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</table>
| 1           | Equation Item   | Understand congruence and similarity using physical models, transparencies, or geometry software. | Verify experimentally the properties of rotations, reflections, and translations: (8.G.1)  
a. Lines are taken to lines, and line segments to line segments of the same length. | ---         | 1 point |
| 2           | Multiple Choice | Investigate patterns of association in bivariate data. | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. (8.SP.2) | B          | 1 point |
| 3           | Multiple Choice | Define, evaluate, and compare functions. | 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) | B          | 1 point |
## Grade 8 Math
### Spring 2017 Item Release
#### Content Summary and Answer Key

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<tr>
<td>4</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>
<tr>
<td>5</td>
<td>Multiple Choice</td>
<td>Understand the connections between proportional relationships, lines, and linear equations.</td>
<td>Use similar triangles to explain why the slope <em>m</em> 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 <em>b</em>. <em>(8.EE.6)</em></td>
<td>B</td>
<td>1 point</td>
</tr>
<tr>
<td>6</td>
<td>Multiple Choice</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. <em>For example, the function</em> ( A = s^2 ) <em>giving the area of a square as a function of its side length is not linear because its graph contains the points</em> ((1, 1), (2, 4)) <em>and</em> ((3, 9)), <em>which are not on a straight line</em>. <em>(8.F.3)</em></td>
<td>D</td>
<td>1 point</td>
</tr>
<tr>
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<tr>
<td>7</td>
<td>Equation 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. <em>(8.G.2)</em></td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
<td>8</td>
<td>Multi-Select Item</td>
<td>Know that there are numbers that are not rational, and approximate them by rational numbers.</td>
<td>Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. <em>(8.NS.1)</em></td>
<td>B, E</td>
<td>1 point</td>
</tr>
<tr>
<td>9</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>---</td>
<td>1 point</td>
</tr>
<tr>
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| 10          | 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. | --- | 1 point |
| 11          | Multiple Choice | Understand congruence and similarity using physical models, transparencies, or geometry software. | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. *(8.G.3)* | A | 1 point |
| 12          | Table Item | Use functions to model relationships between quantities. | 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)* | --- | 1 point |
| 13          | Equation Item | Understand and apply the Pythagorean Theorem. | Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. *(8.G.7)* | --- | 1 point |
# Grade 8 Math

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### Content Summary and Answer Key

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<tr>
<td>14</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>C</td>
<td>1 point</td>
</tr>
<tr>
<td>15</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>---</td>
<td>1 point</td>
</tr>
<tr>
<td>16</td>
<td>Multi-Select 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., ( \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. <em>(8.NS.2)</em></td>
<td>C, D</td>
<td>1 point</td>
</tr>
</tbody>
</table>
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<tr>
<td>17</td>
<td>Equation Item</td>
<td>Work with radicals and integer exponents.</td>
<td>Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities and to express how many times as much one is than the other. For example, estimate the population of the United States as $3 \cdot 10^8$; and the population of the world as $7 \cdot 10^9$; and determine that the world population is more than 20 times larger. (8.EE.3)</td>
<td>---</td>
<td>1 point</td>
</tr>
</tbody>
</table>
| 18           | Multiple Choice | Analyze and solve linear equations and pairs of simultaneous linear equations. | Analyze and solve pairs of simultaneous linear equations. (8.EE.8)  
(a) Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | C | 1 point |
<p>| 19           | Equation Item | Work with radicals and integer exponents. | Perform operations with numbers expressed in scientific notation, including problems where both decimal notation 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) | --- | 1 point |</p>
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<tr>
<td>20</td>
<td>Multiple Choice</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. <em>(8.G.4)</em></td>
<td>C</td>
<td>1 point</td>
</tr>
<tr>
<td>21</td>
<td>Equation Item</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? <em>(8.SP.4)</em></td>
<td>---</td>
<td>1 point</td>
</tr>
<tr>
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<tr>
<td>22</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>C</td>
<td>1 point</td>
</tr>
</tbody>
</table>
Question 1

Two quadrilaterals are shown, where quadrilateral $EFGH$ is created by reflecting quadrilateral $ABCD$ across a line and then rotating it.

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

$\text{units}$

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: (8.G.1)

a. Lines are taken to lines, and line segments to line segments of the same length.
Scoring Guidelines

Exemplar Response

• 6

Other Correct Responses

• Any equivalent value

For this item, a full-credit response includes:

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

Two quadrilaterals are shown, where quadrilateral EFGH is created by reflecting quadrilateral ABCD across a line and then rotating it.

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

6 units

Notes on Scoring

This response earns full credit (1 point) because the student identifies the correct value.
Sample Response: 1 point

Two quadrilaterals are shown, where quadrilateral EFGH is created by reflecting quadrilateral ABCD across a line and then rotating it.

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

6.0 units

Notes on Scoring

This response earns full credit (1 point) because the student identifies the correct value.
Sample Response: 0 points

Notes on Scoring

This response earns no credit (0 points) because the student does not identify the correct value of the corresponding side length.
Sample Response: 0 points

Two quadrilaterals are shown, where quadrilateral EFOH is created by reflecting quadrilateral ABCD across a line and then rotating it.

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

4 units

Notes on Scoring

This response earns no credit (0 points) because the student does not identify the correct value of the corresponding side length.
Grade 8
Math
Spring 2017 Item Release

Question 2

Question and Scoring Guidelines
Question 2

Which graph shows a line of best fit for the data?

A

B

C

D

Points Possible: 1

Content Cluster: Investigate patterns of association in bivariate data.

Content Standard: Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. (8.SP.2)
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may think that a positive proportional relationship is correct.

Rationale for Option B: Key – The student correctly chooses an appropriate line of best fit.

Rationale for Option C: This is incorrect. The student chooses a line of best fit that is too low.

Rationale for Option D: This is incorrect. The student may think that a horizontal line represents the line of best fit.

Sample Response: 1 point
Grade 8
Math
Spring 2017 Item Release

Question 3

Question and Scoring Guidelines
Question 3

Pumps are used to empty water from two tanks, tank P and tank Q.

Tank P begins with 65 gallons of water and empties at a rate of 6.5 gallons per minute. The amount of water in tank Q is represented by the equation \( y = 63.5 - 5.25x \), where \( x \) is the number of minutes the pump has been emptying the tank.

Which statement is true?

A. Tank P empties at a faster rate than tank Q and had a lesser starting amount than tank Q.
B. Tank P empties at a faster rate than tank Q and had a greater starting amount than tank Q.
C. Tank P empties at a slower rate than tank Q and had a lesser starting amount than tank Q.
D. Tank P empties at a slower rate than tank Q and had a greater starting amount than tank Q.

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 misinterpret or switch the starting amounts.

Rationale for Option B: **Key** – The student correctly compares the rates of 6.5 and 5.25 gallons per minute and the starting amounts of 65 and 63.5 gallons.

Rationale for Option C: This is incorrect. The student may think that because –6.5 is less than –5.25, tank P empties more slowly than tank Q, and may misinterpret or switch the starting amounts.

Rationale for Option D: This is incorrect. The student may think that because –6.5 is less than –5.25, tank P empties more slowly than tank Q.

Sample Response: 1 point

Pumps are used to empty water from two tanks, tank P and tank Q.

Tank P begins with 65 gallons of water and empties at a rate of 6.5 gallons per minute. The amount of water in tank Q is represented by the equation \( y = 63.5 - 5.25x \), where \( x \) is the number of minutes the pump has been emptying the tank.

Which statement is true?

A. Tank P empties at a faster rate than tank Q and had a lesser starting amount than tank Q.

B. Tank P empties at a faster rate than tank Q and had a greater starting amount than tank Q.

C. Tank P empties at a slower rate than tank Q and had a lesser starting amount than tank Q.

D. Tank P empties at a slower rate than tank Q and had a greater starting amount than tank Q.
Grade 8
Math
Spring 2017 Item Release

Question 4

Question and Scoring Guidelines
Question 4

Nadya has a cylindrical container that stores sugar. The radius of the container’s base is 5 centimeters, and the height of the container is 15 centimeters.

What is the volume of Nadya’s container, rounded to the nearest cubic centimeter?

$cubic \ centimeters$

Points Possible: 1

Content Cluster: 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

• 1414

Other Correct Responses

• Any value between 1413.0 and 1414.3, inclusive

For this item, a full-credit response includes:

• A correct volume (1 point).
Grade 8
Math
Spring 2017 Item Release

Question 4

Sample Responses
Sample Response: 1 point

Nadya has a cylindrical container that stores sugar. The radius of the container’s base is 5 centimeters, and the height of the container is 18 centimeters.

What is the volume of Nadya’s container, rounded to the nearest cubic centimeter?

1414 cubic centimeters

Notes on Scoring

This response earns full credit (1 point) because the student calculates the correct volume of the container, probably using \( \pi \) (Pi) on the calculator and rounding correctly to the nearest whole cubic centimeter.
Sample Response: 1 point

Nadya has a cylindrical container that stores sugar. The radius of the container’s base is 5 centimeters, and the height of the container is 18 centimeters.

What is the volume of Nadya’s container, rounded to the nearest cubic centimeter?

\[ 1413 \text{ cubic centimeters} \]

Notes on Scoring

This response earns full credit (1 point) because the student calculates the correct volume of the container, probably using 3.14 for \( \pi \).
Sample Response: 1 point

Nadya has a cylindrical container that stores sugar. The radius of the container’s base is 5 centimeters, and the height of the container is 18 centimeters.

What is the volume of Nadya’s container, rounded to the nearest cubic centimeter?

1414.3 cubic centimeters

Notes on Scoring

This response earns full credit (1 point) because the student calculates the correct volume of the container, probably using $\frac{22}{7}$ for Pi.
Sample Response: 0 points

Nadya has a cylindrical container that stores sugar. The radius of the container’s base is 5 centimeters, and the height of the container is 18 centimeters.

What is the volume of Nadya’s container, rounded to the nearest cubic centimeter?

450 cubic centimeters

Notes on Scoring

This response earns no credit (0 points) because the student does not calculate the correct volume of the container. The student may calculate $5^2 \times 18$ but forget to multiply by Pi.
Nadya has a cylindrical container that stores sugar. The radius of the container’s base is 5 centimeters, and the height of the container is 18 centimeters.

What is the volume of Nadya’s container, rounded to the nearest cubic centimeter?

565 cubic centimeters

Notes on Scoring

This response earns no credit (0 points) because the student does not calculate the correct volume of the container. The student may incorrectly use the formula for the circumference of the circle and multiply this by the height.
Grade 8
Math
Spring 2017 Item Release

Question 5

Question and Scoring Guidelines
Question 5

Point M is located at (10, 10) and point N is located at (15, 25).

Which point lies on line MN?

A  (0, 0)
B  (11, 13)
C  (13, 13)
D  (20, 20)

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)


**Scoring Guidelines**

**Rationale for Option A:** This is incorrect. The student may assume that the line goes through the origin.

**Rationale for Option B:** Key – The student correctly derives the slope of the line and uses it to find an additional point.

**Rationale for Option C:** This is incorrect. The student may find the slope to be 3, but adds it incorrectly to both the x- and y-coordinates.

**Rationale for Option D:** This is incorrect. The student may think that because (10, 10) was a point on the line, the line is proportional.

**Sample Response: 1 point**

```
Point M is located at (10, 10) and point N is located at (15, 25).

Which point lies on line MN?

A  (0, 0)
B  (11, 13)
C  (13, 13)
D  (20, 20)
```
Grade 8
Math
Spring 2017 Item Release

Question 6

Question and Scoring Guidelines
Which graph represents a linear function?

A | B | C | D

\[ y = mx + b \]

**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 notes that the graphed relation is a straight line but does not realize that it is not a function because more than one y-value is associated with x = 5.

Rationale for Option B: This is incorrect. The student may recognize that the graphed relation is a function but overlooks that it is not linear.

Rationale for Option C: This is incorrect. The student may recognize that the graphed relation is a function but overlooks that it is not linear.

Rationale for Option D: Key – The student correctly identifies the linear graph.

Sample Response: 1 point

Which graph represents a linear function?

A

B

C

D
Grade 8
Math
Spring 2017 Item Release

Question 7

Question and Scoring Guidelines
Question 7

Quadrilateral ABCD is shown.

ABCD is translated to create quadrilateral EFGH.

What is the length, in units, of side EH?

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. (8.G.2)
Scoring Guidelines

Exemplar Response

- 8

Other Correct Responses

- Any equivalent value

For this item, a full-credit response includes:

- A correct value (1 point).
Grade 8
Math
Spring 2017 Item Release

Question 7

Sample Responses
Sample Response: 1 point

Quadrilateral ABCD is shown.

ABCD is translated to create quadrilateral EFGH.

What is the length, in units, of side EH?

8 units

Notes on Scoring

This response earns full credit (1 point) because the student identifies corresponding sides and correctly states the length.
Sample Response: 1 point

Quadrilateral ABCD is shown.

ABCD is translated to create quadrilateral EFGH.

What is the length, in units, of side EH?

8.0 units

Notes on Scoring

This response earns full credit (1 point) because the student identifies corresponding sides and correctly states the length.
Sample Response: 0 points

Quadrilateral ABCD is shown.

ABCD is translated to create quadrilateral EFGH.

What is the length, in units, of side EH?

3 units

Notes on Scoring

This response earns no credit (0 points) because the student does not identify corresponding sides and states an incorrect length.
Sample Response: 0 points

Quadrilateral ABCD is shown.

ABCD is translated to create quadrilateral EFGH.

What is the length, in units, of side EH?

5 units

Notes on Scoring

This response earns no credit (0 points) because the student does not identify corresponding sides and states an incorrect length.
Grade 8
Math
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Question 8

Question and Scoring Guidelines
Question 8

A statement is shown.
“The square root of $x$ is a number that is non-terminating and non-repeating.”
Select all of the values of $x$ that make the statement true.

☐ $x = 1$
☐ $x = 8$
☐ $x = 25$
☐ $x = 81$
☐ $x = 125$

Points Possible: 1

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

Content Standard: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. (8.NS.1)
Scoring Guidelines

Rationale for First Option: This is incorrect. The student may not recall that 1 is a perfect square number because $1 \times 1 = 1$.

Rationale for Second Option: Key – The student correctly understands that the square root of a non-perfect square number is an irrational number, which is non-terminating and non-repeating.

Rationale for Third Option: This is incorrect. The student may have forgotten the definitions of rational and irrational numbers or forgotten that taking the square root of a perfect square number results in a rational number instead of an irrational number.

Rationale for Fourth Option: This is incorrect. The student may have forgotten the definitions of rational and irrational numbers or forgotten that taking the square root of a perfect square number results in a rational number instead of an irrational number.

Rationale for Fifth Option: Key – The student correctly understands that the square root of a non-perfect square number is an irrational number, which is non-terminating and non-repeating.

Sample Response: 1 point

A statement is shown.

“The square root of $x$ is a number that is non-terminating and non-repeating.”

Select all of the values of $x$ that make the statement true.

☐ $x = 1$

☑ $x = 8$

☐ $x = 25$

☐ $x = 81$

☑ $x = 125$
Grade 8
Math
Spring 2017 Item Release

Question 9

Question and Scoring Guidelines
Question 9

Two equations are shown, where $a > 0$.

\[
\begin{align*}
a^2 &= \frac{1}{64} \\
b^3 &= a
\end{align*}
\]

What is the value of $b$?

\[
b =
\]

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)
Scoring Guidelines

Exemplar Response

- $\frac{1}{2}$

Other Correct Responses

- Any equivalent value

For this item, a full-credit response includes:

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

Two equations are shown, where $a > 0$.

\[ a^2 = \frac{1}{64} \]
\[ b^3 = a \]

What is the value of $b$?

\[ b = \frac{1}{2} \]

Notes on Scoring

This response earns full credit (1 point) because the student calculates a correct value of $b$.

\[ a = \frac{1}{8} \text{ because } \frac{1}{8} \times \frac{1}{8} \text{ equals } \frac{1}{64}. \]
\[ b = \frac{1}{2} \text{ because } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \text{ equals } \frac{1}{8}. \]
Sample Response: 1 point

Two equations are shown, where $a > 0$.

\[ a^2 = \frac{1}{64} \]
\[ b^3 = a \]

What is the value of $b$?

\[ b = \frac{1}{\sqrt[3]{8}} \]

Notes on Scoring

This response earns full credit (1 point) because the student calculates a correct value of $b$.

\[ a = \frac{1}{8} \text{ because } \frac{1}{8} \times \frac{1}{8} = \frac{1}{64}. \]

\[ b = \frac{1}{2} \text{ because } \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}. \text{ The cube root of 8, in the denominator, is equal to 2.} \]
Sample Response: 0 points

Two equations are shown, where $a > 0$.

\[ a^2 = \frac{1}{64} \]
\[ b^3 = a \]

What is the value of $b$?

The student may calculate the square root of $\frac{1}{64}$ as $\frac{1}{8}$. The student may then incorrectly multiply $\frac{1}{8} \cdot \frac{1}{8} \cdot \frac{1}{8}$ to get $\frac{1}{512}$ instead of finding the cubed root of $\frac{1}{8}$.

Notes on Scoring

This response earns no credit (0 points) because the student does not calculate a correct value of $b$. The student may calculate the square root of $\frac{1}{64}$ as $\frac{1}{8}$. The student may then incorrectly multiply $\frac{1}{8} \cdot \frac{1}{8} \cdot \frac{1}{8}$ to get $\frac{1}{512}$ instead of finding the cubed root of $\frac{1}{8}$. 
Two equations are shown, where $a > 0$.

\[ a^2 = \frac{1}{64} \]
\[ b^3 = a \]

What is the value of $b$?

\[ b = 2 \]

**Notes on Scoring**

This response earns no credit (0 points) because the student does not calculate a correct value of $b$. The student may calculate the square root of 64 as 8. Then, the student finds the cube root of 8 as 2, not realizing that the 2 should be in the denominator of the fraction.
Grade 8
Math
Spring 2017 Item Release

Question 10

Question and Scoring Guidelines
Question 10

An equation is shown.

\[6x - 3 = 3x + 12\]

What is the solution to the equation?

\[x = \_\]

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.
Scoring Guidelines

Exemplar Response

- 5

Other Correct Responses

- Any equivalent value

For this item, a full-credit response includes:

- A correct value (1 point).
Grade 8
Math
Spring 2017 Item Release

Question 10

Sample Responses
Sample Response: 1 point

An equation is shown.

\[ 6x - 3 = 3x + 12 \]

What is the solution to the equation?

\[ x = 5 \]

Notes on Scoring

This response earns full credit (1 point) because the student calculates the correct solution to the equation.
Sample Response: 1 point

An equation is shown.

$6x - 3 = 3x + 12$

What is the solution to the equation?

$x = \frac{15}{3}$

Notes on Scoring

This response earns full credit (1 point) because the student calculates a correct solution to the equation.
Sample Response: 0 points

An equation is shown.

6x - 3 = 3x + 12

What is the solution to the equation?

\[ x = 15 \]

Notes on Scoring

This response earns no credit (0 points) because the student does not calculate a correct solution to the equation. The student may correctly subtract 3x from both sides as well as add 3 to both sides and then forget to divide both sides by 3, answering with the right side of the equation.
Notes on Scoring

This response earns no credit (0 points) because the student does not calculate a correct solution to the equation. The student may correctly subtract 3x from both sides but incorrectly subtract 3 from the right side and eliminate the −3 on the left side, arriving at 3x = 9. The student may then correctly divide both sides by 3 to get 3.
Grade 8
Math
Spring 2017 Item Release

Question 11

Question and Scoring Guidelines
Question 11

Two triangles, ΔJKL and ΔMNO, are shown.

Which transformation can be applied to ΔJKL to create ΔMNO?

A. a clockwise rotation of 180° about the origin
B. a clockwise rotation of 90° about the origin
C. a reflection across the line y = x
D. a reflection across the x-axis

Points Possible: 1

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

Content Standard: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (8.G.3)
Scoring Guidelines

Rationale for Option A: **Key** – The student notes that a rotation of 180 degrees will carry the triangle into the fourth quadrant with the orientation shown.

Rationale for Option B: This is incorrect. The student may note that the orientation of the triangle will change with a rotation, but a 90° clockwise rotation will only carry the triangle into the first quadrant, not the fourth.

Rationale for Option C: This is incorrect. The student may note that reflecting across \( y = x \) will move the triangle from the second to fourth quadrant but fail to realize the orientation will be incorrect.

Rationale for Option D: This is incorrect. The student may note that reflecting across the \( x \)- and \( y \)-axes will create this transformation, but only one of these reflections alone will not be enough.

Sample Response: 1 point

Two triangles, \( \triangle JKL \) and \( \triangle MNO \), are shown.

Which transformation can be applied to \( \triangle JKL \) to create \( \triangle MNO \)?

- a clockwise rotation of 180° about the origin
- a clockwise rotation of 90° about the origin
- a reflection across the line \( y = x \)
- a reflection across the \( x \)-axis
Grade 8
Math
Spring 2017 Item Release

Question 12

Question and Scoring Guidelines
Question 12

Complete the table to create a linear function.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

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)
Scoring Guidelines

Exemplar Response

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>29</td>
</tr>
</tbody>
</table>

Other Correct Responses

- Any values that create a linear function

For this item, a full-credit response includes:

- A correct table (1 point).
Grade 8
Math
Spring 2017 Item Release

Question 12

Sample Responses
Sample Response: 1 point

Complete the table to create a linear function.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y'$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>29</td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns full credit (1 point) because the student correctly completes the table and creates a linear function with a consistent rate of change.
Sample Response: 1 point

Complete the table to create a linear function.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns full credit (1 point) because the student correctly completes the table and creates a linear function with a consistent rate of change.
Sample Response: 0 points

Complete the table to create a linear function.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

Notes on Scoring

This response earns no credit (0 points) because the student does not correctly complete the table to create a linear function. The rate of change between the first two points is 8, and the rate of change between the second and third point is approximately 10.7, so the function is not linear.
Sample Response: 0 points

Notes on Scoring

This response earns no credit (0 points) because the student does not correctly complete the table to create a linear function. The rate of change between the first two points is 2, and the rate of change between the second and third point is 7, so the function is not linear.
Grade 8
Math
Spring 2017 Item Release

Question 13

Question and Scoring Guidelines
Question 13

Isosceles right triangle $ABC$ is shown.

In a right triangle $DEF$, $\angle D$ is the right angle, the length of $DE$ is 2 times the length of $AB$, and the length of $DF$ is 4 times the length of $AC$.

How many times greater is the length of $EF$ than the length of $BC$?

Points Possible: 1

Content Cluster: Understand and apply the Pythagorean Theorem.

Content Standard: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (8.G.7)
Scoring Guidelines

Exemplar Response

- 3.2

Other Correct Responses

- $\sqrt{10}$
- Any decimal number between 3.16 and 3.25, inclusive

For this item, a full-credit response includes:

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

Isosceles right triangle ABC is shown.

In a right triangle DEF, \( \angle D \) is the right angle, the length of DE is 2 times the length of AB, and the length of DF is 4 times the length of AC.

How many times greater is the length of EF than the length of BC?

\[ \sqrt{10} \]

Notes on Scoring

This response earns full credit (1 point) because the student correctly calculates how many times greater the hypotenuse is.
Sample Response: 1 point

Isosceles right triangle ABC is shown.

In a right triangle DEF, \( \angle D \) is the right angle, the length of DE is 2 times the length of AB, and the length of DF is 4 times the length of AC.

How many times greater is the length of EF than the length of BC?

3.2

Notes on Scoring

This response earns full credit (1 point) because the student correctly calculates how many times greater the hypotenuse is, calculating the square root of 10 and rounding to the nearest tenth.
Sample Response: 0 points

Isosceles right triangle ABC is shown.

In a right triangle DEF, \( \angle D \) is the right angle, the length of \( DE \) is 2 times the length of \( AB \), and the length of \( EF \) is 4 times the length of \( AC \).

How many times greater is the length of \( EF \) than the length of \( BC \)?

\[ 2\sqrt{10} \]

Notes on Scoring

This response earns no credit (0 points) because the student does not correctly calculate how many times greater the hypotenuse is. The response is two times greater than the correct response.
Sample Response: 0 points

Isosceles right triangle ABC is shown.

In a right triangle DEF, \( \angle D \) is the right angle, the length of \( \overline{DE} \) is 2 times the length of \( \overline{AB} \), and the length of \( \overline{DF} \) is 4 times the length of \( \overline{AC} \).

How many times greater is the length of \( \overline{EF} \) than the length of \( \overline{BC} \)?

\[6\sqrt{5}\]

Notes on Scoring

This response earns no credit (0 points) because the student does not correctly calculate how many times greater the hypotenuse is. The student may calculate the length of side \( \overline{EF} \) but forget that the question asks for how many times greater the length of side \( \overline{EF} \) is than the length of side \( \overline{AC} \) in the original triangle, and therefore the student does not divide the two as a last step.
Grade 8
Math
Spring 2017 Item Release

Question 14

Question and Scoring Guidelines
Question 14

Mario rides his scooter to his friend’s house. His trip is represented in the graph shown.

Which statement describes Mario’s ride?

(A) Mario first stayed in one place and then rode at a constant rate.
(B) Mario first rode at a constant speed and then he stopped for some time.
(C) Mario first rode at one constant speed and then at a faster constant speed.
(D) Mario first rode at one constant speed and then at a slower constant speed.

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: This is incorrect. The student may think that the part of the graph with a lesser slope indicated a part where Mario stayed in one place.

Rationale for Option B: This is incorrect. The student may think that the part of the graph with a greater slope indicated a part where Mario stopped.

Rationale for Option C: Key – The student notices that the graph consists of two linear portions, one which has a greater slope than the other, and correctly interprets this in terms of the context.

Rationale for Option D: This is incorrect. The student may notice the graph consists of two linear portions, one which has a greater slope than the other, but reverses the interpretation of the lesser and greater slopes.

Sample Response: 1 point
Grade 8
Math
Spring 2017 Item Release

Question 15

Question and Scoring Guidelines
Question 15

Parallel lines $p$ and $q$ are intersected by transversal $r$, as shown.

What is the value of $x$?

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)
Scoring Guidelines

Exemplar Response

- 150

Other Correct Responses

- Any equivalent value

For this item, a full-credit response includes:

- The correct value (1 point).
Grade 8
Math
Spring 2017 Item Release

Question 15

Sample Responses
Sample Response: 1 point

Notes on Scoring

This response earns full credit (1 point) because the student shows understanding that the two angles are supplementary and calculates the correct value of $x$: $180 - 30 = 150$. 
Sample Response: 1 point

Parallel lines p and q are intersected by transversal r, as shown.

What is the value of x?

150.0

Notes on Scoring

This response earns full credit (1 point) because the student shows understanding that the two angles are supplementary and calculates the correct value of x: 180.0 – 30.0 = 150.0
Notes on Scoring

This response earns no credit (0 points) because the student does not calculate the correct value of angle $x$. The student may think that the $x^\circ$ angle and the $30^\circ$ angle are complementary.
Sample Response: 0 points

Parallel lines $p$ and $q$ are intersected by transversal $r$, as shown.

What is the value of $x^\circ$?

30

Notes on Scoring

This response earns no credit (0 points) because the student does not calculate the correct value of angle $x$. The student may think that the $x^\circ$ angle and the 30° angle are vertical angles and equal.
Grade 8
Math
Spring 2017 Item Release

Question 16

Question and Scoring Guidelines
Question 16

The value of $\sqrt{k}$ lies between 2.2 and 2.3.

Select all possible values of $k$.

- [ ] 1.49
- [ ] 4.8
- [ ] 5
- [ ] 5.04
- [ ] 5.3
- [ ] 6

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)
Scoring Guidelines

Rationale for First Option: This is incorrect. The student may choose a number that is between the square roots of 2.2 and 2.3.

Rationale for Second Option: This is incorrect. The student may choose a number whose square root is slightly outside of the range 2.2 – 2.3.

Rationale for Third Option: Key – The student correctly identifies that the square root of 5 is between 2.2 and 2.3.

Rationale for Fourth Option: Key – The student correctly identifies that the square root of 5.04 is between 2.2 and 2.3.

Rationale for Fifth Option: This is incorrect. The student may choose a number whose square root is slightly outside of the range 2.2 – 2.3.

Rationale for Sixth Option: This is incorrect. The student may think that the square root of 6 is in the range 2.2 – 2.3.

Sample Response: 1 point

The value of \( \sqrt{k} \) lies between 2.2 and 2.3.
Select all possible values of \( k \).

- [ ] 1.49
- [ ] 4.8
- [x] 5
- [x] 5.04
- [ ] 5.3
- [ ] 6
Grade 8
Math
Spring 2017 Item Release

Question 17

Question and Scoring Guidelines
Question 17

The radius of a fluorine atom is about $5 \times 10^{-8}$ millimeter. The radius of a strontium atom is about $2 \times 10^{-7}$ millimeter. About how many times larger is the radius of a strontium atom than the radius of a fluorine atom?

\[
\text{times larger}
\]

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities and to express how many times as much one is than the other. For example, estimate the population of the United States as $3 \cdot 10^8$; and the population of the world as $7 \cdot 10^9$; and determine that the world population is more than 20 times larger. (8.EE.3)

Scoring Guidelines

Exemplar Response

- 4

Other Correct Responses

- Any equivalent value

For this item, a full-credit response includes:

- A correct value (1 point).
Grade 8
Math
Spring 2017 Item Release

Question 17

Sample Responses
Sample Response: 1 point

The radius of a fluorine atom is about $5 \times 10^{-8}$ millimeter. The radius of a strontium atom is about $2 \times 10^{-7}$ millimeter. About how many times larger is the radius of a strontium atom than the radius of a fluorine atom?

4 times larger

Notes on Scoring

This response earns full credit (1 point) because the student correctly calculates how many times larger the strontium atom radius is than the fluorine atom radius.
Sample Response: 1 point

The radius of a fluorine atom is about $5 \times 10^{-8}$ millimeter. The radius of a strontium atom is about $2 \times 10^{-7}$ millimeter.

About how many times larger is the radius of a strontium atom than the radius of a fluorine atom?

\[
\frac{0.00000002}{0.00000005} \quad \text{times larger}
\]

Notes on Scoring

This response earns full credit (1 point) because the student correctly shows how to calculate how many times larger the strontium atom radius is than the fluorine atom radius.

Even though this is an equivalent fraction to the one-digit answer and earns credit, students are expected to respond in a real-world manner when the item is describing a real-world context. The question “How many times larger?” expects a “scale factor” response, which is 4 in this case.
Sample Response: 0 points

The radius of a fluorine atom is about $5 \times 10^{-8}$ millimeter. The radius of a strontium atom is about $2 \times 10^{-7}$ millimeter. About how many times larger is the radius of a strontium atom than the radius of a fluorine atom?

\[
\frac{1}{4} \quad \text{times larger}
\]

Notes on Scoring

This response earns no credit (0 points) because the student does not correctly calculate how many times larger the strontium atom radius is than the fluorine atom radius. The student may confuse the two atoms and respond with the inverse scale factor.
Sample Response: 0 points

The radius of a fluorine atom is about $5 \times 10^{-8}$ millimeter. The radius of a strontium atom is about $2 \times 10^{-7}$ millimeter.

About how many times larger is the radius of a strontium atom than the radius of a fluorine atom?

2.5 times larger

Notes on Scoring

This response earns no credit (0 points) because the student does not correctly calculate how many times larger the strontium atom radius is than the fluorine atom radius. The student may calculate 5 divided by 2 to get 2.5, not taking into consideration that the powers of ten are different.
Grade 8
Math
Spring 2017 Item Release

Question 18

Question and Scoring Guidelines
Question 18

The graph of a system of two linear equations is shown.

Which point represents the solution to the system?

- A. P
- B. Q
- C. R
- D. S

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)
a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may think that the y-intercept of one equation represents the solution of the system.

Rationale for Option B: This is incorrect. The student may think that the origin represents the solution of the system.

Rationale for Option C: Key – The student correctly identifies that the intersection point represents the solution of the system.

Rationale for Option D: This is incorrect. The student may think that the x-intercept of one equation represents the solution of the system.

Sample Response: 1 point

The graph of a system of two linear equations is shown.

Which point represents the solution to the system?

(A) P

(B) Q

(C) R

(D) S
Grade 8
Math
Spring 2017 Item Release

Question 19

Question and Scoring Guidelines
Question 19

A scientist estimates that there are $2.2 \times 10^7$ walleye in Lake Erie. The total volume of Lake Erie is $4.83 \times 10^{11}$ cubic meters. A pool with a volume of 200,000 cubic meters is built to model the lake.

How many walleye should be put into the pool to model the conditions in the lake?

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 notation 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)
Scoring Guidelines

Exemplar Response

- 9

Other Correct Responses

- Any value between 9 and 9.2, inclusive
- 10

For this item, a full-credit response includes:

- A correct value (1 point).
Grade 8
Math
Spring 2017 Item Release

Question 19

Sample Responses
Notes on Scoring

This response earns full credit (1 point) because the student correctly calculates the number of walleye to use to create a model of the lake.

\[2.2 \times 10^7 \text{ fish in } 4.83 \times 10^{11} \text{ m}^3 \text{ water is about } 4.55 \times 10^{-5} \text{ fish per m}^3.\] Multiply this number by 200,000 m\(^3\) (water in the tank) and the answer is about 9.11 fish. Since fish are living organisms, it makes sense to round to the nearest whole fish and respond with 9.
Sample Response: 1 point

A scientist estimates that there are $2.2 \times 10^7$ walleye in Lake Erie. The total volume of Lake Erie is $4.83 \times 10^{11}$ cubic meters. A pool with a volume of 200,000 cubic meters is built to model the lake.

How many walleye should be put into the pool to model the conditions in the lake?

| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 | 9 |
| 0 | - | 8 |

Notes on Scoring

This response earns full credit (1 point) because the student correctly calculates the number of walleye to use to create a model of the lake.

$2.2 \cdot 10^7$ fish in $4.83 \cdot 10^{11}$ m$^3$ water gives about $4.55 \cdot 10^{-5}$ fish per m$^3$. If the student rounds to $5 \cdot 10^{-5}$ and multiplies by 200,000 m$^3$ (water in the tank), the answer is 10. Although rounding should take place at the very end of calculations, rounding is not being assessed in this item, and therefore a response of 10 fish earns credit.
A scientist estimates that there are $2.2 \times 10^7$ walleye in Lake Erie. The total volume of Lake Erie is $4.83 \times 10^{11}$ cubic meters. A pool with a volume of 200,000 cubic meters is built to model the lake.

How many walleye should be put into the pool to model the conditions in the lake?

21955

Notes on Scoring

This response earns no credit (0 points) because the student does not correctly calculate the number of walleye to use to create a model of the lake.

The student may divide 4.83 (the larger number) by 2.2 (the smaller number) to get 2.195454. . . . , then round this to 2.1955. The student may then subtract the exponents (larger number minus smaller number), $11 - 7$, and get $10^4$ and then multiply by 2.1955 to get the response of 21955.
Sample Response: 0 points

A scientist estimates that there are $2.2 \times 10^7$ walleye in Lake Erie. The total volume of Lake Erie is $4.83 \times 10^{11}$ cubic meters. A pool with a volume of 200,000 cubic meters is built to model the lake.

How many walleye should be put into the pool to model the conditions in the lake?

2

Notes on Scoring

This response earns no credit (0 points) because the student does not correctly calculate the number of walleye to use to create a model of the lake.

The student may divide 4.83 (the larger number) by 2.2 (the smaller number) to get 2.195454. . . , then round this to 2 whole fish. In this case, the calculation incorrectly determines the number of fish per m$^3$ in Lake Erie, ignoring the powers of ten and using the wrong factor as the numerator.
Grade 8
Math
Spring 2017 Item Release

Question 20

Question and Scoring Guidelines
Question 20

Two triangles are shown.

What transformations can be used to show that \( \triangle LMN \) is similar to \( \triangle PQR \)?

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

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: This is incorrect. The student may identify that a dilation will be required to show that they are similar but may confuse reflection with rotation.

Rationale for Option B: This is incorrect. The student may confuse reflection with rotation and think that because vertices move vertically and horizontally, a translation occurs.

Rationale for Option C: Key – The student identifies the two transformations that could be used to show that the figures are similar.

Rationale for Option D: This is incorrect. The student may identify that a rotation will be required to show that they are similar but may think that because vertices move vertically and horizontally, a translation occurs.

Sample Response: 1 point

Two triangles are shown.

What transformations can be used to show that \( \triangle LMN \) is similar to \( \triangle PQR \)?

A  dilation, reflection  
B  reflection, translation  
C  rotation, dilation  
D  translation, rotation
Grade 8
Math
Spring 2017 Item Release

Question 21

Question and Scoring Guidelines
Question 21

A teacher surveys her students to find out whether they prefer riding a bike or playing soccer. The two-way table shows some of her data.

<table>
<thead>
<tr>
<th></th>
<th>Riding a Bicycle</th>
<th>Playing Soccer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>25</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>?</td>
</tr>
</tbody>
</table>

Based on her data, the teacher concludes that if a girl is chosen at random from this sample, there is a 56% probability that she prefers playing soccer.

What is the total number of students the teacher surveyed?

**Total number of students** =

**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

Exemplar Response

- 101

Other Correct Responses

- Any equivalent value

For this item, a full-credit response includes:

- The correct value (1 point).
Grade 8
Math
Spring 2017 Item Release

Question 21

Sample Responses
Sample Response: 1 point

A teacher surveys her students to find out whether they prefer riding a bike or playing soccer. The two-way table shows some of her data.

<table>
<thead>
<tr>
<th></th>
<th>Riding a Bicycle</th>
<th>Playing Soccer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>25</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on her data, the teacher concludes that if a girl is chosen at random from this sample, there is a 56% probability that she prefers playing soccer.

What is the total number of students the teacher surveyed?

**Total number of students** = 101

Notes on Scoring

This response earns full credit (1 point) because the student calculates the correct total number of students surveyed.

Girls who prefer to play soccer is 56% of the girls; therefore, 44% of the girls, or 22, prefer to ride bikes. Knowing that 44% of x is 22, the student calculates the total number of girls.

\[
\frac{44x}{100} = 22
\]

multiply both sides by 100 and divide both sides by 44

\[
x = \frac{22 \cdot 100}{44}
\]

\[
x = 50\text{ girls}
\]

Then add the number of boys (51) to get 101.
Sample Response: 1 point

A teacher surveys her students to find out whether they prefer riding a bike or playing soccer. The two-way table shows some of her data.

<table>
<thead>
<tr>
<th></th>
<th>Riding a Bicycle</th>
<th>Playing Soccer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>25</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on her data, the teacher concludes that if a girl is chosen at random from this sample, there is a 56% probability that she prefers playing soccer.

What is the total number of students the teacher surveyed?

Total number of students = 101.0

Notes on Scoring

This response earns full credit (1 point) because the student calculates the correct total number of students surveyed.

Girls who prefer to play soccer is 56% of the girls; therefore, 44% of the girls, or 22, prefer to ride bikes. Knowing that 44% of \( x \) is 22, the student calculates the total number of girls.

\[
\frac{44x}{100} = 22 \quad \text{multiply both sides by 100 and divide both sides by 44}
\]

\[
x = \frac{22 \cdot 100}{44}
\]

\[x = 50 \text{ girls}
\]

Then add the number of boys (51) to get 101.0.
A teacher surveys her students to find out whether they prefer riding a bike or playing soccer. The two-way table shows some of her data.

<table>
<thead>
<tr>
<th></th>
<th>Riding a Bicycle</th>
<th>Playing Soccer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>25</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on her data, the teacher concludes that if a girl is chosen at random from this sample, there is a 56% probability that she prefers playing soccer.

What is the total number of students the teacher surveyed?

\[ \text{Total number of students} = 28 \]

Notes on Scoring

This response earns no credit (0 points) because the student does not complete the calculations to get the correct total number of students surveyed. Instead, the student calculates the number of girls who prefer to play soccer and ends there.
A teacher surveys her students to find out whether they prefer riding a bike or playing soccer. The two-way table shows some of her data.

<table>
<thead>
<tr>
<th></th>
<th>Riding a Bicycle</th>
<th>Playing Soccer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>25</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>73</td>
</tr>
</tbody>
</table>

Based on her data, the teacher concludes that if a girl is chosen at random from this sample, there is a 56% probability that she prefers playing soccer.

What is the total number of students the teacher surveyed?

\[
\text{Total number of students} = 73
\]
Grade 8 Math
Spring 2017 Item Release

Question 22

Question and Scoring Guidelines
Lyla and Dwayne each sell tickets at a concert. They start selling the tickets at the same time.

- Lyla starts with 500 tickets and sells them at an average rate of 5 tickets per minute.
- The number of tickets, \( t \), Dwayne has left after \( m \) minutes is represented in the table shown.

<table>
<thead>
<tr>
<th>( m )</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>600</td>
</tr>
<tr>
<td>4</td>
<td>580</td>
</tr>
<tr>
<td>8</td>
<td>560</td>
</tr>
<tr>
<td>12</td>
<td>540</td>
</tr>
</tbody>
</table>

Which statement is true?

A. Dwayne’s average rate of tickets sold per minute is higher than Lyla’s average rate.
B. Lyla’s average rate of tickets sold per minute is higher than Dwayne’s average rate.
C. Dwayne begins with more tickets than Lyla.
D. Lyla begins with more tickets than Dwayne.

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 look at the decrease of 20 in each output of the table, not taking into consideration that the input was not changing by 1.

**Rationale for Option B:** This is incorrect. The student may see the change of 4 in each input of the table and interpret that as the average rate, or the student may interpret a decrease in the table as a negative average rate.

**Rationale for Option C:** Key – The student identifies the correct statement.

**Rationale for Option D:** This is incorrect. The student may confuse the input and output, thinking that Dwayne’s initial value is 0 instead of 600.

**Sample Response: 1 point**

Lyla and Dwayne each sell tickets at a concert. They start selling the tickets at the same time. 

- Lyla starts with 500 tickets and sells them at an average rate of 5 tickets per minute.
- The number of tickets, $t$, Dwayne has left after $m$ minutes is represented in the table shown.

<table>
<thead>
<tr>
<th>$m$</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>600</td>
</tr>
<tr>
<td>4</td>
<td>580</td>
</tr>
<tr>
<td>8</td>
<td>560</td>
</tr>
<tr>
<td>12</td>
<td>540</td>
</tr>
</tbody>
</table>

Which statement is true?

- **A** Dwayne’s average rate of tickets sold per minute is higher than Lyla’s average rate.
- **B** Lyla’s average rate of tickets sold per minute is higher than Dwayne’s average rate.
- **C** Dwayne begins with more tickets than Lyla.
- **D** Lyla begins with more tickets than Dwayne.
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