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**New York State Testing Program  
Grade 8 Common Core  
Mathematics Test**

**Released Questions with Annotations**

**August 2013**



THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK /  
ALBANY, NY 12234

## **New York State Testing Program Grade 8 Common Core Mathematics Test**

### **Released Questions with Annotations**

With the adoption of the New York P-12 Common Core Learning Standards (CCLS) in ELA/Literacy and Mathematics, the Board of Regents signaled a shift in both instruction and assessment. In Spring 2013, New York State administered the first set of tests designed to assess student performance in accordance with the instructional shifts and the rigor demanded by the Common Core State Standards (CCSS). To aid in the transition to new tests, New York State released a number of resources during the 2012-2013 year, including test blueprints and specifications, and criteria for writing test questions. These resources can be found at <http://www.engageny.org/common-core-assessments>.

New York State administered the first ELA/Literacy and Mathematics Common Core tests in April 2013 and is now making a portion of the questions from those tests available for review and use. These released questions will help students, families, educators, and the public better understand how tests have changed to assess the instructional shifts demanded by the Common Core and to assess the rigor required to ensure that all students are on track to college and career readiness.

#### ***Annotated Questions Are Teaching Tools***

The released questions are intended to help students, families, educators, and the public understand how the Common Core is different. The annotated questions will demonstrate the way the Common Core should drive instruction and how tests have changed to better assess student performance in accordance with the instructional shifts demanded by the Common Core. They are also intended to help educators identify how the rigor of the State tests can inform classroom instruction and local assessment. The annotations will indicate common student misunderstandings related to content standards; educators should use these to help inform unit and lesson planning. In some cases, the annotations may offer insight into particular instructional elements (conceptual thinking, visual models) that align to the Common Core that may be used in curricular design. It should not be assumed, however, that a particular standard will be measured with an identical item in future assessments.

The annotated questions will include both multiple-choice and constructed-response questions. With each multiple-choice question released, a rationale will be available to demonstrate why the question measures the intended standards; why the correct answer is correct; and why each wrong answer is plausible but incorrect. The rationales describe why the wrong answer choices are plausible but incorrect and are based in common errors in computation. While these rationales will speak to a possible and likely reason for selection of the incorrect option by the student, these rationales do not contain definitive statements as to why the student chose the incorrect option or what we can infer about knowledge and skills of the student based on their selection of an incorrect response. These multiple-choice questions are designed to assess student proficiency, not to diagnose specific misconceptions/errors with each and every incorrect option.

Additionally, for each constructed-response question, there will be an explanation for why the question measures the intended standards and sample student responses representing each possible score point.

Questions from the upper grades may feature more detailed annotations, as the items tend to be more complex.

### ***Understanding Math Annotated Questions***

#### **Multiple Choice**

Multiple-choice questions are designed to assess CCLS for Mathematics. Mathematics multiple-choice questions will mainly be used to assess standard algorithms and conceptual standards. Multiple-choice questions incorporate both Standards and Standards for Mathematical Practices, some in real-world applications. Many multiple-choice questions require students to complete multiple steps. Likewise, many of these questions are linked to more than one standard, drawing on the simultaneous application of multiple skills and concepts. Within answer choices, distractors will all be based on plausible missteps.

Short and extended constructed-response questions may refer to the scoring rubric, which can be found at [www.engageny.org/resource/test-guides-for-english-language-arts-and-mathematics](http://www.engageny.org/resource/test-guides-for-english-language-arts-and-mathematics).

#### **Short Response**

Short-response questions are similar to past 2-point questions, requiring students to complete a task and show their work. Like multiple-choice questions, short-response questions will often require multiple steps, the application of multiple mathematics skills, and real-world applications. Many of the short-response questions will cover conceptual and application Standards.

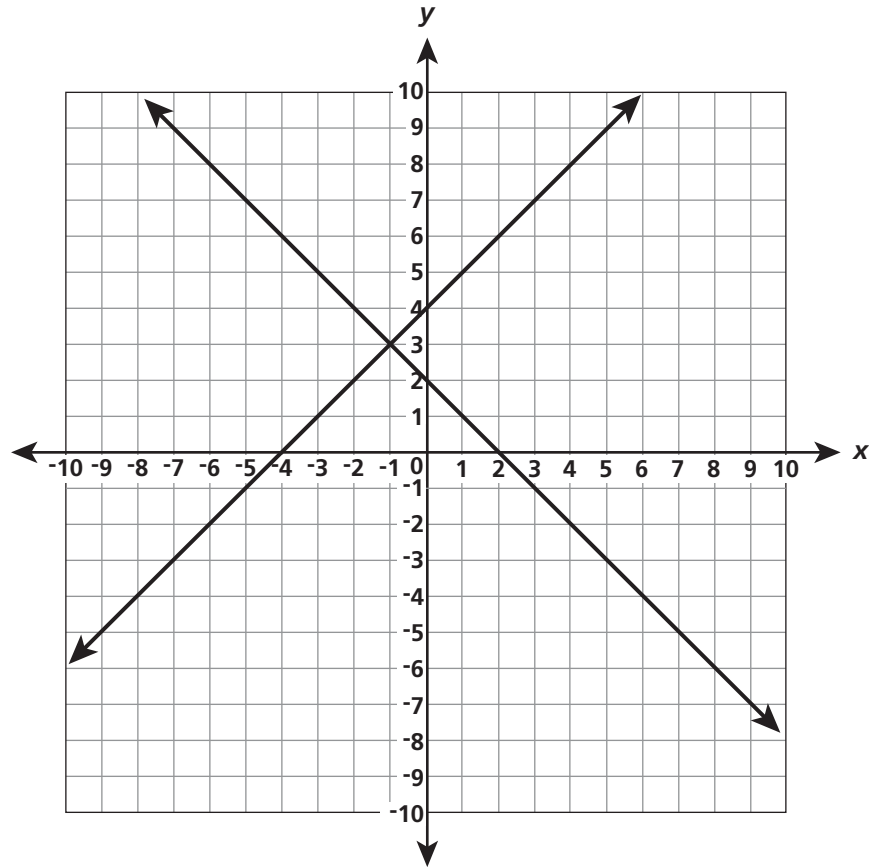
Extended-response questions are similar to past 3-point questions, asking students to show their work in completing two or more tasks or a more extensive problem. Extended-response questions allow students to show their understanding of mathematical procedures, conceptual understanding, and application. Extended-response questions may also assess student reasoning and the ability to critique the arguments of others.

### ***Released Questions Do Not Comprise a Mini Test***

This document is NOT intended to show how operational tests look or to provide information about how teachers should administer the test; rather, the purpose of the released questions is to provide an overview of how the new test reflects the demands of the Common Core.

The released questions do not represent the full spectrum of standards assessed on the State test, nor do they represent the full spectrum of how the Common Core should be taught and assessed in the classroom. Specific criteria for writing test questions as well as test information is available at [www.engageny.org/common-core-assessments](http://www.engageny.org/common-core-assessments).

Lucy graphed a system of linear equations.



What is the solution to the system of equations?

- A  $(-4, 2)$
- B  $(-1, 3)$
- C  $(0, 2)$
- D  $(2, 4)$

**Key: B**

**Measured CCLS: 8.EE.8a**

**Commentary:** The item aligns to 8.EE.8a because it requires the student to understand that solutions to a system of two linear equations in two variables correspond to the points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

**Answer Choice A:**  $(-4, 2)$  This response reflects the x-coordinates of the x-intercepts of each line,  $(-4, 0)$  and  $(2, 0)$ . The student may have identified that the solution would involve both lines, but did not select the point of intersection.

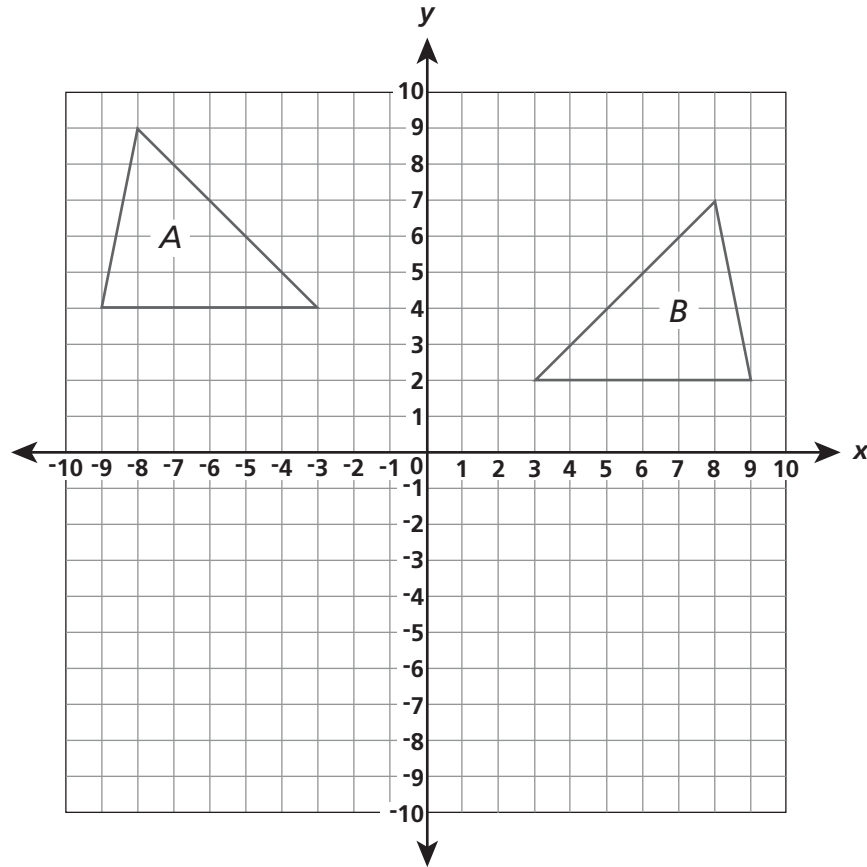
**Answer Choice B:**  $(-1, 3)$  The student correctly determined the solution to a system of linear equations shown on a coordinate plane. The student who selects this response understands that the solution to the given system of linear equations corresponds to the point of intersection.

**Answer Choice C:**  $(0, 2)$  This response is the  $y$ -intercept of the line  $y = -x + 2$ . The student selected the point at which one of the lines intersects the  $y$ -axis.

**Answer Choice D:**  $(2, 4)$  The 2 and 4 in the coordinates of this response correspond to the  $y$ -coordinates of the  $y$ -intercepts of each line,  $(0, 4)$  and  $(0, 2)$ . The student identified that the solution would involve both lines, but did not select the point of intersection.

Answer options A, C, and D are plausible but incorrect. They represent common student errors made when finding the solution to a system of linear equations shown on a coordinate plane. Answer option B represents the correct solution to the given system of linear equations.

Which sequence of transformations takes  $\triangle A$  to its image,  $\triangle B$ ?



- A reflection over the  $x$ -axis and translation 2 units down
- B reflection over the  $y$ -axis and translation 2 units down
- C translation 2 units down and  $90^\circ$  rotation about the origin
- D translation 12 units right and  $90^\circ$  rotation about the origin

**Key: B**

**Measured CCLS: 8.G.2**

**Commentary:** The item measures 8.G.2 because it asks the student to describe a sequence of transformations that will take triangle A to triangle B, where triangles A and B are congruent.

**Answer Choice A:** "Reflection over the  $x$ -axis and translation 2 units down." This response represents an incorrect reflection of the triangle A over the  $x$ -axis instead of the  $y$ -axis. A student who selects this response may be able to perform translations, but may confuse translations over the  $y$ -axis and  $x$ -axis.

**Answer Choice B:** "Reflection over the  $y$ -axis and translation 2 units down." The student correctly identified that a reflection over the  $y$ -axis, followed by a translation 2 units down, would transform triangle A to triangle B. The student who selects this response successfully determined a sequence of transformations that will take triangle A to triangle B.

**Answer Choice C:** "Translation 2 units down and  $90^\circ$  rotation about the origin." This sequence takes triangle A to the same quadrant as triangle B, but lacks precision and does not fully exhibit their congruence. A student who selects this response may be able to perform translations, but may not be able to perform rotations with precision.

**Answer Choice D:** "Translation 12 units right and  $90^\circ$  rotation about the origin." While the translating triangle A 12 units right will bring it to the same quadrant as triangle B, the subsequent rotation will move it to a different quadrant. The resulting figure will not match the position or orientation of triangle B and thus will not exhibit their congruence. A student who selects this response may have limited understanding of how to perform transformations.

Answer options A, C, and D are plausible but incorrect. They represent common student errors made when determining a sequence of transformations that exhibits the congruence between two given congruent figures. Answer option B represents a correct sequence of transformations that will take triangle A to triangle B.

What is the solution to the equation below?

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

- A**  $x = 2\frac{3}{4}$
- B**  $x = -2\frac{3}{4}$
- C** There is no solution.
- D** There are infinitely many solutions.

**Key: C**

**Measured CCLS: 8.EE.7a**

**Commentary:** The item measures 8.EE.7a because it asks the student to determine the solution of a linear equation in one variable. The answer choices represent three different possibilities (one solution, infinitely many solutions, no solutions) of solving the linear equation in one variable.

**Answer Choice A:**  $x = 2\frac{3}{4}$ . This response reflects the simplest form of the equation  $2x + 2x = 5 + 6$ . The student likely added  $2x$  to both sides, instead of subtracting, while simplifying the equation. A student who selects this response may be able to apply some properties of operations to solve linear equations, but may not understand how to solve equations with variables on both sides of the equal sign.

$$\begin{aligned} 2(x - 3) &= 2x + 5 \\ 2x - 6 &= 2x + 5 \\ 2x &= 2x + 5 + 6 \\ 2x + 2x &= 5 + 6 \end{aligned}$$

**Answer Choice B:**  $x = -2\frac{3}{4}$ . This response reflects the simplest form of the equation  $-6 - 5 = 2x + 2x$ . The student likely added  $2x$  to both sides, instead of subtracting, while simplifying the equation. A student who selects this response may be able to apply some properties of operations to solve linear equations, but may not understand how to solve equations with variables on both sides of the equal sign.

$$\begin{aligned} 2(x - 3) &= 2x + 5 \\ 2x - 6 &= 2x + 5 \\ 2x - 6 - 5 &= 2x + 5 - 5 \\ -6 - 5 &= 2x + 2x \end{aligned}$$

**Answer Choice C:** There is no solution. The student correctly determined the simplest form of the given equation is in the form of  $a = b$ , where  $a$  and  $b$  are different numbers. The student who selects this response may have simplified the given linear equation to  $0 = 11$  and interpreted that solution to mean that the equation has no solution.



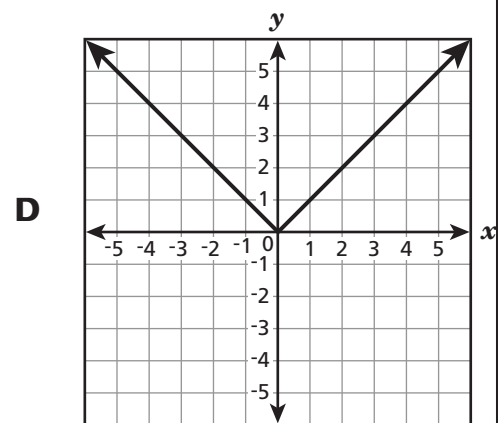
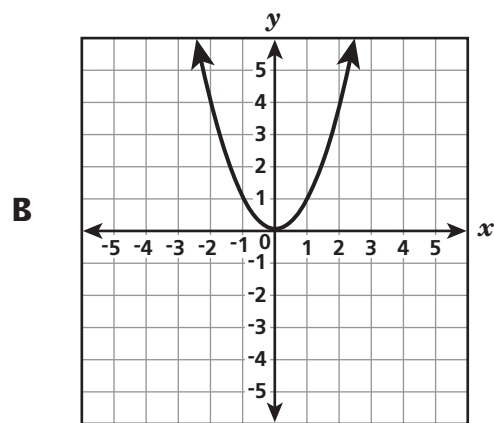
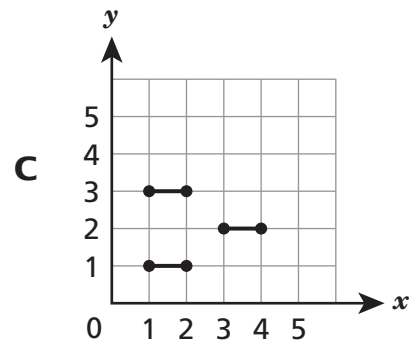
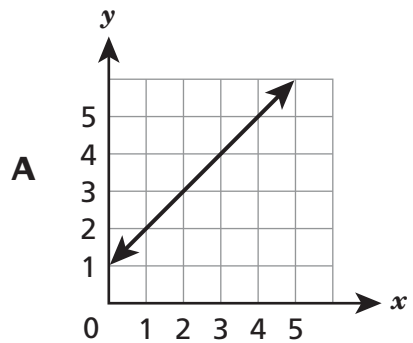
$$\begin{aligned}2(x - 3) &= 2x + 5 \\2x - 6 &= 2x + 5 \\2x &= 2x + 5 + 6 \\2x - 2x &= 5 + 6 \\0 &= 11\end{aligned}$$

Students may have also recognized after distributing the 2 to get the expression  $2x - 6 = 2x + 5$  that there is no value for the term  $2x$  such that when six is subtracted from it, it will equal the same value when five is added to it.

**Answer Choice D:** There are infinitely many solutions. This response reflects a misinterpretation of the solution to an equation in the form of  $a = b$ . The student may have simplified the equation to get  $0 = 11$  but then incorrectly interpreted that there are infinitely many solutions to this equation. A student who selects this response may be able to apply the properties of operations to solve linear equations, but not understand how to interpret the solution.

Answer options A, B, and D are plausible but incorrect. They represent common student errors made when successively transforming a linear 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). Answer option C represents the correct process used to determine the solution to a linear equation whose simplest form is in the form of  $a = b$  (where  $a$  and  $b$  are different numbers).

Which graph below does **not** represent a function of  $x$ ?



**Key: C**  
**Measured CCLS: 8.F.1**

**Commentary:** The item measures 8.F.1 because it involves understanding that a function is a rule that assigns to each input ( $x$ ) exactly one output ( $y$ ) (though two different inputs may have the same output, as in graphs B and D). This item specifically requires that the students determine which graph does not represent a function of  $x$ .

**Answer Choice A:** This response shows a graph that represents a function of  $x$ . The graph shows a linear function where each input has exactly one output. A student who selects this response may not understand how to determine if a graph represents a function when only a graph is provided.

**Answer Choice B:** This response shows a graph that represents a function of  $x$ . The graph shows a quadratic function where each input has exactly one output. A student who selects this response may not understand how to determine if a graph represents a function when only a graph is provided.

**Answer Choice C:** The student correctly determined that the graph does not represent a function of  $x$ . The student who selects this response understands the graph of a function is the set of ordered pairs consisting of an input and exactly one corresponding output. The following two ordered pairs (1.5, 1) and (1.5, 3) are each part of the graph shown and are one example where an input, 1.5, has more than one corresponding output, 1 and 3.

**Answer Choice D:** This response shows a graph that represents a function of  $x$ . The graph shows an absolute value function where each input has exactly one output. A student who selects this response may not understand how to determine if a graph represents a function when only a graph is provided.

Answer options A, B, and D are plausible but incorrect. They represent common student errors made when determining which graph does not represent a function of  $x$ . Answer option C does not represent a function of  $x$ .

Simplify:

$$\frac{4^8}{4^{-4}}$$

- A**  $4^{-32}$
- B**  $4^{-2}$
- C**  $4^4$
- D**  $4^{12}$

**Key: D****Measured CCLS: 8.EE.1**

**Commentary:** The item measures 8.EE.1 because it involves knowing and applying the properties of integer exponents to generate equivalent numerical expressions. This item specifically assesses division including positive and negative exponents. Compare with the item on page 10, which also assesses 8.EE.1.

**Answer Choice A:**  $4^{-32}$  This response reflects the simplified form of the expression  $(4^8)^{-4}$ . The student likely multiplied the exponents 8 and  $-4$  instead of subtracting. A student who selects this response may have some understanding of properties of exponents, but may not understand that when dividing numerical expressions with exponents, the exponents are subtracted not divided.

**Answer Choice B:**  $4^{-2}$  This response most likely reflects dividing the exponents 8 and  $-4$  instead of subtracting. A student who selects this response may have some understanding of properties of exponents, but may not understand that when dividing numerical expressions with exponents, the exponents are subtracted not divided.

**Answer Choice C:**  $4^4$  This response reflects the simplified form of the expression  $4^8 \times 4^{-4}$ . The student added the exponents 8 and  $-4$  instead of subtracting. A student who selects this response has some understanding of properties of exponents, but may not understand how to simplify a division expression including exponents.

**Answer Choice D:**  $4^{12}$  The student correctly simplified the given expression. The student who selects this response properly applied the properties of exponents, subtracting the exponents 8 and  $-4$  to simplify the given expression.

$$\frac{4^8}{4^{-4}} = 4^{[8-(-4)]} = 4^{(8+4)} = 4^{12}$$

Answer options A, B, and C are plausible but incorrect. They represent common student errors made when applying the properties of integer exponents to generate equivalent numerical expressions. Answer option D represents the correct process used to simplify the given division expression including exponents.

Which expression is **not** equivalent to  $\frac{6^3}{6^6}$ ?

**A**  $\frac{1}{6^2}$

**B**  $6^{-3}$

**C**  $\frac{1}{216}$

**D**  $\frac{1}{6^3}$

**Key: A**

**Measured CCLS: 8.EE.1**

**Commentary:** The item measures knowing and applying the properties of integer exponents to generate equivalent numerical expressions because it has students identify which expression is not equivalent to a given expression containing exponents. This item assesses division including positive and negative exponents. Compare with the item on page 9, which also assesses 8.EE.1.

**Answer Choice A:**  $\frac{1}{6^2}$ . The student determined the expression that is not equivalent to the given expression. The student who selects this response determined that  $\frac{1}{6^2}$  is not equivalent to  $\frac{6^3}{6^6}$ .

$$\frac{1}{6^2} \neq \frac{6^3}{6^6}$$

$$\frac{1}{6^2} \neq \frac{1}{6^3}$$

**Answer Choice B:**  $6^{-3}$ . This response is an expression that is equivalent to the given expression. The student likely did not understand that it is possible to subtract the exponents 3 and 6, and then rewrite the expression as a base with a negative exponent.

$$\frac{6^3}{6^6} = 6^{3-6} = 6^{-3}$$

**Answer Choice C:**  $\frac{1}{216}$ . This response is an expression that is equivalent to the given expression. The student likely did not understand that it is possible to subtract the exponents 3 and 6, and then rewrite the expression as a fraction.

$$\frac{6^3}{6^6} = 6^{3-6} = 6^{-3} = \frac{1}{216}$$

**Answer Choice D:**  $\frac{1}{6^3}$ . This response is an expression that is equivalent to the given expression. The student likely did not understand that it is possible to subtract the exponents 3 and 6, and then rewrite the expression as a fraction.

$$\frac{6^3}{6^6} = 6^{3-6} = 6^{-3} = \frac{1}{6^3}$$

Answer options B, C, and D are plausible but incorrect. They represent common student misunderstandings about applying the properties of integer exponents to generate equivalent numerical expressions. Answer option A represents the correct process used to identify which expression is not equivalent to a given expression.

A lab has two bacteria cultures. Culture A contains  $8 \times 10^4$  bacteria, and culture B contains  $4 \times 10^6$  bacteria. How do the two cultures compare in size?

- A** Culture A contains twice as many bacteria as culture B.
- B** Culture A contains  $\frac{1}{2}$  as many bacteria as culture B.
- C** Culture A contains  $\frac{1}{25}$  as many bacteria as culture B.
- D** Culture A contains  $\frac{1}{50}$  as many bacteria as culture B.

**Key: D**

**Measured CCLS: 8.EE.3**

**Commentary:** The item measures 8.EE.3 because it has students compare the sizes of two bacteria cultures expressed as a single digit times an integer power of ten. To make this multiplicative comparison, students need to divide the two expressions, including the single digits and powers of ten.

**Answer Choice A:** Culture A contains twice as many bacteria as culture B. This response reflects a comparison of the single digits only. The student may have divided 8 by 4, but did not take the powers of ten into account. A student who selects this response may not understand how the single digit relates to the power of ten in each expression.

**Answer Choice B:** Culture A contains  $\frac{1}{2}$  as many bacteria as culture B. This response reflects a comparison of the single digits only from culture B to culture A. The student may have divided 4 by 8, but did not take the powers of ten into account. The student may also have performed the comparison in the wrong direction (by dividing 4 by 8 rather than 8 by 4). A student who selects this response may not understand how the single digit relates to the power of ten in each expression.

**Answer Choice C:** Culture A contains  $\frac{1}{25}$  as many bacteria as culture B. This response reflects an incorrect division of the two expressions. The student may have subtracted 4 from 8 and then subtracted the exponents on the powers of ten. A student who selects this response may not understand how to divide expressions in the form of a single digit times a power of ten.

**Answer Choice D:** Culture A contains  $\frac{1}{50}$  as many bacteria as culture B. The student correctly determined multiplicative comparison of culture A with respect to culture B. The student who selects this response likely divided the given expressions using one of these methods:

$$\text{Method 1: } \frac{8 \times 10^4}{4 \times 10^6} = \frac{2}{10^2} = \frac{1}{50}$$

$$\text{Method 2: } \frac{8 \times 10^4}{4 \times 10^6} = \frac{80000}{4000000} = \frac{8}{400} = \frac{1}{50}$$

Answer options A, B, and C are plausible but incorrect. They represent common student errors made when comparing numbers expressed in the form of a single digit times an integer power of ten. Answer option D represents the correct process used to compare the sizes of two bacteria cultures.

Evaluate:

$$(2.4 \times 10^4)(4.5 \times 10^3)$$

- A**  $1.08 \times 10^7$
- B**  $1.08 \times 10^8$
- C**  $1.08 \times 10^{12}$
- D**  $1.08 \times 10^{13}$

**Key: B**

**Measured CCLS: 8.EE.4**

**Commentary:** The item measures 8.EE.4 because it involves performing operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. This item specifically assesses multiplication of expressions represented in scientific notation. The word “coefficient” may be used to name the number being multiplied by the power of ten (e.g., 2.4 is the coefficient in  $2.4 \times 10^4$ ).

**Answer Choice A:**  $1.08 \times 10^7$ . This response reflects the correct product of the coefficients with the incorrect power of ten. The student likely multiplied the expressions to get  $10.8 \times 10^7$ , but did not adjust the power of ten when rewriting this amount in scientific notation. A student who selects this response may be able to multiply some expressions represented in scientific notation, but may not understand how the coefficient is related to the power of ten.

**Answer Choice B:**  $1.08 \times 10^8$ . The student correctly simplified the given expression. The student who selects this response multiplied the expressions to get  $10.8 \times 10^7$ , and then adjusted the power of ten when rewriting this amount in scientific notation.

$$(2.4 \times 10^4)(4.5 \times 10^3) = 10.8 \times 10^7 = 1.08 \times 10^8$$

**Answer Choice C:**  $1.08 \times 10^{12}$ . This response reflects the correct product of the coefficients with the incorrect power of ten. The student likely multiplied the coefficients to get 10.8, rewrote this amount as 1.08 without adjusting the power of ten, and then multiplied the exponents on the powers of ten to get  $10^{12}$ . A student who selects this response may not understand how the coefficient is related to the power of ten as well as how to apply the properties of exponents when multiplying expressions in scientific notation.

**Answer Choice D:**  $1.08 \times 10^{13}$ . This response reflects the correct product of the coefficients with the incorrect exponent on the powers of ten. The student likely multiplied the coefficients to get 10.8, multiplied the exponents on the powers of ten to get  $10^{12}$ , and then rewrote the expression  $10.8 \times 10^{12}$  in scientific notation as  $1.08 \times 10^{13}$ . A student who selects this response may not understand how to apply the properties of exponents when multiplying expressions in scientific notation.

Answer options A, C, and D are plausible but incorrect. They represent common student errors made when performing operations with numbers expressed in scientific notation. Answer option B represents the correct process used when multiplying expressions represented in scientific notation.

A water tank is in the shape of a right circular cylinder with a height of 20 feet and a volume of  $320\pi$  cubic feet. What is the diameter, in feet, of the water tank?

- A** 16
- B** 10
- C** 8
- D** 4

**Key: C**

**Measured CCLS: 8.G.9**

**Commentary:** The item measures 8.G.9 because it measures using the formula for the volume of a cylinder ( $V = \pi r^2 h$ ) to solve real-world problems; it has students solve for the diameter of a cylinder given the volume and height.

**Answer Choice A:** 16. This response reflects the radius squared of the cylinder. The student likely divided the volume by the height times  $\pi$ , but did not take the square root of the result to determine the radius. A student who selects this response may have limited understanding of how to solve for a variable in a formula.

$$320\pi \div 20\pi = 16$$

**Answer Choice B:** 10. This response reflects half of the height of the cylinder. A student who selects this response may not understand how to use the formula for the volume of a cylinder or the relationship between the dimensions of the cylinder.

$$20 \div 2 = 10$$

**Answer Choice C:** 8. The student correctly determined the diameter of the cylinder. The student who selects this response used the formula for the volume of a cylinder to solve for the radius of the cylinder, and then used the radius to find the diameter.

$$V = \pi r^2 h$$

$$320\pi = \pi r^2(20) \qquad 2r = d$$

$$16 = r^2 \qquad 2 \times 4 = 8$$

$$4 = r$$

**Answer Choice D:** 4. This response reflects the radius of the cylinder. A student who selects this response may understand how to use the formula for the volume of a cylinder, but may not understand the relationship between the radius and diameter of the cylinder or attend to precision when answering the question posed in the problem.

$$V = \pi r^2 h$$

$$320\pi = \pi r^2(20)$$

$$16 = r^2$$

$$4 = r$$

Answer options A, B, and D are plausible but incorrect. They represent common student errors made when using the formula of a cylinder to solve real-world and mathematical problems. Answer option C represents the correct process used to solve for the diameter of a cylinder given the volume and height.



Which equation does **not** represent a linear function of  $x$ ?

**A**  $y = -\frac{3}{4}x$

**B**  $y = \frac{x}{2}$

**C**  $y = -3 + 2x$

**D**  $y = 3x^2 - 2$

**Key: D**

**Measured CCLS: 8.F.3**

**Commentary:** The item measures 8.F.3 because it involves interpreting whether a function is linear by determining if the equation can be written in the form  $y = mx + b$ .

**Answer Choice A:**  $y = -\frac{3}{4}x$ . This response is an equation that represents a linear function in the form  $y = mx + b$  where  $b = 0$ . The graph of  $y = -\frac{3}{4}x$  is a straight line through the origin with a constant slope of  $-\frac{3}{4}$ . A student who selects this response may not understand that a constant slope can be negative or that the coefficient of  $x$ ,  $m$ , can be a fraction.

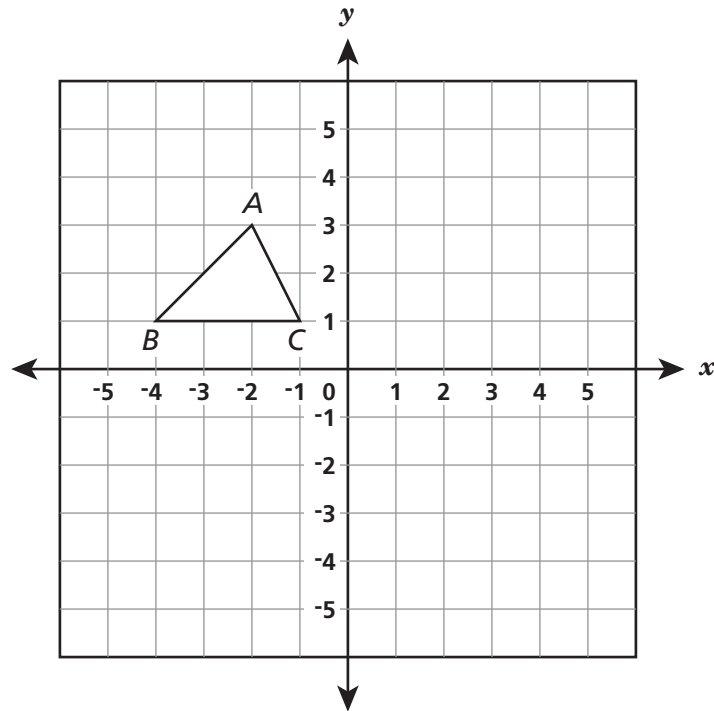
**Answer Choice B:**  $y = \frac{x}{2}$ . This response is an equation that represents a linear function in the form  $y = mx + b$  where  $b = 0$ . The graph of  $y = \frac{x}{2}$  is a straight line through the origin with a constant slope of  $\frac{1}{2}$ . A student who selects this response may not understand different forms that linear equations can take, specifically that  $\frac{x}{2}$  can be represented as  $\frac{1}{2}x$ .

**Answer Choice C:**  $y = -3 + 2x$ . This response is an equation that represents a linear function. The graph of  $y = -3 + 2x$  is a straight line with a  $y$ -intercept of  $-3$  and a constant slope of  $2$ . A student who selects this response may not understand that a linear function can be written in the form of  $y = b + mx$ .

**Answer Choice D:**  $y = 3x^2 - 2$ . The student correctly determined that  $y = 3x^2 - 2$  does not represent a linear function. The student who selects this response understands a linear function must be in the form of  $y = mx + b$ , where the power of  $x$  is  $1$ . A student may also have substituted different values for  $x$  and recognized the resulting ordered pairs do not represent a straight line.

Answer options A, B, and C are plausible but incorrect. They represent common student errors made when determining which equation does not represent a linear function. Answer option D does not represent a linear function.

If  $\triangle ABC$  is rotated  $90^\circ$  clockwise about the origin, what will be the new coordinates of vertex  $B$ ?



- A  $(-1, -4)$
- B  $(1, 4)$
- C  $(4, 1)$
- D  $(4, -1)$

**Key: B**

**Measured CCLS: 8.G.3**

**Commentary:** The item measures 8.G.3 because it asks students to describe the effect of a rotation on the coordinates of a two-dimensional figure.

**Answer Choice A:**  $(-1, -4)$ . This response reflects the coordinates of point  $B$  after a  $90^\circ$  counterclockwise rotation about the origin rather than a clockwise rotation. A student who selects this response may only have partial understanding of how to perform rotations on the coordinate plane.

**Answer Choice B:**  $(1, 4)$ . The student correctly determined the coordinates of point  $B$  after a  $90^\circ$  clockwise rotation about the origin. The student who selects this response performed the correct rotation on point  $B$ .

**Answer Choice C:**  $(4, 1)$ . This response represents the coordinates of  $B$  after a reflection in the  $y$ -axis. A student who selects this response may not understand how to perform a rotation.

**Answer Choice D:**  $(4, -1)$ . This response reflects the coordinates of point  $B$  after a  $180^\circ$  rotation about the origin. A student who selects this response may only have partial understanding of how to perform rotations on the coordinate plane.

Answer options A, C, and D are plausible but incorrect. They represent common student errors made when describing the effect of a rotation on two-dimensional figures using coordinates. Answer option B represents the correct coordinates of point B after a  $90^\circ$  clockwise rotation about the origin.

Mr. Wallace surveyed 75 students at Poole Middle School to find out the students' favorite place to eat lunch. The results are shown below.

**FAVORITE PLACE TO EAT LUNCH**

	Cafeteria	Outside	Total
Boys	16	21	37
Girls	24	14	38
Total	40	35	75

Which table shows the approximate relative frequencies of Mr. Wallace's data?

**FAVORITE PLACE TO EAT LUNCH**

**A**

	Cafeteria	Outside	Total
Boys	16%	21%	37%
Girls	24%	14%	38%
Total	40%	35%	75%

**FAVORITE PLACE TO EAT LUNCH**

**C**

	Cafeteria	Outside	Total
Boys	40%	60%	49%
Girls	60%	40%	51%
Total	100%	100%	100%

**FAVORITE PLACE TO EAT LUNCH**

**B**

	Cafeteria	Outside	Total
Boys	21%	28%	49%
Girls	32%	19%	51%
Total	53%	47%	100%

**FAVORITE PLACE TO EAT LUNCH**

**D**

	Cafeteria	Outside	Total
Boys	43%	57%	100%
Girls	63%	37%	100%
Total	53%	47%	100%

**Key: B**

**Measured CCLS: 8.SP.4**

**Commentary:** The item measures 8.SP.4 because it asks students to interpret a two-way table summarizing data on two categorical data and identify the two-way frequency table that displays the relative frequencies of the given data.

**Answer Choice A:** The student did not convert each data value into a percentage of the total students, but repeated the original data values. A student who selects this response may not understand the meaning of relative frequency or is unable to calculate the relative frequency from a two-way table.

**Answer Choice B:** The student correctly constructed a two-way table that displays the relative frequencies of the given data. The student who selects this response likely divided each piece of original data by the total number of students to determine the relative frequency represented by that piece of data. An example of a correct calculation is shown below:

Boys that ate in the cafeteria:  $\frac{16}{75} \times 100 \approx 21$

**Answer Choice C:** This response reflects the relative frequency of each data value based on the respective column totals. A student who selects this response may have partial understanding of the meaning of relative frequency and may also have difficulty accurately reading a two-way data table. An example of a calculation is shown below:

Boys that ate in the cafeteria:  $\frac{16}{40} \times 100 \approx 40$

**Answer Choice D:** This response reflects the relative frequency of each data value based on the respective row totals. A student who selects this response may have partial understanding of the meaning of relative frequency and may also have difficulty accurately reading a two-way data table. An example of a calculation is shown below:

Boys that ate in the cafeteria:  $\frac{16}{37} \times 100 \approx 43$

Answer options A, C, and D are plausible but incorrect. They represent common student errors made when constructing a two-way table summarizing data on two categorical variables collected from the same subjects. Answer option B represents the correct process used to construct a two-way frequency table that displays the relative frequencies of the given data.

Solve the equation below for  $d$ .

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

**Show your work.**

**Answer**  $d = \underline{\hspace{2cm}}$

**Measured CCLS: 8.EE.7b**

**Commentary:** The item measures 8.EE.7b because it assesses solving linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

**Extended Rationale:** This question asks students to solve a given linear equation for a variable. Students must include a set of computations that will lead to a correct response where work is provided to defend each step in the process. As indicated in the rubric, student responses will be rated on whether they show sufficient work to indicate a thorough understanding of solving a linear equation for the variable. The determining factor in demonstrating a thorough understanding is using mathematically sound procedures to lead to a correct response.

The correct answer may be arrived at by applying properties of operations to solve the given linear equation for the variable:

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

$$0.2d - 1.2 = 0.3d + 0.1d + 5 - 3$$

$$0.2d - 1.2 = 0.4d + 2$$

$$0.2d - 0.4d = 2 + 1.2$$

$$-0.2d = 3.2$$

$$d = -16$$

**SAMPLE STUDENT RESPONSES AND SCORES APPEAR ON THE FOLLOWING PAGES:**

## Additional

Solve the equation below for  $d$ .

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

Show your work.

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

$$0.2d - 1.2 = 0.3d + 5 - 3 + 0.1d$$

$$0.2d - 1.2 = 0.4d + 2$$

$$\begin{array}{r} +1.2 \\ \hline 0.2d - 1.2 = 0.4d + 2 \\ +1.2 \end{array}$$

$$0.2d = 0.4d + 3.2$$

$$\begin{array}{r} -0.4d \\ \hline -0.2d = 3.2 \end{array}$$

$$\begin{array}{r} -0.2d = 3.2 \\ \hline -0.2 \quad -0.2 \end{array}$$

$$d = -16$$

$$\boxed{d = -16}$$

check =

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

$$0.2(-16 - 6) = 0.3(-16) + 2 + 0.1(-16)$$

$$0.2(-22) = -4.8 + 2 - 1.6$$

$$-4.4 = -4.4 \quad \checkmark$$

Answer  $d = \underline{-16}$

### Score Point 2 (out of 2 points)

This response answers the question correctly and demonstrates a thorough understanding of the mathematical concepts. The equation is correctly solved for  $d$  using mathematically sound procedures.



Solve the equation below for  $d$ .

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

**Show your work.**

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

$$0.2d - 1.2 = 0.3d + 5 - 3 + 0.1d$$

$$0.2d - 1.2 = 0.4d + 2$$

$$\begin{array}{r} 0.2d - 1.2 = 0.4d + 2 \\ +1.2 \qquad \qquad +1.2 \\ \hline 0.2d = 0.4d + 3.2 \\ -0.4d \quad -0.4d \\ \hline -0.2d = 3.2 \\ -0.2 \quad -0.2 \\ \hline d = -16 \end{array}$$

**Answer**  $d =$  \_\_\_\_\_

**Score Point 2 (out of 2 points)**

This response answers the question correctly and demonstrates a thorough understanding of the mathematical concepts. The equation is correctly solved for  $d$  using mathematically sound procedures.

Solve the equation below for  $d$ .

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

Show your work.

$$\begin{array}{r} 0.2d - 1.2 = 0.4d + 2 \\ -0.2d \quad -0.2 \end{array}$$

$$\begin{array}{r} -1.2 = 0.2d + 2 \\ -2 \quad -d \end{array}$$

$$\begin{array}{r} -3.2 = 0.2d \\ \hline 0.2 \quad 0.2 \end{array}$$

$$d = -16$$

Answer  $d = \underline{-16}$

**Score Point 2 (out of 2 points)**

This response answers the question correctly and demonstrates a thorough understanding of the mathematical concepts. The equation is correctly solved for  $d$  using mathematically sound procedures.

Solve the equation below for  $d$ .

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

Show your work.

$$0.2(d-6) = 0.3d + 5 - 3 + 0.1d$$

$$\begin{array}{r} 0.2d - 1.2 = 0.4d + 2 \\ -0.2d \quad -0.2d \end{array}$$

$$\begin{array}{r} -1.2 = 0.2d + 2 \\ -2 \quad -2 \end{array}$$

$$\begin{array}{r} -3.2 = 0.2d \\ 0.2 \quad 0.2 \end{array}$$

$$\boxed{16 = d}$$

Answer  $d = \underline{16}$

**Score Point 1 (out of 2 points)**

This response is only partially correct. The response applies a mathematically appropriate process; however, the answer (16) omits the negative sign and is therefore incorrect.

Solve the equation below for  $d$ .

$$0.2(d - 5) = 0.3d + 5 - 3 + 0.1d$$

Show your work.

$$\begin{aligned} 0.2d - 1.2 &= 0.3d + 5 - 3 + 0.1d && \begin{array}{r} 0.2 \\ \times 6 \\ \hline 1.2 \end{array} \\ 0.2d - 1.2 &= 0.3d + 2 + 0.1d \\ 0.2d - 1.2 &= 0.4d + 2 \\ \hline 0.2d &= 0.4d + 3.2 \\ -0.4d & \quad -0.4d \\ \hline -0.2d &= 3.2 \\ \hline -2 & \quad -2 \\ \hline d &= 1.6 \end{aligned}$$
$$\begin{array}{r} 1.6 \\ 2 \overline{) 3.2} \\ \underline{-2} \phantom{0} \\ 12 \end{array}$$

Answer  $d = \underline{1.6}$

**Score Point 1 (out of 2 points)**

This response is only partially correct. This response applies a mathematically appropriate process; however, due to a division error, the answer (1.6) is incorrect.

Solve the equation below for  $d$ .

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

Show your work.

$$\begin{aligned} 0.2(d-6) &= 0.3d + 5 - 3 + 0.1d \\ .2d(1.2) &= 0.4d + 5 - 3 \\ .2d = 1.2 &= 0.4d + 2 \\ +1.2 & \quad +1.2 \\ .2d &= 0.4d + 3.2 \\ -.4d & \quad -.4d \\ \hline -.8d &= 3.2 \\ \hline -.8 & \quad -.8 \\ d &= -4 \end{aligned}$$

Answer  $d = \underline{-4}$

**Score Point 1 (out of 2 points)**

This response is only partially correct. This response contains an incorrect solution (-4), but applies a mathematically appropriate process, with a subtraction error.

## Additional

Solve the equation below for  $d$ .

$$0.2(d - 6) = 0.3d + 5 - 3 + 0.1d$$

Show your work.

$$\begin{array}{r} 0.2 \\ \times 6 \\ \hline 0.18 \end{array}$$

$$0.2(d-6) = 0.3d + 5 - 3 + 0.1d$$

$$0.2d - 0.18 = 0.3d + 5 - 3 + 0.1d$$

$$\begin{array}{r} 0.2d + 0.18 = 0.2d + 5 - 3 \\ -0.2d \quad -0.2d \\ \hline \end{array}$$

$$0.18 = 5 - 3$$

$$\begin{array}{r} 0.18 = 2 \\ \hline 2 \quad 2 \end{array}$$

$$x = 9$$

Answer  $d = \underline{9}$

### Score Point 0 (out of 2 points)

This response is incorrect. Computational and procedural errors initially show no solution ( $0.18 = 5 - 3$ ); however, the response continues and incorrectly determines the answer is 9.

Triangle  $ABC$  was rotated  $90^\circ$  clockwise. Then it underwent a dilation centered at the origin with a scale factor of 4. Triangle  $A'B'C'$  is the resulting image.

What parts of  $\triangle A'B'C'$  are congruent to the corresponding parts of the original triangle? Explain your reasoning.

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Compare the perimeters of  $\triangle ABC$  and  $\triangle A'B'C'$ . Explain your reasoning.

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**Measured CCLS: 8.G.4**

**Commentary:** The item measures 8.G.4 because students are asked to demonstrate understanding that a triangle obtained from a rotation and dilation is similar to the original triangle. Congruent angles are an essential characteristic of similar figures. Also, in similar figures, all corresponding distances (affecting the perimeter in this case) are related by the same ratio, known as the scale factor.

**Extended Rationale:** This question asks students to compare the aspects of a figure and its image after a rotation and a dilation by a scale factor of 4. Students must include explanations for their reasoning for each question. As indicated in the rubric, student responses will be rated on whether their explanations indicate a thorough understanding of the specified aspects of the figure and its image after a rotation and a dilation. The determining factor in demonstrating a thorough understanding is using mathematically sound reasoning to explain a correct response.

The correct response to the first question should include the fact that the corresponding angles of  $\triangle ABC$  and  $\triangle A'B'C'$  will be congruent and an explanation based on the fact that the triangles will be similar due to  $\triangle A'B'C'$  being the result of a rotation and a dilation upon  $\triangle ABC$ . A sample response to the first question would be:

The corresponding angles of each triangle will be congruent because  $\triangle A'B'C'$  was made by rotating and dilating  $\triangle ABC$ . The image of any figure that is the product of a rotation and a dilation on the original figure will result in similar figures.

The correct response to the second question should include the fact that the perimeter of  $\triangle A'B'C'$  will be 4 times as large as the perimeter of  $\triangle ABC$  and an explanation based on the fact that  $\triangle A'B'C'$  is the result of a dilation by a scale factor of 4 upon  $\triangle ABC$ . A sample response to the second question would be:

The perimeter of  $\triangle A'B'C'$  will be 4 times as large as the perimeter of  $\triangle ABC$  because  $\triangle A'B'C'$  was made by dilating  $\triangle ABC$  by a scale factor of 4. Dilating  $\triangle ABC$  by a scale factor of 4 will make each side of  $\triangle A'B'C'$  4 times longer than the corresponding side of  $\triangle ABC$ , so the perimeter of  $\triangle A'B'C'$  will be 4 times as long as the perimeter of  $\triangle ABC$ .

**SAMPLE STUDENT RESPONSES AND SCORES APPEAR ON THE FOLLOWING PAGES:**



## Additional

Triangle  $ABC$  was rotated  $90^\circ$  clockwise. Then it underwent a dilation centered at the origin with a scale factor of 4. Triangle  $A'B'C'$  is the resulting image.

What parts of  $\triangle A'B'C'$  are congruent to the corresponding parts of the original triangle? Explain your reasoning.

The angles of the triangle are congruent to the original triangle

Compare the perimeters of  $\triangle ABC$  and  $\triangle A'B'C'$ . Explain your reasoning.

The perimeter of triangle  $ABC$  would be less than the perimeter of triangle  $A'B'C'$  because it went under dilation

### Score Point 2 (out of 2 points)

This response answers the questions correctly and demonstrates a thorough understanding of the mathematical concepts. The response correctly identifies which parts of triangle  $A'B'C'$  are congruent to the original triangle (The angles of the triangle are congruent). The response also correctly identifies that the perimeter of triangle  $ABC$  is smaller than the dilated triangle  $A'B'C'$  (The perimeter of triangle  $ABC$  would be less).

Triangle  $ABC$  was rotated  $90^\circ$  clockwise. Then it underwent a dilation centered at the origin with a scale factor of 4. Triangle  $A'B'C'$  is the resulting image.

What parts of  $\triangle A'B'C'$  are congruent to the corresponding parts of the original triangle? Explain your reasoning.

The angles because its still the same shape so the angles didn't change.

Compare the perimeters of  $\triangle ABC$  and  $\triangle A'B'C'$ . Explain your reasoning.

The perimeter of  $A'B'C'$  is larger because it was dilated from  $ABC$

### Score Point 2 (out of 2 points)

This response answers the questions correctly and demonstrates a thorough understanding of the problem. The response correctly identifies which parts of triangle  $A'B'C'$  are congruent to the original triangle (The angles because its still the same shape so the angles didn't change). The response also correctly identifies that the perimeter of triangle  $ABC$  is smaller than the dilated triangle  $A'B'C'$  (The perimeter of  $A'B'C'$  is larger).

Triangle  $ABC$  was rotated  $90^\circ$  clockwise. Then it underwent a dilation centered at the origin with a scale factor of 4. Triangle  $A'B'C'$  is the resulting image.

What parts of  $\triangle A'B'C'$  are congruent to the corresponding parts of the original triangle? Explain your reasoning.

The angles of triangle  $A'B'C'$  are congruent to those of triangle  $ABC$ , as they are not affected by rotation or dilation.

Compare the perimeters of  $\triangle ABC$  and  $\triangle A'B'C'$ . Explain your reasoning.

They are similar, they are the same shape, but at different scales.

### Score Point 1 (out of 2 points)

This response is only partially correct. This response correctly identifies which parts of triangle  $A'B'C'$  are congruent to the original triangle (The angles of triangle  $A'B'C'$  are congruent to those of triangle  $ABC$ ). However, the perimeter comparison (They are similar, they are the same shape, but at different scales) is too vague to demonstrate a thorough understanding.

Triangle  $ABC$  was rotated  $90^\circ$  clockwise. Then it underwent a dilation centered at the origin with a scale factor of 4. Triangle  $A'B'C'$  is the resulting image.

What parts of  $\triangle A'B'C'$  are congruent to the corresponding parts of the original triangle? Explain your reasoning.

it is the equal because it matches up to the same points but just bigger than the original and same shape.

Compare the perimeters of  $\triangle ABC$  and  $\triangle A'B'C'$ . Explain your reasoning.

triangle  $A'B'C'$  is somewhat the same as triangle  $ABC$  just slightly bigger.



**Score Point 0 (out of 2 points)**

This response answers the question incorrectly. This response does not sufficiently explain which parts are equal to demonstrate even a limited understanding. This response also incorrectly explains that triangle  $ABC$ 's perimeter is bigger than that of triangle  $A'B'C'$ .

## Additional

Triangle  $ABC$  was rotated  $90^\circ$  clockwise. Then it underwent a dilation centered at the origin with a scale factor of 4. Triangle  $A'B'C'$  is the resulting image.

What parts of  $\triangle A'B'C'$  are congruent to the corresponding parts of the original triangle? Explain your reasoning.

Each side are congruent to the corresponding parts of the original triangle.

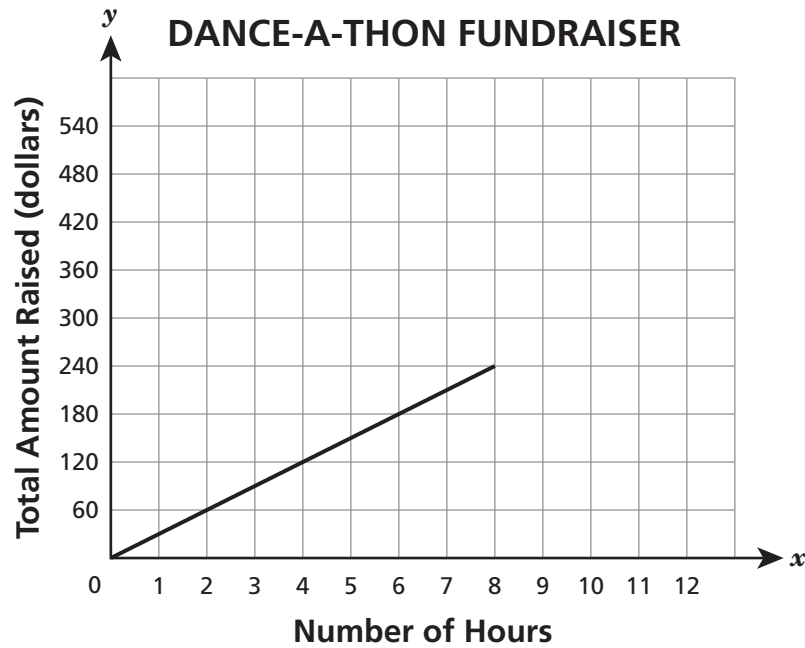
Compare the perimeters of  $\triangle ABC$  and  $\triangle A'B'C'$ . Explain your reasoning.

Both triangle  $ABC$  and triangle  $A'B'C'$  equal the same amount.

### Score Point 0 (out of 2 points)

This response answers the question incorrectly. The response incorrectly explains that triangle  $A'B'C'$ 's sides are equal to that of triangle  $ABC$  (Each side are congruent). This response also incorrectly compares perimeters (triangle  $ABC$  and triangle  $A'B'C'$  equal the same amount).

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

**Show your work or explain how you determined your answer.**

**Answer** \$ \_\_\_\_\_ per hour

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

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## Measured CCLS: 8.EE.5

**Commentary:** The item measures 8.EE.5 because it asks students to graph a proportional relationship, interpret the unit rate as the slope of the graph, and interpret a comparison of two different proportional relationships represented in different ways.

**Extended Rationale:** This question asks students to interpret the slope of a given graph in terms of the situation and then use a verbal comparison to determine the slope and graph on the next section of the line.

For the first question, students must include a set of computations or an explanation that will lead to a correct slope where work or an explanation is provided to defend each step in the process. As indicated in the rubric, this response will be rated on whether they show sufficient work or explanation to indicate a thorough understanding of determining slope from a given graph. The determining factor in demonstrating a thorough understanding is using mathematically sound procedures or reasoning to lead to a correct response.

For the second question, students must draw the second section of the line on the graph and explain their reasoning for the placement of that section. As indicated in the rubric, student responses will be rated on whether their explanation indicates a thorough understanding of determining a slope based on a verbal comparison and then the placement of a section of a line on a given graph. The determining factor in demonstrating a thorough understanding is using mathematically sound reasoning to explain a correct response.

The correct answer for the first question may be calculated from any two points on the given graph by using the formula for slope:

Slope of given graph using (0, 0) and (8, 240):  $m = \frac{(240 - 0)}{(8 - 0)} = 30$ ; \$30 per hour

Or, the correct answer for the first question may be read off the graph by carefully examining how  $y$  changes with respect to  $x$  and explaining this. A sample response to the first question would be:

Sample explanation: The  $y$ -values increase by 30 dollars for each  $x$ -value increase of 1 hour; \$30 per hour

The correct response to the second question would include a line segment drawn from (8, 240) to (12, 480) and an explanation based on the fact that the slope should be \$60 per hour. A sample explanation to the second question would be:

Twice as much money per hour was raised during the last 4 hours of the dance-a-thon. If \$30 was raised each hour for the first 8 hours of the dance-a-thon, then \$60 would be raised each hour for the last 4 hours. The next 4 hours would be from 8 to 12 hours. So I started my line at the end of the first 8 hours, at (8, 240), and drew a line with a slope of 60 from  $x = 8$  to  $x = 12$ .

**SAMPLE STUDENT RESPONSES AND SCORES APPEAR ON THE FOLLOWING PAGES:**



## Additional

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

*Show your work or explain how you determined your answer.*

$$\frac{\$60}{2} = \frac{\$30}{1 \text{ hr}}$$

$$\$30 = 1 \text{ hr.}$$

\* \$30 was made per hour. I found this because \$60 was made for 2 hrs. And half of that is \$30 for 1 hr.

Answer \$ 30 per hour

## Additional

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

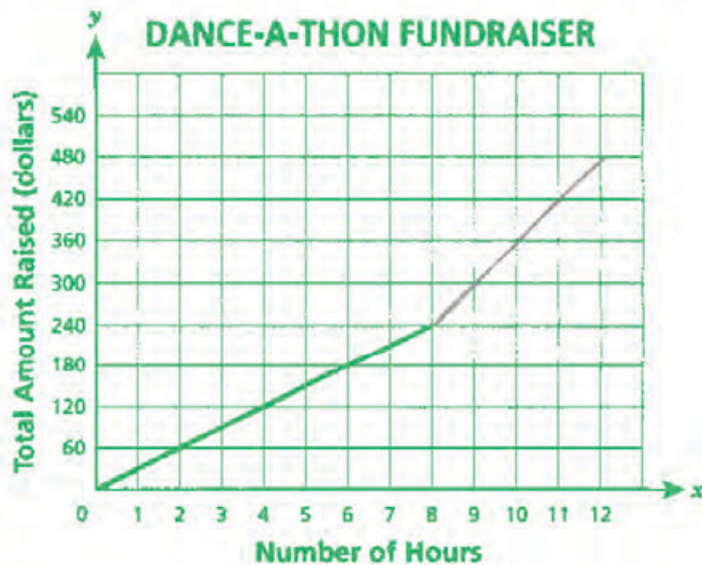
On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

I knew where to draw the next 4 hrs on the graph b/c for the first 8 hrs. it took half a box (\$30) per hr. and the next 4 hrs. now has to be doubled so, I knew it would be one full box (\$60) each hr.

### Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts and procedures. The amount of money raised per hour for the first 8 hours is correct and an appropriate mathematical procedure ( $60 \div 2$ ) is used to determine the rate. In the second part, the explanation is sufficient (first 8 hrs. it took half a box (\$30) per hr and the next 4 hrs now has to be doubled so, I knew it would be one full box (\$60) each hr.). The line segment drawn on the graph is correct.

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

*Show your work or explain how you determined your answer.*

1<sup>st</sup> hr = 30  
 2<sup>nd</sup> hr = 60 } increase by 30  
 3<sup>rd</sup> hr = 90 } increase by 30  
 4<sup>th</sup> hr = 120 } increase by 30  
 5<sup>th</sup> hr = 150 } increase by 30  
 6<sup>th</sup> hr = 180 } increase by 30  
 7<sup>th</sup> hr = 210 } increase by 30  
 8<sup>th</sup> hr = 240 } increase by 30

Answer \$ 30 per hour

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

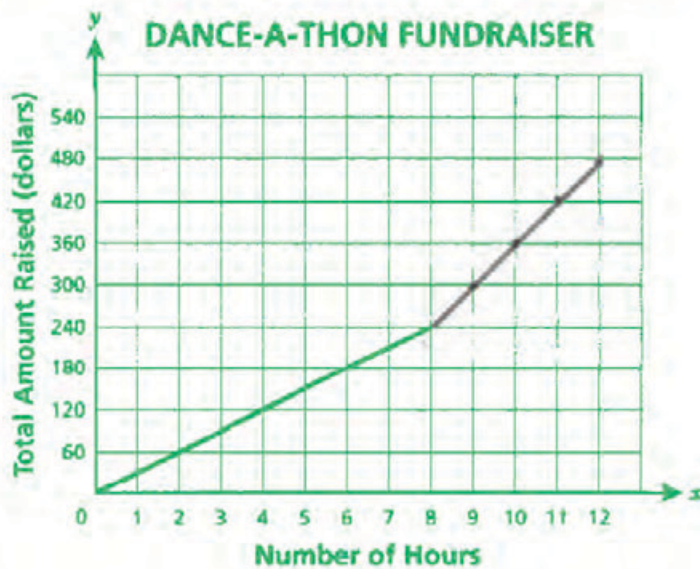
On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

I knew where to draw on the graph because I knew that for the first 8 hours, \$30 were raised per hour. Then, for the next 4 hours, since it doubled, \$60 were raised per hour. So, on the graph, I increased the last 4 hours (9-12) by \$60 for each hour.

### Score Point 3 (out of 3 points)

This response answers the question correctly and demonstrates a thorough understanding of the mathematical concepts. The amount of money raised per hour for the first 8 hours is correct and an appropriate mathematical procedure is used. In the second part, the explanation is sufficient and the line segment drawn on the graph is correct.

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

*Show your work or explain how you determined your answer.*

$$240 \div 8 = 30$$

Answer \$ 30 per hour

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

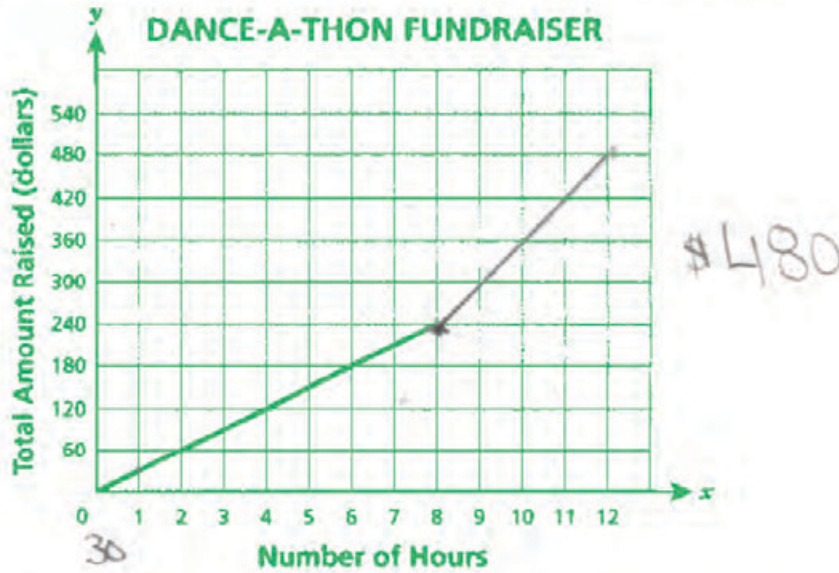
On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

For the first 8 hours they raised \$30 per hour. 60 is 30 doubled. For every hour it has to go up 60

### Score Point 3 (out of 3 points)

This response answers the question correctly and demonstrates a thorough understanding of the mathematical concepts. The amount of money raised per hour for the first 8 hours is correct, and an appropriate mathematical procedure is used ( $240 \div 8 = 30$ ). In the second part, the explanation is sufficient (every hour it has to go up 60) and the line segment drawn on the graph is correct.

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

*Show your work or explain how you determined your answer.*

I got my answer, 240 by looking at the eight hour spot on the graph then moving up to where the line stops on that line which was 240

Answer \$ 240 per hour

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

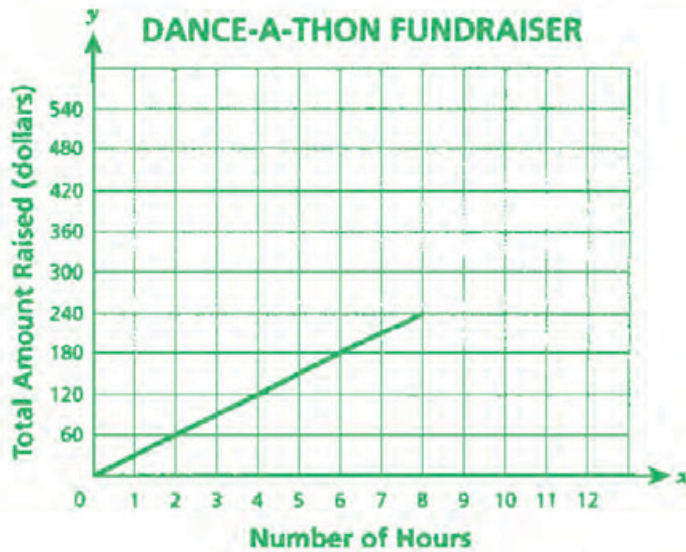
I knew that every hour they raised 30 dollars so if I multiplied that by two, they would be getting 60 dollars per hour so all you do is add on 60 dollars every hour after hour eight.

**Score Point 2 (out of 3 points)**

This response is partially correct. The amount of money raised per hour for the first 8 hours is not correct; the explanation indicates that the answer given is the total amount of money raised for the entire 8 hours. In the second part, the explanation is sufficient (add on 60 dollars every hour after hour eight) and the line segment drawn on the graph is correct.



Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

*Show your work or explain how you determined your answer.*

1st hour 2nd 3rd 4th 5th 6th 7th 8th  
30 60 90 120 150 180 210 240

all multiples or addition of 30's

Answer \$ 30 per hour

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

it goes up by 20's so multiply that by 2  
you got 60 per hour.

### Score Point 2 (out of 3 points)

This response is partially correct and addresses most aspects of the task, using mathematically sound procedures. The amount of money raised per hour for the first 8 hours is correct and an appropriate mathematical procedure is used. In the second part, the explanation is sufficient; however, the line segment representing the hours from 8 until 12 is not drawn on the graph.

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours? 240

Show your work or explain how you determined your answer.

$$\begin{array}{r} 60 \\ \times 8 \\ \hline 480 \end{array}$$

$$\begin{array}{r} 30 \\ \times 8 \\ \hline 240 \end{array}$$

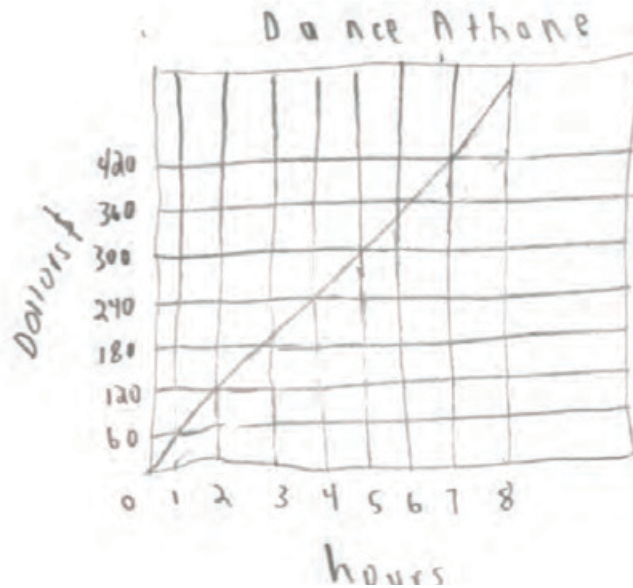
every 1 hours, the money goes up 30 dollars so the money went up every hour 30 dollars.

Answer \$ 30 per hour

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

B/c it doubled its gonna increase bigger/taller on the graph. And while the hours go up the money goes up as well.



### Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts embodied in the task. The amount of money raised per hour for the first 8 hours is correct and an appropriate mathematical procedure is used ( $30 \times 8 = 240$ ). In the second part, although the line segment is drawn correctly on the graph on the first page, the explanation is vague and insufficient (It's gonna increase bigger/taller on the graph. And while the hours go up the money goes up as well).

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

*Show your work or explain how you determined your answer.*

$$\frac{x}{1} = \frac{60}{2}$$
$$\frac{2x}{2} = \frac{60}{2}$$
$$x = 30$$

Answer \$ 30 per hour

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

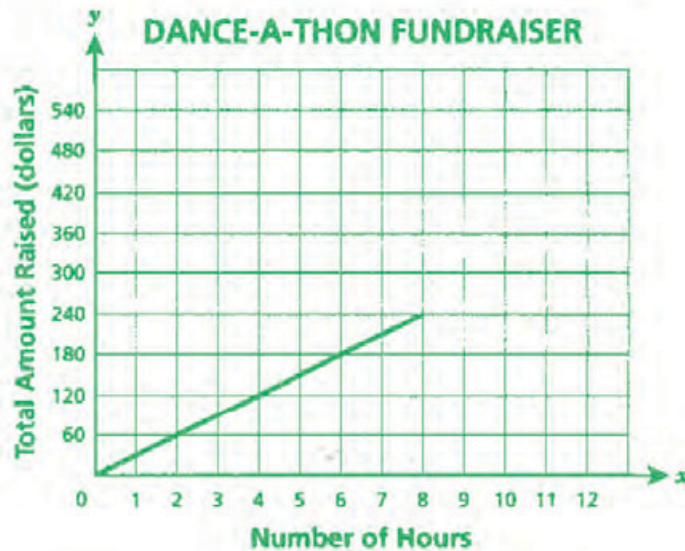
I knew where to draw the graph because they make 30 dollars every hour. Therefore, for each hour I plot the point 30 dollars higher, or half a line up the y-axis, on the graph.

**Score Point 1 (out of 3 points)**

This response demonstrates only a limited understanding of the mathematical concepts. In the first part, the answer and work are correct. For the second part; the line segment on the graph is not plotted correctly – it is an extension of the line segment given for the first part – and the explanation is inaccurate (Therefore, for each hour I plot the point 30 dollars higher) and does not reflect the doubling of the rate.

## Additional

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

*\$30 per hour*

**Show your work or explain how you determined your answer.**

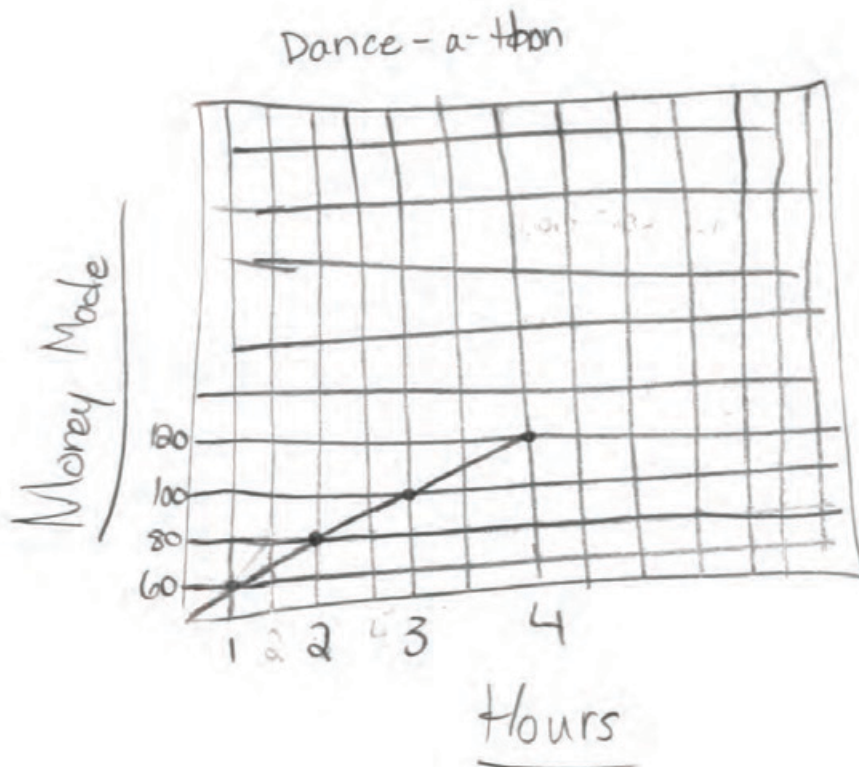
<u>hours</u>	<u>\$</u>		
1	\$30	6	\$170
2	\$60	7	\$200
3	\$80	8	\$230
4	\$110		
5	\$140		

Answer \$ 30 per hour

## Additional

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

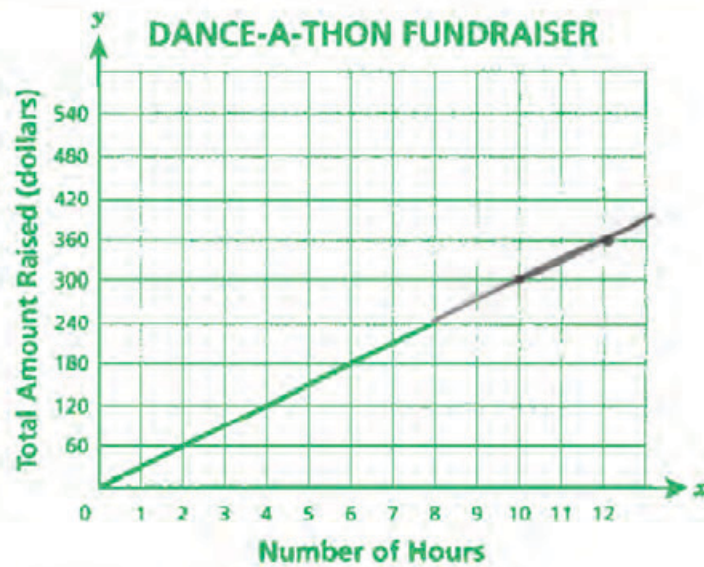


### Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding. In the first part, the answer is correct and although the work shown contains errors, an appropriate mathematical procedure is used. In the second part, the extension of the line on the graph and the explanation are not completed. The graph drawn on the second page is incorrect.



Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

*Show your work or explain how you determined your answer.*

Answer \$ 240 per hour

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

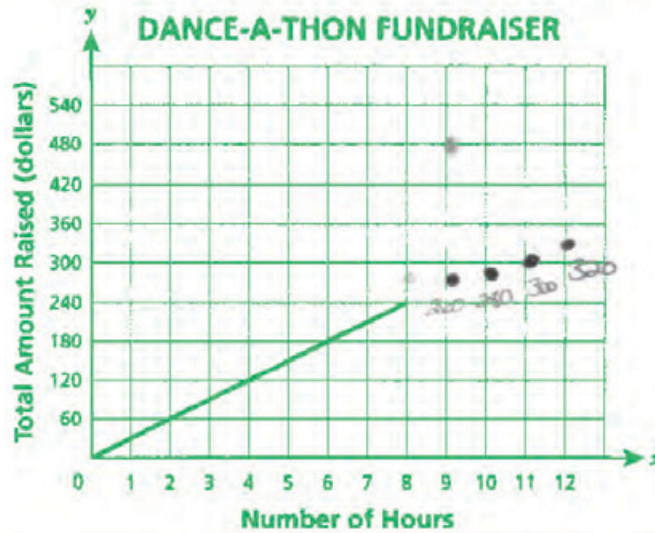
For the next, four hours the amount of money increasing after 12 hours the total amount of money raised was at \$360.

**Score Point 0 (out of 3 points)**

This response is incorrect. In the first part, the answer (240) is incorrect and work is missing. In the second part, the line extension and the explanation (after 12 hours the total amount of money raised was at \$360.00) are both incorrect.

## Additional

Students organized a 12-hour "dance-a-thon" as a fundraiser for their summer camp. The graph below represents the amount of money they raised during the first 8 hours.



What was the amount of money raised per hour during the first 8 hours?

Show your work or explain how you determined your answer.

Hours	1	2	3	4	5	6	7	8
Amount of \$	40	60	80	120	140	180	200	240

240
200
180
140
120
80
60
40
1060

Answer \$ 1,060 per hour

## Additional

During the next 4 hours of the dance-a-thon, the students raised money at twice the hourly rate of the first 8 hours.

On the coordinate plane on the previous page, complete the graph for the next 4 hours to represent the total amount of money raised at the dance-a-thon. Use words and numbers on the following lines to explain how you knew where to draw the graph.

what i did was just basically sum or add 2 and 240 together and just kept adding 2 until i got to 12 hours.

### Score Point 0 (out of 3 points)

This response is incorrect. The answer (1,060), the work, the line segment, and the explanation (add 2 and 240 together and just kept adding 2 until I got to 12 Hours) are incorrect.