



**pennsylvania**  
DEPARTMENT OF EDUCATION



**PENNSYLVANIA  
KEYSTONE EXAMS**

**ALGEBRA I**

**ITEM AND SCORING SAMPLER**

**2015**

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## INTRODUCTION

The Pennsylvania Department of Education (PDE) provides districts and schools with tools to assist in delivering focused instructional programs aligned to the Pennsylvania Core Standards. These tools include the standards, assessment anchor documents, assessment handbooks, and content-based item and scoring samplers. This 2015 Algebra I Item and Scoring Sampler is a useful tool for Pennsylvania educators in preparing students for the Keystone Exams.

This Item and Scoring Sampler contains released operational multiple-choice and constructed-response items that have appeared on previously administered Keystone Exams. These items will not appear on any future Keystone Exams. Released items provide an idea of the types of items that have appeared on operational exams and that will appear on future operational Keystone Exams. Each item has been through a rigorous review process to ensure alignment with the Assessment Anchors and Eligible Content. This sampler includes items that measure a variety of Assessment Anchor or Eligible Content statements, but it does not include sample items for all Assessment Anchor or Eligible Content statements.

The items in this sampler may be used as examples for creating assessment items at the classroom level, and they may also be copied and used as part of a local instructional program.<sup>1</sup> Classroom teachers may find it beneficial to have students respond to the constructed-response items in this sampler. Educators can then use the sampler as a guide to score the responses either independently or together with colleagues.

## ABOUT THE KEYSTONE EXAMS

The Keystone Exams are end-of-course assessments currently designed to assess proficiencies in Algebra I, Biology, and Literature. The Pennsylvania Department of Education continues to evaluate the implementation schedule for additional subjects, including English Composition, Civics and Government, U.S. History, World History, Algebra II, Geometry, and Chemistry. The Keystone Exams are just one component of Pennsylvania's high school graduation requirements. Students must also earn state-specified credits, complete a culminating project, and complete any additional district requirements to receive a Pennsylvania high school diploma.

For detailed information about how the Keystone Exams are being integrated into the Pennsylvania graduation requirements, please contact the Pennsylvania Department of Education or visit the PDE website at <http://www.education.pa.gov>.

### Alignment

The Algebra I Keystone Exam consists of exam questions grouped into **two modules**: Operations and Linear Equations & Inequalities and Linear Functions and Data Organizations. Each module corresponds to specific content aligned to statements and specifications included in the course-specific Assessment Anchor documents. The Algebra I content included in the Keystone Algebra I multiple-choice items will align with the Assessment Anchors as defined by the Eligible Content statements. The process skills, directives, and action statements will also specifically align with the Assessment Anchors as defined by the Eligible Content statements.

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<sup>1</sup> The permission to copy and/or use these materials does not extend to commercial purposes.

The content included in Algebra I constructed-response items aligns with content included in the Eligible Content statements. The process skills, directives, and action statements included in the performance demands of the Algebra I constructed-response items align with specifications included in the Assessment Anchor statements, the Anchor Descriptor statements, and/or the Eligible Content statements. In other words, the verbs or action statements used in the constructed-response items or stems can come from the Eligible Content, Anchor Descriptor, or Assessment Anchor statements.

### Depth of Knowledge

Webb's Depth of Knowledge (DOK) was created by Dr. Norman Webb of the Wisconsin Center for Education Research. Webb's definition of depth of knowledge is the cognitive expectation demanded by standards, curricular activities, and assessment tasks. Webb's DOK includes four levels, from the lowest (basic recall) level to the highest (extended thinking) level.

Depth of Knowledge	
Level 1	Recall
Level 2	Basic Application of Skill/Concept
Level 3	Strategic Thinking
Level 4	Extended Thinking

Each Keystone item has been through a rigorous review process and is assigned a DOK level. For additional information about depth of knowledge, please visit the PDE website at [http://static.pdesas.org/Content/Documents/Keystone\\_Exam\\_Program\\_Overview.pdf](http://static.pdesas.org/Content/Documents/Keystone_Exam_Program_Overview.pdf).

### Exam Format

The Keystone Exams are delivered in a paper-and-pencil format as well as in a computer-based online format. The multiple-choice items require students to select the best answer from four possible answer options and record their answers in the spaces provided. The correct answer for each multiple-choice item is worth one point. The constructed-response items require students to develop and write (or construct) their responses. Constructed-response items in Algebra I are scored using item-specific scoring guidelines based on a 0–4-point scale. Each multiple-choice item is designed to take about one to one and a half minutes to complete. Each constructed-response item is designed to take about 10 minutes to complete. The estimated time to respond to a test question is the same for both test formats. During an actual exam administration, students are given additional time as necessary to complete the exam.

## ITEM AND SCORING SAMPLER FORMAT

This sampler includes the test directions, scoring guidelines, and formula sheet that appear in the Keystone Exams. Each sample multiple-choice item is followed by a table that includes the alignment, answer key, DOK, the percentage<sup>2</sup> of students who chose each answer option, and a brief answer option analysis or rationale. Each constructed-response item is followed by a table that includes the item alignment, DOK, and the mean student score. Additionally, each of the included item-specific scoring guidelines is combined with sample student responses representing each score point to form a practical, item-specific scoring guide. The General Description of Scoring Guidelines for Algebra I should be used if any additional item-specific scoring guidelines are created for use within local instructional programs.

**Example Multiple-Choice Item Information Table**

Item Information				Option Annotations	
<b>Alignment</b>		Assigned AAEC		Brief answer option analysis or rationale	
<b>Answer Key</b>		Correct Answer			
<b>Depth of Knowledge</b>		Assigned DOK			
<b><i>p</i>-values</b>					
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>		
Percentage of students who selected each option					

**Example Constructed-Response Item Information Table**

Alignment	Assigned AAEC	Depth of Knowledge	Assigned DOK	Mean Score	

<sup>2</sup> All *p*-value percentages listed in the item information tables have been rounded.

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## ALGEBRA I EXAM DIRECTIONS

Below are the exam directions available to students. These directions may be used to help students navigate through the exam.

Formulas that you may need to solve questions in this module are found on page 7 of this test booklet. You may refer to the formula page at any time during the exam.

You may use a calculator on this module. When performing operations with  $\pi$  (pi), you may use either calculator  $\pi$  or the number 3.14.

There are two types of questions in each module.

### Multiple-Choice Questions

These questions will ask you to select an answer from among four choices.

- First read the question and solve the problem on scratch paper. Then choose the correct answer.
- Only one of the answers provided is correct.
- If none of the choices matches your answer, go back and check your work for possible errors.
- Record your answer in the Algebra I answer booklet.

### Constructed-Response Questions

These questions will require you to write your response.

- These questions have more than one part. Be sure to read the directions carefully.
- You cannot receive the highest score for a constructed-response question without completing all the tasks in the question.
- If the question asks you to show your work or explain your reasoning, be sure to show your work or explain your reasoning. However, not all questions will require that you show your work or explain your reasoning. If the question does not require that you show your work or explain your reasoning, you may use the space provided for your work or reasoning, but the work or reasoning will not be scored.
- All responses must be written in the appropriate location within the response box in the Algebra I answer booklet. Some answers may require graphing, plotting, labeling, drawing, or shading. If you use scratch paper to write your draft, be sure to transfer your final response to the Algebra I answer booklet.

### If you finish early, you may check your work in Module 1 [or Module 2] only.

- Do not look ahead at the questions in Module 2 [or back at the questions in Module 1] of your exam materials.
- After you have checked your work, close your exam materials.

You may refer to this page at any time during this portion of the exam.

## GENERAL DESCRIPTION OF SCORING GUIDELINES FOR ALGEBRA I

### 4 POINTS

- The response demonstrates a *thorough* understanding of the mathematical concepts and procedures required by the task.
- The response provides correct answer(s) with clear and complete mathematical procedures shown and a correct explanation, as required by the task. Response may contain a minor “blemish” or omission in work or explanation that does not detract from demonstrating a *thorough* understanding.

### 3 POINTS

- The response demonstrates a *general* understanding of the mathematical concepts and procedures required by the task.
- The response and explanation (as required by the task) are mostly complete and correct. The response may have minor errors or omissions that do not detract from demonstrating a *general* understanding.

### 2 POINTS

- The response demonstrates a *partial* understanding of the mathematical concepts and procedures required by the task.
- The response is somewhat correct with *partial* understanding of the required mathematical concepts and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

### 1 POINT

- The response demonstrates a *minimal* understanding of the mathematical concepts and procedures required by the task.

### 0 POINTS

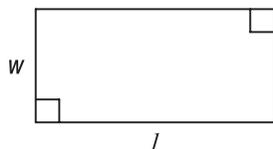
- The response has no correct answer and *insufficient* evidence to demonstrate any understanding of the mathematical concepts and procedures required by the task for that grade level.

## FORMULA SHEET

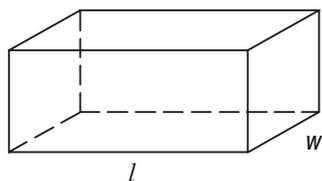
Formulas that you may need to work questions in this sampler are found below.

You may refer to this page at any time during this module.

You may use calculator  $\pi$  or the number 3.14.



$$A = lw$$



$$V = lwh$$

## Linear Equations

$$\text{Slope: } m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{Point-Slope Formula: } (y - y_1) = m(x - x_1)$$

$$\text{Slope-Intercept Formula: } y = mx + b$$

$$\text{Standard Equation of a Line: } Ax + By = C$$

## Arithmetic Properties

$$\text{Additive Inverse: } a + (-a) = 0$$

$$\text{Multiplicative Inverse: } a \cdot \frac{1}{a} = 1$$

$$\text{Commutative Property: } a + b = b + a$$
$$a \cdot b = b \cdot a$$

$$\text{Associative Property: } (a + b) + c = a + (b + c)$$
$$(a \cdot b) \cdot c = a \cdot (b \cdot c)$$

$$\text{Identity Property: } a + 0 = a$$
$$a \cdot 1 = a$$

$$\text{Distributive Property: } a \cdot (b + c) = a \cdot b + a \cdot c$$

$$\text{Multiplicative Property of Zero: } a \cdot 0 = 0$$

$$\text{Additive Property of Equality:}$$
$$\text{If } a = b, \text{ then } a + c = b + c$$

$$\text{Multiplicative Property of Equality:}$$
$$\text{If } a = b, \text{ then } a \cdot c = b \cdot c$$

## ALGEBRA I MODULE 1

### MULTIPLE-CHOICE ITEMS

1. Two expressions are shown below.

$$\pi x \quad x^2$$

For which value of  $x$  is the value of  $\pi x$  **greater** than the value of  $x^2$ ?

- A.  $x = -2$
- B.  $x = 0$
- C.  $x = 1.5$
- D.  $x = 9$

Item Information				Option Annotations
<b>Alignment</b>		A1.1.1.1.1		A student could determine the <b>correct</b> answer, option C, by setting up the inequality $\pi x > x^2$ . This results in $0 < x < \pi$ , since $x$ must be a positive number. Of the given answer choices, only $x = 1.5$ falls into this interval.
<b>Answer Key</b>		C		
<b>Depth of Knowledge</b>		1		
<b>p-values</b>				A student could arrive at an <b>incorrect</b> answer by making a comparison error or by making a sign error. For example, a student could arrive at option A by incorrectly cancelling out the negative signs, resulting in $6.28 > 4$ .
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
13%	9%	61%	17%	

2. Which shows a correct procedure to simplify  $3\sqrt{8}$ ?
- A.  $3\sqrt{8} = 3\sqrt{4 \cdot 2} = 3\sqrt{4} \cdot \sqrt{2} = 6\sqrt{2}$
- B.  $3\sqrt{8} = 3\sqrt{4 \cdot 2} = 3\sqrt{4} \cdot \sqrt{2} = 12\sqrt{2}$
- C.  $3\sqrt{8} = 3\sqrt{3 + 3 + 2} = 3(\sqrt{3 + 3} + \sqrt{2}) = 3 + 3\sqrt{2} = 6\sqrt{2}$
- D.  $3\sqrt{8} = 3\sqrt{3 + 3 + 2} = 3(\sqrt{3 + 3} + \sqrt{2}) = 9 + 3\sqrt{2} = 12\sqrt{2}$

Item Information				Option Annotations
<b>Alignment</b>		A1.1.1.3.1		A student could determine the <b>correct</b> answer, option A, by factoring 8 into $4 \cdot 2$ , simplifying the $\sqrt{4}$ to 2, and then multiplying $3 \cdot 2 = 6$ , which results in $6\sqrt{2}$ .
<b>Answer Key</b>		A		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				A student could arrive at an <b>incorrect</b> answer by incorrectly simplifying $\sqrt{8}$ . For example, a student could arrive at option D by expanding 8 to $3 + 3 + 2$ , incorrectly distributing the square root over addition, incorrectly simplifying $\sqrt{3 + 3}$ to 3, distributing the 3 to each term, and incorrectly adding the constant term (3) to the coefficient of $3\sqrt{2}$ .
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
57%	20%	17%	6%	

3. The list below shows the items Ethan and his friends bought for lunch.

- 2 sandwiches for \$5.29 each
- 2 burgers for \$6.79 each
- 1 bowl of soup for \$3.89
- 5 drinks for \$1.19 each

They paid 8% tax. They then paid a tip that was about twice the amount of the tax they paid. Which is the **closest estimate** of the total amount Ethan and his friends paid for their food, drinks, tax, and tip?

- A. \$22
- B. \$33
- C. \$43
- D. \$51

Item Information		Option Annotations	
<b>Alignment</b>	A1.1.1.4.1	<p>A student could determine the <b>correct</b> answer, option C, by rounding each dollar amount to the nearest whole dollar, simplifying the expression <math>2 \cdot 5 + 2 \cdot 7 + 1 \cdot 4 + 5 \cdot 1 = 10 + 14 + 4 + 5 = 33</math>. By rounding 8% to 10%, the tax is about \$3.30 and the tip is about <math>2 \cdot 3.3 = \\$6.60</math>, which combines to \$9.90 or \$10. Adding \$10 to \$33 yields an answer of \$43.</p> <p>A student could arrive at an <b>incorrect</b> answer by using only the dollar amounts, not including tax and tip, or by rounding every dollar amount up to the next dollar. For example, a student could arrive at option A by rounding each dollar amount to the nearest whole dollar, adding those amounts together to get \$17, adding a tax and tip of \$5 (10% of 17 plus <math>2 \cdot 10\%</math> of 17, rounded down) to arrive at a total of <math>\\$17 + \\$5 = \\$22</math>.</p>	
<b>Answer Key</b>	C		
<b>Depth of Knowledge</b>	2		
<b>p-values</b>			
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
12%	16%	63%	9%

4. The difference of 2 polynomial expressions is shown below.

$$(-2x^2 + wx - 4) - (x^2 + 5x + 6) = -3x^2 - 10$$

What is the value of  $w$ ?

- A. -8
- B. -5
- C. 2
- D. 5

Item Information				Option Annotations
<b>Alignment</b>		A1.1.1.5.1		A student could determine the <b>correct</b> answer, option D, by setting the difference of the $x$ -terms to 0 since there is no $x$ -term in the difference expression: $wx - 5x = 0$ . Solving for $w$ results in $wx = 5x$ , or $w = 5$ .
<b>Answer Key</b>		D		
<b>Depth of Knowledge</b>		2		
<b><i>p</i>-values</b>				A student could arrive at an <b>incorrect</b> answer by making a sign error or by incorrectly using a coefficient of the $x^2$ -term. For example, a student could arrive at option C by incorrectly setting the difference of the $x$ -terms to equal the $x^2$ -term in the difference expression: $wx - 5x = -3x$ . Solving for $w$ results in $wx = 2x$ , or $w = 2$ .
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
17%	24%	27%	32%	

5. Keyshawn buys 100 baseball cards to start a collection. He purchases 25 more baseball cards each week. Which equation could be used to represent the number of baseball cards ( $b$ ) in Keyshawn's collection after  $w$  weeks?
- A.  $w = 25b + 100$
- B.  $w = 100b + 25$
- C.  $b = 25w + 100$
- D.  $b = 100w + 25$

Item Information				Option Annotations
<b>Alignment</b>		A1.1.2.1.1		A student could determine the <b>correct</b> answer, option C, by interpreting "25 more baseball cards each week" as multiplying 25 and $w$ (the number of weeks). Of the given answer choices, only $b = 25w + 100$ uses $25w$ .
<b>Answer Key</b>		C		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				A student could arrive at an <b>incorrect</b> answer by incorrectly interpreting what the numbers and the variables represent. For example, a student could arrive at option B by switching the variables $b$ and $w$ in the equation and by switching the values 25 and 100 in the equation.
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
17%	8%	71%	4%	

6. One of the steps Lewis used to correctly solve an equation is shown below.

$$3(x - 7) + 40 = -5$$

$$3x - 21 + 40 = -5$$

Which statements describe the procedure Lewis used in this step of solving the equation and identify the property that justifies that procedure?

- A. Lewis added 3 and  $x$  to eliminate the parentheses. This procedure is justified by the associative property.
- B. Lewis added 3 and  $x$  to eliminate the parentheses. This procedure is justified by the distributive property.
- C. Lewis multiplied  $x$  and 7 by 3 to eliminate the parentheses. This procedure is justified by the associative property.
- D. Lewis multiplied  $x$  and 7 by 3 to eliminate the parentheses. This procedure is justified by the distributive property.

Item Information				Option Annotations
<b>Alignment</b>		A1.1.2.1.2		<p>A student could determine the <b>correct</b> answer, option D, by recognizing that to go from <math>3(x - 7)</math> to <math>3x - 21</math>, both terms of <math>x - 7</math> were multiplied by 3, which is justified by the distributive property.</p> <p>A student could arrive at an <b>incorrect</b> answer by incorrectly interpreting how to go from <math>3(x - 7)</math> to <math>3x - 21</math> or by identifying an incorrect property. For example, a student could arrive at option A by thinking <math>3x</math> is equivalent to <math>3 + x</math> and by incorrectly selecting the associative property.</p>
<b>Answer Key</b>		D		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
5%	10%	12%	<b>73%</b>	

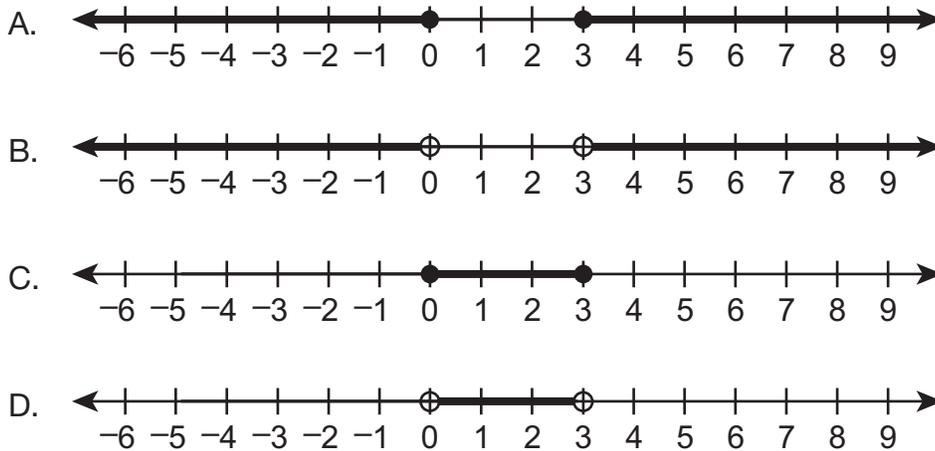
7. Raul has \$640 saved, and Jaime has \$320 saved. They each begin a new job on the same day and save all of their money. Raul earns \$180 per day, and Jaime earns \$200 per day. In how many days will they have an equal amount of money?
- A. 8
- B. 16
- C. 24
- D. 32

Item Information		Option Annotations			
<b>Alignment</b>	A1.1.2.2.1	A student could determine the <b>correct</b> answer, option B, by setting up the equation $180x + 640 = 200x + 320$ . Subtracting $180x$ from both sides yields $640 = 20x + 320$ . Subtracting 320 from both sides yields $320 = 20x$ . Dividing both sides by 20 yields $16 = x$ .			
<b>Answer Key</b>	B				
<b>Depth of Knowledge</b>	2				
<b>p-values</b>		A student could arrive at an <b>incorrect</b> answer by incorrectly setting up the equation. For example, the student could arrive at option D by incorrectly setting up the equation as $180x + 640 = 200x$ , which yields $x = 32$ .			
<b>A</b>	<b>B</b>			<b>C</b>	<b>D</b>
10%	72%			11%	7%

8. A compound inequality is shown below.

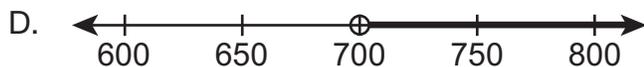
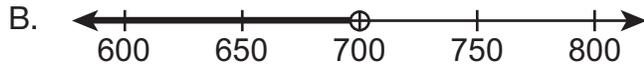
$$x \leq 3 \text{ and } x \geq 0$$

Which graph represents the solution of the inequality?



Item Information				Option Annotations
<b>Alignment</b>		A1.1.3.1.1		<p>A student could determine the <b>correct</b> answer, option C, by interpreting the <math>x \leq 3</math> as “less than or equal to 3,” which includes a closed circle at 3, by interpreting the <math>x \geq 0</math> as “greater than or equal to 0,” which includes a closed circle at 0, and by interpreting the “and” between the inequalities as “must be true for both inequalities.” The graph of the solution would consist of all the numbers from 0 through 3 by using solid circles at 0 and 3 and by using a line segment to connect the points.</p> <p>A student could arrive at an <b>incorrect</b> answer by incorrectly interpreting the direction of the inequality signs. For example, a student could arrive at option B using an open circle at 3 with a ray extending to the right to represent <math>x \leq 3</math> and an open circle at 0 with a ray extending to the left to represent <math>x \geq 0</math>.</p>
<b>Answer Key</b>		C		
<b>Depth of Knowledge</b>		1		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
17%	8%	65%	10%	

9. Patricia keeps apples in 3 bins and 2 crates in her store. Each bin can hold no more than 200 pounds. Each crate can hold no more than 50 pounds. Which graph represents all of the possible weights, in pounds, of apples Patricia can keep in her store?



Item Information				Option Annotations	
<b>Alignment</b>		A1.1.3.1.2		<p>A student could determine the <b>correct</b> answer, option A, by interpreting “no more than 200 pounds” as <math>b \leq 200</math> and “no more than 50 pounds” as <math>c \leq 50</math>. Multiplying both sides of the first inequality by 3 and the second inequality by 2 yields <math>3b \leq 600</math> and <math>2c \leq 100</math>. Adding these together yields <math>3b + 2c \leq 700</math>. The graph of the solution would consist of all the numbers less than or equal to 700 by using a solid circle at 700 and by using a ray extending to the left.</p> <p>A student could arrive at an <b>incorrect</b> answer by incorrectly interpreting “no more than.” For example, a student could arrive at option D by incorrectly interpreting “no more than” as “greater than” by using an open circle at 700 and a ray extending to the right.</p>	
<b>Answer Key</b>		A			
<b>Depth of Knowledge</b>		2			
<b>p-values</b>					
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>		
67%	20%	8%	5%		

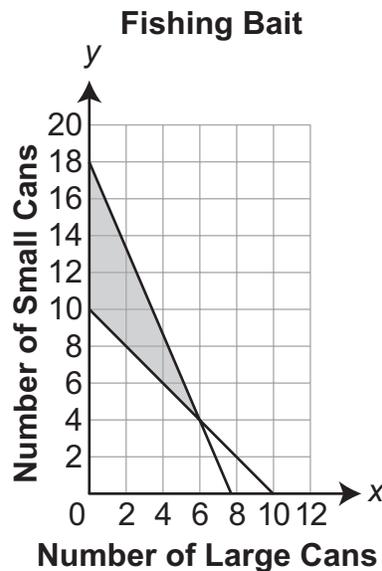
10. Nitrogen is a gas at certain temperatures under normal conditions. These temperatures ( $t$ ), in degrees Celsius ( $^{\circ}\text{C}$ ), are represented by the inequality  $t \geq -196$ . Which best describes the meaning of the inequality?
- A. Nitrogen is a gas only if the temperature is below  $-196^{\circ}\text{C}$ .
  - B. Nitrogen is a gas only if the temperature is above  $-196^{\circ}\text{C}$ .
  - C. Nitrogen is a gas only if the temperature is at or below  $-196^{\circ}\text{C}$ .
  - D. Nitrogen is a gas only if the temperature is at or above  $-196^{\circ}\text{C}$ .

Item Information				Option Annotations
<b>Alignment</b>		A1.1.3.1.3		A student could determine the <b>correct</b> answer, option D, by interpreting the $t \geq -196$ as “at or above $-196$ .”
<b>Answer Key</b>		D		
<b>Depth of Knowledge</b>		2		A student could arrive at an <b>incorrect</b> answer by incorrectly interpreting the inequality sign. For example, a student could arrive at option B by incorrectly interpreting $\geq$ as “above” only, without including the value $-196$ .
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
7%	9%	23%	61%	

11. A band is determining how many songs to record for a new album. The band members want to record no more than 16 songs, and their album has to be shorter than 78 minutes. They can record short songs that are about 3 minutes in length or long songs that are about 5 minutes in length. Which system of inequalities **best** represents the number of short songs ( $x$ ) and the number of long songs ( $y$ ) the band can record for the new album?
- A.  $x + y < 16$   
 $3x + 5y \leq 78$
- B.  $x + y \leq 16$   
 $3x + 5y < 78$
- C.  $x + y \leq 78$   
 $3x + 5y < 16$
- D.  $x + y < 78$   
 $3x + 5y \leq 16$

Item Information				Option Annotations
<b>Alignment</b>		A1.1.3.2.1		A student could determine the <b>correct</b> answer, option B, by interpreting “no more than 16 songs” as $\leq 16$ and “shorter than 78 minutes” as $< 78$ . Since the $x$ and $y$ represent the number of songs, their sum must be less than or equal to 16. Since $3x$ and $5y$ represent the lengths of all the short songs and the lengths of all the long songs, their sum must be less than 78.
<b>Answer Key</b>		B		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	A student could arrive at an <b>incorrect</b> answer by using the incorrect inequalities or by matching the expressions with the incorrect totals. For example, a student could arrive at option A by incorrectly interpreting “no more than 16 songs” as $< 16$ and “shorter than 78 minutes” as $\leq 78$ .
21%	55%	10%	14%	

12. Nate will buy at least 10 cans of fishing bait. Each large can costs \$7, and each small can costs \$3. He will spend up to \$54 on bait. This system of inequalities is graphed below.



Which combination of cans could Nate buy?

- A. 2 large cans and 6 small cans
- B. 2 large cans and 10 small cans
- C. 6 large cans and 10 small cans
- D. 8 large cans and 2 small cans

Item Information				Option Annotations
<b>Alignment</b>		A1.1.3.2.2		<p>A student could determine the <b>correct</b> answer, option B, by interpreting the combination as the ordered pair (2, 10) and identifying the ordered pair as a point within the solution set.</p> <p>A student could arrive at an <b>incorrect</b> answer by incorrectly interpreting the meanings of the variable(s) or by not identifying the ordered pair as a point in the solution set. For example, a student could arrive at option C by identifying the point (6, 2) as the intersection of the two boundary equations and selecting the only answer choice using “6 large cans” but failing to notice the point is not part of the solution for the “up to \$54” inequality.</p>
<b>Answer Key</b>		B		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
8%	67%	12%	13%	

**CONSTRUCTED-RESPONSE ITEM**

13. John spends \$94 to buy packages of cleaning supplies for a camp. He buys  $t$  packages of towels; each package is \$6 and contains 8 towels. He also buys  $s$  packages of soap; each package is \$4 and contains 10 bars of soap. John buys 20 packages of cleaning supplies altogether.

A. Write a system of two equations to represent the packages of cleaning supplies John buys.

B. How many packages of towels does John buy?

**Go to the next page to finish question 13.**

13. **Continued.** Please refer to the previous page for task explanation.

C. Explain why it would **not** be possible for John to buy exactly 16 bars of soap.

## SCORING GUIDE

### #13 ITEM INFORMATION

<b>Alignment</b>	A1.1.2	<b>Depth of Knowledge</b>	3	<b>Mean Score</b>	1.60
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### ITEM-SPECIFIC SCORING GUIDELINE

<b>Score</b>	<b>Description</b>
<b>4</b>	Demonstrates a <i>thorough</i> understanding of how to write and solve a system of linear equations (including problem situations) using substitution or elimination and interpret solutions to problems in the context of the problem situation by correctly solving problems and clearly explaining procedures.
<b>3</b>	Demonstrates a <i>general</i> understanding of how to write and solve a system of linear equations (including problem situations) using substitution or elimination and interpret solutions to problems in the context of the problem situation by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
<b>2</b>	Demonstrates a <i>partial</i> understanding of how to write and solve a system of linear equations (including problem situations) using substitution or elimination and interpret solutions to problems in the context of the problem situation by correctly performing a significant portion of the required task.
<b>1</b>	Demonstrates <i>minimal</i> understanding of how to write and solve a system of linear equations (including problem situations) using substitution or elimination and interpret solutions to problems in the context of the problem situation.
<b>0</b>	The response has no correct answer and <i>insufficient</i> evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. Response may show only information copied from the question.
<b>Non-scorables</b>	B – Blank, entirely erased, or written refusal to respond F – Foreign Language K – Off-task U – Unreadable

**Top Scoring Response:**

Part A Answer	
What?	Why?
$t + s = 20$ <b>AND</b> $6t + 4s = 94$	<b>OR equivalent</b>  <b>OR equivalent</b>

**(2 score points)**1 point for each correct equation

Part B Answer	
What?	Why?
7 (packages of towels) [Note: carry over any errors from part A]	

**(1 score point)**

1 point for correct answer

Part C Answer	
What?	Why?
	Since John is buying soap in packages of 10 bars, the number of bars of soap he buys must be a multiple of 10. Since 16 is not a multiple of 10, it would not be possible for John to buy exactly 16 bars of soap. <b>OR equivalent</b>

**(1 score point)**

1 point for correct answer

## STUDENT RESPONSE

## RESPONSE SCORE: 4 POINTS

13. John spends \$94 to buy packages of cleaning supplies for a camp. He buys  $t$  packages of towels; each package is \$6 and contains 8 towels. He also buys  $s$  packages of soap; each package is \$4 and contains 10 bars of soap. John buys 20 packages of cleaning supplies altogether.

- A. Write a system of two equations to represent the packages of cleaning supplies John buys.

$$t + s = 20 \text{ Packages}$$
$$\$6t + \$4s = \$94$$

Student has given two correct equations,  $t + s = 20$  and  $\$6t + \$4s = \$94$ .

- B. How many packages of towels does John buy?

John buys 7 packages of towels.

Student has given a correct answer, 7.

Go to the next page to finish question 13.

13. **Continued.** Please refer to the previous page for task explanation.

C. Explain why it would **not** be possible for John to buy exactly 16 bars of soap.

It would not be possible for John to buy exactly 16 bars of soap because they only come in packs of 10 and 10 doesn't divide evenly into 16 and he can't buy a fraction of a pack.

Student has given a complete explanation.

## STUDENT RESPONSE

RESPONSE SCORE: 3 POINTS



Question 13  
Page 1 of 2

Item ID

John spends \$94 to buy packages of cleaning supplies for a camp. He buys  $t$  packages of towels; each package is \$6 and contains 8 towels. He also buys  $s$  packages of soap; each package is \$4 and contains 10 bars of soap. John buys 20 packages of cleaning supplies altogether.

?

**A.** Write a system of two equations to represent the packages of cleaning supplies John buys.

Next

EQ  
 $6t+4s=94$   
 $t+s=20$   
15 / 1000

Student has given two correct equations,  $6t + 4s = 94$  and  $t + s = 20$ .

Options

**B.** How many packages of towels does John buy?

Flag

EQ  
10 contains of soap 10 of towels  
32 / 50

Student has given an incorrect answer, 10.

Pause

Review/End Test

Next

Question 13  
Page 2 of 2

Item ID

John spends \$94 to buy packages of cleaning supplies for a camp. He buys  $t$  packages of towels; each package is \$6 and contains 8 towels. He also buys  $s$  packages of soap; each package is \$4 and contains 10 bars of soap. John buys 20 packages of cleaning supplies altogether.

C. Explain why it would **not** be possible for John to buy exactly 16 bars of soap.

ECI

This is because of the fact that all soap packages(to my knowledge) contain 10 bars each. you cant simply have 16 bars of soap. John would have to buy 2 packages for 16 bars, and still he would have 4 bars of soap left over from the package.

Student has given a complete explanation.

241 / 1000

Back

Options

Flag

Pause

Rewind/End Test

## STUDENT RESPONSE

## RESPONSE SCORE: 2 POINTS

13. John spends \$94 to buy packages of cleaning supplies for a camp. He buys  $t$  packages of towels; each package is \$6 and contains 8 towels. He also buys  $s$  packages of soap; each package is \$4 and contains 10 bars of soap. John buys 20 packages of cleaning supplies altogether.

- A. Write a system of two equations to represent the packages of cleaning supplies John buys.

$$t \cdot 6 + s \cdot 4 = 94$$

Student has given one correct equation,  $t6 + s4 = 94$ .

- B. How many packages of towels does John buy?

8 packages

Student has given an incorrect answer, 8.

Go to the next page to finish question 13.

13. **Continued.** Please refer to the previous page for task explanation.

C. Explain why it would **not** be possible for John to buy exactly 16 bars of soap.

It is not possible because each package contains 10 bars. So if he buys one package he has 10. If he buys 2 packages, he has 20 bars.

Student has given a complete explanation.

## STUDENT RESPONSE

RESPONSE SCORE: 1 POINT



Question 13  
Page 1 of 2

John spends \$94 to buy packages of cleaning supplies for a camp. He buys  $t$  packages of towels; each package is \$6 and contains 8 towels. He also buys  $s$  packages of soap; each package is \$4 and contains 10 bars of soap. John buys 20 packages of cleaning supplies altogether.

**A.** Write a system of two equations to represent the packages of cleaning supplies John buys.

Eq  
 $8t + 10s = 20$   
 $\$6t + \$4s = \$94$   
 29 / 1000

Student has given one correct equation,  $\$6t + \$4s = \$94$ , and one incorrect equation,  $8t + 10s = 20$ .

**B.** How many packages of towels does John buy?

Eq  
 2 packages  
 10 / 50

Student has given an incorrect answer, 2.

Review/End Test   Pause   Flag   Options   Next

Question 13  
Page 2 of 2

Item ID ?

Line Guide  
Calculator  
Eraser  
Pencil  
Highlighter  
Ruler  
Protractor

John spends \$94 to buy packages of cleaning supplies for a camp. He buys  $t$  packages of towels; each package is \$6 and contains 8 towels. He also buys  $s$  packages of soap; each package is \$4 and contains 10 bars of soap. John buys 20 packages of cleaning supplies altogether.

C. Explain why it would **not** be possible for John to buy exactly 16 bars of soap.

Eq

It would not be possible for John to buy 16 bars of soap because it would cost more than \$94 dollars.

Student has given an incorrect explanation.

97 / 1000

Back

Review/End Test  
Pause  
Flag  
Options

## STUDENT RESPONSE

## RESPONSE SCORE: 0 POINTS

13. John spends \$94 to buy packages of cleaning supplies for a camp. He buys  $t$  packages of towels; each package is \$6 and contains 8 towels. He also buys  $s$  packages of soap; each package is \$4 and contains 10 bars of soap. John buys 20 packages of cleaning supplies altogether.

- A. Write a system of two equations to represent the packages of cleaning supplies John buys.

$$20 = sx$$

$$20 = tx$$

Student has given two incorrect equations,  $20 = sx$  and  $20 = tx$ .

- B. How many packages of towels does John buy?

10

Student has given an incorrect answer, 10.

Go to the next page to finish question 13.

13. **Continued.** Please refer to the previous page for task explanation.

C. Explain why it would **not** be possible for John to buy exactly 16 bars of soap.

This would'nt be possible  
because That would'nt  
add up to \$94.<sup>00</sup> dollars

Student has given an incorrect explanation.

**CONSTRUCTED-RESPONSE ITEM**

14. Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

- A. Write a system of two linear inequalities to model the number of tickets Tom and Sally need to earn based on the number of times each plays the ring toss ( $x$ ) and the number of times each plays the fishing game ( $y$ ).

Tom: \_\_\_\_\_

Sally: \_\_\_\_\_

**Go to the next page to finish question 14.**

14. **Continued.** Please refer to the previous page for task explanation.

B. What is the **least** number of times Sally needs to play only the ring toss in order to have enough tickets for the prize she wants?

\_\_\_\_\_ times

Tom decides to play the ring toss only 1 time. After that, he will play the fishing game.

C. What is the **least** number of times Tom needs to play the fishing game in order to have enough tickets for the prize he wants?

\_\_\_\_\_ times

## SCORING GUIDE

### #14 ITEM INFORMATION

<b>Alignment</b>	A1.1.3	<b>Depth of Knowledge</b>	3	<b>Mean Score</b>	1.58
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### ITEM-SPECIFIC SCORING GUIDELINE

<b>Score</b>	<b>Description</b>
<b>4</b>	Demonstrates a <i>thorough</i> understanding of writing and solving a system of linear inequalities and interpreting solutions to problems in the context of the problem situation by correctly solving problems and clearly explaining procedures.
<b>3</b>	Demonstrates a <i>general</i> understanding of writing and solving a system of linear inequalities and interpreting solutions to problems in the context of the problem situation by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
<b>2</b>	Demonstrates a <i>partial</i> understanding of writing and solving a system of linear inequalities and interpreting solutions to problems in the context of the problem situation by correctly performing a significant portion of the required task.
<b>1</b>	Demonstrates <i>minimal</i> understanding of writing and solving a system of linear inequalities and interpreting solutions to problems in the context of the problem situation.
<b>0</b>	The response has no correct answer and <i>insufficient</i> evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. Response may show only information copied from the question.
<b>Non-scorables</b>	B – Blank, entirely erased, or written refusal to respond F – Foreign Language K – Off-task U – Unreadable

**Top Scoring Response:**

Part A Answer	
What?	Why?
Tom: $5x + 3y \geq 15$ <b>AND</b> Sally: $3x + 4y > 12$	<b>OR equivalent</b>

**(2 score points)**1 point for each correct answer

OR

1 total point for correct inequalities but on incorrect answer spaces

Part B Answer	
What?	Why?
5 (times) [Note: carry over any errors from part A]	

**(1 score point)**

1 point for correct answer

Part C Answer	
What?	Why?
4 (times) [Note: carry over any errors from part A]	

**(1 score point)**

1 point for correct answer

STUDENT RESPONSE

RESPONSE SCORE: 4 POINTS



Question 14  
Page 1 of 2

Item ID

**A.** Write a system of two linear inequalities to model the number of tickets Tom and Sally need to earn based on the number of times each plays the ring toss ( $x$ ) and the number of times each plays the fishing game ( $y$ ).

Tom:

Eq1  
 $15 \leq 5x + 3y$

8 / 50

Sally:

Eq1  
 $12 < 3x + 4y$

8 / 50

Student has given two correct answers.

Options

Flag

Pause

Review/End Test

Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

Question 14  
Page 2 of 2



Item ID

Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

**B.** What is the **least** number of times Sally needs to play only the ring toss in order to have enough tickets for the prize she wants?

EQ

 times
 

Student has given a correct answer, 5.

1 / 50

Tom decides to play the ring toss only 1 time. After that, he will play the fishing game.

**C.** What is the **least** number of times Tom needs to play the fishing game in order to have enough tickets for the prize he wants?

EQ

 times
 

Student has given a correct answer, 4.

1 / 50

Review/End Test

Pause

Flag

Options

Back

## STUDENT RESPONSE

## RESPONSE SCORE: 3 POINTS

14. Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

- A. Write a system of two linear inequalities to model the number of tickets Tom and Sally need to earn based on the number of times each plays the ring toss ( $x$ ) and the number of times each plays the fishing game ( $y$ ).

$x = \text{ring toss}$      $y = \text{fishing game}$

Sally  $3x + 4y$

Tom  $5x + 3y$

Tom:  $5x + 3y \geq 15$

Sally:  $3x + 4y > 12$

Student has given two correct answers,  $5x + 3y \geq 15$  and  $3x + 4y > 12$ .

Go to the next page to finish question 14.

14. **Continued.** Please refer to the previous page for task explanation.

- B. What is the **least** number of times Sally needs to play only the ring toss in order to have enough tickets for the prize she wants?

$$\begin{array}{r} 3x \geq 12 \\ \hline 3 \quad 3 \end{array}$$

Student has given a correct answer, 5.

$$x > 4$$

if  $x$  must be greater than 4, the least number of times is 5.

5 times

Tom decides to play the ring toss only 1 time. After that, he will play the fishing game.

- C. What is the **least** number of times Tom needs to play the fishing game in order to have enough tickets for the prize he wants?

$$\begin{array}{r} 3y + 5 \geq 15 \\ -5 \quad -5 \end{array}$$

$$\begin{array}{r} 3y \geq 10 \\ \hline 3 \quad 3 \end{array}$$

Student has given an incorrect answer,  $3\frac{1}{3}$ .

$$y \geq 3\frac{1}{3}$$

$3\frac{1}{3}$  times

STUDENT RESPONSE

RESPONSE SCORE: 2 POINTS



Question 14  
Page 1 of 2

Item ID

Line Guide

Next

**A.** Write a system of two linear inequalities to model the number of tickets Tom and Sally need to earn based on the number of times each plays the ring toss ( $x$ ) and the number of times each plays the fishing game ( $y$ ).

EQ

Tom:  $5x + 3y = 15$

8 / 50

EQ

Sally:  $3x + 4y > 12$

8 / 50

Student has given the answer for Tom incorrectly,  $5x + 3y = 15$ . The answer given for Sally is correct.

Options

Next

Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

Review/End Test

Pause

Flag

Options

Question 14  
Page 2 of 2



Item ID

Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

B. What is the **least** number of times Sally needs to play only the ring toss in order to have enough tickets for the prize she wants?

Eq | 5 | 1 / 50

Student has given a correct answer, 5.

Tom decides to play the ring toss only 1 time. After that, he will play the fishing game.

C. What is the **least** number of times Tom needs to play the fishing game in order to have enough tickets for the prize he wants?

Eq | 5 | 1 / 50

Student has given an incorrect answer, 5.

Review/End Test

Pause

Flag

Options

Back

## STUDENT RESPONSE

## RESPONSE SCORE: 1 POINT

14. Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

- A. Write a system of two linear inequalities to model the number of tickets Tom and Sally need to earn based on the number of times each plays the ring toss ( $x$ ) and the number of times each plays the fishing game ( $y$ ).

$$2x + 2y = 15$$

$$3x + 3y = 24$$

Tom:  $2x + 2y = 15$

Sally:  $3x + 3y = 24$

Student has given two incorrect answers,  $2x + 2y = 15$  and  $3x + 3y = 24$ .

Go to the next page to finish question 14.

14. **Continued.** Please refer to the previous page for task explanation.

B. What is the **least** number of times Sally needs to play only the ring toss in order to have enough tickets for the prize she wants?

4 times

Student has an incorrect answer, 4.

Tom decides to play the ring toss only 1 time. After that, he will play the fishing game.

C. What is the **least** number of times Tom needs to play the fishing game in order to have enough tickets for the prize he wants?

$$\begin{array}{r} 5 + y = 15 \\ -5 \quad -5 \\ \hline y = 10 \end{array}$$

4 times

Student has a correct answer, 4.

STUDENT RESPONSE

RESPONSE SCORE: 0 POINTS



Question 14  
Page 1 of 2

Item ID

?

Line Guide

Calculator

Graphing

**A.** Write a system of two linear inequalities to model the number of tickets Tom and Sally need to earn based on the number of times each plays the ring toss ( $x$ ) and the number of times each plays the fishing game ( $y$ ).

EQ

$5x > 4y + 1x$

8 / 50

Tom:

EQ

$3y > 4x$

5 / 50

Sally:

Student has given two incorrect answers.

Next

Options

Flag

Pause

Review/End Test

Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

Question 14  
Page 2 of 2


**B.** What is the **least** number of times Sally needs to play only the ring toss in order to have enough tickets for the prize she wants?

EQ

4 times

7 / 50

Student has given an incorrect answer, 4.



Item ID

?

Tom and Sally are at a carnival. At this carnival, participants earn tickets while playing different games. The tickets can then be turned in for prizes. Tom earns 5 tickets each time he plays the ring toss and 3 tickets each time he plays the fishing game. Sally earns 3 tickets each time she plays the ring toss and 4 tickets each time she plays the fishing game.

Tom needs to earn at least 15 tickets for the prize he wants. Sally needs to earn more than 12 tickets for the prize she wants.

Tom decides to play the ring toss only 1 time. After that, he will play the fishing game.

**C.** What is the **least** number of times Tom needs to play the fishing game in order to have enough tickets for the prize he wants?

EQ

3 times

7 / 50

Student has given an incorrect answer, 3.

Review/End Test

Pause

Flag

Options

Back

## ALGEBRA I MODULE I—SUMMARY DATA

## MULTIPLE-CHOICE

Sample Number	Alignment	Answer Key	Depth of Knowledge	<i>p</i> -values			
				A	B	C	D
1	A1.1.1.1.1	C	1	13%	9%	61%	17%
2	A1.1.1.3.1	A	2	57%	20%	17%	6%
3	A1.1.1.4.1	C	2	12%	16%	63%	9%
4	A1.1.1.5.1	D	2	17%	24%	27%	32%
5	A1.1.2.1.1	C	2	17%	8%	71%	4%
6	A1.1.2.1.2	D	2	5%	10%	12%	73%
7	A1.1.2.2.1	B	2	10%	72%	11%	7%
8	A1.1.3.1.1	C	1	17%	8%	65%	10%
9	A1.1.3.1.2	A	2	67%	20%	8%	5%
10	A1.1.3.1.3	D	2	7%	9%	23%	61%
11	A1.1.3.2.1	B	2	21%	55%	10%	14%
12	A1.1.3.2.2	B	2	8%	67%	12%	13%

## CONSTRUCTED-RESPONSE

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
13	A1.1.2	4	3	1.60
14	A1.1.3	4	3	1.58



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## ALGEBRA I MODULE 2

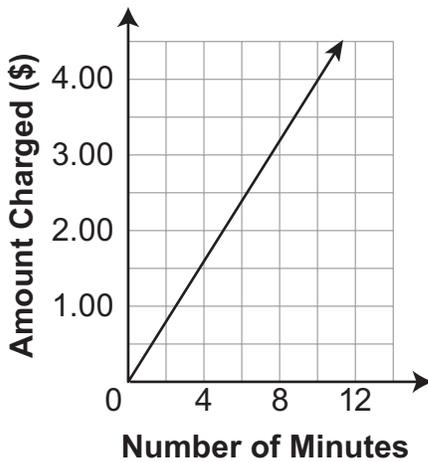
## MULTIPLE-CHOICE ITEMS

1. A pattern in Shannon's phone charges is shown in the table below.

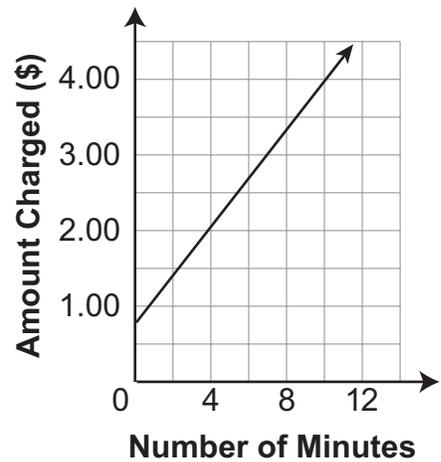
Number of Minutes	Amount Charged (\$)
2	0.80
4	1.60
6	2.40
8	3.20
10	4.00

The pattern continues. Which graph represents the pattern in the charges?

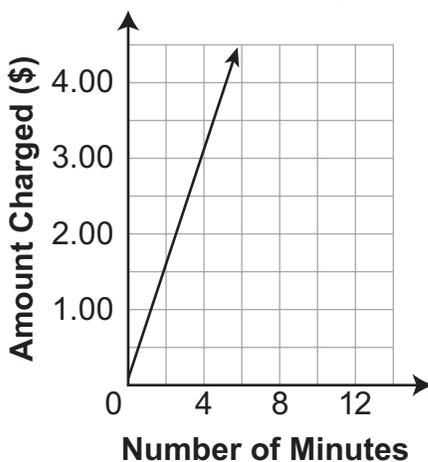
A. Phone Charges



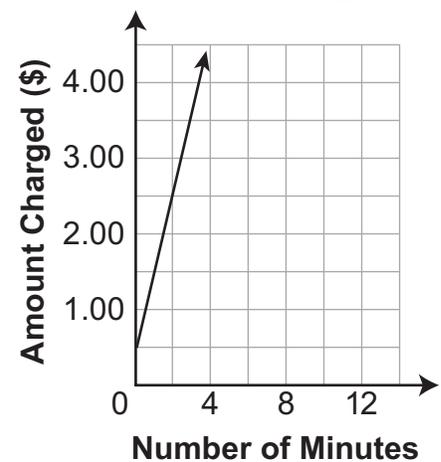
B. Phone Charges



C. Phone Charges



D. Phone Charges



Item Information				Option Annotations
<b>Alignment</b>		A1.2.1.1.1		A student could determine the <b>correct</b> answer, option A, by interpreting the relationship in the table to be proportional, which means the graphed line must go through the origin, and by interpreting the last pair in the table as the point (10, 4.00).
<b>Answer Key</b>		A		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				A student could arrive at an <b>incorrect</b> answer by incorrectly interpreting the pairs of numbers in the table. For example, a student could arrive at option B by looking at the first y-value in the table (0.80), incorrectly plotting that point along the y-axis, and then extending the line through the point (10, 4.00).
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
78%	13%	5%	4%	

2. The set of ordered pairs shown below is a relation that is a function of  $x$ .

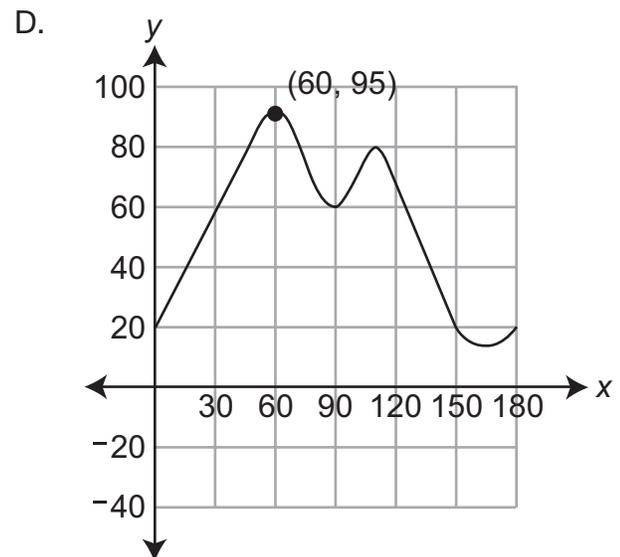
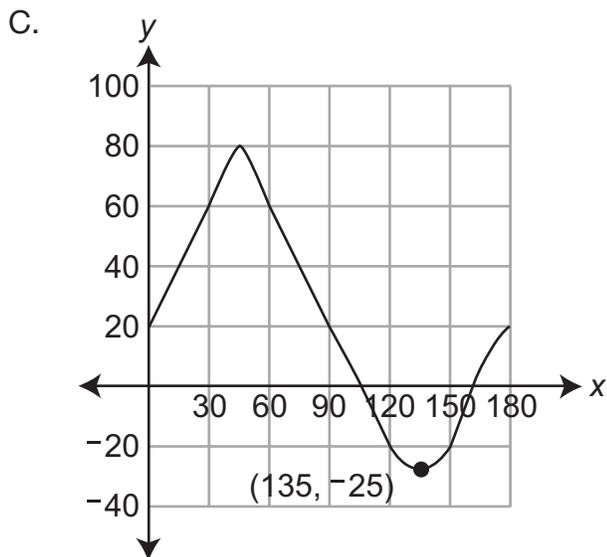
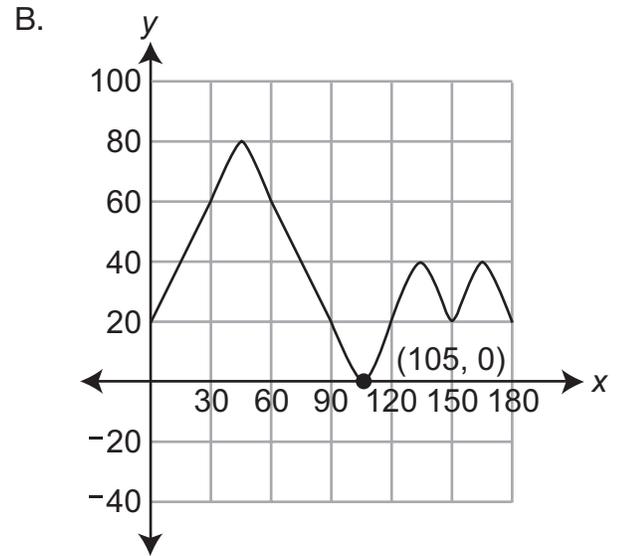
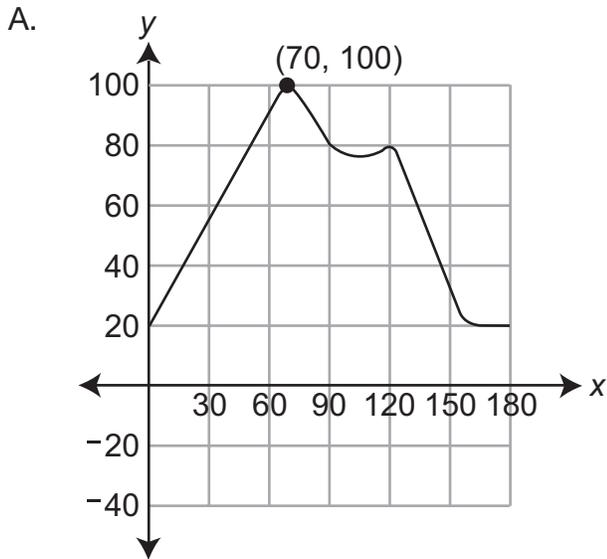
$$\{(-5, 1), (-4, 1), (-3, 1), (-2, 1)\}$$

Which ordered pairs could be included in the set so that the relation remains a function of  $x$ ?

- A.  $(-6, 1)$   $(-5, -1)$
- B.  $(-6, 1)$   $(-1, -1)$
- C.  $(-2, 2)$   $(-1, 1)$
- D.  $(-3, 0)$   $(-1, 1)$

Item Information				Option Annotations
<b>Alignment</b>		A1.2.1.1.2		A student could determine the <b>correct</b> answer, option B, by identifying the set of ordered pairs that do not have the same $x$ -value as any ordered pair in the relation.
<b>Answer Key</b>		B		
<b>Depth of Knowledge</b>		2		
<b><i>p</i>-values</b>				A student could arrive at an <b>incorrect</b> answer by using only one of the given ordered pairs. For example, a student could arrive at option A by identifying that the first ordered pair would keep the relation a function but failing to notice that the second ordered pair contains an $x$ -value already given in the relation with a different $y$ -value.
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
19%	49%	18%	14%	

3. A function models the height ( $y$ ), in feet, of a car on a roller coaster based on the time ( $x$ ), in seconds. The range consists only of positive numbers **less than** 100. Which graph could represent the function?

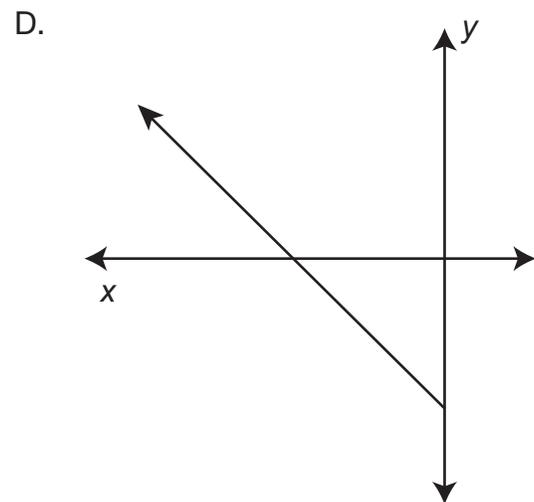
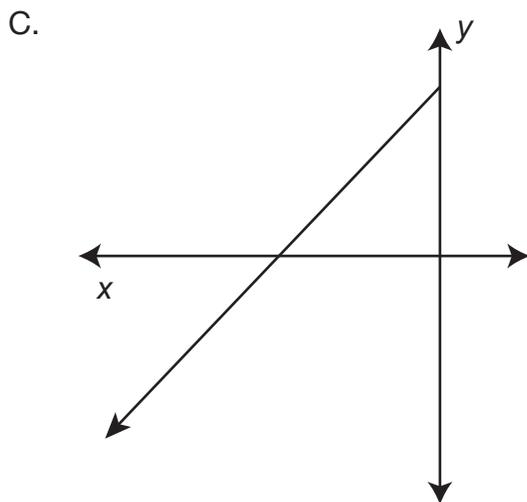
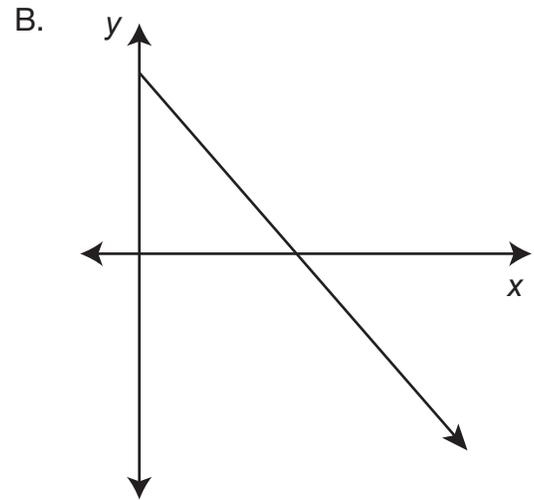
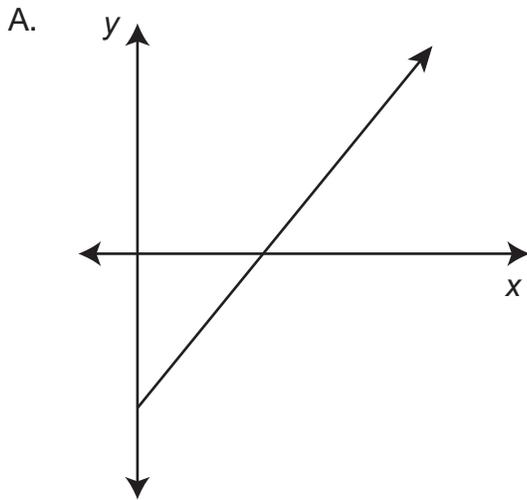


Item Information				Option Annotations
<b>Alignment</b>		A1.2.1.1.3		A student could determine the <b>correct</b> answer, option D, by identifying the graph for which the $y$ -values are included in the range $0 < y < 100$ .
<b>Answer Key</b>		D		
<b>Depth of Knowledge</b>		2		
<b><i>p</i>-values</b>				A student could arrive at an <b>incorrect</b> answer by identifying a graph that incorrectly includes a $y$ -value outside of $0 < y < 100$ . For example, a student could arrive at option B by identifying the graph that includes $y = 100$ .
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
14%	12%	8%	66%	

4. The table below shows the relationship between the number of tickets sold for a concert and a theater's net profit, in dollars.

Tickets Sold	Net Profit (\$)
150	-500
200	0
225	250
400	2,000

Which graph could represent the relationship between the number of tickets sold ( $x$ ) and the theater's net profit ( $y$ )?



Item Information				Option Annotations
<b>Alignment</b>		A1.2.1.2.2		A student could determine the <b>correct</b> answer, option A, by examining the table and identifying that the $y$ -intercept should be negative and the $x$ -intercept is positive. Since the points have a positive correlation, the student could also determine the slope is positive.
<b>Answer Key</b>		A		
<b>Depth of Knowledge</b>		2		
<b><i>p</i>-values</b>				A student could arrive at an <b>incorrect</b> answer by incorrectly identifying the location of the $y$ -intercept or the $x$ -intercept, or by switching the sign for the slope. For example, a student could arrive at option B by incorrectly identifying a positive $y$ -intercept and by incorrectly using a negative slope.
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
67%	12%	11%	10%	

5. A truck left a warehouse at 1:00 P.M. The truck traveled 232 miles by 5:00 P.M. The truck continued traveling at the same average speed. How many miles, altogether, did the truck travel by 6:30 P.M.?
- A. 58
- B. 87
- C. 319
- D. 348

Item Information		Option Annotations			
<b>Alignment</b>	A1.2.2.1.1	A student could determine the <b>correct</b> answer, option C, by calculating and using the constant rate of change. Dividing 232 miles by 4 hours yields a constant rate of change of 58 miles per hour. Multiplying the rate by 5.5 hours yields 319 miles.			
<b>Answer Key</b>	C				
<b>Depth of Knowledge</b>	2				
<b>p-values</b>		A student could arrive at an <b>incorrect</b> answer by applying the rate incorrectly or by not following through to the end of the calculation. For example, a student could arrive at option B by finding the difference between 6:30 and 5:00 (1.5 hours) and then multiplying that amount by the rate.			
<b>A</b>	<b>B</b>			<b>C</b>	<b>D</b>
7%	15%			68%	10%

6. A line segment on a coordinate plane representing the distance a bicyclist is from home has a slope of  $\frac{35}{2}$ . On the line segment,  $x$  represents the time, in hours, that the bicyclist has been riding and  $y$  represents the bicyclist's distance, in miles, from home. The bicyclist began his ride at home and rides his bicycle at a constant rate. How long will it take until the bicyclist is 140 miles from home?
- A. 2 hours  
 B. 4 hours  
 C. 7 hours  
 D. 8 hours

Item Information				Option Annotations
<b>Alignment</b>		A1.2.2.1.2		A student could determine the <b>correct</b> answer, option D, by setting up the linear equation $y = \frac{35}{2}x$ , substituting 140 for $y$ , and then solving for $x$ . Dividing both sides of the equation by $\frac{35}{2}$ yields $x = 8$ .
<b>Answer Key</b>		D		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	A student could arrive at an <b>incorrect</b> answer by using incorrect calculations. For example, a student could arrive at option A by dividing 140 by 35 and then by dividing by 2.
9%	24%	21%	46%	

7. The ordered pairs shown below are on the same line.

$$(6, 4) \quad (12, 6)$$

Which equation describes the relationship between the  $x$ -coordinates and  $y$ -coordinates in the ordered pairs?

A.  $y = 3x - 14$

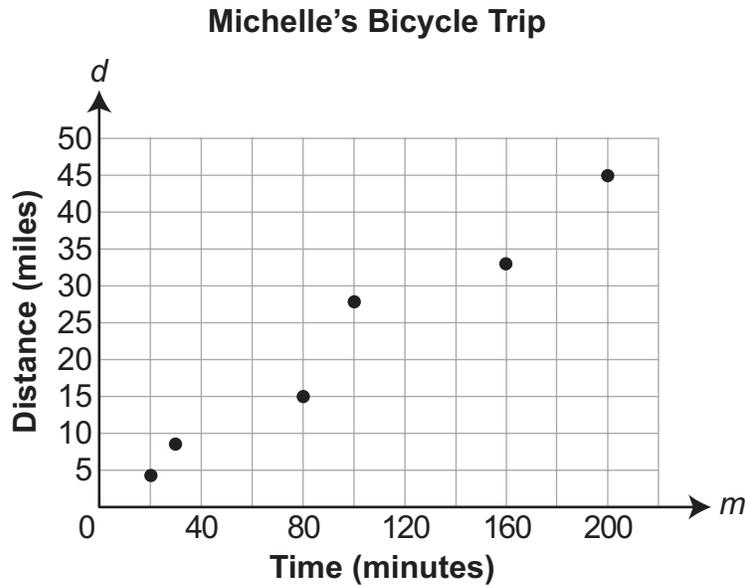
B.  $y = 3x - 6$

C.  $y = \frac{1}{3}x + 10$

D.  $y = \frac{1}{3}x + 2$

Item Information				Option Annotations
<b>Alignment</b>		A1.2.2.1.3		<p>A student could determine the <b>correct</b> answer, option D, by applying these points to the formula <math>m = \frac{y_2 - y_1}{x_2 - x_1}</math> to find the slope and then substituting one of the points into the slope-intercept form <math>y = mx + b</math> to find the y-intercept. Using the slope formula yields <math>m = \frac{6 - 4}{12 - 6} = \frac{2}{6} = \frac{1}{3}</math>. Substituting the point (6, 4) into the slope-intercept form yields <math>4 = \frac{1}{3}(6) + b</math>. Solving for <math>b</math> yields <math>2 = b</math>, which yields an equation of <math>y = \frac{1}{3}x + 2</math>.</p> <p>A student could arrive at an <b>incorrect</b> answer by using the reciprocal of the slope or by switching the <math>x</math>-value and <math>y</math>-value when finding the <math>y</math>-intercept. For example, a student could arrive at option B by finding the reciprocal of the slope, which yields <math>m = 3</math>. Substituting the point (6, 4) into the slope-intercept form by switching the <math>x</math>-value and <math>y</math>-value yields <math>b = -6</math>. Combining these yields an equation of <math>y = 3x - 6</math>.</p>
<b>Answer Key</b>		D		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
11%	22%	11%	56%	

8. Michelle went on a bicycle trip. The scatter plot below shows the distance she had traveled for various lengths of time during the bicycle trip.



Which equation describes the line of best fit for the scatter plot?

- A.  $d = \frac{11}{50}m + \frac{13}{20}$
- B.  $d = \frac{50}{11}m + \frac{13}{20}$
- C.  $d = \frac{11}{50}m + 50$
- D.  $d = \frac{50}{11}m + 50$

Item Information				Option Annotations
<b>Alignment</b>		A1.2.2.2.1		<p>A student could determine the <b>correct</b> answer, option A, by examining the scatter plot and identifying that the <math>y</math>-intercept should be between 0 and 5 and by identifying that the slope should be between 0 and 0.5. Of the given answer choices, only <math>d = \frac{11}{50}m + \frac{13}{20}</math> satisfies both conditions.</p> <p>A student could arrive at an <b>incorrect</b> answer by using the reciprocal of the slope or by incorrectly identifying the location of the <math>d</math>-intercept. For example, a student could arrive at option D by using the reciprocal of the slope and by incorrectly identifying the <math>y</math>-intercept as the grid line that is closest to the greatest <math>d</math>-value for the points on the scatter plot.</p>
<b>Answer Key</b>		A		
<b>Depth of Knowledge</b>		2		
<b><math>p</math>-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
37%	24%	26%	13%	

9. A data set shows the number of minutes each of 153,477 students takes to complete a reading test. The median completion time is 110 minutes. The interquartile range is 34. Which statement about the completion times is **most likely** to be true?
- A. Of these students, 25% complete the test in 110 minutes or less.
- B. Of these students, 50% complete the test in 110 minutes or less.
- C. Of these students, 75% complete the test in 127 minutes or less.
- D. Of these students, 75% complete the test in 144 minutes or less.

Item Information				Option Annotations
<b>Alignment</b>		A1.2.3.1.1		A student could determine the <b>correct</b> answer, option B, by interpreting the median value as being the value for which 50% of the data has a lower value.
<b>Answer Key</b>		B		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				A student could arrive at an <b>incorrect</b> answer by incorrectly identifying how the median relates to the data set or by incorrectly using the interquartile range. For example, a student could arrive at option C by incorrectly calculating the value of the 3rd quartile by dividing the interquartile range by 2 and adding the quotient to the median.
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
21%	53%	16%	10%	

10. Marti has been keeping track of the number of visitors to her new website for the past 9 months. The line graph below shows the data Marti recorded.



Based on the trend shown in the graph, which will **most likely** be the number of visitors to Marti's website for the 12th month?

- A. 5,000
- B. 6,000
- C. 8,000
- D. 10,000

Item Information				Option Annotations
<b>Alignment</b>		A1.2.3.2.1		A student could determine the <b>correct</b> answer, option C, by examining the line graph and estimating that the line of best fit is approximately $y = \frac{2}{3}x$ . Substituting $x = 12$ into the equation yields $y = 8$ , which represents 8,000 visitors.
<b>Answer Key</b>		C		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	A student could arrive at an <b>incorrect</b> answer by basing the prediction on the most recent 1-month change or by using an incorrect slope. For example, a student could arrive at option A by using the line from $x = 8$ to $x = 9$ and extending it through $x = 12$ . This yields $y = 5$ , which represents 5,000 visitors.
7%	12%	74%	7%	

11. Brent works at a tire store. He recorded the number of tires sold each day for two weeks in the stem-and-leaf plot below.

Daily Tire Sales

8	4 6
9	3 8
10	0 0
11	5 9
12	4
13	
14	6
15	2 3
16	1 3

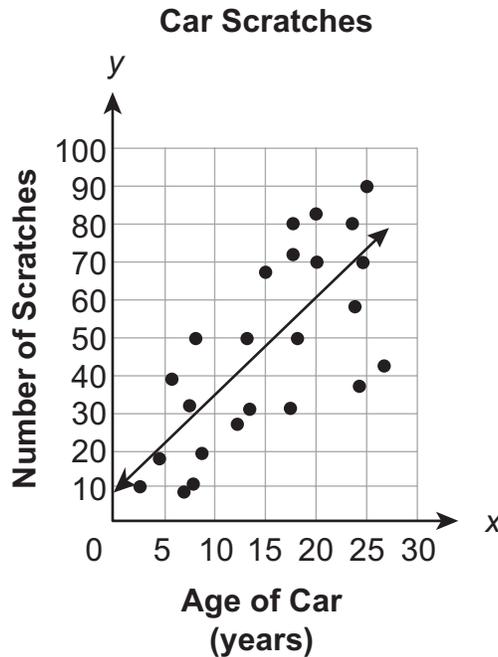
Key
11   2 = 112 tires

What is the **median** of the number of tires sold each day?

- A. 100
- B. 117
- C. 121
- D. 124

Item Information		Option Annotations	
<b>Alignment</b>	A1.2.3.2.2	<p>A student could determine the <b>correct</b> answer, option B, by calculating the middle value of the stem-and-leaf plot. Since there are an even number of data points, the middle value is the mean of 115 and 119, which is 117.</p> <p>A student could arrive at an <b>incorrect</b> answer by incorrectly determining the median. For example, a student could arrive at option D by incorrectly using the middle row of the stem-and-leaf plot.</p>	
<b>Answer Key</b>	B		
<b>Depth of Knowledge</b>	2		
<b>p-values</b>			
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
5%	69%	11%	15%

12. Hank counted the number of scratches on cars of different ages. Hank then created the scatter plot below showing the relationship between the age of a car ( $x$ ) and the number of scratches found on the car ( $y$ ).



Based on the line of best fit, which is **most likely** the number of scratches that could be found on a car that is 30 years old?

- A. 30
- B. 74
- C. 87
- D. 100

Item Information				Option Annotations
<b>Alignment</b>		A1.2.3.2.3		A student could determine the <b>correct</b> answer, option C, by visually extending the line to $x = 30$ and seeing the value should be between 80 and 90. Of the given answer choices, only 87 falls in this interval.
<b>Answer Key</b>		C		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	A student could arrive at an <b>incorrect</b> answer by incorrectly interpreting the line of best fit. For example, a student could arrive at option B by incorrectly using $x = 25$ since the line visually passes through this grid line and there are no points for $x = 30$ .
7%	12%	58%	23%	

**CONSTRUCTED-RESPONSE ITEM**

13. A number pattern is shown below.

row 1				1		
row 2			4		7	
row 3		10		13		16
row 4	19		22		25	28

The pattern continues.

- A.** What is the difference between the last number in row 5 and the first number in row 5?

difference: \_\_\_\_\_

- B.** Write an equation that can be used to find  $d$ , the difference between the last number and the first number, for any row  $r$ .

$d =$  \_\_\_\_\_

**Go to the next page to finish question 13.**

13. **Continued.** Please refer to the previous page for task explanation.

C. What is the first number in row 8?

first number: \_\_\_\_\_

D. What is the last number in row 8?

last number: \_\_\_\_\_

**SCORING GUIDE****#13 ITEM INFORMATION**

<b>Alignment</b>	A1.2.1	<b>Depth of Knowledge</b>	3	<b>Mean Score</b>	1.52
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**ITEM-SPECIFIC SCORING GUIDELINE**

<b>Score</b>	<b>Description</b>
<b>4</b>	Demonstrates a <i>thorough</i> understanding of analyzing and/or using patterns or relations by correctly solving problems and clearly explaining procedures.
<b>3</b>	Demonstrates a <i>general</i> understanding of analyzing and/or using patterns or relations by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
<b>2</b>	Demonstrates a <i>partial</i> understanding of analyzing and/or using patterns or relations by correctly performing a significant portion of the required task.
<b>1</b>	Demonstrates <i>minimal</i> understanding of analyzing and/or using patterns or relations.
<b>0</b>	The response has no correct answer and <i>insufficient</i> evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. Response may show only information copied from the question.
<b>Non-scorables</b>	B – Blank, entirely erased, or written refusal to respond F – Foreign Language K – Off-task U – Unreadable

**Top Scoring Response:**

Part A Answer	
What?	Why?
12	

**(1 score point)**

1 point for correct answer

Part B Answer	
What?	Why?
$3(r - 1)$ OR $d = 3(r - 1)$ <b>OR equivalent</b>	

**(1 score point)**

1 point for correct answer

Part C Answer	
What?	Why?
85	

**(1 score point)**

1 point for correct answer

Part D Answer	
What?	Why?
106	

**(1 score point)**

1 point for correct answer

## STUDENT RESPONSE

## RESPONSE SCORE: 4 POINTS

13. A number pattern is shown below.

row 1			1			
row 2		4		7		
row 3		10		13	16	
row 4	19		22		25	28

The pattern continues.

A. What is the difference between the last number in row 5 and the first number in row 5?

~~25 - 13 = 12~~

difference: 12

Student has given a correct answer, 12.

B. Write an equation that can be used to find  $d$ , the difference between the last number and the first number, for any row  $r$ .

$d = \underline{(r-1)3}$

Student has given a correct answer,  $d = (r-1)3$ .

Go to the next page to finish question 13.

13. **Continued.** Please refer to the previous page for task explanation.

C. What is the first number in row 8?

19 22 25 28  
31 34 37 40 43  
46 49 52 58 58 61  
64 67 70 73 76 79 82  
85 88 91 94 97 100 103 106

first number: 85

Student has given a correct answer, 85.

D. What is the last number in row 8?

last number: 106

Student has given a correct answer, 106.

STUDENT RESPONSE

RESPONSE SCORE: 3 POINTS



Question 13  
Page 1 of 2

Item ID

?

Line Guide

Calculator

Grid

Next

A number pattern is shown below.

row 1	1			
row 2	4	7		
row 3	10	13	16	
row 4	19	22	25	28

The pattern continues.

**A.** What is the difference between the last number in row 5 and the first number in row 5?

Eq

difference: 12

2 / 50

Student has given a correct answer, 12.

**B.** Write an equation that can be used to find  $d$ , the difference between the last number and the first number, for any row  $r$ .

Eq

$d = 43 - 31$

5 / 50

Student has given an incorrect answer,  $d = 43 - 31$ .

Review/End Test

Pause

Flag

Options

Question 13  
Page 2 of 2


A number pattern is shown below.

row 1	1			
row 2	4	7		
row 3	10	13	16	
row 4	19	22	25	28

The pattern continues.


Eq

first number:

2 / 50

C. What is the first number in row 8?

Student has given a correct answer, 85.

Eq

last number:

3 / 50

Review/End Test

Pause

Flag

Options

Back

## STUDENT RESPONSE

## RESPONSE SCORE: 2 POINTS

13. A number pattern is shown below.

row 1				1		
row 2			4		7	
row 3		10		13	16	
row 4	19		22		25	28

The pattern continues.

- A. What is the difference between the last number in row 5 and the first number in row 5?

difference: 12

Student has given a correct answer, 12.

- B. Write an equation that can be used to find  $d$ , the difference between the last number and the first number, for any row  $r$ .

$d =$   $l - f = d$

Student has given an incorrect answer,  $l - f = d$ .

Go to the next page to finish question 13.

13. **Continued.** Please refer to the previous page for task explanation.

C. What is the first number in row 8?

first number: 85

Student has given a correct answer, 85.

D. What is the last number in row 8?

last number: 97

Student has given an incorrect answer, 97.

**STUDENT RESPONSE**

**RESPONSE SCORE: 1 POINT**



Question 13  
Page 1 of 2

Item ID

?

Line Guide

Options

A number pattern is shown below.

row 1	1			
row 2	4	7		
row 3	10	13	16	
row 4	19	22	25	28

The pattern continues.

**A.** What is the difference between the last number in row 5 and the first number in row 5?

Eq

difference: 12

2 / 50

Student has given a correct answer, 12.

**B.** Write an equation that can be used to find  $d$ , the difference between the last number and the first number, for any row  $r$ .

Eq

$d = 3$

1 / 50

Student has given an incorrect answer,  $d = 3$ .

Review/End Test

Pause

Flag

Options

Next

Question 13  
Page 2 of 2









Item ID

?

A number pattern is shown below.

row 1	1			
row 2	4	7		
row 3	10	13	16	
row 4	19	22	25	28

The pattern continues.

C. What is the first number in row 8?

Eq

first number: 38

Eq

last number: 56

## STUDENT RESPONSE

## RESPONSE SCORE: 0 POINTS

13. A number pattern is shown below.

row 1				1		
row 2			4		7	
row 3		10		13	16	
row 4	19		22		25	28

The pattern continues.

A. What is the difference between the last number in row 5 and the first number in row 5?

$$28 - 19 = 9$$

difference: 9

Student has given an incorrect answer, 9.

B. Write an equation that can be used to find  $d$ , the difference between the last number and the first number, for any row  $r$ .

$$f - 1 = d$$

$\swarrow$  last #  
 $\uparrow$  first #

$d =$   $f - 1$

Student has given an incorrect answer,  $d = f - 1$ .

Go to the next page to finish question 13.

13. **Continued.** Please refer to the previous page for task explanation.

C. What is the first number in row 8?

first number: \_\_\_\_\_ 16 \_\_\_\_\_

Student has given an incorrect answer, 16.

D. What is the last number in row 8?

last number: \_\_\_\_\_ 4 \_\_\_\_\_

Student has given an incorrect answer, 4.

**CONSTRUCTED-RESPONSE ITEM**

14. There was a layer of snow on Joe's driveway when it began to snow again. As the snow fell, Joe measured the depth, in centimeters (cm), of snow on his driveway. After 10 minutes, he measured 2.0 cm of snow on the driveway. After 30 minutes, the snow was 3.6 cm deep. The snow continued to fall at the same constant rate. Joe graphed a line to represent the snowfall.

**A.** What should be the slope of Joe's line?

**B.** Explain what the slope means in this situation.

**Go to the next page to finish question 14.**

14. **Continued.** Please refer to the previous page for task explanation.

C. Write the equation for Joe's line.

D. How many minutes should it take for the depth of the snow to reach 8 cm?

## SCORING GUIDE

### #14 ITEM INFORMATION

<b>Alignment</b>	A1.2.2	<b>Depth of Knowledge</b>	3	<b>Mean Score</b>	0.91
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### ITEM-SPECIFIC SCORING GUIDELINE

Score	Description
<b>4</b>	Demonstrates a <i>thorough</i> understanding of how to identify, describe, and/or use constant rate of change; write or identify a linear equation when given the graph of the line, two points on the line, or the slope and a point on the line; and determine the slope and/or y-intercept represented by a linear equation or graph by correctly solving problems and clearly explaining procedures.
<b>3</b>	Demonstrates a <i>general</i> understanding of how to identify, describe, and/or use constant rate of change; write or identify a linear equation when given the graph of the line, two points on the line, or the slope and a point on the line; and determine the slope and/or y-intercept represented by a linear equation or graph by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
<b>2</b>	Demonstrates a <i>partial</i> understanding of how to identify, describe, and/or use constant rate of change; write or identify a linear equation when given the graph of the line, two points on the line, or the slope and a point on the line; and determine the slope and/or y-intercept represented by a linear equation or graph by correctly performing a significant portion of the required task.
<b>1</b>	Demonstrates <i>minimal</i> understanding of how to identify, describe, and/or use constant rate of change; write or identify a linear equation when given the graph of the line, two points on the line, or the slope and a point on the line; and determine the slope and/or y-intercept represented by a linear equation or graph.
<b>0</b>	The response has no correct answer and <i>insufficient</i> evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. Response may show only information copied from the question.
<b>Non-scorables</b>	B – Blank, entirely erased, or written refusal to respond F – Foreign Language K – Off-task U – Unreadable

**Top Scoring Response:**

Part A Answer	
What?	Why?
0.08 <b>OR equivalent</b>	

**(1 score point)**

1 point for correct answer

Part B Answer	
What?	Why?
	The snow is falling at a rate of 0.08 cm each minute. <b>OR equivalent</b>

**(1 score point)**

1 point for correct explanation

Part C Answer	
What?	Why?
$y = 0.08x + 1.2$ <b>OR equivalent</b> [Note: equation does NOT need to be in slope-intercept form] [Note: student will most likely use his/her slope from <b>part A</b> ]	

**(1 score point)**

1 point for correct answer

Part D Answer	
What?	Why?
85 (minutes)	

**(1 score point)**

1 point for correct answer

## STUDENT RESPONSE

RESPONSE SCORE: 4 POINTS



Question 14  
Page 1 of 2

There was a layer of snow on Joe's driveway when it began to snow again. As the snow fell, Joe measured the depth, in centimeters (cm), of snow on his driveway. After 10 minutes, he measured 2.0 cm of snow on the driveway. After 30 minutes, the snow was 3.6 cm deep. The snow continued to fall at the same constant rate. Joe graphed a line to represent the snowfall.

**A.** What should be the slope of Joe's line?

Eq 0.08 4 / 50

Student has given a correct answer, 0.08.

**B.** Explain what the slope means in this situation.

Eq The slope represents how much snow will fall every minute. In this case, the slope is 0.08, so every minute 0.08 centimeters of snow will fall.

143 / 1000

Student has given a complete explanation.

Next

Options

Flag

Pause

Review/End Test

Question 14  
Page 2 of 2



Item ID

There was a layer of snow on Joe's driveway when it began to snow again. As the snow fell, Joe measured the depth, in centimeters (cm), of snow on his driveway. After 10 minutes, he measured 2.0 cm of snow on the driveway. After 30 minutes, the snow was 3.6 cm deep. The snow continued to fall at the same constant rate. Joe graphed a line to represent the snowfall.

C. Write the equation for Joe's line.

EQ  $y = 0.08x + 1.2$  11 / 50

Student has given a correct equation,  $y = 0.08x + 1.2$ .

D. How many minutes should it take for the depth of the snow to reach 8 cm?

EQ 85 minutes 10 / 50

Student has given a correct answer, 85.

Review/End Test

Pause

Flag

Options

Back

**STUDENT RESPONSE****RESPONSE SCORE: 3 POINTS**

14. There was a layer of snow on Joe's driveway when it began to snow again. As the snow fell, Joe measured the depth, in centimeters (cm), of snow on his driveway. After 10 minutes, he measured 2.0 cm of snow on the driveway. After 30 minutes, the snow was 3.6 cm deep. The snow continued to fall at the same constant rate. Joe graphed a line to represent the snowfall.

A. What should be the slope of Joe's line?

$$\frac{.8}{10}$$

Student has given a correct answer,  $\frac{.8}{10}$ .

B. Explain what the slope means in this situation.

Every 10 minutes, .8cm of snow will pile onto Joe's driveway.

Student has given a complete explanation.

**Go to the next page to finish question 14.**

14. **Continued.** Please refer to the previous page for task explanation.

C. Write the equation for Joe's line.

$$A(.8) + B(.10) = C$$

Student has given an incorrect equation,  $A(.8) + B(.10) = C$ .

D. How many minutes should it take for the depth of the snow to reach 8 cm?

85 min

Student has given a correct answer, 85.

STUDENT RESPONSE

RESPONSE SCORE: 2 POINTS



Question 14  
Page 1 of 2

Item ID

?

Line Guide

Calculator

Graphing

**A.** What should be the slope of Joe's line?

EQ

0.08

4 / 50

Student has given a correct answer, 0.08.

**B.** Explain what the slope means in this situation.

EQ

the rate in centimeters that the snow is falling in minutes

59 / 1000

Student has given a complete explanation.

Next

Options

Flag

Pause

Review/End Test

There was a layer of snow on Joe's driveway when it began to snow again. As the snow fell, Joe measured the depth, in centimeters (cm), of snow on his driveway. After 10 minutes, he measured 2.0 cm of snow on the driveway. After 30 minutes, the snow was 3.6 cm deep. The snow continued to fall at the same constant rate. Joe graphed a line to represent the snowfall.

Question 14  
Page 2 of 2



Item ID

There was a layer of snow on Joe's driveway when it began to snow again. As the snow fell, Joe measured the depth, in centimeters (cm), of snow on his driveway. After 10 minutes, he measured 2.0 cm of snow on the driveway. After 30 minutes, the snow was 3.6 cm deep. The snow continued to fall at the same constant rate. Joe graphed a line to represent the snowfall.

C. Write the equation for Joe's line.

Eq.  8 / 50

Student has given an incorrect equation,  $y = .08 + .8$ .

D. How many minutes should it take for the depth of the snow to reach 8 cm?

Eq.  3 / 50

Student has given an incorrect answer, 100.

Review/End Test

Pause

Flag

Options

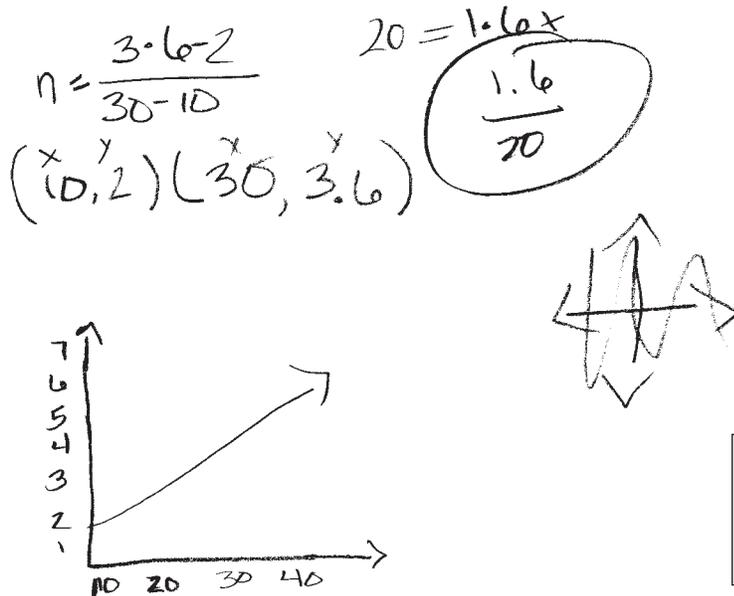
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## STUDENT RESPONSE

## RESPONSE SCORE: 1 POINT

14. There was a layer of snow on Joe's driveway when it began to snow again. As the snow fell, Joe measured the depth, in centimeters (cm), of snow on his driveway. After 10 minutes, he measured 2.0 cm of snow on the driveway. After 30 minutes, the snow was 3.6 cm deep. The snow continued to fall at the same constant rate. Joe graphed a line to represent the snowfall.

A. What should be the slope of Joe's line?



Student has given a correct answer,  $\frac{1.6}{20}$ , that is equivalent to .08.

B. Explain what the slope means in this situation.

The slope shows the steady increase of the snow on the ground.

Student has given an incorrect explanation.

Go to the next page to finish question 14.

14. **Continued.** Please refer to the previous page for task explanation.

C. Write the equation for Joe's line.

~~$15x + 16$~~

~~$20x + 1.6x$~~

$$20x + 1.6x = 7$$

Student has given an incorrect equation,  $20x + 1.6x = y$ .

D. How many minutes should it take for the depth of the snow to reach 8 cm?

~~160 minutes~~

~~$8 + 1.6 = 5.20 = 160$~~

172.8 minutes

Student has given an incorrect answer, 172.8.

**STUDENT RESPONSE**

**RESPONSE SCORE: 0 POINTS**



Question 14  
Page 1 of 2

Next

**A.** What should be the slope of Joe's line?

The slope is 5.

15 / 50

**B.** Explain what the slope means in this situation.

Slope means the depth of the snow fall in this situation.

Student has given an incorrect answer, 5.

Student has given an incorrect explanation.

58 / 1000

Question 14  
Page 2 of 2



Item ID

There was a layer of snow on Joe's driveway when it began to snow again. As the snow fell, Joe measured the depth, in centimeters (cm), of snow on his driveway. After 10 minutes, he measured 2.0 cm of snow on the driveway. After 30 minutes, the snow was 3.6 cm deep. The snow continued to fall at the same constant rate. Joe graphed a line to represent the snowfall.

C. Write the equation for Joe's line.

Eq

$$m = \frac{10 - 30}{2 - 6}$$

7 / 50

Student has given an incorrect equation,  $m = \frac{10 - 30}{2 - 6}$ .

D. How many minutes should it take for the depth of the snow to reach 8 cm?

Eq

100 minutes.

12 / 50

Student has given an incorrect answer, 100.

Options

Flag

Pause

Review/End Test

Back

## ALGEBRA I MODULE 2—SUMMARY DATA

## MULTIPLE-CHOICE

Sample Number	Alignment	Answer Key	Depth of Knowledge	<i>p</i> -values			
				A	B	C	D
1	A1.2.1.1.1	A	2	78%	13%	5%	4%
2	A1.2.1.1.2	B	2	19%	49%	18%	14%
3	A1.2.1.1.3	D	2	14%	12%	8%	66%
4	A1.2.1.2.2	A	2	67%	12%	11%	10%
5	A1.2.2.1.1	C	2	7%	15%	68%	10%
6	A1.2.2.1.2	D	2	9%	24%	21%	46%
7	A1.2.2.1.3	D	2	11%	22%	11%	56%
8	A1.2.2.2.1	A	2	37%	24%	26%	13%
9	A1.2.3.1.1	B	2	21%	53%	16%	10%
10	A1.2.3.2.1	C	2	7%	12%	74%	7%
11	A1.2.3.2.2	B	2	5%	69%	11%	15%
12	A1.2.3.2.3	C	2	7%	12%	58%	23%

## CONSTRUCTED-RESPONSE

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
13	A1.2.1	4	3	1.52
14	A1.2.2	4	3	0.91



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INTENTIONALLY BLANK.**

KEYSTONE EXAMS  
ALGEBRA I

ITEM AND SCORING SAMPLER 2015

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