebra I 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 Algebra I Assessment Items

Now try coding some sample assessment items using the Algebra I 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 Algebra I 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

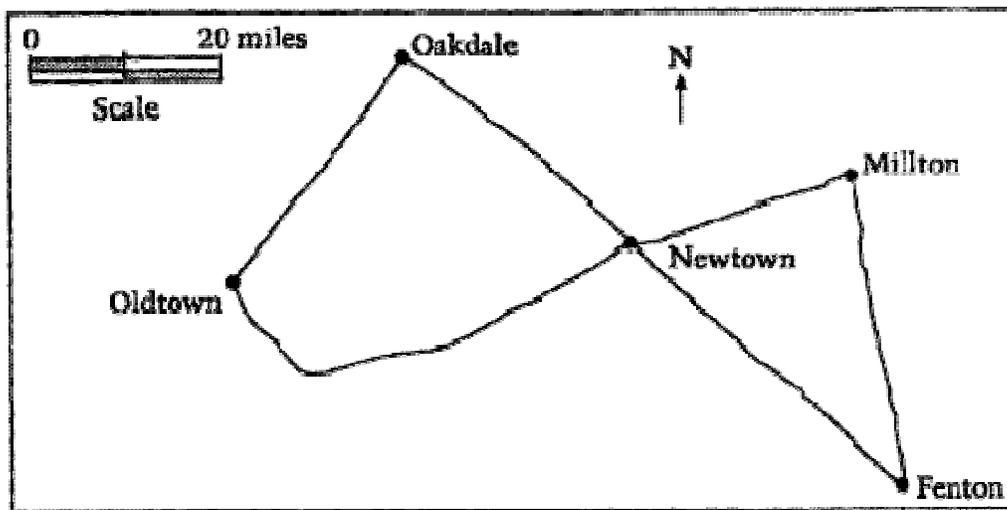
4)

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

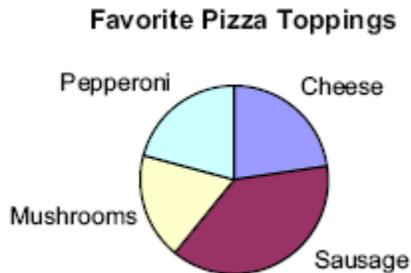
8)

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.

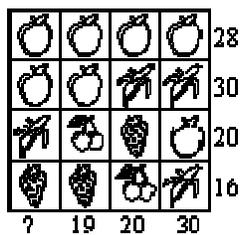


What information would best help you determine the number of people surveyed who preferred sausage?

- 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?

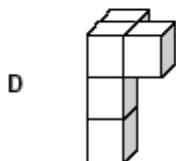
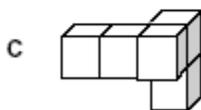
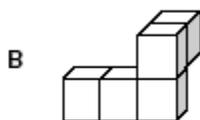
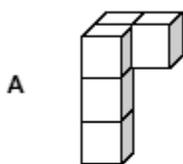
For what values of  $n$ , if any, is it best to be player A?

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 Algebra I 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.

## Biology

### Biology DOK Levels

Please note that, in Biology, “knowledge” can refer both to content knowledge and knowledge of scientific processes. This meaning of knowledge is consistent with the *National Biology Education Standards* (NSES), which terms “Biology 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 Biology 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 Biology 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 Biology 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 Biology Objectives and Assessment Items

### Sample Biology Objectives

Use the Biology 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 Biology 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 Biology 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 Biology is related to other ways of knowing; show how Biology and technology affect our society; and show how people of diverse cultures have contributed to and influenced developments in Biology.
- 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 Biology 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 Biology Assessment Items

Now try coding some sample assessment items using the Biology 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)<sup>1</sup>

---

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

---

<sup>1</sup> [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.]

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

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.

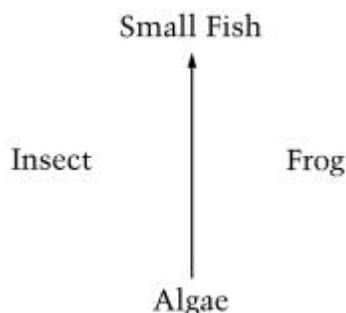
INDIVIDUAL ACTIVITY

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.

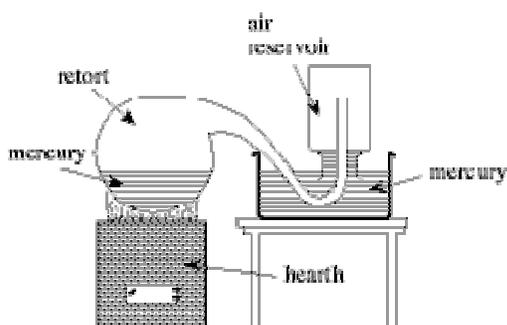
**G.** supporting combustion of another piece of charcoal.

**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?

- a. Give half the mice the drug, the other half none, and compare their tumor rates.
- b. Give the drug to all mice, but only to half every other day, and record tumor rates.
- c. Double the dosage to all mice each day until tumors start to disappear.
- d. 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

Dosage	Days of Treatment						
	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?

- a. The effectiveness of the drug over time depends on the size of the dosage.
- b. The drug is effective over time regardless of the size of the dosage.
- c. The size of the dosage affects tumor size regardless of the length of time.
- d. 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 Biology 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 grade level expectations (GLEs) electronically into the Webb Alignment Tool (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 English II as an example.

The screenshot shows a web browser window displaying the Webb Alignment Tool (WAT) website. The page title is "Missouri Communication Arts Grade 3 2009, Language Arts, Grade 3". The table below lists various standards and their corresponding DOK levels.

Level	Description	DOK
R	Reading	2
R.1	Develop and apply skills and strategies to the reading process	3
R.1.a.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.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
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 EOC 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.

