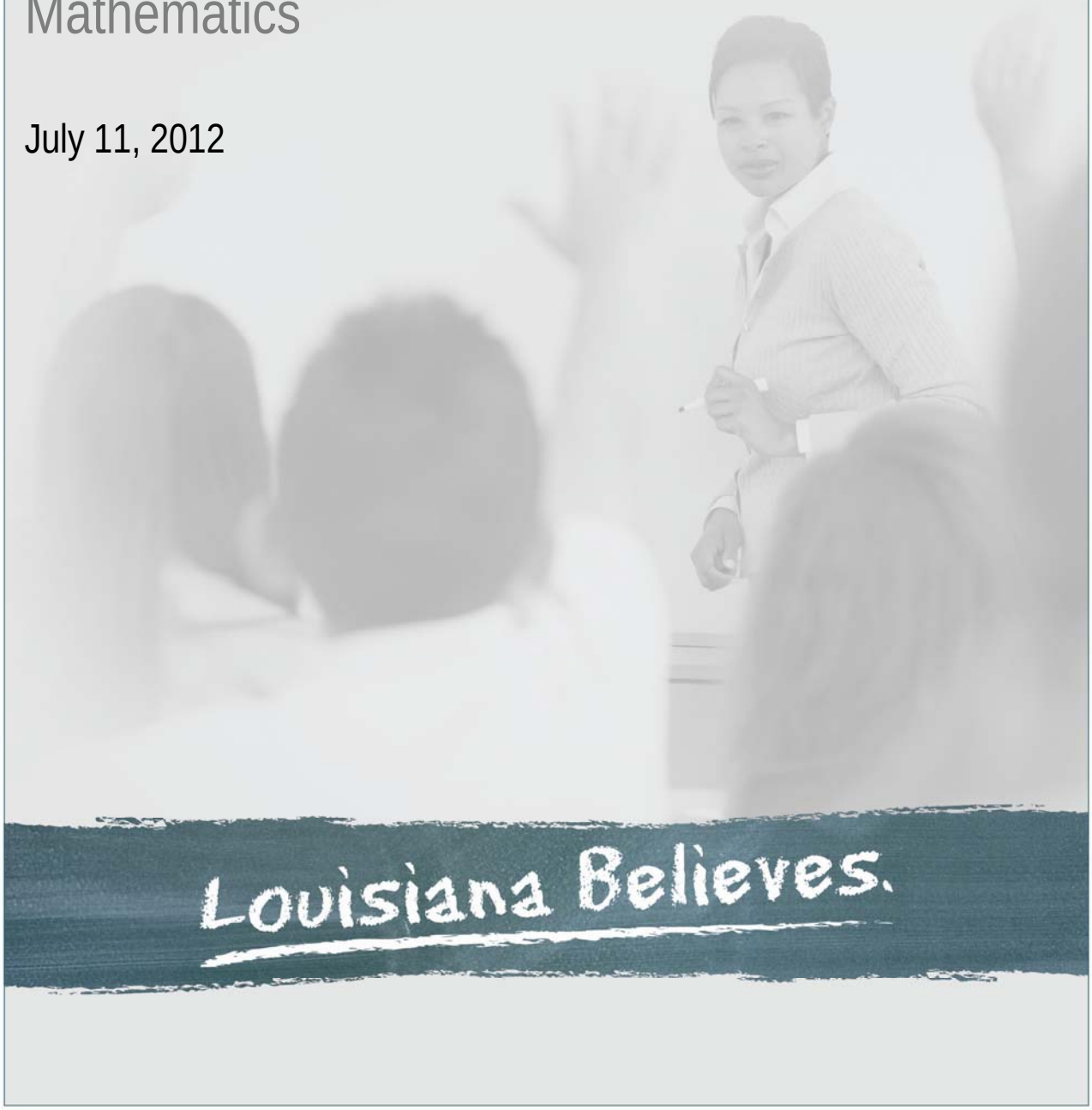
Preview of Common Core State Standards Sample EAGLE Items

Grade 8

Mathematics

July 11, 2012



Grade 8

Technology-enabled, multiple-part, constructed-response item types use a common context and contain several prompts that increase in difficulty or cognitive complexity and guide students to a culminating activity. This type of item can show where a student is within the difficulty or cognitive complexity ranges within a particular standard. It can also be a very effective item type to connect content and practices and assess both conceptual and procedural skills.

The first item assesses the practice standards by making use of structure (MP.7) and looking for regularity (MP.8). A student with a good understanding of exponents and place value will be able to complete this item quickly and more successfully than a student who is only familiar with whole-number exponents.

The second item assesses a student's ability to show the process of solving an equation rather than only finding an answer. Multiple-choice items that ask students for a solution are prone to test-taking strategies such as substituting each answer choice into the equation. In this sample item, there are three different solutions possible, giving the student more room for creativity while providing more information to the teacher.

The third item scaffolds a very challenging task so a Grade 8 student who understands the concept of a proof can complete the task. At the same time, the item aligns to multiple practice standards (MP.1, 2, 3, 7, and 8) by keeping the method of the proof open-ended.

The fourth item creates a work-centered context requiring volume calculations without using the word *volume*. This approach requires the student to understand the problem (MP.1), find the volume formulas needed (MP.5), and use proportional reasoning with units to answer the second question (MP.2 and MP.6).

The fifth item provides a mostly linear set of data to plot and analyze with a trend line (MP.4). The item assesses the student's depth of understanding by including an outlier and asking for an explanation as to the range over which the trend line would be useful for making predictions.

UIN:	E18001	Subject:	Math	Grade:	8	Item Type:	CR
CCSS:	8.EE.01	Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 3^2 × 3^–5 = 3^–3 = 1/3^3 = 1/27.					
Practice standard(s):		7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.					

MC Key:		Item Name:	Descending powers of 10	Calc	NC	Est. Difficulty:	M	DOK	2
Points:	0–3	Accommodations:		Scoring Method:		AS			
Passage Title(s):									
Source info:									

Part A

Type numbers in the boxes below to complete the pattern of exponents and equivalent values.

$10^5 = 100{,}000$

$10^4 = 10{,}000$

$10^3 = 1{,}000$

$10^{\square} =$ ☐

$10^{\square} =$ ☐

$10^{\square} =$ ☐

$10^{\square} =$ ☐

$10^{\square} =$ ☐

Part B

Write a number in the box that is equivalent to the expression.

$10^{-5} \times 10^2 \times 10^0 =$ ☐

Rubric

Exemplary Response

Part A

$10^2 = 100$

$10^1 = 10$

$10^0 = 1$

$10^{-1} = 0.1$

$10^{-2} = 0.01$

Part B

0.001

Scoring Notes

Fractions may be used in place of decimals in part A.
Fractions or exponential form may be used in place of decimal in part B.

Points Assigned

- 1 point for correct answers in the first three problems in part A
- 1 point for correct answers in the last two problems in part A
- 1 point for correct value in part B

Scoring Rubric

Score	Description
3	3 points
2	2 points
1	1 point
0	The student's response is incorrect or blank.

UIN:	E18002	Subject:	Math	Grade:	8	Item Type:	CR
CCSS:	8.EE.07b	Solve linear equations in one variable. b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.					
Practice standard(s):		2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others.					
MC Key:	NA	Item Name:	drag-and-drop solving	Calculator	CN	Est. Difficulty:	M	DOK	2
Points:	0–2	Accommodations:		Scoring Method:		AS			
Passage Title(s):									
Source info:									

Show how to solve this equation for *x*.

$3(2x - 5) + 9 = 12$

Drag selected equations to the Solution Steps column and place them in the correct order under the given equation.

You must show **at least** 4 steps in the correct order to receive full credit.

Leave unneeded equations in the Equations column.

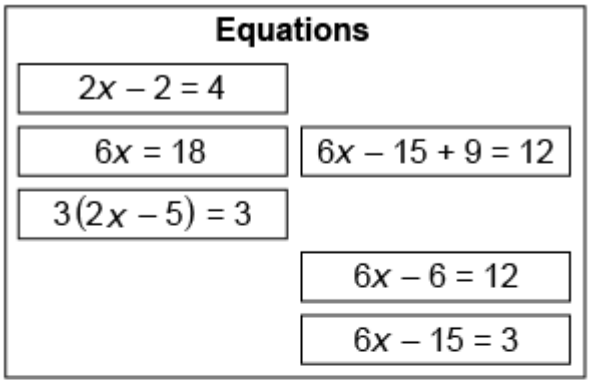
Equations	
$2x - 2 = 4$	$x = 3$
$6x = 18$	$6x - 15 + 9 = 12$
$3(2x - 5) = 3$	$2x - 5 + 3 = 4$
$2x - 5 = 1$	$6x - 6 = 12$
$2x = 6$	$6x - 15 = 3$

Step	Solution Steps
Given	$3(2x - 5) + 9 = 12$
1	
2	
3	
4	
5	

RESET

Rubric

Exemplary Response



Step	Solution Steps
Given	$3(2x - 5) + 9 = 12$
1	$2x - 5 + 3 = 4$
2	$2x - 5 = 1$
3	$2x = 6$
4	$x = 3$
5	

RESET

Points Assigned

- 2 points for correct solution with 4 steps
  OR
- 1 point for correct solution with 3 steps

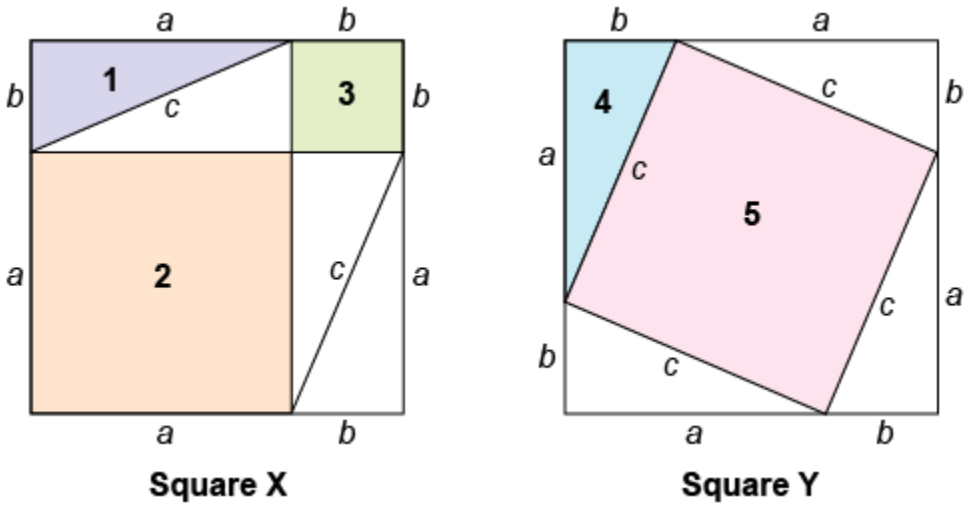
Scoring Rubric

Score	Description
2	2 points
1	1 point
0	The student's response is incorrect, blank, or has fewer than three steps.

UIN:	E18003	Subject:	Math	Grade:	8	Item Type:	CR
CCSS:	8.G.06	Explain a proof of the Pythagorean Theorem and its converse.					
Practice standard(s):		1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.					

MC Key:		Item Name:	Prove Pythagorean Theorem	Calc	CN	Est. Difficulty:	M	DOK	2
Points:	0–4	Accommodations:		Scoring Method:		Mixed			
Passage Title(s):									
Source info:									

Use the two diagrams to answer the question.



The diagram shows two congruent squares divided in different ways. For both squares, each side has been divided into the same two lengths, *a* and *b*.

Part A

Give the area of each shaded region in terms of *a*, *b*, and/or *c*.

Area 1 =	
Area 2 =	
Area 3 =	
Area 4 =	
Area 5 =	

Part B

The diagram provides a basis for proving the Pythagorean theorem for right triangles, $a^2 + b^2 = c^2$, where a and b are the lengths of the legs of the right triangle and c is the length of the hypotenuse.

The statements in the table prove that $a^2 + b^2 = c^2$. For each statement, write a brief justification of the truth of the statement in the right-hand column.

Step	Statement	Justification
1	Each side of each square is divided into the same two parts, a and b.	Given
2	Squares X and Y are congruent.	Given
3	Area of Square X = Area of Square Y	Squares X and Y are congruent.
4	Area of Square X = $a^2 + b^2 + 4(\frac{ab}{2}) = a^2 + b^2 + 2ab$	
5	Area of Square Y = $c^2 + 4(\frac{ab}{2}) = c^2 + 2ab$	
6	$a^2 + b^2 + 2ab = c^2 + 2ab$	
7	$a^2 + b^2 = c^2$	

Rubric

Exemplary Responses

Part A

Area 1 =	$\frac{ab}{2}$
Area 2 =	a^2
Area 3 =	b^2
Area 4 =	$\frac{ab}{2}$
Area 5 =	c^2

Part B

Step	Statement	Justification
1	Each side of each square is divided into the same two parts, *a* and *b*.	Given
2	Squares X and Y are congruent.	Given
3	Area of Square X = Area of Square Y	Squares X and Y are congruent.
4	Area of Square X = $a^2 + b^2 + 4(\frac{ab}{2}) = a^2 + b^2 + 2ab$	Total area of an object equals the sum of all the partial areas within it.
5	Area of Square Y = $c^2 + 4(\frac{ab}{2}) = c^2 + 2ab$	Total area of an object equals the sum of all the partial areas within it.
6	$a^2 + b^2 + 2ab = c^2 + 2ab$	Substitution
7	$a^2 + b^2 = c^2$	Subtracted same thing from both sides

Points Assigned

- 1 point for areas of shaded squares
- 1 point for areas of shaded triangles
- 0–2 points for the justifications (holistic)

Scoring Rubric

Score	Description
4	4 points
3	3 points
2	2 points
1	1 point or demonstrates minimal understanding of constructing a proof
0	The student's response is incorrect, irrelevant, too brief to evaluate, or blank.

UIN:	E18004	Subject:	Math	Grade:	8	Item Type:	CR
CCSS:	8.G.09	Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.					
Practice standard(s):		1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 5. Use appropriate tools strategically. 6. Attend to precision.					

MC Key:	NA	Item Name:	Ice cream cone design	Calc	C	Est. Difficulty:	M	DOK	2
Points:	0–3	Accommodations:		Scoring Method:		AS			
Passage Title(s):									
Source info:									

Use the diagram of the ice cream cone to answer the question.

IceScream is a manufacturer of premade ice cream cones and is looking for a new design to set itself apart from the competition. IceScream's creative director has proposed a waffle cone 16 centimeters high and 8 centimeters in diameter with a sphere of ice cream with the same diameter set in the cone. The company president asks two questions about the design:

1) If all the ice cream melted, is the waffle cone large enough to hold all the liquid?
2) How many filled cones will they be able to make using a 100-liter batch of ice cream? (1 liter = 1,000 cm^3)

As a junior engineer in the company, you are asked to determine the answers to the president's questions. Show your work, including units.

Question 1:	

Question 2:	

Rubric

Exemplary Responses

Question 1:	Volume of the sphere = (4/3)(pi)(4^3) = 268 cubic centimeters Volume of the cone = bh /3 = (1/3)(pi)(4^2)(16) = 268 cc, so yes, just barely OR Volume of the sphere = (4/3)(pi)(r^3) = (4/3)(pi)(4^3) = 4^4(pi)/3 Volume of the cone = bh/3 = (1/3)(pi)(4^2)(16) = 4^4(pi)/3 So they are exactly the same.

Question 2:	100 L = 100,000 cc 100,000 cc/268 cc/cone = 373 cones.

Points Assigned

- 1 point for finding volume of the ice cream
- 1 point for finding the volume of the cone
- 1 point for finding how many cones can be made using 100 liters of ice cream

Scoring Rubric

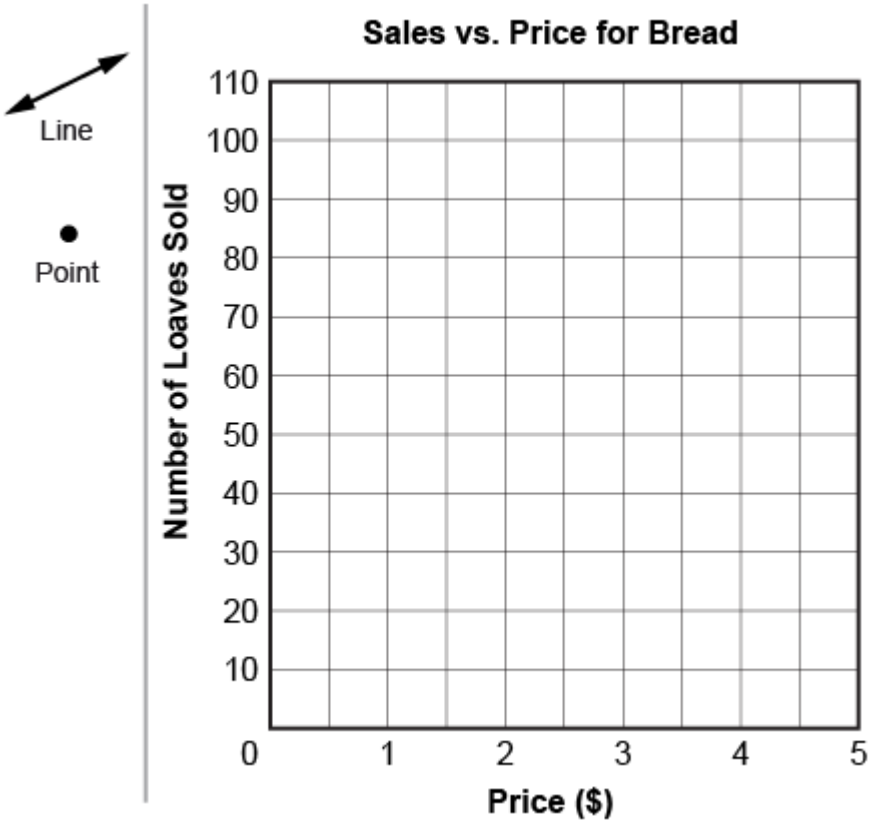
Score	Description
3	3 points
2	2 points
1	1 point or demonstrates minimal understanding of finding volume
0	The student's response is incorrect, irrelevant, too brief to evaluate, or blank.

UIN:	E18005	Subject:	Math	Grade:	8	Item Type:	CR
CCSS:	8.SP.02	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.					
Practice standard(s):		3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.					

MC Key:		Item Name:	Bakery data	Calc	C	Est. Difficulty:	M	DOK	2
Points:	0–3	Accommodations:		Scoring Method:		mixed			
Passage Title(s):									
Source info:									

A bakery collected data on the price they charged for a loaf of bread and the number of loaves sold at that price.

Sales vs. Price for Bread	
Price	**Number of Loaves**
$2.00	105
$3.00	80
$3.50	63
$4.00	45
$4.50	6



Part A

Graph the data with the point tool and then draw a trend line for the data.

To draw a point or a line, drag the appropriate tool to the grid. Position a selected line by dragging the handles. To remove a point or line, drag it outside of the grid.

Part B

In what price range does your trend line do a good job of predicting sales? Outside this range, what differences are there between your trend line and actual sales? Explain your reasoning.

Rubric

Exemplary Responses

Part A

Part B

The trend line fits the data well between $2 and $4. Since it did not predict the actual sales at a price of $4.50, it would not be reliable at higher prices. It might be accurate for lower prices close to $2, but probably would not be accurate for very low prices.

Scoring Notes

Part A: Line does not have to be perfectly accurate but should not attempt to include the outlier.
Part B: Discussion should make it clear why the trend line is not going to be accurate at high prices, at least.

Points Assigned

- 1 point for plotting data correctly
- 1 point for drawing a trend line that does not include the outlier
- 1 point for an acceptable discussion of the data

Scoring Rubric

Score	Description
3	3 points
2	2 points
1	1 point or demonstrates minimal understanding of plotting data and drawing a trend line
0	The student's response is incorrect, irrelevant, too brief to evaluate, or blank.