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# Grade 8 Math
## Spring 2016 Item Release
### Content Summary and Answer Key

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<tr>
<th>Question No.</th>
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<th>Content Cluster</th>
<th>Content Standard</th>
<th>Answer Key</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Table Item</td>
<td>Analyze and solve linear equations and pairs of simultaneous linear equations.</td>
<td>Solve linear equations in one variable.</td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td>2</td>
<td>Graphic Response Item</td>
<td>Understand the connections between proportional relationships, lines, and linear equations.</td>
<td>Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. (8.EE.5)</td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td>3</td>
<td>Graphic Response Item</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. (8.F.5)</td>
<td>---</td>
<td>1 point</td>
</tr>
</tbody>
</table>
### Grade 8 Math
**Spring 2016 Item Release**
**Content Summary and Answer Key**

<table>
<thead>
<tr>
<th>Question No.</th>
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<th>Points</th>
</tr>
</thead>
</table>
| 4           | Equation Item    | Understand congruence and similarity using physical models, transparencies, or geometry software. | Verify experimentally the properties of rotations, reflections, and translations.  
**a.** Lines are taken to lines, and line segments to line segments of the same length. *(8.G.1a)* | ---         | 1 point |
<p>| 5           | Graphic Response Item | Understand the connections between proportional relationships, lines, and linear equations. | Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. <em>(8.EE.5)</em> | ---         | 1 point |
| 6           | Multiple Choice  | Define, evaluate, and compare functions. | 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. <em>(8.F.3)</em> | B          | 1 point |</p>
<table>
<thead>
<tr>
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<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Multi-Select Item</td>
<td>Define, evaluate, and compare functions.</td>
<td>Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. (8.F.2)</td>
<td>B, D</td>
<td>1 point</td>
</tr>
</tbody>
</table>
| 8           | Equation Item    | Understand congruence and similarity using physical models, transparencies, or geometry software. | Verify experimentally the properties of rotations, reflections, and translations.  
  b. Angles are taken to angles of the same measure. (8.G.1b) | ---        | 1 point |
<p>| 9           | Multiple Choice  | Understand congruence and similarity using physical models, transparencies, or geometry software. | 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. (8.G.4) | A          | 1 point |</p>
<table>
<thead>
<tr>
<th>Question No.</th>
<th>Item Type</th>
<th>Content Cluster</th>
<th>Content Standard</th>
<th>Answer Key</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</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. (8.F.5)</td>
<td>A</td>
<td>1 point</td>
</tr>
</tbody>
</table>
| 11          | Equation Item   | Analyze and solve linear equations and pairs of simultaneous linear equations.   | Analyze and solve pairs of simultaneous linear equations.  
  b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. 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. (8.EE.8b) | ---        | 1 point |
<table>
<thead>
<tr>
<th>Question No.</th>
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<th>Content Standard</th>
<th>Answer Key</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Multiple Choice</td>
<td>Define, evaluate, and compare functions.</td>
<td>Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. (8.F.2)</td>
<td>B</td>
<td>1 point</td>
</tr>
<tr>
<td>13</td>
<td>Multiple Choice</td>
<td>Investigate patterns of association in bivariate data.</td>
<td>Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores? (8.SP.4)</td>
<td>D</td>
<td>1 point</td>
</tr>
</tbody>
</table>
# Grade 8 Math
## Spring 2016 Item Release
### Content Summary and Answer Key

<table>
<thead>
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<th>Answer Key</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Multi-Select 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.) <em>(8.F.1)</em></td>
<td>B, C</td>
<td>1 point</td>
</tr>
<tr>
<td>15</td>
<td>Equation Item</td>
<td>Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.</td>
<td>Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. <em>(8.G.9)</em></td>
<td>---</td>
<td>1 point</td>
</tr>
</tbody>
</table>
Grade 8
Math
Spring 2016 Item Release

Question 1

Question and Scoring Guidelines
Question 1

Select whether each equation has no solution, one solution, or infinitely many solutions.

<table>
<thead>
<tr>
<th>No solution</th>
<th>One solution</th>
<th>Infinitely many solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7x + 10 = 7x + 10$</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>$4x = 4x + 3$</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>$5x + 3 = 2x - 3$</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>$2x + 8 = 3 + 2x$</td>
<td>□</td>
<td></td>
</tr>
</tbody>
</table>

Points Possible: 1

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

Content Standard: Solve linear equations in one variable. 
a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a, a = a,$ or $a = b$ results (where $a$ and $b$ are different numbers). (8.EE.7a)

Scoring Guidelines

For this item, a full-credit response includes:

- “Infinitely many solutions” selected for “$7x + 10 = 7x + 10$”; AND
- “No solution” selected for “$4x = 4x + 3$”; AND
- “One solution” selected for “$5x + 3 = 2x - 3$”; AND
- “No solution” selected for “$2x + 8 = 3 + 2x$” (1 point).
Grade 8
Math
Spring 2016 Item Release

Question 1

Sample Responses
Sample Response: 1 point

Select whether each equation has no solution, one solution, or infinitely many solutions.

<table>
<thead>
<tr>
<th></th>
<th>No solution</th>
<th>One solution</th>
<th>Infinitely many solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7x + 10 = 7x + 10$</td>
<td>☐</td>
<td>☐</td>
<td>✓</td>
</tr>
<tr>
<td>$4x = 4x + 3$</td>
<td>✓</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>$5x + 3 = 2x - 3$</td>
<td>☐</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>$2x + 8 = 3 + 2x$</td>
<td>✓</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns full credit (1 point) because the student correctly identified the number of solutions each equation has.

1. $7x + 10 = 7x + 10$
   a. Both sides are equal so any number can be substituted for $x$, i.e., this equation has an infinite number of solutions.

2. $4x = 4x + 3$
   a. Subtracting $4x$ from both sides leaves $0 = 3$, which is not true. No matter what number is substituted for $x$ will still leave $0 = 3$.

3. $5x + 3 = 2x - 3$
   a. To create equality between the two sides of the equation $x$ needs to be substituted with $-2$. This would be the only solution to this equation.

4. $2x + 8 = 3 + 2x$
   a. Subtracting $2x$ from both sides leaves $8 = 3$, which is not true. No matter what number is substituted for $x$ will still leave $8 = 3$. 
Sample Response: 0 points

Select whether each equation has no solution, one solution, or infinitely many solutions.

<table>
<thead>
<tr>
<th></th>
<th>No solution</th>
<th>One solution</th>
<th>Infinitely many solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7x + 10 = 7x + 10$</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>$4x = 4x + 3$</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$5x + 3 = 2x - 3$</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>$2x + 8 = 3 + 2x$</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly identify the number of solutions each equation has. The student did not identify that the first equation has an infinite number of solutions.
Sample Response: 0 points

Select whether each equation has no solution, one solution, or infinitely many solutions.

<table>
<thead>
<tr>
<th></th>
<th>No solution</th>
<th>One solution</th>
<th>Infinitely many solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7x + 10 = 7x + 10$</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>$4x = 4x + 3$</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>$5x + 3 = 2x - 3$</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$2x + 8 = 3 + 2x$</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly identify the number of solutions each equation has. The student may have incorrectly thought that when the same number as the coefficient to the $x$ is on both sides (i.e., $7x$, $4x$, $2x$), the equation has infinitely many solutions. The student may have thought that when the coefficient to the $x$ is not the same, the equation has no solutions, which is also incorrect.
Grade 8
Math
Spring 2016 Item Release

Question 2

Question and Scoring Guidelines
A grocery store sells 2 pounds of apples for $4.

Use the Add Arrow tool to graph the relationship between the cost of apples and their weight.

**Points Possible:** 1

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

**Content Standard:** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. (8.EE.5)
Scoring Guidelines

Exemplar Response

Other Correct Responses
- Any graph with two points on the line $y = 2x$

For this item, a full-credit response includes:
- A correct graph (1 point).
Grade 8
Math
Spring 2016 Item Release

Question 2

Sample Responses
Sample Response: 1 point

A grocery store sells 2 pounds of apples for $4.

Use the Add Arrow tool to graph the relationship between the cost of apples and their weight.

Notes on Scoring

This response earns full credit (1 point) because the student correctly graphed the relationship. The student correctly identified the unit rate, $2 per pound of apples, and used this as the slope of the line. The student also correctly interpreted this scenario to be a proportional relationship and therefore started the line at the origin.
Sample Response: 0 points

A grocery store sells 2 pounds of apples for $4.

Use the Add Arrow tool to graph the relationship between the cost of apples and their weight.

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly graph the relationship. The student may have thought that the weight of apples should be plotted directly on the x-axis, at (2, 0), then thought that the cost, $4, is plotted on the y-axis and placed 4 on the x-axis as well, at (4, 4).
A grocery store sells 2 pounds of apples for $4.

Use the Add Arrow tool to graph the relationship between the cost of apples and their weight.

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly graph the relationship. The student may have thought that the weight should be plotted directly on the x-axis, at (2, 0), and then thought that the line should be drawn to the top-right corner of the graph at (11, 11).
Grade 8
Math
Spring 2016 Item Release

Question 3

Question and Scoring Guidelines
Question 3

The cost of a product, C, remains constant over time, t.

Use the Add Arrow tool to create a graph that could represent this situation.

**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)
Scoring Guidelines

Exemplar Response

Other Correct Responses

- Any horizontal line

For this item, a full-credit response includes:

- A correct graph (1 point).
Grade 8
Math
Spring 2016 Item Release

Question 3

Sample Responses
The cost of a product, $C$, remains constant over time, $t$. Use the Add Arrow tool to create a graph that could represent this situation.

**Notes on Scoring**

This response earns full credit (1 point) because the student correctly graphed a line that shows a constant cost for a product over time. Regardless of the time (anywhere on the $x$-axis), the product costs the same (it has the same value on the $y$-axis).
The cost of a product, $C$, remains constant over time, $t$.

Use the Add Arrow tool to create a graph that could represent this situation.

**Notes on Scoring**

This response earns no credit (0 points) because the student did not correctly graph a line that shows a constant cost for a product over time. The student may have thought that the cost grows with a constant rate, which means that for each time interval, the cost would grow an equal amount, i.e., the cost does not remain constant over time.
Sample Response: 0 points

The cost of a product, \( C \), remains constant over time, \( t \).

Use the Add Arrow tool to create a graph that could represent this situation.

![Graph of Product Cost]

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly graph a line that shows a constant cost for a product over time. The student may have thought that the cost decreases with a constant rate, which means that for each time interval, the cost would decrease an equal amount, i.e., the cost does not remain constant over time.
Grade 8
Math
Spring 2016 Item Release

Question 4

Question and Scoring Guidelines
Question 4

A company created a logo using two hexagons as shown. Hexagon $PQRSTU$ is a translation of hexagon $ABCDEF$.

What is the length of line segment $TS$?

Points Possible: 1

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

Content Standard: Verify experimentally the properties of rotations, reflections, and translations.

a. Lines are taken to lines, and line segments to line segments of the same length. (8.G.1a)
Scoring Guidelines

Exemplar Response

• 4

For this item, a full-credit response includes:

• The correct length of $TS$ (1 point).
Grade 8
Math
Spring 2016 Item Release

Question 4

Sample Responses
Sample Response: 1 point

A company created a logo using two hexagons as shown. Hexagon $PQRSTU$ is a translation of hexagon $ABCDEF$.

What is the length of line segment $TS$?

4

Notes on Scoring

This response earns full credit (1 point) because the student determined the correct length of line segment $TS$. The student identified that line segment $TS$ corresponds to line segment $ED$ and responded correctly that the length of line segment $TS$ is the same length as line segment $ED$, 4. The student understands that a translation does not change the side lengths of a shape.
A company created a logo using two hexagons as shown. Hexagon $PQRSTU$ is a translation of hexagon $ABCDEF$.

What is the length of line segment $TS$?

4.5

Notes on Scoring

This response earns no credit (0 points) because the student did not determine the correct length of line segment $TS$. The student may have incorrectly thought that the line segment increased in length by 0.5 when translated.
A company created a logo using two hexagons as shown. Hexagon $PQRSUT$ is a translation of hexagon $ABCDEF$.

What is the length of line segment $TS$?

Sample Response: 0 points

Notes on Scoring

This response earns no credit (0 points) because the student did not determine the correct length of line segment $TS$. The student may have thought that the side length increased in length by 1 when translated.
Grade 8
Math
Spring 2016 Item Release

Question 5

Question and Scoring Guidelines
Question 5

Roderick can water his lawn with a small hose or a large hose.

- The small hose pumps 15 gallons of water per minute.
- The large hose pumps water at twice the rate of the small hose.

Use the Add Arrow tool to show the relationship between time and the gallons of water pumped by the large hose.

Points Possible: 1

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

Content Standard: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. (8.EE.5)
Scoring Guidelines

Exemplar Response

• The graph of \( y = 30x \)

Other Correct Responses

• The student will not be penalized for graphing the relationship for the small hose.
• The student will not be penalized for an incorrect direction of the ray.
• The student will not be penalized for a correct graph that starts somewhere other than the origin.

For this item, a full-credit response includes:

• The correct line (1 point).
Grade 8
Math
Spring 2016 Item Release

Question 5

Sample Responses
Sample Response: 1 point

Roderick can water his lawn with a small hose or a large hose.

- The small hose pumps 15 gallons of water per minute.
- The large hose pumps water at twice the rate of the small hose.

Use the Add Arrow tool to show the relationship between time and the gallons of water pumped by the large hose.

Notes on Scoring

This response earns full credit (1 point) because the student has correctly shown the relationship between time and the gallons of water pumped by the large hose, 30 gallons per minute.
Sample Response: 1 point

Roderick can water his lawn with a small hose or a large hose.
- The small hose pumps 15 gallons of water per minute.
- The large hose pumps water at twice the rate of the small hose.

Use the Add Arrow tool to show the relationship between time and the gallons of water pumped by the large hose.

Notes on Scoring

This response earns full credit (1 point) because the student has correctly shown the relationship between time and the gallons of water pumped by the large hose, 30 gallons per minute. Even though the student did not start the graph at the origin, the student is still showing the correct relationship.
Roderick can water his lawn with a small hose or a large hose.

- The small hose pumps 15 gallons of water per minute.
- The large hose pumps water at twice the rate of the small hose.

Use the Add Arrow tool to show the relationship between time and the gallons of water pumped by the large hose.

**Notes on Scoring**

This response earns no credit (0 points) because the student used an incorrect graph to depict the scenario. This graph shows discrete data, not continuous data. This graph shows a scatter plot, which shows that at 1 minute, from the start, 30 gallons of water is released onto the lawn; at 2 minutes, 60 gallons is released onto the lawn, and so on. The scenario in the item needs to be depicted by a line-graph showing continuous data—the total amount of water that has, over time, been added to the lawn.
Sample Response: 0 points

Roderick can water his lawn with a small hose or a large hose.
- The small hose pumps 15 gallons of water per minute.
- The large hose pumps water at twice the rate of the small hose.

Use the Add Arrow tool to show the relationship between time and the gallons of water pumped by the large hose.

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly show the relationship between time and the gallons of water pumped by the large hose, 30 gallons per minute. The student may have misread the scale on the x-axis and thought that 1 minute is the first blue line to the right of zero, when it is actually only half of a minute.
Grade 8
Math
Spring 2016 Item Release

Question 6

Question and Scoring Guidelines
Question 6

Which table represents a linear function?

A

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

B

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>−2</td>
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</tr>
<tr>
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<td>2</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
</tr>
<tr>
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<td>4</td>
</tr>
</tbody>
</table>

C

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
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<td>−8</td>
</tr>
<tr>
<td>8</td>
<td>−4</td>
</tr>
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</table>

D

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

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)
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may have thought that linear functions must repeat.

Rationale for Option B: Key – The student recognized that the rate of change for this function is constant.

Rationale for Option C: This is incorrect. The student may have thought that dividing the previous output by 2 results in a linear function.

Rationale for Option D: This is incorrect. The student may have thought that if the x-value changed at a constant rate, the function is linear.

Sample Response: 1 point
Question 7

Charlie and Susan are planning a party for 10 people. Charlie finds a location that charges an initial fee of $20 plus $25 per person. Susan finds a location whose rental fee is represented by the equation $y = 15x + 100$, where $x$ is the number of people in attendance and $y$ is the total cost.

Select all the statements that are true.

- Charlie’s location is a cheaper location.
- Susan’s location is cheaper for 10 people.
- The charge for each additional person is greater for Susan’s location.
- The charge for each additional person is greater for Charlie’s location.
- If the number of people at the party changes to 12, the total cost at each location is the same.

Points Possible: 1

Content Strand: Define, evaluate, and compare functions.

Content Standard: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. (8.F.2)

Scoring Guidelines

Rationale for First Option: This is incorrect. The student may have compared the two functions with a number of people in attendance less than 8.

Rationale for Second Option: Key – The student correctly compared the two functions.

Rationale for Third Option: This is incorrect. The student may not have known how to calculate the rate of change.

Rationale for Fourth Option: Key – The student correctly compared the two functions.

Rationale for Fifth Option: This is incorrect. The student may not have calculated correctly when substituting values for $x$. 
Grade 8
Math
Spring 2016 Item Release

Question 7

Sample Responses
Sample Response: 1 point

Charlie and Susan are planning a party for 10 people. Charlie finds a location that charges an initial fee of $20 plus $2.50 per person.
Susan finds a location whose rental fee is represented by the equation $y = 15x + 100$, where $x$ is the number of people in attendance and $y$ is the total cost.

Select all the statements that are true.

- Charlie’s location is a cheaper location.  
  - Susan’s location is cheaper for 10 people.
  - The charge for each additional person is greater for Susan’s location.
  - The charge for each additional person is greater for Charlie’s location.
  - If the number of people at the party changes to 12, the total cost at each location is the same.

Notes on Scoring

This response earns full credit (1 point) because the student identified the two correct statements.
Sample Response: 0 points

<table>
<thead>
<tr>
<th>Charlie and Susan are planning a party for 10 people. Charlie finds a location that charges an initial fee of $20 plus $2.50 per person. Susan finds a location whose rental fee is represented by the equation $y = 15x + 100$, where $x$ is the number of people in attendance and $y$ is the total cost. Select all the statements that are true.</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔ Charlie’s location is a cheaper location.</td>
</tr>
<tr>
<td>✔ Susan’s location is cheaper for 10 people.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>✔ The charge for each additional person is greater for Charlie’s location.</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns no credit (0 points) because the student selected one statement that is not correct (the first statement) in addition to the two correct statements. For the first statement, the student may have compared the two equations, substituting for $x$ a number of people in attendance that was less than 8.
Sample Response: 0 points

Charlie and Susan are planning a party for 10 people. Charlie finds a location that charges an initial fee of $20 plus $25 per person.

Susan finds a location whose rental fee is represented by the equation \( y = 15x + 100 \), where \( x \) is the number of people in attendance and \( y \) is the total cost.

Select all the statements that are true.

- [ ] Charlie’s location is a cheaper location.
- [ ] Susan’s location is cheaper for 10 people.
- [x] The charge for each additional person is greater for Susan’s location.
- [ ] The charge for each additional person is greater for Charlie’s location.
- [ ] If the number of people at the party changes to 12, the total cost at each location is the same.

Notes on Scoring

This response earns no credit (0 points) because the student did not identify the two correct statements.
Question 8

Quadrilateral $MNOP$ is reflected over a line and translated up, as shown.

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

Points Possible: 1

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

Content Standard: Verify experimentally the properties of rotations, reflections, and translations.

b. Angles are taken to angles of the same measure. (8.G.1b)
Scoring Guidelines

Exemplar Response

- 130

Other Correct Responses

- N/A

For this item, a full-credit response includes:

- The correct value of x (1 point).
Grade 8
Math
Spring 2016 Item Release

Question 8

Sample Responses
Sample Response: 1 point

Quadrilateral MNOP is reflected over a line and translated up, as shown.

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

130

Notes on Scoring

This response earns full credit (1 point) because the student correctly determined the value of $x$ by understanding that the value of $x$ corresponds to the measure of angle $N$ in the original quadrilateral.
Sample Response: 0 points

Quadrilateral $MNOP$ is reflected over a line and translated up, as shown.

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

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly determine the value of $x$. The student may have thought that the value of $x$ corresponds to the measure of angle $O$ in the original quadrilateral.
Sample Response: 0 points

Quadrilateral $MNOP$ is reflected over a line and translated up, as shown.

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

120

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly determine the value of $x$. The student may have seen $x$ correspond to the measure of angle $M$. The student may have thought that the angle sum in a quadrilateral is 370 degrees, when it is actually 360 degrees, and calculated the measure of angle $M$ to be 120 degrees based on this. The student then may have thought that this corresponded with the value of $x$: $370 - 70 - 50 - 130 = 120$.

OR

The student may have thought that the measure of angle $M$ is the sum of the adjacent angle (70 degrees) and the opposite angles (50 degrees).
Grade 8
Math
Spring 2016 Item Release

Question 9

Question and Scoring Guidelines
Question 9

Parallelograms $ABCD$ and $WXYZ$ are shown.

What transformation is used to show that the parallelograms are similar?

- A dilation
- B reflection
- C rotation
- D translation

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. (8.G.4)

Scoring Guidelines

Rationale for Option A: Key – The student identified the correct transformation.

Rationale for Option B: This is incorrect. The student may have confused reflection with dilation.

Rationale for Option C: This is incorrect. The student may have confused rotation with dilation.

Rationale for Option D: This is incorrect. The student may have confused translation with dilation.
Parallelograms $ABCD$ and $WXYZ$ are shown.

What transformation is used to show that the parallelograms are similar?

- [ ] dilation
- [x] reflection
- [ ] rotation
- [ ] translation
Grade 8
Math
Spring 2016 Item Release

Question 10

Question and Scoring Guidelines
Question 10

Which graph shows a zero rate of change?

A) [Graph A]

B) [Graph B]

C) [Graph C]

D) [Graph D]

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)
Scoring Guidelines

Rationale for Option A: Key – The student correctly identified a horizontal line as having a zero rate of change; no matter what time, the distance has not changed.

Rationale for Option B: This is incorrect. The student may have thought that with a y-intercept of 8 and an x-intercept of 8, the difference between the two is a zero rate of change.

Rationale for Option C: This is incorrect. The student may have thought that the rate of change of the line is zero because it has both positive and negative slopes and the graph seems to have a line of symmetry.

Rationale for Option D: This is incorrect. The student may have incorrectly thought that the rate of change is zero when the line is vertical; at “4 hours”, the distance can be anything from zero to infinity.

Sample Response: 1 point
Grade 8  
Math  
Spring 2016 Item Release  

Question 11  

Question and Scoring Guidelines
A system of equations is shown.

\[ 2x - y = 15 \]
\[ y = 9 \]

What is the value of \( x \) in the solution to this system?

Points Possible: 1

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

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

b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. 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. (8.EE.8b)
Scoring Guidelines

Exemplar Response

- 12

Other Correct Responses

- N/A

For this item, a full-credit response includes:

- The correct value of x (1 point).
Grade 8
Math
Spring 2016 Item Release

Question 11

Sample Responses
Sample Response: 1 point

A system of equations is shown.

\[2x - y = 15\]
\[y = 9\]

What is the value of \(x\) in the solution to this system?

12

Notes on Scoring

This response earns full credit (1 point) because the student correctly determined the value of \(x\). The student may have substituted 9 for \(y\) in the first equation, solved that equation and then found that \(x\) needs to be equal to 12 to make the equation true.
Sample Response: 0 points

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly determine the value of \( x \). The student may have incorrectly substituted 9 for \( x \) in the first equation to get the answer of 3.
Sample Response: 0 points

A system of equations is shown.

\[ 2x - y = 15 \]
\[ y = 9 \]

What is the value of \( x \) in the solution to this system?

\[-3\]

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly determine the value of \( x \). The student may have incorrectly substituted 9 for \( x \) in the first equation, subtracted 18 from both sides to get \(-y = -3\) and forgotten the negative sign in front of the \( y \).
Grade 8
Math
Spring 2016 Item Release

Question 12

Question and Scoring Guidelines
Brian and Tim both ride their bikes at a constant speed and leave from the same location. Brian’s ride times are shown in the table.

**Brian’s Bike Ride**

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Distance (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>3</td>
</tr>
</tbody>
</table>

Tim rides faster than Brian.
Which graph could represent Tim’s bike ride?

**Points Possible:** 1

**Content Cluster:** Define, evaluate, and compare functions.

**Content Standard:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. *(8.F.2)*
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may have graphed the data shown in Brian’s table.

Rationale for Option B: Key – The student correctly identified that a speed of $1/6$ mile per minute is faster than $1/8$ mile per minute.

Rationale for Option C: This is incorrect. The student may have thought that $1/9$ mile per minute is faster than $1/8$ mile per minute.

Rationale for Option D: This is incorrect. The student may have thought that $1/10$ mile per minute is faster than $1/8$ mile per minute.

Sample Response: 1 point
Grade 8
Math
Spring 2016 Item Release

Question 13

Question and Scoring Guidelines
Question 13

A restaurant manager surveys 80 people in two different age groups on whether they prefer turkey or chicken sandwiches. Which two-way table shows no association between age and sandwich choice?

<table>
<thead>
<tr>
<th></th>
<th>Turkey</th>
<th>Chicken</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>People Age 30 and Over</td>
<td>30</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>People Under Age 30</td>
<td>10</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>40</td>
<td>80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Turkey</th>
<th>Chicken</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>People Age 30 and Over</td>
<td>0</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>People Under Age 30</td>
<td>40</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>40</td>
<td>80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Turkey</th>
<th>Chicken</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>People Age 30 and Over</td>
<td>40</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>People Under Age 30</td>
<td>0</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>40</td>
<td>80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Turkey</th>
<th>Chicken</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>People Age 30 and Over</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>People Under Age 30</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>40</td>
<td>80</td>
</tr>
</tbody>
</table>

**Points Possible:** 1

**Content Cluster:** Investigate patterns of association in bivariate data.

**Content Standard:** Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores? (8.SP.4)
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may have chosen a table with a weaker association.

Rationale for Option B: This is incorrect. The student may have chosen a table with a strong association.

Rationale for Option C: This is incorrect. The student may have chosen a table with a strong association.

Rationale for Option D: **Key** – The student chose a table with an equal association across all options, thus indicating no association between age and sandwich choice.

Sample Response: 1 point
Grade 8
Math
Spring 2016 Item Release

Question 14

Question and Scoring Guidelines
Question 14

Select all the tables with data that represent a function.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>24</td>
<td>4</td>
</tr>
</tbody>
</table>

Points Possible: 1

Content Strand: 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)
Scoring Guidelines

Rationale for First Option: This is incorrect. The student may have failed to see that this is not a function because both $x=5$ and $x=10$ are related to more than one output.

Rationale for Second Option: Key – The student correctly noticed that this is a function because each $x$-value relates to exactly one $y$-value.

Rationale for Third Option: Key – The student correctly noticed that this is a function because each $x$-value relates to exactly one $y$-value.

Rationale for Fourth Option: This is incorrect. The student may have failed to see that this is not a function because 15 appears as an $x$-value more than one time, and it is related to a different $y$-value each time.

Rationale for Fifth Option: This is incorrect. The student may have failed to recognize that this is not a function because 24 appears as an $x$-value more than one time, and it is related to a different $y$-value each time.
Grade 8 Math
Spring 2016 Item Release

Question 14

Sample Responses
Notes on Scoring

This response earns full credit (1 point) because the student correctly identified the two tables that represent functions.
Sample Response: 0 points

Select all the tables with data that represent a function.

- ✔️  
  
<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

- ✔️  
  
<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

- ✔️  
  
<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
</tr>
</tbody>
</table>

- ✗  
  
<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

- ✗  
  
<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>24</td>
<td>4</td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns no credit (0 points) because the student selected one table that is incorrect in addition to the two correct tables, and thus earns no credit.
Sample Response: 0 points

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns no credit (0 points) because the student did not select the two correct tables. Instead, the student selected one incorrect table.
Grade 8
Math
Spring 2016 Item Release

Question 15

Question and Scoring Guidelines
Question 15

A farm has two cylindrical silos for storing grain as shown.

How much greater is the volume, in cubic feet, of the larger silo than the smaller silo?

Points Possible: 1

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

Content Standard: Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. (8.G.9)
Scoring Guidelines

Exemplar Response

- $2160\pi$

Other Correct Responses

- Any value from 6782 to 6789, inclusive.

For this item, a full-credit response includes:

- A correct difference in volume (1 point).
Grade 8
Math
Spring 2016 Item Release

Question 15

Sample Responses
Sample Response: 1 point

A farm has two cylindrical silos for storing grain as shown.

How much greater is the volume, in cubic feet, of the larger silo than the smaller silo?

\[ 2160\pi \]

Notes on Scoring

This response earns full credit (1 point) because the student correctly calculated the difference in volume.
Sample Response: 1 point

A farm has two cylindrical silos for storing grain as shown.

How much greater is the volume, in cubic feet, of the larger silo than the smaller silo?

\[ \pi \cdot 18^2 \cdot 20 - \pi \cdot 12^2 \cdot 30 \]

Notes on Scoring

This response earns full credit (1 point) because the student responded with a correct equivalent expression for the difference in volume.
Sample Response: 0 points

A farm has two cylindrical silos for storing grain as shown.

How much greater is the volume, in cubic feet, of the larger silo than the smaller silo?

2160

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly calculate the difference in volume. The student seems to have forgotten to multiply by Pi ($\pi$).
Sample Response: 0 points

A farm has two cylindrical silos for storing grain as shown.

How much greater is the volume, in cubic feet, of the larger silo than the smaller silo?

$10800\cdot\pi$

Notes on Scoring

This response earns no credit (0 points) because the student did not correctly calculate the difference in volume. The student seems to have added the volumes instead of finding the difference between the volumes.