Ohio’s State Tests

ITEM RELEASE

SPRING 2019

GRADE 8

MATHEMATICS
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## Grade 8 Math
### Spring 2019 Item Release
#### Content Summary and Answer Key

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<th>Answer Key</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>Equation Item</td>
<td>Investigate patterns of association in bivariate data.</td>
<td>Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. (GAISE Model, steps 3 and 4) (8.SP.3)</td>
<td>Level 1</td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td>4</td>
<td>Equation Item</td>
<td>Use functions to model relationships between quantities.</td>
<td>Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two ((x, y)) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. (8.F.4)</td>
<td>Level 2</td>
<td>---</td>
<td>1 point</td>
</tr>
</tbody>
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<tbody>
<tr>
<td>8</td>
<td>Equation Item</td>
<td>Work with radicals and integer exponents.</td>
<td></td>
<td>Level 2</td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. <em>(8.EE.4)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Multiple Choice Item</td>
<td>Understand the connections between proportional relationships, lines, and linear equations.</td>
<td></td>
<td>Level 2</td>
<td>C</td>
<td>1 point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation ( y = mx ) for a line through the origin and the equation ( y = mx + b ) for a line intercepting the vertical axis at ( b ). <em>(8.EE.6)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
| 13            | Table Item| Analyze and solve linear equations and pairs of simultaneous linear equations. | Analyze and solve pairs of simultaneous linear equations. *(8.EE.8)*  
b. Use graphs to find or estimate the solution to a pair of two simultaneous linear equations in two variables. Equations should include all three solution types: one solution, no solution, and infinitely many solutions. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. | Level 2 | --- | 1 point |
| 15            | Equation Item| Work with radicals and integer exponents. | Understand, explain, and apply the properties of integer exponents to generate equivalent numerical expressions. For example, \(3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27\). *(8.EE.1)* | Level 3 | --- | 1 point |
| 17            | Multi Interaction Item| Understand and apply the Pythagorean Theorem. | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. *(8.G.8)* | Level 3 | --- | 2 points |
| 18            | Equation Item| Analyze and solve linear equations and pairs of simultaneous linear equations. | Solve linear equations in one variable. *(8.EE.7)*  
b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. | Level 2 | --- | 1 point |

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<tr>
<td>20</td>
<td>Equation Item</td>
<td>Understand congruence and similarity using physical models, transparencies, or geometry software.</td>
<td>Verify experimentally the properties of rotations, reflections, and translations (include examples both with and without coordinates). (8.G.1) b. Angles are taken to angles of the same measure.</td>
<td>Level 2</td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td>24</td>
<td>Multi Interaction Item</td>
<td>Define, evaluate, and compare functions.</td>
<td>Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Function notation is not required for Grade 8. (8.F.1)</td>
<td>Level 2</td>
<td>---</td>
<td>2 points</td>
</tr>
<tr>
<td>26</td>
<td>Multiple Choice Item</td>
<td>Understand congruence and similarity using physical models, transparencies, or geometry software.</td>
<td>Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. (Include examples both with and without coordinates.) (8.G.2)</td>
<td>Level 1</td>
<td>D</td>
<td>1 point</td>
</tr>
<tr>
<td>30</td>
<td>Equation Item</td>
<td>Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.</td>
<td>Solve real-world and mathematical problems involving volumes of cones, cylinders, and spheres. (8.G.9)</td>
<td>Level 3</td>
<td>---</td>
<td>1 point</td>
</tr>
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<tr>
<td>31</td>
<td>Equation Item</td>
<td>Know that there are numbers that are not rational, and approximate them by rational numbers.</td>
<td>Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., ( \sqrt{2} )). For example, by truncating the decimal expansion of ( \sqrt{2} ), show that ( \sqrt{2} ) is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. (8.NS.2)</td>
<td>Level 3</td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td>32</td>
<td>Multiple Choice Item</td>
<td>Define, evaluate, and compare functions.</td>
<td>Interpret the equation ( y = mx + b ) as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function ( A = s^2 ) giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. (8.F.3)</td>
<td>Level 1</td>
<td>A</td>
<td>1 point</td>
</tr>
<tr>
<td>36</td>
<td>Multiple Choice Item</td>
<td>Understand congruence and similarity using physical models, transparencies, or geometry software.</td>
<td>Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. (Include examples both with and without coordinates.) (8.G.4)</td>
<td>Level 2</td>
<td>C</td>
<td>1 point</td>
</tr>
</tbody>
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<tr>
<td>44</td>
<td>Equation Item</td>
<td>Work with radicals and integer exponents.</td>
<td>Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where $p$ is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. <em>(8.EE.2)</em></td>
<td>Level 1</td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td>45</td>
<td>Equation Item</td>
<td>Understand congruence and similarity using physical models, transparencies, or geometry software.</td>
<td>Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. <em>(8.G.5)</em></td>
<td>Level 2</td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td>46</td>
<td>Multiple Choice</td>
<td>Use functions to model relationships between quantities.</td>
<td>Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. <em>(8.F.5)</em></td>
<td>Level 1</td>
<td>D</td>
<td>1 point</td>
</tr>
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Depth of Knowledge (DOK)

DOK refers to the complexity of thinking required to complete a task in a given item. Items with a DOK 1 designation focus on the recall of information, such as definitions and terms, and simple procedures. Items with a DOK 2 designation require students to make decisions, solve routine problems, perform calculations, or recognize patterns. Items with a DOK 3 designation feature higher-order cognitive tasks. These DOK 3 tasks include but are not limited to: critiquing a statement and forming a conclusion; explaining, justifying, or proving a statement; or approaching abstract, complex, open-ended, and non-routine problems. Each grade’s blueprint contains information about the number of points of opportunity students will encounter at each DOK level.

Table 1: Math Descriptors – Applying Depth of Knowledge Levels for Mathematics (Webb, 2002) & NAEP 2002 Mathematics Levels of Complexity (M. Petit, Center for Assessment 2003, K. Hess, Center for Assessment, updated 2006)

<table>
<thead>
<tr>
<th>Level 1 Recall</th>
<th>Level 2 Skills/Concepts</th>
<th>Level 3 Strategic Thinking</th>
<th>Level 4 Extended Thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Recall, observe, or recognize a fact, definition, term, or property</td>
<td>a. Classify plane and three-dimensional figures</td>
<td>a. Interpret information from a complex graph</td>
<td>a. Relate mathematical concepts to other content areas</td>
</tr>
<tr>
<td>b. Apply/compute a well-known algorithm (e.g., sum, quotient)</td>
<td>b. Interpret information from a simple graph</td>
<td>b. Explain thinking when more than one response is possible</td>
<td>b. Relate mathematical concepts to real-world applications in new situations</td>
</tr>
<tr>
<td>c. Apply a formula</td>
<td>c. Use models to represent mathematical concepts</td>
<td>c. Make and/or justify conjectures</td>
<td>c. Apply a mathematical model to illuminate a problem, situation</td>
</tr>
<tr>
<td>d. Determine the area or perimeter of rectangles or triangles given a drawing and labels</td>
<td>d. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts</td>
<td>d. Use evidence to develop logical arguments for a concept</td>
<td>d. Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results</td>
</tr>
<tr>
<td>e. Identify a plane or three-dimensional figure</td>
<td>e. Compare and/or contrast figures or statements</td>
<td>e. Make and/or justify conjectures</td>
<td>e. Design a mathematical model to inform and solve a practical or abstract situation</td>
</tr>
<tr>
<td>f. Measure</td>
<td>f. Construct 2-dimensional patterns for 3-dimensional models, such as cylinders and cones</td>
<td>f. Use concepts to solve non-routine problems</td>
<td>f. Develop generalizations of the results obtained and the strategies used and apply them to new problem situations</td>
</tr>
<tr>
<td>g. Perform a specified or routine procedure (e.g., apply rules for rounding)</td>
<td>g. Provide justifications for steps in a solution process</td>
<td>g. Generalize a pattern</td>
<td>g. Formulate a mathematical model for a complex situation</td>
</tr>
<tr>
<td>h. Evaluate an expression</td>
<td>h. Extend a pattern</td>
<td>h. Describe, compare, and contrast solution methods</td>
<td>h. Provide mathematical justifications</td>
</tr>
<tr>
<td>i. Solve a one-step word problem</td>
<td>i.</td>
<td>i.</td>
<td></td>
</tr>
<tr>
<td>j. Retrieve information from a table or graph</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 continued on next page.
<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall</td>
<td>Skills/Concepts</td>
<td>Strategic Thinking</td>
<td>Extended Thinking</td>
</tr>
<tr>
<td>k. Recall, identify, or make conversions between and among representations or numbers (fractions, decimals, and percents), or within and between customary and metric measures</td>
<td>i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps</td>
<td>k. Solve a multiple-step problem and provide support with a mathematical explanation that justifies the answer</td>
<td>g. Apply one approach among many to solve problems</td>
</tr>
<tr>
<td>l. Locate numbers on a number line, or points on a coordinate grid</td>
<td>j. Translate between tables, graphs, words and symbolic notation</td>
<td>l. Solve 2-step linear equations/inequalities in one variable over the rational numbers, interpret solution(s) in the original context, and verify reasonableness of results</td>
<td>h. Apply understanding in a novel way, providing an argument/justification for the application</td>
</tr>
<tr>
<td>m. Solve linear equations</td>
<td>k. Make direct translations between problem situations and symbolic notation</td>
<td>m. Translate between a problem situation and symbolic notation that is not a direct translation</td>
<td></td>
</tr>
<tr>
<td>n. Represent math relationships in words, pictures, or symbols</td>
<td>l. Select a procedure according to criteria and perform it</td>
<td>n. Formulate an original problem, given a situation</td>
<td></td>
</tr>
<tr>
<td>o. Read, write, and compare decimals in scientific notation</td>
<td>m. Specify and explain relationships between facts, terms, properties, or operations</td>
<td>o. Analyze the similarities and differences between procedures</td>
<td></td>
</tr>
<tr>
<td>n. Compare, classify, organize, estimate, or order data</td>
<td>n. Compare, classify, organize, estimate, or order data</td>
<td>p. Draw conclusion from observations or data, citing evidence</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Level 4 involves such things as complex restructuring of data or establishing and evaluating criteria to solve problems.

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Grade 8 Math
Spring 2019 Item Release

Question 3

Question and Scoring Guidelines
Question 3

The number of inches of rain, $y$, after $x$ minutes of rainfall during a storm can be modeled by the equation shown.

$$y = 0.003x$$

How many inches of rain falls in 2 minutes?

Points Possible: 1

Content Cluster: Investigate patterns of association in bivariate data.

Content Standard: Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. (GAISE Model, steps 3 and 4) (8.SP.3)

Depth of Knowledge: Level 1
b. Apply/compute a well-known algorithm (e.g., sum, quotient)
i. Solve a one-step word problem
m. Solve linear equations
Scoring Guidelines

Exemplar Response

• 0.006

Other Correct Responses

• any equivalent value

For the item, a full-credit response includes

• the correct value (1 point).
Sample Response: 1 point

The number of inches of rain, $y$, after $x$ minutes of rainfall during a storm can be modeled by the equation shown.

\[ y = 0.003x \]

How many inches of rain falls in 2 minutes?

\[ 0.006 \text{ inches} \]

Notes on Scoring

This response earns full credit (1 point). The student correctly substitutes 2 for $x$ and multiplies 0.003 by 2.
Sample Response: 1 point

The number of inches of rain, $y$, after $x$ minutes of rainfall during a storm can be modeled by the equation shown.

$y = 0.003x$

How many inches of rain falls in 2 minutes?

\[
\frac{6}{1000} \text{ inches}
\]

Notes on Scoring

This response earns full credit (1 point). The student may convert 0.003 to a fraction, substitute 2 for $x$ and correctly multiply $\frac{3}{1000}$ by 2.
Sample Response: 0 points

The number of inches of rain, $y$, after $x$ minutes of rainfall during a storm can be modeled by the equation shown.

$y = 0.003x$

How many inches of rain falls in 2 minutes?

\[
\frac{2000}{3} \text{ inches}
\]

Notes on Scoring

This response earns no credit (0 points). The student may incorrectly substitute 2 for $y$ and solve for $x$, multiplying both numerator and denominator by 1000 to get \( \frac{2000}{3} \).
Sample Response: 0 points

The number of inches of rain, \( y \), after \( x \) minutes of rainfall during a storm can be modeled by the equation shown.

\[ y = 0.003x \]

How many inches of rain falls in 2 minutes?

2.003 inches

Notes on Scoring

This response earns no credit (0 points). The student may correctly substitute 2 for \( x \) but add 0.003 and 2 instead of multiplying.
Question 4

Question and Scoring Guidelines
Question 4

The graph of a linear function passes through the two given points on the coordinate plane.

(3, 15)
(6, 21)

What is the rate of change of the function?
**Points Possible:** 1

**Content Cluster:** Use functions to model relationships between quantities.

**Content Standard:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two \((x, y)\) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. \((8.F.4)\)

**Depth of Knowledge:** Level 2
- c. Use models to represent mathematical concepts
- d. **Solve a routine problem** requiring multiple steps/decision points, or the application of multiple concepts
- i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps

---

**Scoring Guidelines**

**Exemplar Response**

- 2

**Other Correct Responses**

- any equivalent value

For the item, a full-credit response includes

- a correct value (1 point).
Grade 8 Math
Spring 2019 Item Release

Question 4

Sample Responses
Sample Response: 1 point

The graph of a linear function passes through the two given points on the coordinate plane.

(3, 15)
(6, 21)

What is the rate of change of the function?

2

Notes on Scoring

This response earns full credit (1 point). The student correctly identifies the rate of change between the two points. The student may create a coordinate plane on a sheet of grid paper and draw the line between the two points to identify the rate of change.
Sample Response: 1 point

The graph of a linear function passes through the two given points on the coordinate plane.

(3, 15)
(6, 21)

What is the rate of change of the function?

\[
\frac{6}{3}
\]

Notes on Scoring

This response earns full credit (1 point). The student may calculate that when the x-value increases by 3 the y-value increases by 6, and then state the rate of change as a fraction.
Sample Response: 0 points

The graph of a linear function passes through the two given points on the coordinate plane.

(3, 15)
(6, 21)

What is the rate of change of the function?

3

Notes on Scoring

This response earns no credit (0 points). The student may calculate the difference between the x-coordinates and think that this represents the rate of change.
Sample Response: 0 points

The graph of a linear function passes through the two given points on the coordinate plane.

(3, 15)
(6, 21)

What is the rate of change of the function?

\[
\frac{3}{6}
\]

Notes on Scoring

This response earns no credit (0 points). The student may identify that when the x-value increases by 3, the y-value increases by 6, but may place the numbers incorrectly when writing the rate of change as a fraction.
Grade 8 Math
Spring 2019 Item Release

Question 8

Question and Scoring Guidelines
Question 8

An ant weighs $8.8 \times 10^{-6}$ pound and can carry objects up to 5,000 times greater than its own body weight.

What is the greatest weight, in pounds, the ant can carry? Express your answer in standard form.

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. (8.EE.4)

Depth of Knowledge: Level 2

d. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts
Scoring Guidelines

Exemplar Response

• 0.044

Other Correct Responses

• any equivalent value

For the item, a full-credit response includes

• the correct value (1 point).
Grade 8 Math
Spring 2019 Item Release

Question 8

Sample Responses
Sample Response: 1 point

An ant weighs $8.8 \times 10^{-6}$ pound and can carry objects up to 5,000 times greater than its own body weight.

What is the greatest weight, in pounds, the ant can carry? Express your answer in standard form.

0.044 pound

Notes on Scoring

This response earns full credit (1 point). The student correctly multiplies the two values to get 0.044 pounds.
Sample Response: 0 points

An ant weighs $8.8 \times 10^{-6}$ pound and can carry objects up to 5,000 times greater than its own body weight.

What is the greatest weight, in pounds, the ant can carry? Express your answer in standard form.

$pound$

Notes on Scoring

This response earns no credit (0 points). The student may add the values instead of multiplying them.
Sample Response: 0 points

An ant weighs $8.8 \times 10^{-6}$ pound and can carry objects up to 5,000 times greater than its own body weight.

What is the greatest weight, in pounds, the ant can carry? Express your answer in standard form.

44000 pound

Notes on Scoring

This response earns no credit (0 points). The student may multiply 8.8 by 5000 and forget to take $10^{-6}$ into consideration.
Grade 8 Math
Spring 2019 Item Release

Question 9

Question and Scoring Guidelines
Question 9

Point P is located at $(-1, 5)$ on the coordinate plane, and point Q is located at $(3, -3)$. Which point lies on line PQ?

A. $(5, -13)$  
B. $(2, 1)$  
C. $(1, 1)$  
D. $(3, 13)$

**Points Possible:** 1

**Content Cluster:** Understand the connections between proportional relationships, lines, and linear equations.

**Content Standard:** Use similar triangles to explain why the slope $m$ is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at $b$. (8.EE.6)

**Depth of Knowledge:** Level 2  
C. Use models to represent mathematical concepts  
D. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts.
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may incorrectly graph and identify the equation $y = -2x - 3$ as the line connecting the points P and Q. They may then substitute 5 for $x$, and correctly solve the equation to get a $y$-value of $-13$.

Rationale for Option B: This is incorrect. The student may incorrectly graph and identify the equation $y = 2x - 3$ as the line connecting the points P and Q. They may then substitute 2 for $x$, and correctly solve the equation to get a $y$-value of 1.

Rationale for Option C: Key – The student correctly graphs and identifies the equation $y = -2x + 3$ as the line connecting the points P and Q. They then substitute 1 for $x$, and correctly solve the equation to get a $y$-value of 1.

Rationale for Option D: This is incorrect. The student may calculate the slope as 2 instead of $-2$. The student may then graph the first point, ($-1, 5$) and graph the “next point” at $(0, 7)$, resulting in the equation $y = 2x + 7$. The student substitutes 3 for $x$, and solves the equation to get a $y$-value of 13.

Sample Response: 1 point

Point P is located at $(-1, 5)$ on the coordinate plane, and point Q is located at $(3, -3)$. Which point lies on line PQ?

- A  $(5, -13)$
- B  $(2, 1)$
-  $(1, 1)$
- D  $(3, 13)$
Grade 8 Math
Spring 2019 Item Release

Question 13

Question and Scoring Guidelines
Question 13

A system of equations is shown.

\[
\begin{align*}
    y &= 2x - 7 \\
    y &= -x + 5
\end{align*}
\]

What is the solution to the system of equations?

Points Possible: 1

Content Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.

Content Standard: Analyze and solve pairs of simultaneous linear equations. (8.EE.8)
b. Use graphs to find or estimate the solution to a pair of two simultaneous linear equations in two variables. Equations should include all three solution types: one solution, no solution, and infinitely many solutions. Solve simple cases by inspection. For example, \(3x + 2y = 5\) and \(3x + 2y = 6\) have no solution because \(3x + 2y\) cannot simultaneously be 5 and 6.

Depth of Knowledge: Level 2  
b. Interpret information from a simple graph  
c. Use models to represent mathematical concepts  
d. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts  
i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps
Scoring Guidelines

Exemplar Response

- (4, 1)

Other Correct Responses

- N/A

For the item, a full-credit response includes

- a correct ordered pair (1 point).
Grade 8 Math
Spring 2019 Item Release

Question 13

Sample Responses
Sample Response: 1 point

A system of equations is shown.
\[
\begin{align*}
y &= 2x - 7 \\
y &= -x + 5
\end{align*}
\]

What is the solution to the system of equations?
\[
(4, 1)
\]

Notes on Scoring

This response earns full credit (1 point). The student may graph the two equations on scratch/grid paper to correctly identify the solution to the system.

Note: In the future, the Content Advisory Committee has requested we incorporate a graphing component in items like this aligned to 8.EE.8, so the student will both graph the system and identify the solution in the test environment.

Grid paper is encouraged to be used in the classroom and as “scratch paper” during assessments.

see Test Administration Manual, p.30,
http://education.ohio.gov/Topics/Testing/Ohios-State-Test-in-ELA-
Math-Science-SocialStudies/Test-Administration-Resources-for-Ohio-
State-Tests
Sample Response: 0 points

A system of equations is shown.
\[
\begin{align*}
    y &= 2x - 7 \\
    y &= -x + 5
\end{align*}
\]

What is the solution to the system of equations?

(12, 17)

Notes on Scoring

This response earns no credit (0 points). The student may graph the first equation correctly and then miss the negative sign when graphing the second equation, resulting in a solution of (12, 17).
Sample Response: 0 points

A system of equations is shown.

\[
\begin{align*}
y &= 2x - 7 \\
y &= -x + 5
\end{align*}
\]

What is the solution to the system of equations?

(4, 9)

Notes on Scoring

This response earns no credit (0 points). The student may try to solve the system algebraically and calculate the correct \( x \) value. The student may then miss the negative sign when substituting 4 into the second equation to calculate \( y \), resulting in the equation \( y = 4 + 5 \).
Grade 8 Math
Spring 2019 Item Release

Question 15

Question and Scoring Guidelines
Question 15

An equation is given, where \( P \) and \( Q \) represent integers.

\[ 3^P \cdot 3^Q = \frac{1}{9} \]

What are possible values of \( P \) and \( Q \)?

\[ P = \]

\[ Q = \]

Options:

1  2  3
4  5  6
7  8  9
0
-  -  \(\frac{3}{9} = \frac{1}{3} \)

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Understand, explain, and apply the properties of integer exponents to generate equivalent numerical expressions. For example, \( 3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27. \) (8.EE.1)

Depth of Knowledge: Level 3
e. Use concepts to solve non-routine problems
g. Generalize a pattern
i. Formulate a mathematical model for a complex situation
Scoring Guidelines

Exemplar Response

• $P = 2$
• $Q = -4$

Other Correct Responses

• any values where $P + Q = -2$

For the item, a full-credit response includes

• two correct values (1 point).
Grade 8 Math
Spring 2019 Item Release

Question 15

Sample Responses
Sample Response: 1 point

An equation is given, where $P$ and $Q$ represent integers.

$3^P \cdot 3^Q = \frac{1}{9}$

What are possible values of $P$ and $Q$?

$P = \quad -1$

$Q = \quad -1$

Notes on Scoring

This response earns full credit (1 point). The student may work backwards, knowing that $\frac{1}{3}$ times $\frac{1}{3}$ equals $\frac{1}{9}$. The student may know that $\frac{1}{3}$ is equal to $3^{-1}$ and therefore identify values of $P$ and $Q$ that make the equation true.
Sample Response: 1 point

An equation is given, where $P$ and $Q$ represent integers.

$$3^P \cdot 3^Q = \frac{1}{9}$$

What are possible values of $P$ and $Q$?

$$P = \underline{2}$$

$$Q = \underline{-4}$$

Notes on Scoring

This response earns full credit (1 point). The student may start by thinking “I need two 3s in the denominator to get $\frac{1}{9}$.” The student may know that they must have a negative exponent in order to have digits in the denominator, so they may set up an expression like $\frac{3^{P+Q}}{3^{Q+P}}$ to identify values of $P$ and $Q$ that make the equation true.
Sample Response: 0 points

An equation is given, where $P$ and $Q$ represent integers.

$$3^P \cdot 3^Q = \frac{1}{9}$$

What are possible values of $P$ and $Q$?

$P = 1$

$Q = 1$

Notes on Scoring

This response earns no credit (0 points). The student may realize that $3^1 \cdot 3^1$ is 9 but miss that the result should be $\frac{1}{9}$. 
Sample Response: 0 points

An equation is given, where \( P \) and \( Q \) represent integers.

\[ 3^P \cdot 3^Q = \frac{1}{9} \]

What are possible values of \( P \) and \( Q \)?

\[ \begin{align*}
P &= 1 \\
Q &= 9
\end{align*} \]

Notes on Scoring

This response earns no credit (0 points). The student may think that the product of the two exponents should be 9.
Grade 8 Math
Spring 2019 Item Release

Stimulus for Question 17
Stimulus for Question 17

Henry is going to ride his bike to and from school each day. He wants to ride the least possible distance. The map shows the possible routes that Henry could ride each day.

The park near Henry’s house is closed before school, so he cannot ride through the park on his way to school.
Grade 8 Math
Spring 2019 Item Release

Question 17

Question and Scoring Guidelines
Question 17

This item has two parts.

**Part A.** Complete the sentence to show which routes Henry should take to ride the least possible distance.

Henry should take ▼ on the way to school and ▼ on the way home from school.

**Part B.** Using the routes selected in Part A, what is the total distance, in yards, that Henry will ride each day? If necessary, round the distance to the nearest hundredth.

Drop down choices:

Henry should take ▼ on the way to school and ▼ on the way home from school.

- Route A
- Route B
- Route C
Points Possible: 2

Content Cluster: Understand and apply the Pythagorean Theorem.

Content Standard: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (8.G.8)

Depth of Knowledge: Level 3
a. Interpret information from a complex graph
e. Use concepts to solve non-routine problems
f. Perform procedures with multiple steps and multiple decision points
p. Draw conclusions from observations or data, citing evidence

Scoring Guidelines

Score: 2
For 2 points, the response satisfies both of the bullets below.
• The student correctly completed the sentence, providing evidence of an ability to apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
• The student correctly determined the distance, based on the information given or the selections in Part A, providing evidence of an ability to apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Exemplar Response

The response may include:
• Part A: Route C, then Route B
• Part B: 5,148.78 or any value between 5,148 and 5,150 inclusive

Score: 1
For 1 point, the response satisfies one of the bullets.

Exemplar Response

The response may include:
• Part A: Route A, then Route B
• Part B: 5,286.94

Points Possible: 2

Content Cluster: Understand and apply the Pythagorean Theorem.

Content Standard: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (8.G.8)

Depth of Knowledge: Level 3
a. Interpret information from a complex graph
e. Use concepts to solve non-routine problems
f. Perform procedures with multiple steps and multiple decision points
p. Draw conclusions from observations or data, citing evidence
Grade 8 Math
Spring 2019 Item Release

Question 17

Sample Responses
Sample Response: 2 points

This item has two parts.

**Part A.** Complete the sentence to show which routes Henry should take to ride the least possible distance.

Henry should take **Route C** on the way to school and **Route B** on the way home from school.

**Part B.** Using the routes selected in Part A, what is the total distance, in yards, that Henry will ride each day? If necessary, round the distance to the nearest hundredth.

5148.78 yards

Notes on Scoring

This response earns full credit (2 points). Part A. The student identifies the shortest route to and from school by calculating the length of each path using the Pythagorean theorem and counting the length of the horizontal and vertical lines. Part B. The student calculates the correct distance Henry travels by using the key to multiply the lengths of Route C and Route B by 100, adding the products together, and rounding the sum to two decimals.
Sample Response: 2 points

This item has two parts.

Part A. Complete the sentence to show which routes Henry should take to ride the least possible distance.

Henry should take Route C on the way to school and Route B on the way home from school.

Part B. Using the routes selected in Part A, what is the total distance, in yards, that Henry will ride each day? If necessary, round the distance to the nearest hundredth.

5150 yards

Notes on Scoring

This response earns full credit (2 points). Part A. The student identifies the shortest route to and from school by calculating the length of each path using the Pythagorean theorem and counting the length of the horizontal and vertical lines. Part B. The student calculates the correct distance Henry travels by using the key to multiply the lengths of Route C and Route B by 100 and adding the products together, although they may have rounded the hypotenuses to the nearest tenth before adding. Intermediate rounding is discouraged in 8th grade but the student is still awarded the point.
Sample Response: 1 point

This item has two parts.

**Part A.** Complete the sentence to show which routes Henry should take to ride the least possible distance.

Henry should take Route C $\rightarrow$ on the way to school and Route B $\rightarrow$ on the way home from school.

**Part B.** Using the routes selected in Part A, what is the total distance, in yards, that Henry will ride each day? If necessary, round the distance to the nearest hundredth.

51.49 yards

---

Notes on Scoring

This response earns partial credit (1 point). Part A. The student identifies the shortest route to and from school by calculating the length of each path using the Pythagorean theorem and counting the length of the horizontal and vertical lines. Part B. The student calculates the distance Henry travels but forgets to use the key to multiply the lengths of Route C and Route B by 100. The student may round each length to the nearest hundredth before adding the two together.
Sample Response: 1 point

This item has two parts.

**Part A.** Complete the sentence to show which routes Henry should take to ride the least possible distance.

Henry should take Route B ▼ on the way to school and Route B ▼ on the way home from school.

**Part B.** Using the routes selected in Part A, what is the total distance, in yards, that Henry will ride each day? If necessary, round the distance to the nearest hundredth.

![Distance Table](image)

**Notes on Scoring**

This response earns partial credit (1 point). Part A. The student may choose route B twice, potentially because they miss the information about how the park is closed in the morning and cannot be used. Part B. The student correctly calculates the distance Henry travels based on the routes they choose for Part A, rounding to the nearest whole number.
Sample Response: 0 points

This item has two parts.

**Part A.** Complete the sentence to show which routes Henry should take to ride the least possible distance.

Henry should take Route B on the way to school and Route B on the way home from school.

**Part B.** Using the routes selected in Part A, what is the total distance, in yards, that Henry will ride each day? If necessary, round the distance to the nearest hundredth.

2383 yards

---

Notes on Scoring

This response earns no credit (0 points). The student may choose route B twice, potentially because they miss the information about how the park is closed in the morning and cannot be used. Part B. The student only calculates the distance of one route and not both routes.
Question 18

What is the solution to the equation $3x + 2 + 5x = 16$?

$x =$

Points Possible: 1

Content Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.

Content Standard: Solve linear equations in one variable. (8.EE.7)

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Depth of Knowledge: Level 2
d. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts
Scoring Guidelines

Exemplar Response

- $x = 1.75$

Other Correct Responses

- any equivalent value

For the item, a full-credit response includes

- the correct value (1 point).
Grade 8 Math
Spring 2019 Item Release

Question 18

Sample Responses
Sample Response: 1 point

What is the solution to the equation $3x + 2 + 5x = 16$?

$x = 1.75$

Notes on Scoring

This response earns full credit (1 point). The student correctly combines like terms and solves for $x$. 
Sample Response: 1 point

What is the solution to the equation $3x + 2 + 5x = 16$?

$x = \frac{7}{4}$

Notes on Scoring

This response earns full credit (1 point). The student correctly combines like terms and solves for $x$. 
Sample Response: 0 points

What is the solution to the equation $3x + 2 + 5x = 16$?

$x = 2$

Notes on Scoring

This response earns no credit (0 points). The student correctly combines like terms but may forget to subtract 2 from each side before dividing 16 by 8 to get $x = 2$. 
Sample Response: 0 points

What is the solution to the equation $3x + 2 + 5x = 16$?

\[ x = 7 \]

Notes on Scoring

This response earns no credit (0 points). The student may incorrectly combine like terms by subtracting $3x$ from $5x$ instead of adding them together.
Grade 8 Math
Spring 2019 Item Release

Question 20

Question and Scoring Guidelines
Question 20

A series of translations, rotations and reflections is applied to Triangle 1 to create Triangle 2, as shown.

What is the measure, in degrees, of the angle $x$?

\[ \text{degrees} \]

\[ \begin{array}{ccc} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \\ \hline 0 \\ \hline . & - & \frac{1}{5} \end{array} \]
Scoring Guidelines

Exemplar Response

- 81

Other Correct Responses

- any equivalent value

For the item, a full-credit response includes

- a correct value (1 point).
Grade 8 Math
Spring 2019 Item Release

Question 20

Sample Responses
Sample Response: 1 point

A series of translations, rotations and reflections is applied to Triangle 1 to create Triangle 2, as shown.

What is the measure, in degrees, of the angle $x$?

81 $\text{degrees}$

Notes on Scoring

This response earns full credit (1 point). The student correctly calculates the missing angle by subtracting 57 degrees and 42 degrees from 180 degrees.
Sample Response: 0 points

A series of translations, rotations and reflections is applied to Triangle 1 to create Triangle 2, as shown.

What is the measure, in degrees, of the angle x?

99 degrees

Notes on Scoring

This response earns no credit (0 points). The student may correctly add 57 degrees and 42 degrees together but forget to subtract the sum from 180 degrees.
Sample Response: 0 points

A series of translations, rotations and reflections is applied to Triangle 1 to create Triangle 2, as shown.

What is the measure, in degrees, of the angle $x$?

261 degrees

Notes on Scoring

This response earns no credit (0 points). The student may correctly add 57 degrees and 42 degrees together but subtract the sum from 360 degrees instead of from 180 degrees.
Grade 8 Math
Spring 2019 Item Release

Question 24

Question and Scoring Guidelines
Question 24

This item has two parts.

A group of words and a rule are given.

**Words**
Six, Seven, Eight, Nine, Ten

**Rule**

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of the letters in the word</td>
<td>The number the word represents</td>
</tr>
</tbody>
</table>

Part A. Complete the table using the rule given.

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seven</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ten</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part B. Complete the statement.

The table of values ___ a function because ___

**Drop down choices:**

- all the outputs are different.
- two different inputs are assigned to the same output.
- each input is assigned to exactly one output.
- two different outputs are assigned to the same input.
Points Possible: 2

Content Cluster: Define, evaluate, and compare functions.

Content Standard: Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Function notation is not required for Grade 8. (8.F.1)

Depth of Knowledge: Level 2
d. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts
j. Translate between tables, graphs, words and symbolic notation
l. Select a procedure according to criteria and perform it
Scoring Guidelines

Score: 2
For 2 points, the response satisfies both of the bullets below.
• The student correctly completed the table, providing evidence of the understanding of a rule that assigns an output to an input.
• The student correctly completed the statement based on the table of values in Part A, providing evidence of the understanding that a function is a rule that assigns to each input exactly one output.

Exemplar Response

• Part A:

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Seven</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Eight</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Nine</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Ten</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

• Part B: The table of values does not represent a function because two different outputs are assigned to the same input.

Score: 1
For 1 point, the response satisfies one of the bullets.

Exemplar Response

• Part A:

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Seven</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Eight</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Nine</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Ten</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

• Part B: The table of values represents a function because all the outputs are different.
  o Other correct responses to Part B include:
    ▪ If the response to Part A represents a function, the table of values represents a function because each input is assigned to exactly one output.
    ▪ If the response to Part A does not represent a function, the table of values does not represent a function because two different outputs are assigned to the same input.
Grade 8 Math
Spring 2019 Item Release

Question 24

Sample Responses
Sample Response: 2 points

This item has two parts.
A group of words and a rule are given.

<table>
<thead>
<tr>
<th>Words</th>
<th>Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six, Seven, Eight, Nine, Ten</td>
<td>The number of the letters in the word</td>
</tr>
</tbody>
</table>

Part A. Complete the table using the rule given.

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Seven</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Eight</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Nine</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Ten</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

Part B. Complete the statement.

The table of values does not represent a function because two different outputs are assigned to the same input.

Notes on Scoring

This response earns full credit (2 points). Part A. The student correctly fills out the table with the given rule. Part B. The student correctly determines that the table does not represent a function since there are two different outputs being assigned to the same input.
Sample Response: 1 point

This item has two parts.

A group of words and a rule are given.

Words
Six, Seven, Eight, Nine, Ten

Rule
<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of the letters in the word</td>
<td>The number the word represents</td>
</tr>
</tbody>
</table>

Part A. Complete the table using the rule given.

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td>3</td>
</tr>
<tr>
<td>Seven</td>
<td>5</td>
</tr>
<tr>
<td>Eight</td>
<td>5</td>
</tr>
<tr>
<td>Nine</td>
<td>4</td>
</tr>
<tr>
<td>Ten</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

Part B. Complete the statement.

The table of values represents a function because all the outputs are different.

Notes on Scoring

This response earns partial credit (1 point). Part A. The student correctly fills out the table with the given rule. Part B. The student may incorrectly think that the table represents a function since all the outputs are different.
Sample Response: 1 point

This item has two parts.
A group of words and a rule are given.

Words
Six, Seven, Eight, Nine, Ten

Rule
<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of the letters in the word</td>
<td>The number the word represents</td>
</tr>
</tbody>
</table>

Part A. Complete the table using the rule given.

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Seven</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Eight</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Nine</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Ten</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Part B. Complete the statement.

The table of values does not represent a function because two different outputs are assigned to the same input.

Notes on Scoring

This response earns partial credit (1 point). Part A. The student may accidentally use the same rule for the input and output of the last row. Part B. The student may still realize that the table does not represent a function since two different outputs are assigned to the same input.
Sample Response: 0 points

This item has two parts.
A group of words and a rule are given.

<table>
<thead>
<tr>
<th>Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six, Seven, Eight, Nine, Ten</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>The number of the letters in the word</td>
</tr>
</tbody>
</table>

Part A. Complete the table using the rule given.

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Seven</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Eight</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Nine</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Ten</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Part B. Complete the statement.

The table of values does not represent a function because all the outputs are different.

Notes on Scoring

This response earns no credit (0 points). Part A. The student may accidentally use the same rule for the input and output for the last row. Part B. The student may think that the table represents a function since all the outputs are different.
Sample Response: 0 points

This item has two parts.
A group of words and a rule are given.

**Words**

Six, Seven, Eight, Nine, Ten

**Rule**

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of the letters in the word</td>
<td>The number the word represents</td>
</tr>
</tbody>
</table>

**Part A. Complete the table using the rule given.**

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Seven</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Eight</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Nine</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Ten</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

**Part B. Complete the statement.**

The table of values **does not represent** a function because **two different inputs are assigned to the same output.**

**Notes on Scoring**

This response earns no credit (0 points). Part A. The student may accidentally flip the input and output rules. Part B. The student may incorrectly think that since two different inputs are assigned to the same output, the table does not represent a function.
Grade 8 Math
Spring 2019 Item Release

Question 26

Question and Scoring Guidelines
Question 26

A transformation is to be performed on a figure. Which transformation will not produce a congruent figure?

A. reflection across the x-axis
B. translation 2 units to the right
C. rotation of 180 degrees about the origin
D. dilation with a scale factor of 2 centered at the origin

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. (Include examples both with and without coordinates.) (8.G.2)

Depth of Knowledge: Level 1
a. Recall, observe, or recognize a fact, definition, term, or property
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may think that changing the orientation of the figure does not produce an image congruent to the original figure.

Rationale for Option B: This is incorrect. The student may think that moving the figure to the right does not produce an image congruent to the original figure.

Rationale for Option C: This is incorrect. The student may think that changing the orientation of the figure with a rotation does not produce an image congruent to the original.

Rationale for Option D: Key – The student recognizes that the image is similar but not congruent to the original figure. The angle measures are preserved but the side lengths are doubled.

Sample Response: 1 point

A transformation is to be performed on a figure.
Which transformation will not produce a congruent figure?

A reflection across the x-axis
B translation 2 units to the right
C rotation of 180 degrees about the origin
D dilation with a scale factor of 2 centered at the origin
Grade 8 Math
Spring 2019 Item Release

Question 30

Question and Scoring Guidelines
Question 30

Chandni compares two cylinders.

- Both cylinders have an identical base.
- The first cylinder has a height of 4 inches and a volume of 120 cubic inches.
- The second cylinder has a height of 7 inches.

What is the volume, in cubic inches, of the second cylinder?

cubic inches

Points Possible: 1

Content Cluster: Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Content Standard: Solve real-world and mathematical problems involving volumes of cones, cylinders, and spheres. (8.G.9)

Depth of Knowledge: Level 3

- Use concepts to solve non-routine problems
- Perform procedures with multiple steps and multiple decision points
- Analyze the similarities and differences between procedures
Scoring Guidelines

Exemplar Response

- 210 cubic inches

Other Correct Responses

- any value between 197.8 and 211.33, inclusive

For the item, a full-credit response includes

- a correct volume (1 point).
Sample Response: 1 point

Chandni compares two cylinders.

- Both cylinders have an identical base.
- The first cylinder has a height of 4 inches and a volume of 120 cubic inches.
- The second cylinder has a height of 7 inches.

What is the volume, in cubic inches, of the second cylinder?

210 cubic inches

Notes on Scoring

This response earns full credit (1 point). The student may divide 120 by 4 to calculate that a cylinder with a height of 1 inch has a volume of 30 cubic inches. The student may then multiply 30 by 7 and calculate the volume of the cylinder with a height of 7 inches to be 210 cubic inches,

or

The student correctly identifies that the radius of both bases of the cylinders is \( \sqrt{\frac{30}{\pi}} \) and substitutes that into the volume formula \( V = \pi r^2 h \) along with \( h = 7 \) to calculate that the volume of the second cylinder is 210 cubic inches.
Sample Response: 1 point

Chandni compares two cylinders.

- Both cylinders have an identical base.
- The first cylinder has a height of 4 inches and a volume of 120 cubic inches.
- The second cylinder has a height of 7 inches.

What is the volume, in cubic inches, of the second cylinder?

209.97 cubic inches

Notes on Scoring

This response earns full credit (1 point). The student correctly calculates that the radius of both bases of the cylinders is about 3.09 inches. The student then substitutes that value into the volume formula $V = \pi r^2 h$ along with $h = 7$ and calculates that the volume of the second cylinder is about 209.97 cubic inches.
Sample Response: 0 points

Chandni compares two cylinders.

- Both cylinders have an identical base.
- The first cylinder has a height of 4 inches and a volume of 120 cubic inches.
- The second cylinder has a height of 7 inches.

What is the volume, in cubic inches, of the second cylinder?

2005.65 cubic inches

Notes on Scoring

This response earns no credit (0 points). The student may calculate the length of the radius in each base and reach 
\[ r^2 = \frac{30}{\pi} \] but forget to take the square root on both sides of the equation resulting in \( r = 9.55 \). The student then uses this value for \( r \) and the height of 7 inches in the volume formula, 
\[ V = \pi r^2 h, \] and calculates that the volume of the second cylinder is about 2005.65 cubic inches.
Sample Response: 0 points

Chandni compares two cylinders.

- Both cylinders have an identical base.
- The first cylinder has a height of 4 inches and a volume of 120 cubic inches.
- The second cylinder has a height of 7 inches.

What is the volume, in cubic inches, of the second cylinder?

21.99 cubic inches

Notes on Scoring

This response earns no credit (0 points). The student may mistakenly think that since the bases are equal they do not need to substitute a value for $r$ into the volume formula. They instead just calculate $7 \cdot \pi$ and get 21.99 cubic inches as the volume for the second cylinder.
Grade 8 Math
Spring 2019 Item Release

Question 31

Question and Scoring Guidelines
Question 31

An expression is given that has a value between 4.4 and 4.5, and where \( x \) represents an integer.

\[ \sqrt{x} + \sqrt{x} \]

What is the value of \( x \)?

\[ x = \]

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Points Possible: 1

Content Cluster: Know that there are numbers that are not rational, and approximate them by rational numbers.

Content Standard: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., \( \pi^2 \)). For example, by truncating the decimal expansion of \( \sqrt{2} \), show that \( \sqrt{2} \) is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. (8.NS.2)

Depth of Knowledge: Level 3
e. Use concepts to solve non-routine problems
f. Perform procedures with multiple steps and multiple decision points
g. Generalize a pattern
i. Formulate a mathematical model for a complex situation

Scoring Guidelines

Exemplar Response

• 5

Other Correct Responses

• any equivalent value

For the item, a full-credit response includes

• the correct value (1 point).
Grade 8 Math
Spring 2019 Item Release
Question 31
Sample Responses
An expression is given that has a value between 4.4 and 4.5, and where $x$ represents an integer.

$\sqrt{x} + \sqrt{x}$

What is the value of $x$?

$x = 5$
This response earns full credit (1 point). The student correctly calculates that when \( x = 5 \), \( \sqrt{x} + \sqrt{x} = \sqrt{5} + \sqrt{5} \). This is equal to \( 2\sqrt{5} \), which is about 4.47.

or

The student may reason that the number in each term needs to be between half of 4.4 and half of 4.5, so between 2.2 and 2.25. The student may know that the square root of 4 is 2, so the digit needs to be a little larger than 4. The student may try the square root of 5 to get 2.236. The student may also try the square root of 6 to be certain, and calculate that this is 2.449, and decide that this will be “too much.” Finally, the student may check if adding the square root of 5 with the square root of 5 is indeed a number between 4.4 and 4.5 and determine that \( 2.236 + 2.236 = 4.472 \), and is correct.
Sample Response: 0 points

An expression is given that has a value between 4.4 and 4.5, and where $x$ represents an integer.

$$\sqrt{x} + \sqrt{x}$$

What is the value of $x$?

$x = 10$

Notes on Scoring

This response earns no credit (0 points). The student may start with what they know, which is that $\sqrt{16} = 4$ and $\sqrt{25} = 5$. The student may realize that the sum must be somewhere between 16 and 25 and randomly choose to calculate $\sqrt{20}$ and get 4.47. The student may notice that this number indeed is between 4.4 and 4.5. Since there are two equal terms added, $\sqrt{x} + \sqrt{x}$, they may think they can divide 20 by 2 to get $x = 10$. However, they do not realize that $\sqrt{10} + \sqrt{10} \neq \sqrt{20}$. 
Sample Response: 0 points

An expression is given that has a value between 4.4 and 4.5, and where \( x \) represents an integer.

\[ \sqrt{x} + \sqrt{x} \]

What is the value of \( x \)?

\[ x = \boxed{20} \]

Notes on Scoring

This response earns no credit (0 points). The student may start with what they know, which is that \( \sqrt{16} = 4 \) and \( \sqrt{25} = 5 \). The student may think that the number must be somewhere between 16 and 25 and choose to calculate a few different square roots between 16 and 25 to finally get to \( \sqrt{20} \), which is 4.47. The student may notice that 4.47 is indeed between 4.4 and 4.5 and therefore may think that \( x = 20 \).
Which graph represents \( y \) as a linear function of \( x \)?
Points Possible: 1

Content Cluster: Define, evaluate, and compare functions.

Content Standard: Interpret the equation \( y = mx + b \) as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function \( A = s^2 \) giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. (8.F.3)

Depth of Knowledge: Level 1
a. Recall, observe, or recognize a fact, definition, term, or property

Scoring Guidelines

Rationale for Option A: Key – The student identifies the graph of a linear function.

Rationale for Option B: This is incorrect. The student may identify a graph that is a line, but does not consider that it is not a function.

Rationale for Option C: This is incorrect. The student may identify a graph that is a function but not linear.

Rationale for Option D: This is incorrect. The student may identify a graph that is a function but not linear.
Sample Response: 1 point

Which graph represents $y$ as a linear function of $x$?
Grade 8 Math
Spring 2019 Item Release

Question 36

Question and Scoring Guidelines
Question 36

A horizontal line \( m \) is shown with two similar triangles, \( ABC \) and \( DEF \).

How can triangle \( ABC \) be transformed to result in triangle \( DEF \)?

A. a reflection across a vertical line
B. a 90-degree rotation about point \( C \)
C. a dilation, then a translation to the right
D. a dilation, then a reflection across a vertical line

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. (Include examples both with and without coordinates.) (8.G.4)

Depth of Knowledge: Level 2
e. Compare and/or contrast figures or statements
i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may note that a reflection across a vertical line can move the triangle to the right, but does not recognize that this will change the orientation which it does not do in the diagram.

Rationale for Option B: This is incorrect. The student may note that a rotation of 90 degrees can move the triangle to the right, but does not recognize that this will change the orientation which it does not do in the diagram.

Rationale for Option C: Key – The student notes that triangle ABC can be dilated and translated to the right to match the orientation and size of triangle DEF.

Rationale for Option D: This is incorrect. The student may correctly note that a dilation is needed but may also incorrectly transform triangle ABC with a reflection rather than a translation.

Sample Response: 1 point

A horizontal line \( m \) is shown with two similar triangles, ABC and DEF.

How can triangle ABC be transformed to result in triangle DEF?

- A reflection across a vertical line
- A 90-degree rotation about point C
- A dilation, then a translation to the right
- A dilation, then a reflection across a vertical line
Question 44

An expression is shown.
\[ \sqrt[3]{27} + 10 \]

What is the value of the expression?

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Use square root and cube root symbols to represent solutions to equations of the form \( x^2 = p \) and \( x^3 = p \), where \( p \) is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that \( \sqrt{2} \) is irrational. (8.EE.2)

Depth of Knowledge: Level 1
a. Recall, observe, or recognize a fact, definition, term, or property
h. Evaluate an expression
Scoring Guidelines

Exemplar Response

- 13

Other Correct Responses

- any equivalent value

For the item, a full-credit response includes

- a correct value (1 point).
Sample Response: 1 point

An expression is shown.

$$\sqrt[3]{27} + 10$$

What is the value of the expression?

13

Notes on Scoring

This response earns full credit (1 point). The student correctly calculates that the third root of 27 is equal to 3 and adds that to 10 to get 13.
Sample Response: 0 points

An expression is shown.

\[ \sqrt[3]{27} + 10 \]

What is the value of the expression?

19

Notes on Scoring

This response earns no credit (0 points). The student may incorrectly calculate the third root of 27 by dividing 27 by 3 to get 9. They then add 9 to 10 to get 19.
Sample Response: 0 points

An expression is shown.
\[ \sqrt[3]{27} + 10 \]
What is the value of the expression?

\[ 15.20 \]

Notes on Scoring

This response earns no credit (0 points). The student may incorrectly calculate the square root of 27 as 5.20 instead of calculating the cube root. They then add 5.20 to 10 to get 15.20.
Grade 8 Math
Spring 2019 Item Release

Question 45

Question and Scoring Guidelines
Question 45

Line \( c \) intersects parallel lines \( m \) and \( n \) as shown.

What is the value of \( x \), in degrees?

degrees

\[
\begin{array}{ccc}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9 \\
0 & & \\
. & - &
\end{array}
\]
Points Possible: 1

**Content Cluster:** Understand congruence and similarity using physical models, transparencies, or geometry software.

**Content Standard:** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. *(8.G.5)*

**Depth of Knowledge:** Level 2
i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps

---

**Scoring Guidelines**

**Exemplar Response**

- 60

**Other Correct Responses**

- N/A

For the item, a full-credit response includes

- the correct value (1 point).
Grade 8 Math
Spring 2019 Item Release

Question 45

Sample Responses
Sample Response: 1 point

Line $c$ intersects parallel lines $m$ and $n$ as shown.

What is the value of $x$, in degrees?

60 degrees

Notes on Scoring

This response earns full credit (1 point). The student calculates the correct value of $x$ by subtracting 120 from 180, using the fact that consecutive interior angles are supplementary.
Sample Response: 0 points

What is the value of $x$, in degrees?

120 degrees

Notes on Scoring

This response earns no credit (0 points). The student may incorrectly think that consecutive interior angles are congruent.
Sample Response: 0 points

Line \( c \) intersects parallel lines \( m \) and \( n \) as shown.

What is the value of \( x \), in degrees?

\[ -30 \text{ degrees} \]

Notes on Scoring

This response earns no credit (0 points). The student may think that consecutive interior angles are complementary and add up to 90 degrees instead of 180 degrees. They may subtract 120 from 90 to get –30.
Question 46

The graph of a function is shown.

Which statement correctly describes the graph?

(A) The slope is zero.
(B) The slope is undefined.
(C) The function is increasing.
(D) The function is decreasing.
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may think because the line crosses both the x- and y-axis at 8 that the slope is zero.

Rationale for Option B: This is incorrect. The student may think that because there is no equation given with the graph, the slope is not defined.

Rationale for Option C: This is incorrect. The student may see the graph as a line with a positive slope from right to left and therefore is increasing.

Rationale for Option D: Key – The student correctly identifies that the graph is a line with a negative slope and therefore is decreasing.

Points Possible: 1

Content Cluster: Use functions to model relationships between quantities.

Content Standard: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. (8.F.5)

Depth of Knowledge: Level 1
a. Recall, observe, or recognize a fact, definition, term, or property
The graph of a function is shown.

Which statement correctly describes the graph?

A. The slope is zero.
B. The slope is undefined.
C. The function is increasing.
D. The function is decreasing.