The Pennsylvania System of School Assessment

Mathematics
Preliminary
Item and Scoring Sampler

2014–2015

Grade 8

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INTRODUCTION

General Introduction

The Pennsylvania Department of Education provides districts and schools with tools to assist in delivering focused instructional programs aligned with the Pennsylvania Core Standards (PCS). These tools include Academic Standards, Assessment Anchor documents, assessment handbooks, and content-based item and scoring samplers. This Item and Scoring Sampler is a useful tool for Pennsylvania educators in preparing local instructional programs. It can also be useful in preparing students for the statewide assessment.

Pennsylvania Core Standards (PCS)

This sampler contains examples of test questions that are aligned to the new Pennsylvania Core Standards-based 2013 PSSA Assessment Anchors and Eligible Content. The Mathematics, Reading, and Writing PSSA will transition to PCS-based operational Mathematics and English Language Arts assessments starting with the spring 2015 PSSA administration; however, multiple-choice and open-ended test questions appearing on the operational portions of the 2014 PSSA will align to both the current Pennsylvania Academic Standards and the new PCS.

The 2013 PCS-aligned Assessment Anchor and Eligible Content documents are posted on this portal: *www.education.state.pa.us* [Click on the green check mark and select "Pennsylvania System of School Assessment (PSSA)."]

What Is Included

This sampler contains test questions (items) that have been written to align to the Assessment Anchors that are based on the Pennsylvania Core Standards (PCS). The test questions provide an idea of the types of items that will appear on an operational, PCS-based PSSA. Each sample test question has been through a rigorous review process to ensure alignment with the Assessment Anchors.

Purpose and Uses

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

Item Format and Scoring Guidelines

The multiple-choice (MC) items have four answer choices. Each correct response to an MC item is worth one point.

Each open-ended (OE) item is designed to take approximately ten to fifteen minutes to complete. During the administration of the PSSA, students are given additional time as necessary to complete the test items. Each OE item in mathematics is scored using an item-specific scoring guideline based on a 0–4 point scale. In this sampler, every item-specific scoring guideline is combined with examples of student responses that represent each score point to form a practical, item-specific scoring guide.

The sampler also includes the *General Description of Scoring Guidelines for Mathematics Open-Ended Questions* used to develop the item-specific guidelines. The general description of scoring guidelines can be used if any additional item-specific scoring guidelines are created for use within local instructional programs.[1]

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[1] The permission to copy and/or use these materials does not extend to commercial purposes.

Item Alignment

All PSSA items are aligned to statements and specifications included in the *Assessment Anchors and Eligible Content Aligned to the Pennsylvania Core Standards*. The mathematics content, process skills, directives, and action statements included in the PSSA mathematics questions will align with the Assessment Anchor Content Standards. The Eligible Content statements represent the limits of the content of the mathematics questions.

Testing Time and Mode of Testing Delivery for the PCS-Based PSSA

The PSSA is delivered in traditional paper-and-pencil format as well as in an online format. The estimated time to respond to a test question is the same for both methods of test delivery. During an official testing administration, students are given additional time as necessary to complete the test questions. The following table shows the estimated response time for each item type.

Item Type	MC	OE
Estimated Response Time (in minutes)	1.5	10 to 15

MATHEMATICS REPORTING CATEGORIES

The Assessment Anchors are organized into four classifications, as listed below.

- ○ A = Numbers and Operations
- ○ B = Algebraic Concepts
- ○ C = Geometry
- ○ D = Data Analysis and Probability

These four classifications are used throughout the grade levels. In addition to these classifications, there are five Reporting Categories for each grade level. The first letter of each Reporting Category represents the classification; the second letter represents the Domain as stated in the Common Core State Standards for Mathematics. Listed below are the Reporting Categories for Grade 8.

- ○ A-N = The Number System
- ○ B-E = Expressions and Equations
- ○ B-F = Functions
- ○ C-G = Geometry
- ○ D-S = Statistics and Probability

Examples of multiple-choice and open-ended items assessing these categories are included in this booklet.

GENERAL DESCRIPTION OF SCORING GUIDELINES
FOR MATHEMATICS OPEN-ENDED QUESTIONS

4 – The response demonstrates a *thorough* understanding of the mathematical concepts and procedures required by the task.

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

3 – The response demonstrates a *general* understanding of the mathematical concepts and procedures required by the task.

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

2 – The response demonstrates a *partial* understanding of the mathematical concepts and procedures required by the task.

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

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

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

Response may show only information copied from the question.

Special Categories within zero reported separately:

BLK (blank)........... Blank, entirely erased, or written refusal to respond
OT............................ Off-task
LOE......................... Response in a language other than English
IL.............................. Illegible

DESCRIPTION OF SAMPLE QUESTIONS

The mathematics multiple-choice questions begin on page 7. Each question is preceded by the Assessment Anchor and Eligible Content coding to which it aligns. Incorrect answer options are followed by the "rationale" which supports the student's response. All correct answer options are indicated by an asterisk (*).

Three open-ended questions follow the multiple-choice questions. Each open-ended question includes question-specific scoring guidelines and examples of student responses with scores and annotations.

Since the PSSA is delivered in both paper-and-pencil and online formats, OE items of each method of test delivery are included in this sampler. The online OE sample items are presented as screen shots in a landscape orientation in order to best approximate the view of a computer monitor. The examples of student responses that follow the online OE sample items are also presented as screen shots.

A calculator is permitted for use in solving questions numbered 5–43 in this sampler. Questions numbered 1–4 are to be solved without the use of a calculator. Scratch paper may be used in solving all questions.

MATHEMATICS FORMULA SHEET

Below is a Mathematics formula sheet that will be available to students during the test. The formula sheet reflects the mathematical approach included in the Assessment Anchors that are based on the Pennsylvania Core Standards (PCS). The formula sheet is also available in Spanish.

> Formulas that you may need to work questions on this test are found below.
> You may refer back to this page at any time during the mathematics test.
> You may use calculator π or the number 3.14.
>
> 2014
> Grade 8

Exponential Properties

$$a^m \cdot a^n = a^{m+n}$$
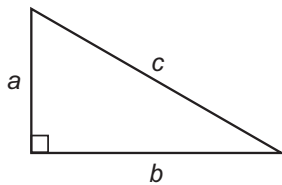
$$(a^m)^n = a^{m \cdot n}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$a^{-1} = \frac{1}{a}$$

Algebraic Equations

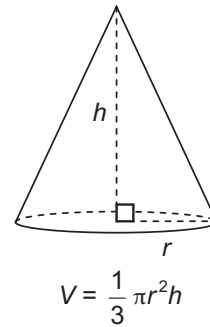**Slope:** $\quad m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Slope-Intercept Form: $\quad y = mx + b$

Pythagorean Theorem

$$a^2 + b^2 = c^2$$

Cone

$$V = \frac{1}{3}\pi r^2 h$$

Cylinder

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

Sphere

$$V = \frac{4}{3}\pi r^3$$
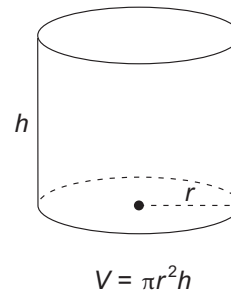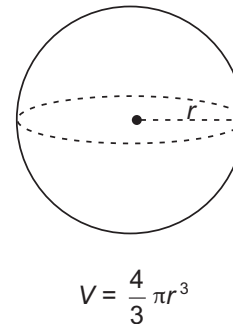
On the following pages are the mathematics questions.

- You may <u>not</u> use a calculator for questions 1–4. You may use a calculator for all other questions on this test.

Directions for Multiple-Choice Questions:

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

For the multiple-choice questions:

- First solve the problem on scratch paper.
- Choose the correct answer and record your choice in the answer booklet.
- If none of the choices matches your answer, go back and check your work for possible errors.
- Only one of the answers provided is the correct response.

Directions for Open-Ended Questions:

Some questions will require you to write your response.

For the open-ended questions:

- These questions have more than one part. Be sure to read the directions carefully.
- You cannot receive the highest score for an open-ended question without completing all tasks in the question. For example, if the question asks you to show your work or explain your reasoning, be sure to show your work or explain your reasoning in the space provided.
- If the question does **not** ask you to show your work or explain your reasoning, you may use the space provided, but only those parts of your response that the question specifically asks for will be scored.
- Write your response in the appropriate location within the response box in the answer booklet. Some answers may require graphing, plotting, labeling, drawing, or shading. If you use scratch paper, be sure to transfer your final response and any needed work or reasoning to the answer booklet.

MULTIPLE-CHOICE QUESTIONS

You may <u>not</u> use a calculator for questions 1–4.

B-E.1.1.1

1. A company makes a puzzle that is made of 5^3 small plastic cubes. The puzzles are shipped in boxes that each contain 5^2 puzzles. The boxes are loaded into trucks that each contain 5^3 boxes. What is the total number of small plastic cubes in each truck?

    A. 5^8 *

    B. 5^{18} *multiplies all the exponents together*

    C. 125^8 *multiplies the bases and adds the exponents*

    D. 125^{18} *multiplies the bases and the exponents*

B-E.1.1.2

2. Solve: $x^2 = 144$

    A. $x = 12$ *only listed the positive solution*

    B. $x = \pm 12$ *

    C. $x = 72$ *divided by 2*

    D. $x = \pm 72$ *divided by 2 and added the ± sign*

B-E.1.1.3

3. The thickness of the skin on the human back is about 3×10^{-3} meter. The thickness of the skin on the human eyelid is about 3×10^{-4} meter. How many times as thick is the skin on the human back as on the human eyelid?

A. 0.1 | reciprocal of correct answer |

B. 1 | misreads or misunderstands difference in exponents |

C. 10   *

D. 30 | 3×10 |

B-E.1.1.3

4. The human body contains about 1×10^{12} bacteria. The human body contains about 4×10^4 genes. The number of bacteria contained in the human body is how many times as great as the number of genes contained in the human body?

A. 250 | used 12/4 as exponent instead of 12 – 4 |

B. 4,000 | used 4 as though in numerator and 12/4 instead of 12 – 4 |

C. 25,000,000   *

D. 400,000,000 | used 4 as though in numerator |

> **A calculator is permitted for use in solving questions numbered 5–43 in this sampler.**

A-N.1.1

5. Craig uses a ruler to determine the length of two pieces of metal. He records the length of each piece of metal as a rational number. Which statement **best** explains whether the sum of the two lengths Craig recorded must also be a rational number?

A. When adding two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$, the numerators a and c do not have to be integers. Therefore, the sum does not have to be a rational number.

> *doesn't realize that since all 4 values are integers, any linear combination is also an integer*

B. When adding two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$, the common denominator bd does not have to be an integer. Therefore, the sum does not have to be a rational number.

> *doesn't realize that both b and d are integers so bd is an integer*

C. When adding two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$, the sum is $\frac{ac}{bd}$, and both the numerator and denominator are integers. Therefore, the sum must be a rational number.

> *doesn't correctly express the sum*

D. When adding two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$, the sum is $\frac{ad + bc}{bd}$, and both the numerator and denominator are integers. Therefore, the sum must be a rational number.
   *

A-N.1.1.1

6. Which statement correctly describes the number $\frac{62}{495}$ and its equivalent decimal notation?

    A.   The number $\frac{62}{495}$ is a rational number and its equivalent decimal notation is a repeating decimal number.   *

    B.   The number $\frac{62}{495}$ is a rational number and its equivalent decimal notation is a terminating decimal number. | *thinks every rational number has a terminating decimal expansion* |

    C.   The number $\frac{62}{495}$ is an irrational number and its equivalent decimal notation is a repeating decimal number. | *thinks every decimal number that does not terminate is irrational* |

    D.   The number $\frac{62}{495}$ is an irrational number and its equivalent decimal notation is a terminating decimal number. | *uses their calculator and so thinks the expansion terminates but thinks the number is irrational because it is not reducible* |

A-N.1.1.2
A-N.1.1.1

7. Amanda graphed a linear function with the equation $y = 1.\overline{4}x$. Which statement about the slope of Amanda's line is true?

A. The slope is a rational number that can be written as $\dfrac{13}{9}$.

 *

B. The slope is a rational number that can be written as $\dfrac{14}{10}$.

 interprets the slope as 14/10, not 13/9

C. The slope is an irrational number that can be written as $\dfrac{13}{9}$.

 interprets the slope as irrational since it is an improper fraction

D. The slope is an irrational number that can be written as $\dfrac{14}{10}$.

 interprets the slope as 14/10, not 13/9, and as irrational since it is an improper fraction

A-N.1.1.4
A-N.1.1.5

8. On the number line below, point P shows the location of an irrational number.

P

4.0   5.0   6.0   7.0   8.0   9.0   10.0
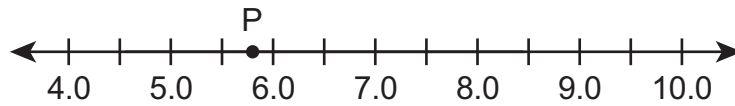
Which expression has a value that is **greater** than the irrational number represented by point P?

A. $\sqrt{7} - 1$ *ignores radical*

B. $2\sqrt{7}$ *uses approximation for sqrt(7) that is too large*

C. $4 + \sqrt{7}$ *

D. $7 - \sqrt{7}$ *uses approximation for sqrt(7) that is too small*

A-N.1.1.4
C-G.2.1.2

9. The lengths of the legs of two right triangles are listed below.

    - triangle A: 5 inches and 5 inches
    - triangle B: 4 inches and 6 inches

    Which statement correctly compares the lengths, in inches, of the hypotenuses for the two triangles?

A. $2\sqrt{5} \approx 4.2$
    $13\sqrt{2} \approx 14.4$
    $2\sqrt{5} < 13\sqrt{2}$

> *when simplifying the radical, pulled out the non-perfect square and left the square root of the perfect square under the radical, then student evaluated the simplified forms by adding instead of multiplying*

B. $2\sqrt{5} \approx 4.5$
    $13\sqrt{2} \approx 18.4$
    $2\sqrt{5} < 13\sqrt{2}$

> *when simplifying the radical, pulled out the non-perfect square and left the square root of the perfect square under the radical*

C. $5\sqrt{2} \approx 6.4$
    $2\sqrt{13} \approx 5.6$
    $5\sqrt{2} > 2\sqrt{13}$

> *calculates 5 + sqrt(2) and 2 + sqrt(13)*

D. $5\sqrt{2} \approx 7.1$
    $2\sqrt{13} \approx 7.2$
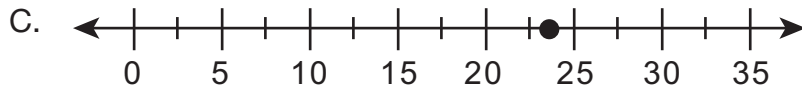 $5\sqrt{2} < 2\sqrt{13}$

    *

A-N.1.1.5
B-E.1.1.2

10. A packing crate in the shape of a cube has a volume of 70 cubic feet. The length (x), in feet, of one side of the cube can be found by solving $x^3 = 70$. Which point on the number line represents the length, in feet, of one side of the cube?
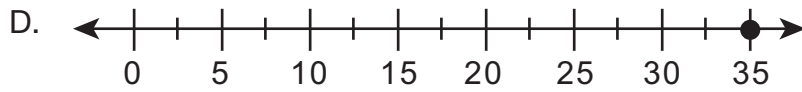
A.

*

B.
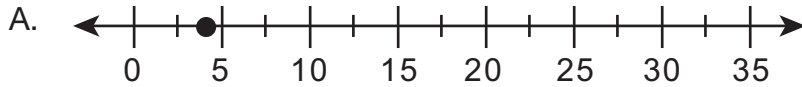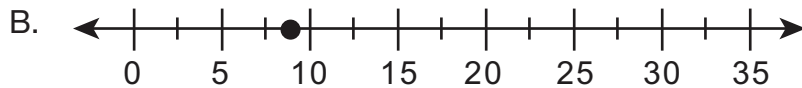
takes the square root of 70

C.

divides 70 by 3

D.

divides 70 by 2

B-E.1.1.1

11. Which expression is equivalent to $\dfrac{2^3 \bullet 5^2}{2^5 \bullet 3 \bullet 5^4}$?

A. $\dfrac{1}{2^5}$

> *ignores bases when using properties, combines all exponents and uses base of 2*

B. $\dfrac{2^3}{3 \bullet 5^4}$

> *cancels 5^2 with 2^5*

C. $\dfrac{2^2 \bullet 5^2}{3}$

> *when using a^m/a^n = a^(m – n), takes absolute value of m – n*

D. $\dfrac{1}{2^2 \bullet 3 \bullet 5^2}$ *

B-E.2.1

12. Connie sells hamburgers at a food stand. The graph below shows the relationship between the weight (x), in pounds, of meat used and the price (y), in dollars, of a hamburger.

Price of Hamburgers
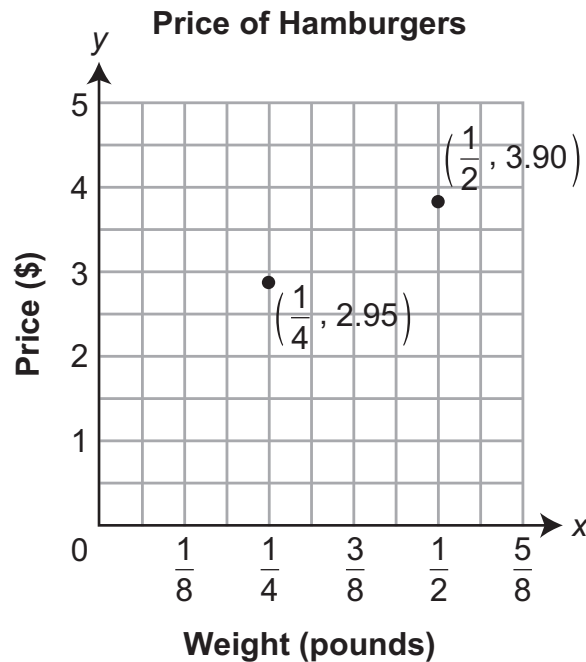
The cost of meat per pound is the same for each hamburger Connie sells. What is the cost of meat per pound for each hamburger Connie sells?

A. $0.95 | $3.90 - 2.95$ |

B. $1.90 | cost of half a pound of meat |

C. $2.00 | y-intercept of graph (fixed cost) |

D. $3.80   *

B-E.2.1.1

13. A school has collected student enrollment data since it opened. The graph below shows the number of students (y), in hundreds, enrolled at the school each year (x) the school has been open.

Student Enrollment
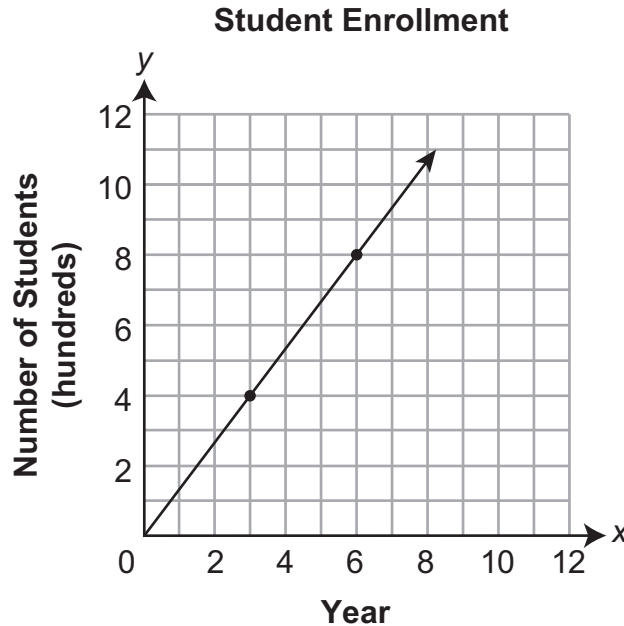
Which statement **best** describes the change in student enrollment shown in the graph?

A. Enrollment has increased by approximately 1.3 students per year.

> *ignores y-axis label*

B. Enrollment has increased by approximately 133 students per year.
    *

C. Enrollment has increased by approximately 400 students per year.

> *ignores change in years*

D. Enrollment has increased by approximately 1,100 students per year.

> *uses maximum y-value shown on graph, ignores change in years*

B-E.2.1.2

14. The graph of a line is shown below.
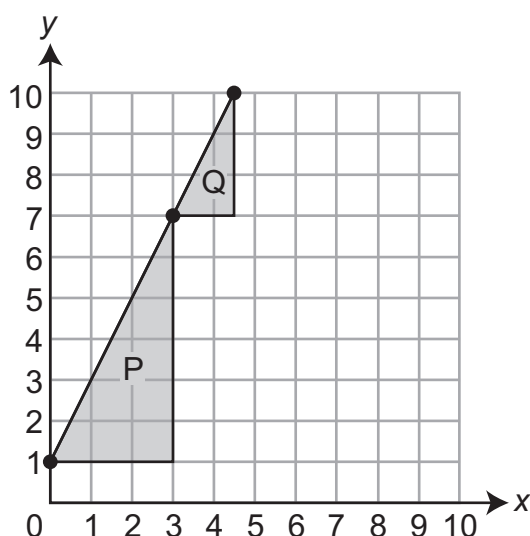
To find the slope, Jackie makes right triangle P by using the graph of the line as the hypotenuse of the triangle as shown in the figure. To check her work, she repeats the process and makes a right triangle Q as shown. Which statement explains why the slope of the line should be the same when calculated with either triangle?

A.   The two triangles are similar.   *

B.   The two triangles are congruent. | confuses congruent and similar |

C.   One triangle is a translation of the other triangle. | ignores the fact that the two triangles aren't congruent |

D.   The lengths of the hypotenuse of each triangle are equal. | thinks slope is related to the length of the hypotenuse |

B-E.2.1.3

15. The graph below shows the relationship between the number of minutes Ray walks and the number of calories he burns.

Calories Burned While Walking
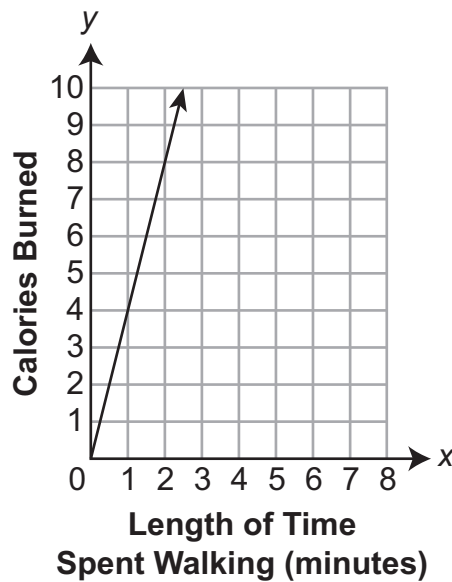
Which equation can be used to find the number of calories (y) Ray burns when he walks for x minutes?

A. $y = x + 4$ *treats the slope as the y-intercept*

B. $y = x - 4$ *subtracts the slope*

C. $y = 4x$ *

D. $y = \dfrac{x}{4}$ *uses the reciprocal of the slope*

B-E.3.1

16. A system of linear equations is shown below.

$$4y = 4x + 12$$
$$y = {}^-x + 3$$

The system is graphed on a coordinate plane. An additional linear equation is graphed so that a triangle is created by the three lines. Which equation could be the additional linear equation?

A. $2y = {}^-2x + 6$ | *thinks a linear equation must include a y and an x* |

B. $3y = 18$ *

C. $5(x + 1) = 5$ | *considers vertical line as best option; neglects to realize it passes through the intersection of the other two equations* |

D. $5y = 3x + 15$ | *adds the two equations* |

B-E.3.1.2

17. Quinn needs to buy fabric for a border to sew onto all four edges of a tablecloth. He also needs an extra 0.875 feet of fabric to make a matching potholder. The length of the table cloth is $\frac{4}{3}$ of its width (*w*), in feet. The total amount of fabric needed (*f*), in feet, is represented by the equation below.

$$f = 2(w + \frac{4}{3}w) + 0.875$$

Quinn needs $\frac{113}{8}$ feet of fabric for the border of the tablecloth and the potholder. What is the width of Quinn's tablecloth?

A. $\frac{39}{14}$ feet   *rounded 113/8 – 0.875 to 13 instead of converting 0.875 into a fraction*

B. $\frac{159}{40}$ feet   *did not distribute 2 to both terms in parentheses*

C. $\frac{159}{56}$ feet   *

D. $\frac{159}{32}$ feet   *multiplied 2 by the denominator in 4/3 instead of the numerator when distributing*

B-E.3.1.3

18. Aiden and Noah are going to work for their neighbor this summer. The neighbor gives Aiden $25 at the beginning of the summer and then pays him $5 each week to mow the lawn. The neighbor pays Noah $7.50 each week to walk the dog. The graph shown below models the total amount of money (*y*) each boy has earned after working for *x* weeks.

Aiden's and Noah's Earnings
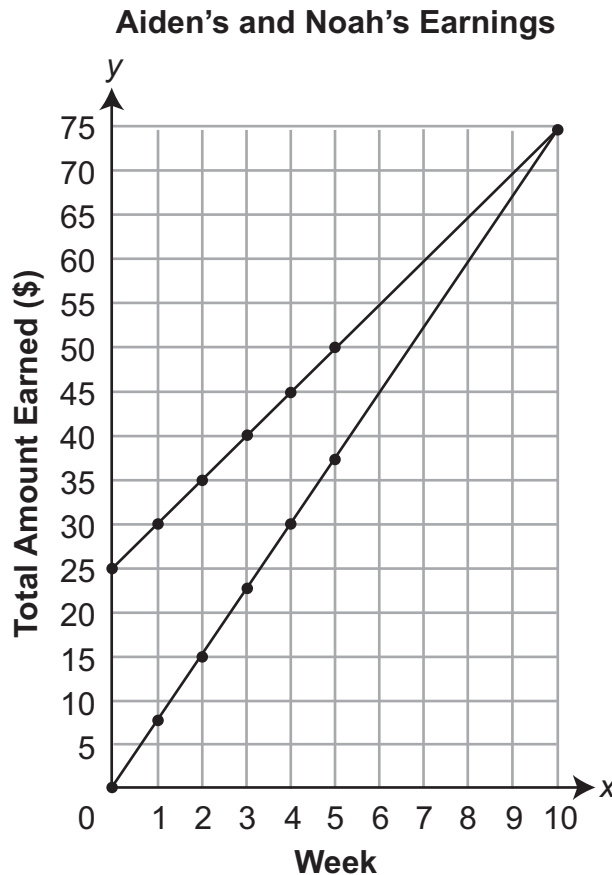
What does the point of intersection on the graph represent?

A.   After 75 weeks, each boy has earned a total of $10.

   mixed up weeks and dollars

B.   After 10 weeks, each boy has earned a total of $75.
   *

C.   After 10 weeks, Noah has earned a total of $75 and Aiden has earned a total of $10.

   reading graph incorrectly

D.   After 75 weeks, Noah has earned a total of $10 and Aiden has earned a total of $75.

   reading graph incorrectly

B-E.3.1.5

19. A store creates a mixture using only peanuts and almonds.

- There are 20 pounds of the mixture.
- Peanuts cost $2.95 per pound.
- Almonds cost $5.95 per pound.
- The mixture costs $4.00 per pound.

How many pounds of peanuts are in the mixture?

A. 2   *sets up first equation as 2.95x + 5.95y = 4 (does not multiply by 20); sets up second equation correctly, solves for y, ignores issues with signs, rounds result; uses result to find x*

B. 6   *finds 20/2.95, rounds down*

C. 7   *number of pounds of almonds*

D. 13   *

B-F.1.1.1

20. Which relation is **not** a function?

A. $y = 8x^2 + 11x + 14$

B.

x	y
1	6
3	18
5	30
7	42

thinks x^2 not a function

since y-value doesn't go up by same amount every time thinks not function

C.
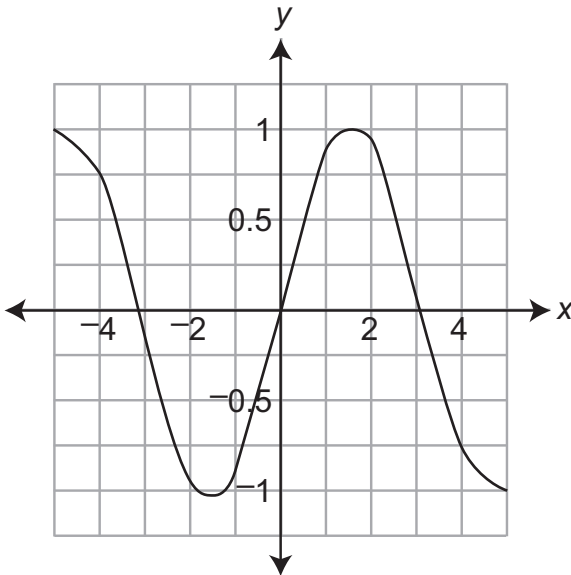
since non-linear and each value of y is repeated thinks not a function
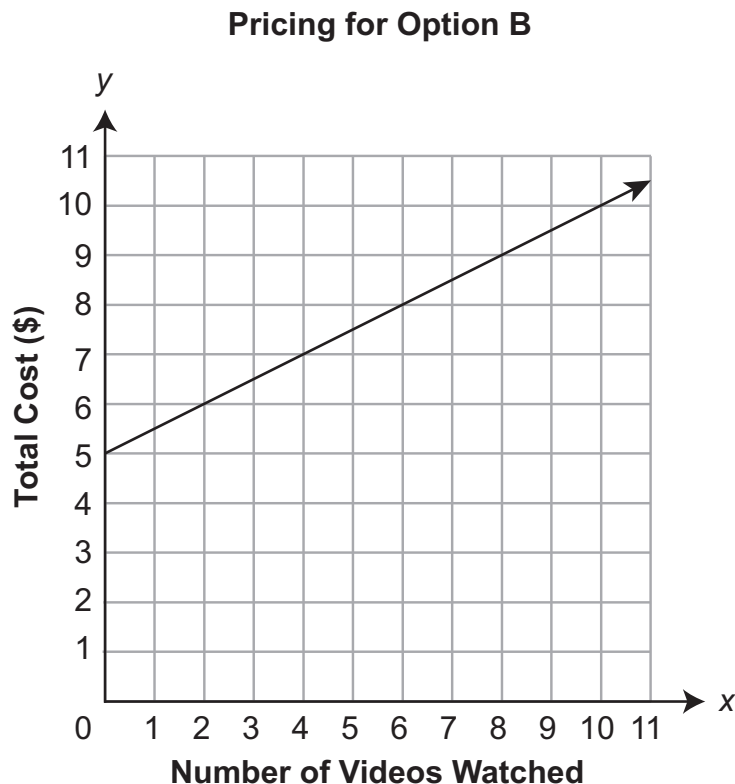
D.

*
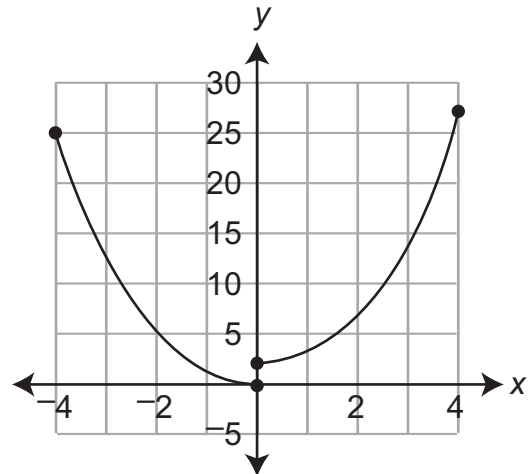
B-F.1.1.2

21. An online video service offers two price options. Pricing for option A is given by $y = 2x + 10$, where x is the number of videos watched and y is the total cost in dollars. Pricing for option B is shown in the graph below.

Pricing for Option B

Both options include an initial charge and a charge per video watched. Which statement correctly compares the two price options?

A. Option A has a higher initial charge and a higher charge per video watched.
   *

B. Option B has a higher initial charge and a higher charge per video watched.

   thinks service A has an initial charge of 2 and a charge per video of 10 cents

C. Option A has a higher initial charge, and option B has a higher charge per video watched.

   uses the rate for B in cents (50) rather than dollars (0.5)

D. Option B has a higher initial charge, and option A has a higher charge per video watched.

   thinks service A's initial charge is 2 and the charge per video is 10

B-F.1.1.2

22. Sofia boarded a bus to school at the bus stop. The distance traveled by Sofia's bus is represented by the graph below.

Sofia's Bus
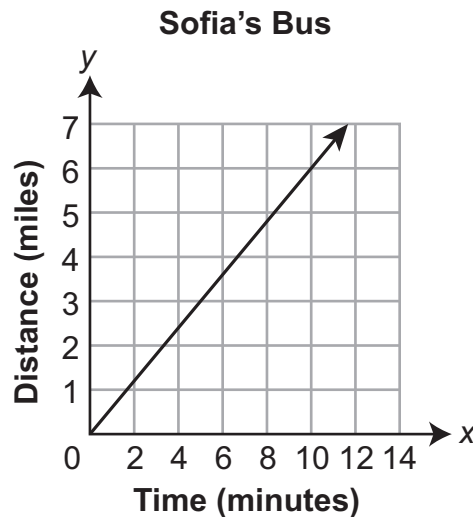
At the same bus stop, Barry boarded a different bus to school 5 minutes after Sofia. The distance traveled by Barry's bus is described by the table below.

Barry's Bus

Time (minutes)	7	9	11
Distance (miles)	2.4	4.8	7.2

The school is located 12 miles from the bus stop. Which bus arrives at the school first, and what is the speed of that bus?

A. Sofia's bus arrives at the school first with a speed of 0.6 miles per minute.

   guesses that Sofia would reach quicker because she starts 5 minutes earlier

B. Barry's bus arrives at the school first with a speed of 0.83 miles per minute.

   calculates time/distance instead of distance/time

C. Barry's bus arrives at the school first with a speed of 1.2 miles per minute.
   *

D. Sofia's bus arrives at the school first with a speed of 1.67 miles per minute.

   calculates time/distance instead of distance/time

B-F.1.1.3

23. Which equation describes a function that is nonlinear?

A. $y = x^2$ *

B. $y = 2x + 7$ | thinks adding constant makes function nonlinear |

C. $y = \dfrac{x + 1}{2}$ | thinks entire sum over number makes function nonlinear |

D. $y = \dfrac{1}{2}x$ | thinks fraction coefficient makes function nonlinear |

B-F.2.1.1

24. Sonia opened a savings account and then added the same amount to the savings account every week. After 5 weeks, her savings account had a total of $45. After 10 weeks, her savings account had a total of $70. Which equation represents the amount of money (y), in dollars, in Sonia's savings account after x weeks?

A. $y = 7x$ | divided $70 by 10 and disregarded the second point given |

B. $y = 9x$ | divided $45 by 5 and disregarded the second point given |

C. $y = 5x + 20$ *

D. $y = 20x + 5$ | mixed up slope and y-intercept |

B-F.2.1.2

25. Andrea walks 5 miles from the library to her home. She starts walking at an average rate of 2 miles per hour. After 1 hour, she stops walking for 0.25 hour. When she begins walking again, Andrea walks at an average rate of 3 miles per hour until she arrives home. Which graph represents Andrea's distance (y), in miles, from her home as a function of the amount of time (x), in hours, since she left the library?
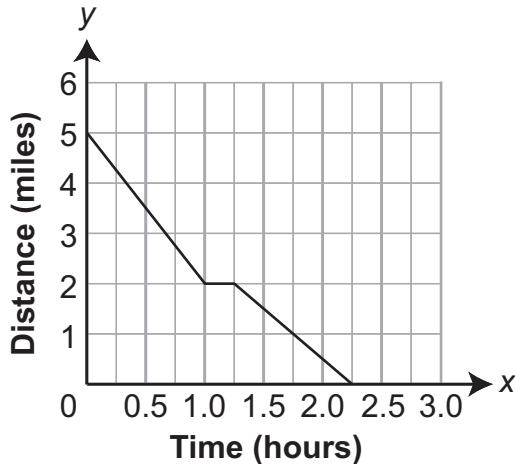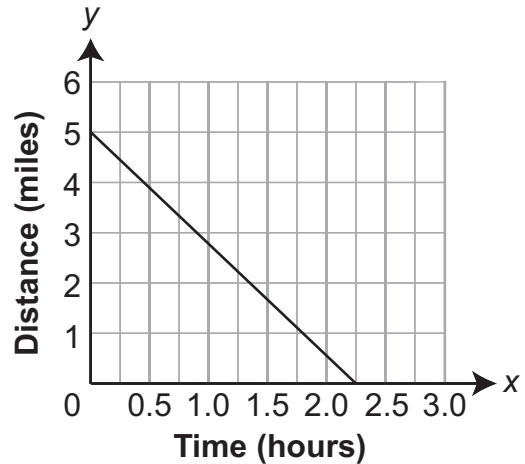
A. **Andrea's Distance from Home**

*
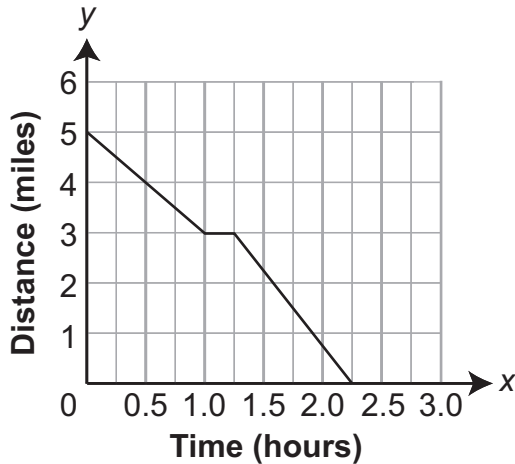
B. **Andrea's Distance from Home**
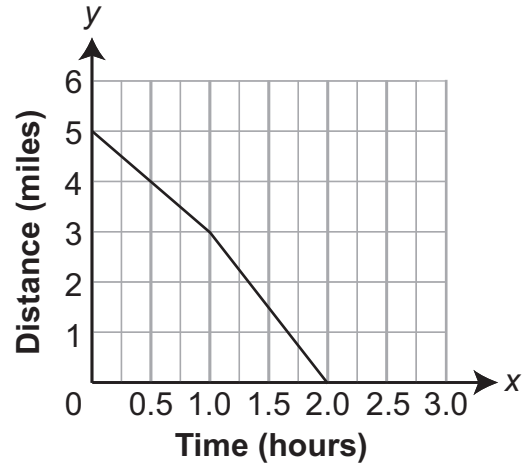
does not consider time spent stopped

C. **Andrea's Distance from Home**

reverses rates

D. **Andrea's Distance from Home**

chooses graph that shows a straight "path" home

B-F.2.1.2

26. The manager of a small chain of restaurants compared the sales at different restaurant locations. She drew a graph comparing the daily sales, in dollars, to the number of competing restaurants in the neighborhood.

Different Restaurant Locations
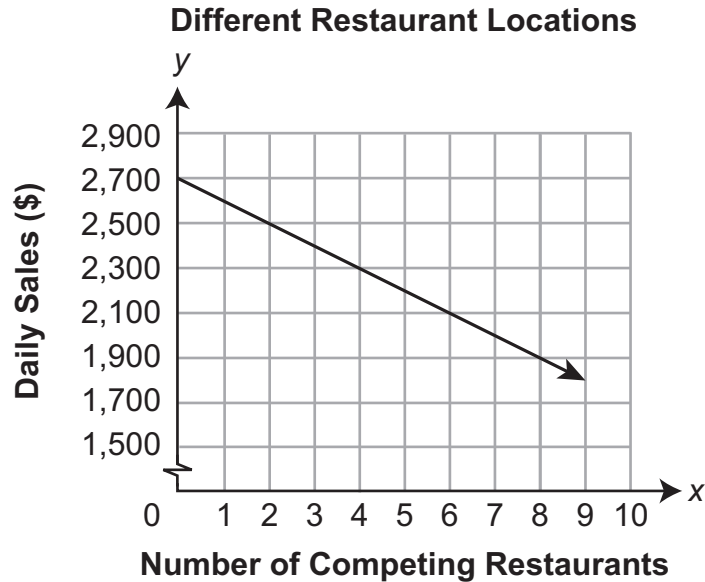
Based on the graph, how much do the daily sales change with each additional competitor in the neighborhood?

A.   The daily sales increase by $100.   *confused decreasing and increasing functions*

B.   The daily sales decrease by $100.   *

C.   The daily sales increase by $200.   *confused increasing/decreasing functions and did not calculate slope correctly*

D.   The daily sales decrease by $200.   *looked at the change between gridlines on the y-axis without calculating slope*
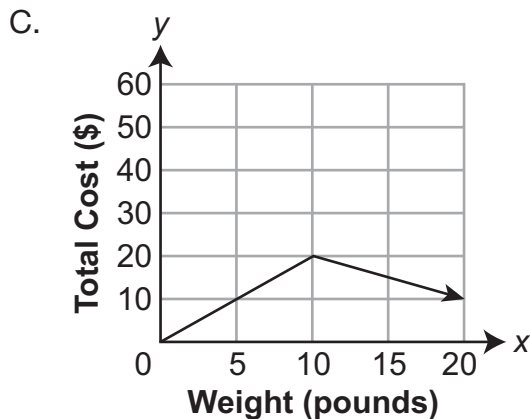
B-F.2.1.2

27. At a market, assorted fruit costs $3 per pound for the first 10 pounds of fruit purchased. After the first 10 pounds, the fruit costs $2 per pound. Which graph represents the total cost (*y*), in dollars, of going to the market as a function of the weight of fruit (*x*), in pounds, purchased?
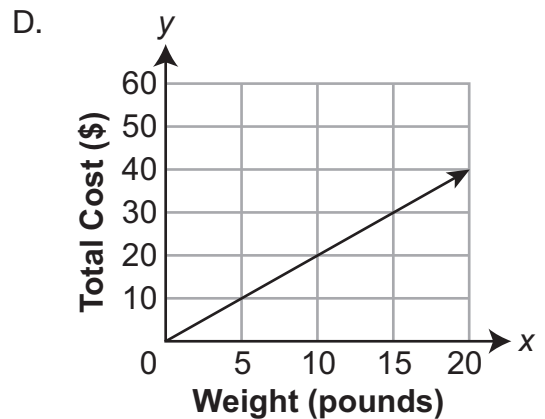
A.
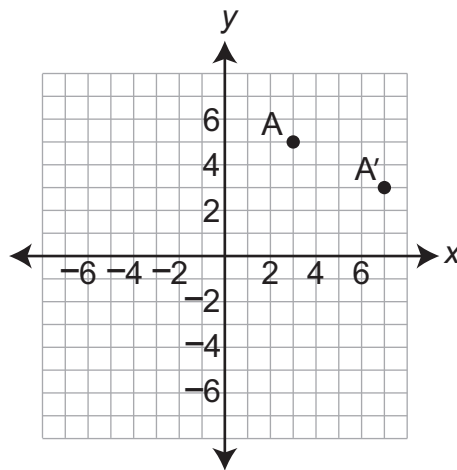

thinks that reduced cost means negative slope

B.

*

C.
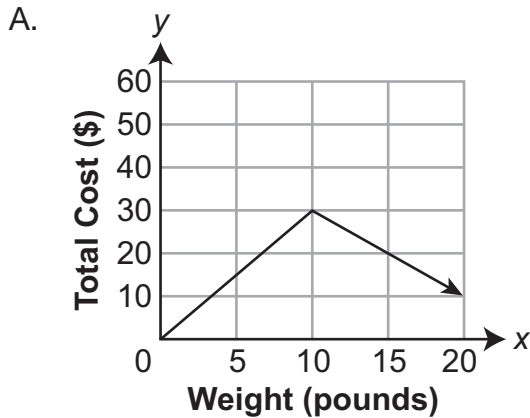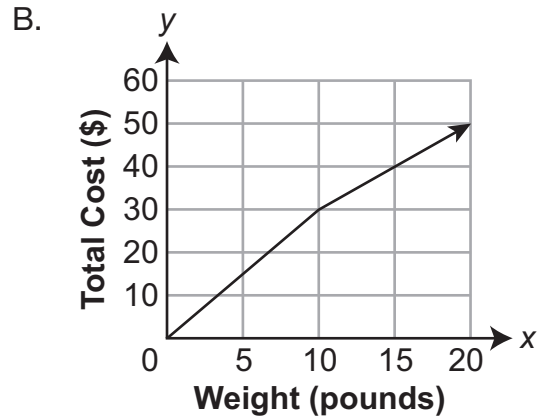
focuses on graph getting to 10 pounds for $20; thinks that reduced cost means negative slope

D.

focuses on graph getting to 10 pounds for $20

C-G.1

28. Point A' is the image of point A after a reflection across line *w*. Both points are graphed on the coordinate plane below.
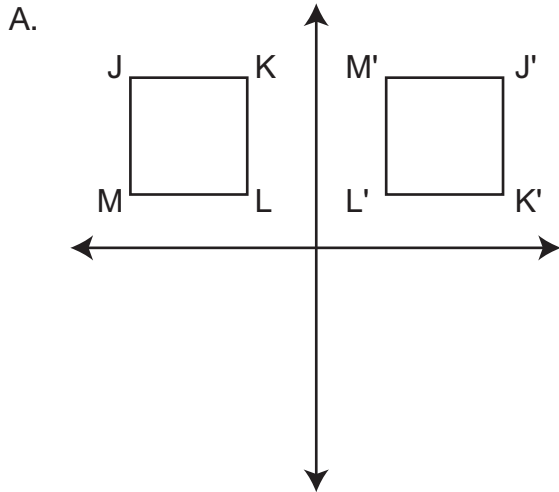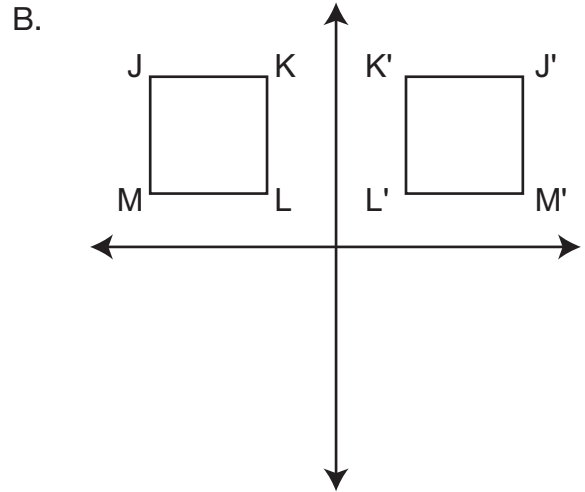

What is the slope of line *w*?

A. ⁻2   *thinks slope must be negative for A' to be "lower" than A*

B. $\frac{-1}{2}$ *finds slope of line that contains the points*

C. $\frac{1}{2}$ *finds slope of line that contains the points, then thinks slope of w must be positive for reflection to occur in the right direction*

D. 2   *

C-G.1.1.1

29. Which graph shows only a rotation of 180° about the origin of square JKLM to square J'K'L'M'?
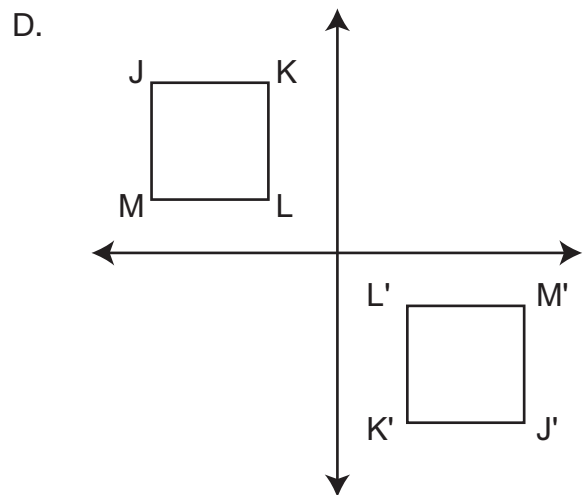
A.

J　　　K　　　M'　　　J'

M　　　L　　　L'　　　K'

rotated only 90 degrees

B.

J　　　K　　　K'　　　J'

M　　　L　　　L'　　　M'

reflection

C.

J　　　K

M　　　L

J'　　　K'

M'　　　L'

translation

D.

J　　　K

M　　　L

L'　　　M'

K'　　　J'

*
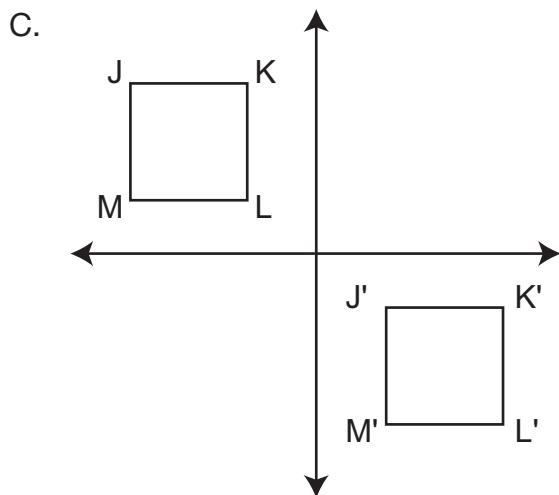
C-G.2.1

30. Triangle ABC is graphed on the coordinate grid below.
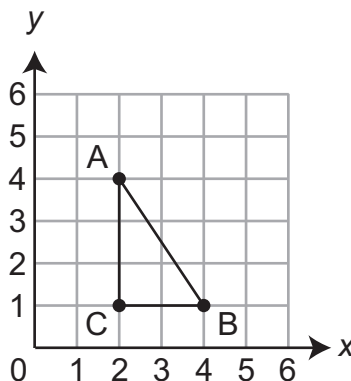
Triangle DEF has a perimeter that is 4 times the perimeter of triangle ABC. Which ordered pairs could describe the locations of the vertices of triangle DEF?

A.   D(14, ⁻8)
     E(14, ⁻14)
     F(18, ⁻14)

     | twice the perimeter |

B.   D(⁻12, ⁻8)
     E(⁻12, ⁻16)
     F(0, ⁻16)

     *

C.   D(⁻7, ⁻6)
     E(⁻7, ⁻9)
     F(⁻9, ⁻6)

     | same perimeter |

D.   D(⁻12, 14)
     E(⁻3, 14)
     F(⁻12, 8)

     | three times the perimeter |

C-G.2.1.1

31. Ken built the picture frame shown below.
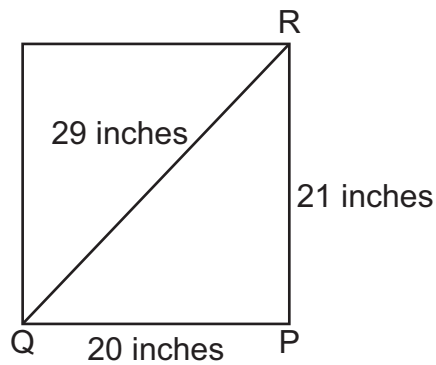
Which statement can be used to determine whether ∠P is a right angle?

A. $20 + 21 > 29$ *picks the most obviously true statement*

B. $20^2 + 21^2 > 29$ *forgets to square the hypotenuse*

C. $(20 + 21)^2 > 29^2$ *thinks you have to add the side lengths together before squaring*

D. $20^2 + 21^2 = 29^2$ *

C-G.2.1.2
A-N.1.1.5

32. The lengths *x* and *y* are shown in the figure below.
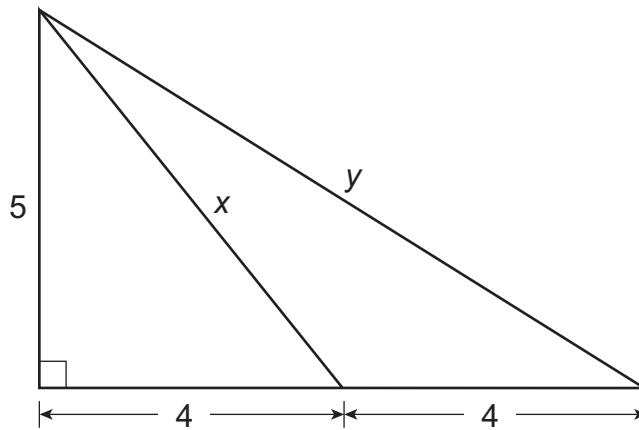
Which number line shows the **closest** approximate values of *x* and *y*?

A.

*

B.

locates x correctly, but locates y incorrectly at 10.4

C.

uses side of length x as leg of right triangle to find y

D.

adds known leg lengths
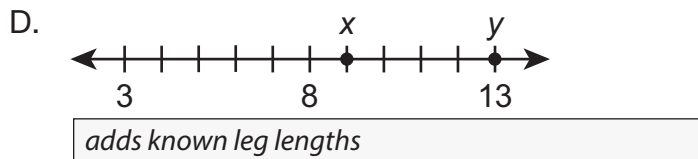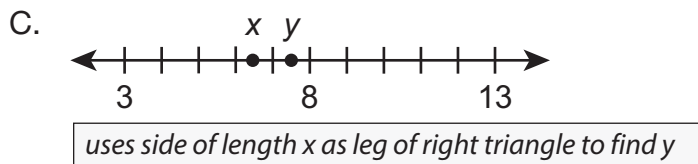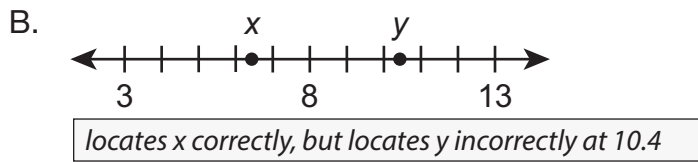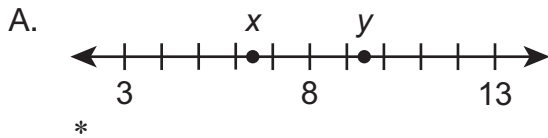
C-G.2.1.3
C-G.2.1.2

33. Points P and Q are graphed on the coordinate plane shown below. A cone with radius r, slant height s, and height h is also shown below.
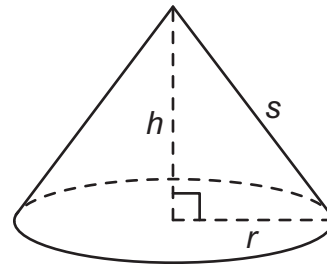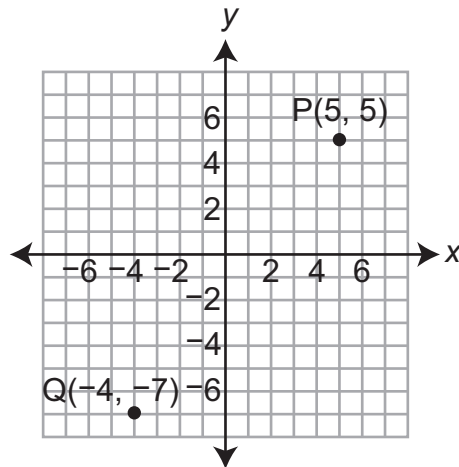
For which radius (r) and slant height (s) is the height (h) of the cone the same as the distance between points P and Q?

A. $r = 5; s = 13$ 5, 12, 13 triple

B. $r = 6; s = 10$ common 3, 4, 5 triple doubled to 6, 8, 10

C. $r = 8; s = 17$ *

D. $r = 9; s = 12$ uses both 9 and 12

C-G.3.1.1
A-N.1.1.1

34. The volume of a 12-inch-tall cone is 144π cubic inches. Which statement about the radius of the base of the cone is true?

    A.   The radius is 6 inches, and it is a rational number.
        *

    B.   The radius is 6 inches, and it is an irrational number.

> *thinks the radius is irrational since the volume is irrational*

    C.   The radius 12π inches, and it is a rational number

> *solves 12r = 144*pi and thinks the answer is rational since 12 is rational*

    D.   The radius is 12π inches, and it is an irrational number.

> *solves 12r = 144*pi*

D-S.1.1

35. The scatter plot below shows how many points Denise scored in a game based on the number of hours she practiced.

**Points Scored
vs. Hours Practiced**
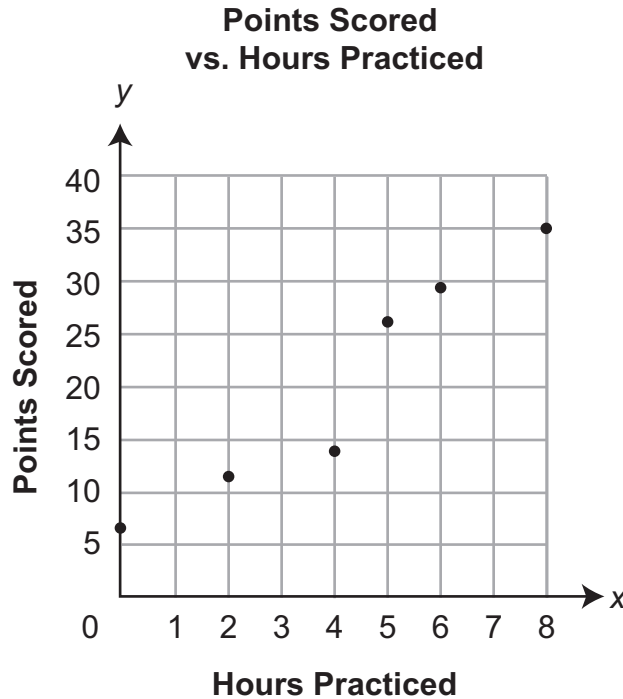
Using a line of best fit, how many points should Denise expect to score after she practices for 3 hours?

A. 7   *estimate for 1 hour instead of 3 OR looked at y-value of the first plotted point*

B. 10   *draws line from first to third point*

C. 12   *only compares two points on each side*

D. 16   *

D-S.1.1

36. The table below shows the average number of fish Jamal caught in an hour based on the water temperature, in degrees Fahrenheit (°F).

Jamal's Fishing

Water Temperature (°F)	Fish Caught
51	5
72	1
45	6
64	2
70	1

Based on a linear model of the information in the table, how many fish should Jamal expect to catch in an hour when the water temperature is 55°F?

A. 3   *55 is less than 64, so he should catch one more fish*

B. 4   *

C. 5   *55 is close to 51*

D. 6   *in the table, 6 comes after 1, and the last entry in the table is 1*

D-S.1.1.1

37. The height (*y*) of the tallest building in Pittsburgh in year *x* is shown in the scatter plot below.

Tallest Building in Pittsburgh
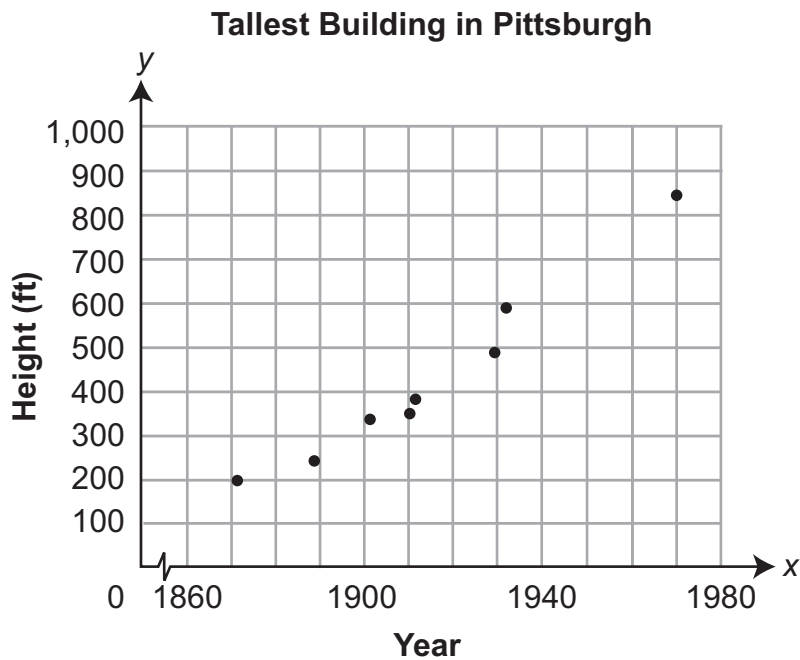
Based on the scatter plot, which statement is true?

A. The data show no correlation.   *incorrect definition*

B. The data show a positive correlation.   *

C. The data show a negative correlation.   *incorrect definition*

D. There are not enough data points to determine correlation.   *incorrect definition*

D-S.1.1.1

38. Data sets A and B are graphed on the coordinate grid below.
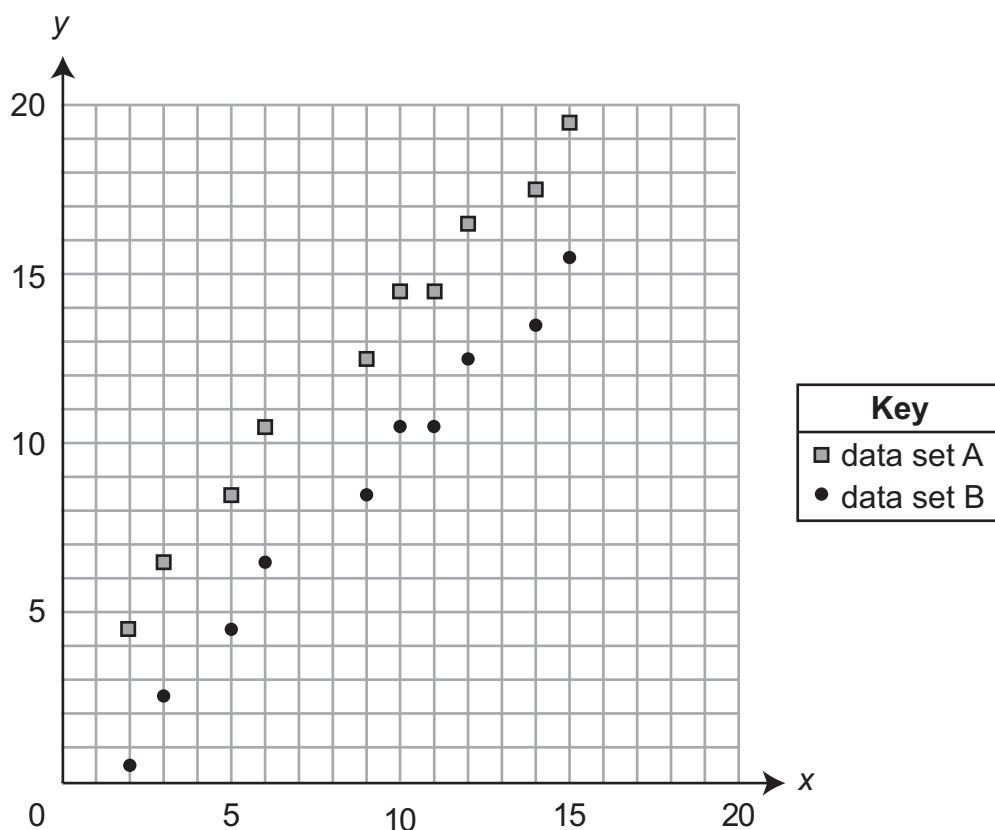
Which statement about the lines of best fit for the two data sets is **most likely** true?

A.   The lines of best fit for data sets A and B are the same line.

> *views as a single scatter plot rather than two distinct data sets, or thinks since slopes of separate lines are the same, then lines of best fit are the same line*

B.   The *y*-intercepts and the slopes of the lines of best fit for data sets A and B both differ by 4.

> *does not see that the slopes would be similar/same*

C.   The *y*-intercepts of the lines of best fit for data sets A and B differ by 4, but the slopes are the same.

> *

D.   The slope of the line of best fit for data set A is 4, and the slope of the line of best fit for data set B is $\frac{1}{4}$.

> *realizes difference of 4 in "corresponding" data points, but applies to slopes as reciprocal values*

D-S.1.1.2
D-S.1.1.3

39. The number of tickets sold for events at a theater last year varied with the cost per ticket, as shown in the scatter plot below.

Ticket Sales for Last Year
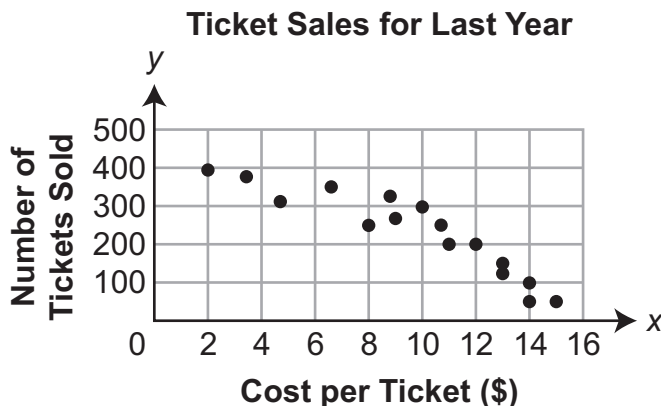
Based on the equation of the line of best fit for the scatter plot, which statement about the relationship between cost per ticket and number of tickets sold is true?

A.   The slope of the line of best fit is approximately ⁻26.5, which means that for every $2 increase in cost per ticket, the number of tickets sold decreased by 26.5.

> *uses $2 change in cost per ticket to match scale on scatter plot*

B.   The slope of the line of best fit is approximately ⁻26.5, which means that for every $1 increase in cost per ticket, the number of tickets sold decreased by 26.5.
*

C.   The slope of the line of best fit is approximately 26.5, which means that for every $2 increase in cost per ticket, the number of tickets sold increased by 26.5.

> *incorrect slope sign; uses $2 change in cost per ticket to match scale on scatter plot*

D.   The slope of the line of best fit is approximately 26.5, which means that for every $1 increase in cost per ticket, the number of tickets sold increased by 26.5.

> *incorrect slope sign*

D-S.1.2.1

40. The table below shows the numbers of grade 7 and grade 8 students who chose cheese pizza or pepperoni pizza as their favorite pizza.

Favorite Pizza

	Cheese Pizza	Pepperoni Pizza
Grade 7 Students	171	254
Grade 8 Students	285	143

Which approximation is **closest** to the percent of the students who chose pepperoni pizza as their favorite?

A. 47%   *

B. 50% | *1 of 2 pizza types, so 50%* |

C. 53% | *cheese as favorite* |

D. 87% | *397/456; total of pepperoni / total of cheese* |

FIRST OPEN-ENDED QUESTION
A-N.1.1.1
A-N.1.1.3
A-N.1.1.5

41. Kelsey draws a series of right triangles with sides that have the lengths shown in the table below.

Lengths of Sides of Kelsey's Right Triangles (inches)

Triangle	Length of First Leg	Length of Second Leg	Length of Hypotenuse
A	1	1	$\sqrt{2}$
B	1	2	$\sqrt{5}$
C	1	3	$\sqrt{10}$
D	1	4	$\sqrt{17}$
E	1	5	$\sqrt{26}$

A. Plot and label each of the five hypotenuse lengths on the number line shown below.

The next hypotenuse in the pattern is $\sqrt{37}$. Kelsey plots $\sqrt{37}$ on a number line without the use of a calculator.

B. Explain how Kelsey could find between which two consecutive whole numbers she should plot $\sqrt{37}$. Also explain how she can determine to which of these two whole numbers $\sqrt{37}$ is closest.

Go to the next page to finish question 41.

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

Kelsey continues making right triangles following the same pattern she used to make the first five right triangles.

C. Explain why none of the right triangles Kelsey makes will have a hypotenuse with a rational number length.

ITEM-SPECIFIC SCORING GUIDELINE

Question #41

Grade 8

Assessment Anchor this item will be reported under:

   M08.A-N.1—Demonstrate an understanding of rational and irrational numbers.

Specific Anchor Descriptor addressed by this item:

   M08.A-N.1.1—Apply concepts of rational and irrational numbers.

Scoring Guide:

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

Top Scoring Student Response And Training Notes:

Score	Description
4	Student earns 4 points.
3	Student earns 3.0 – 3.5 points.
2	Student earns 2.0 – 2.5 points.
1	Student earns 0.5 – 1.5 points. OR Student demonstrates minimal understanding of rational and irrational numbers.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Question #41

Top Scoring Response:

Part A Answer		
What?		**Why?**
A B C D E (number line from 0 to 10 with points plotted)		

(1 score point)

    1 point for correct answer
        OR ½ point for 4 out of 5 correct points
        NOTE: Equivalent labeling is acceptable (e.g., $\sqrt{2}$ instead of A). Student should receive credit
        as long as the point is placed between the two appropriate tick marks (e.g., A is between 1 and 1.5).

Part B Answer	
What?	**Why?**
	Sample Explanation: I know that 37 is between 36 and 49, so $\sqrt{37}$ is between $\sqrt{36}$ and $\sqrt{49}$, which is the same as 6 and 7. Kelsey can determine that it's closer to 6 than 7 because 37 is a lot closer to 36 than it is to 49.

(2 score points)

    1 point for explaining in which interval to plot $\sqrt{37}$
        OR ½ point for correct but incomplete explanation
    1 point for explaining how they determined to which integer $\sqrt{37}$ is closest
        OR ½ point for correct but incomplete explanation

Part C Answer	
What?	**Why?**
	Sample Explanation: None of them will ever be a rational number because the number under the square root sign would have to be a perfect square. The numbers under the square root sign in Kelsey's lists are always 1 greater than a perfect square.

(1 score point)

    1 point for correct explanation
        OR ½ point for correct but incomplete explanation

FIRST OPEN-ENDED QUESTION RESPONSES
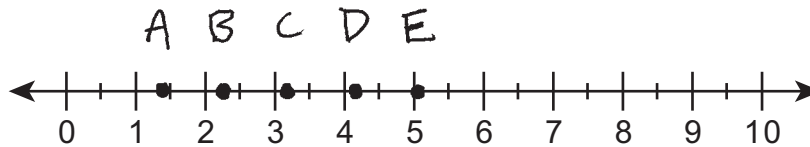A-N.1.1.1
A-N.1.1.3
A-N.1.1.5   **Response Score: 4**

41. Kelsey draws a series of right triangles with sides that have the lengths shown in the table below.

Lengths of Sides of Kelsey's Right Triangles (inches)

Triangle	Length of First Leg	Length of Second Leg	Length of Hypotenuse
A	1	1	$\sqrt{2}$
B	1	2	$\sqrt{5}$
C	1	3	$\sqrt{10}$
D	1	4	$\sqrt{17}$
E	1	5	$\sqrt{26}$

A. Plot and label each of the five hypotenuse lengths on the number line shown below.

The student has given a correct answer.

The next hypotenuse in the pattern is $\sqrt{37}$. Kelsey plots $\sqrt{37}$ on a number line without the use of a calculator.

B. Explain how Kelsey could find between which two consecutive whole numbers she should plot $\sqrt{37}$. (Also) explain how she can determine to which of these two whole numbers $\sqrt{37}$ is closest.

I look for the nearest perfect squares above and below the number 37. That would be 36, whose square root is 6 and 49, whose square root is 7. Because 37 is so close to 36, only 1 away, rather than 49 which is 12 away, the square root of 37 is going to be much closer to 6 than 7.

The student has given an explanation of which interval.
The student has given an explanation of how to determine which whole number.

Go to the next page to finish question 41.

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

Kelsey continues making right triangles following the same pattern she used to make the first five right triangles.

C. Explain why none of the right triangles Kelsey makes will have a hypotenuse with a rational number length.

The only square roots that produce rational numbers are those that come out even or give an exact value, Like the square root of 9 or 16 or 25, unlike any of those that are listed. Kelsey's triangles all have lengths of hypotenuses that are not rational and produce numbers that do not come out even or give exact values, Like $\sqrt{17}$ which starts coming out as 4.1231056256... and never stops.

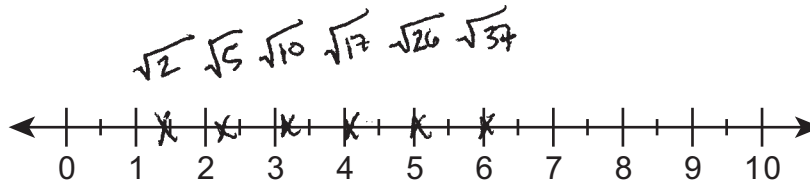> The student has given a complete explanation.

A-N.1.1.1
A-N.1.1.3
A-N.1.1.5 Response Score: 3

41. Kelsey draws a series of right triangles with sides that have the lengths shown in the table below.

Lengths of Sides of Kelsey's Right Triangles (inches)

Triangle	Length of First Leg	Length of Second Leg	Length of Hypotenuse
A	1	1	$\sqrt{2}$
B	1	2	$\sqrt{5}$
C	1	3	$\sqrt{10}$
D	1	4	$\sqrt{17}$
E	1	5	$\sqrt{26}$

A. Plot and label each of the five hypotenuse lengths on the number line shown below.

$\sqrt{2}$ $\sqrt{5}$ $\sqrt{10}$ $\sqrt{17}$ $\sqrt{26}$ $\sqrt{37}$

The student has given a correct answer.

The next hypotenuse in the pattern is $\sqrt{37}$. Kelsey plots $\sqrt{37}$ on a number line without the use of a calculator.

B. Explain how Kelsey could find between which two consecutive whole numbers she should plot $\sqrt{37}$. Also explain how she can determine to which of these two whole numbers $\sqrt{37}$ is closest.

$\sqrt{37}$ IS IRRATIONAL SO IT'S NOT A SQUARE ROOT THAT IS A WHOLE NUMBER.

$\sqrt{36}$ IS RATIONAL BECAUSE THE SQUARE ROOT IS A WHOLE NUMBER, THE NUMBER 6. 36 IS RIGHT NEXT TO 37 SO ONE WOULD PLOT IT ON NUMBER LINE, WHICH I DID, TO THE IMMEDIATE RIGHT OF 6.

The student has given a correct but incomplete explanation of which interval. The student has given an explanation of how to determine which whole number.

Go to the next page to finish question 41.

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

Kelsey continues making right triangles following the same pattern she used to make the first five right triangles.

C. Explain why none of the right triangles Kelsey makes will have a hypotenuse with a rational number length.

2, 5, 10, 17 AND 26 ALL HAVE SQUARE ROOTS THAT ARE IRRATIONAL BECAUSE NONE OF THESE NUMBERS ARE NUMBERS THAT ARE PERFECT SQUARES SO THAT THEIR SQUARE ROOTS WOULD NOT BE POSITIVE INTEGERS.

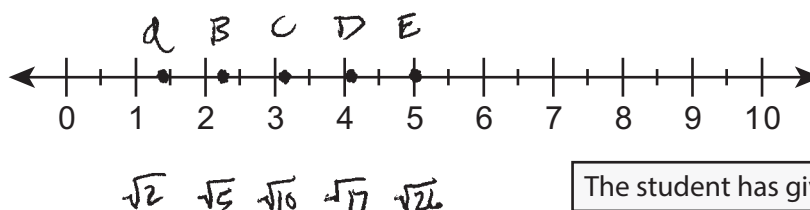The student has given a complete explanation.

A-N.1.1.1
A-N.1.1.3
A-N.1.1.5   Response Score: 2

41. Kelsey draws a series of right triangles with sides that have the lengths shown in the table below.

Lengths of Sides of Kelsey's Right Triangles (inches)

Triangle	Length of First Leg	Length of Second Leg	Length of Hypotenuse
A	1	1	$\sqrt{2}$
B	1	2	$\sqrt{5}$
C	1	3	$\sqrt{10}$
D	1	4	$\sqrt{17}$
E	1	5	$\sqrt{26}$

A. Plot and label each of the five hypotenuse lengths on the number line shown below.

The student has given a correct answer.

The next hypotenuse in the pattern is $\sqrt{37}$. Kelsey plots $\sqrt{37}$ on a number line without the use of a calculator.

B. Explain how Kelsey could find between which two consecutive whole numbers she should plot $\sqrt{37}$. Also explain how she can determine to which of these two whole numbers $\sqrt{37}$ is closest.

If you notice, all of the numbers in Kelsey's table are 1 number more than a perfect square. 17 is 1 more than 16 which is 4 squared. 10 is 1 more than 9 which is 3 squared. So, the square root of 37 is close to the square root of 36 which is 6.

The student has given a correct but incomplete explanation of which interval. The student has given an explanation of how to determine which whole number.

Go to the next page to finish question 41.

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

Kelsey continues making right triangles following the same pattern she used to make the first five right triangles.

C. Explain why none of the right triangles Kelsey makes will have a hypotenuse with a rational number length.

The length of the hypotenuse for each of these triangles is a little bit more than the length of the second leg because the hypotenuse is at an angle. I could see that the hypotenuses would just add a tenth of an inch or so to the measurement so it would be a decimal that might not stop and then could not be a rational length.

> The student has given an incorrect explanation.
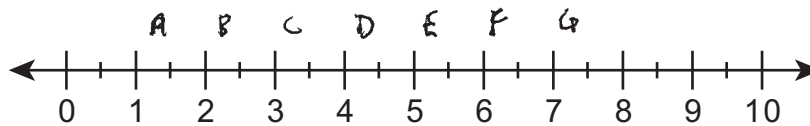
A-N.1.1.1
A-N.1.1.3
A-N.1.1.5   Response Score: 1

41. Kelsey draws a series of right triangles with sides that have the lengths shown in the table below.

Lengths of Sides of Kelsey's Right Triangles (inches)

Triangle	Length of First Leg	Length of Second Leg	Length of Hypotenuse
A	1	1	$\sqrt{2}$
B	1	2	$\sqrt{5}$
C	1	3	$\sqrt{10}$
D	1	4	$\sqrt{17}$
E	1	5	$\sqrt{26}$
F	1	6	$\sqrt{37}$
G	1	7	$\sqrt{50}$

A. Plot and label each of the five hypotenuse lengths on the number line shown below.

A B C D E F G

0 1 2 3 4 5 6 7 8 9 10

The student has given an incorrect answer.

The next hypotenuse in the pattern is $\sqrt{37}$. Kelsey plots $\sqrt{37}$ on a number line without the use of a calculator.

B. Explain how Kelsey could find between which two consecutive whole numbers she should plot $\sqrt{37}$. Also explain how she can determine to which of these two whole numbers $\sqrt{37}$ is closest.

$1^2 + 6^2 = 37$. $1^2 + 7^2 = 50$ and so on. So I could

see that 36 is close to 37 and not close to

49.

The student has given an explanation of which interval.
The student has given a correct but incomplete explanation of how to determine which whole number.

Go to the next page to finish question 41.

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

Kelsey continues making right triangles following the same pattern she used to make the first five right triangles.

C. Explain why none of the right triangles Kelsey makes will have a hypotenuse with a rational number length.

A rational number can always be written as a fraction. The sqrts of 2, 5, 10, 17, 26 are not fractions.

The student has given an incorrect explanation.

A-N.1.1.1
A-N.1.1.3
A-N.1.1.5   Response Score: 0

41. Kelsey draws a series of right triangles with sides that have the lengths shown in the table below.

Lengths of Sides of Kelsey's Right Triangles (inches)

Triangle	Length of First Leg	Length of Second Leg	Length of Hypotenuse
A	1	1	$\sqrt{2}$
B	1	2	$\sqrt{5}$
C	1	3	$\sqrt{10}$
D	1	4	$\sqrt{17}$
E	1	5	$\sqrt{26}$

A. Plot and label each of the five hypotenuse lengths on the number line shown below.

The student has given an incorrect answer.

The next hypotenuse in the pattern is $\sqrt{37}$. Kelsey plots $\sqrt{37}$ on a number line without the use of a calculator.

B. Explain how Kelsey could find between which two consecutive whole numbers she should plot $\sqrt{37}$. Also explain how she can determine to which of these two whole numbers $\sqrt{37}$ is closest.

> The sqrt of 37 has to be 6. I know the sqrt of 36 is 6 so I'm sure the sqrt of 37 rounds to 6. The other number is 7 because 7 is consecutive to 6.

The student has given an incorrect explanation of which interval.
The student has given an incorrect explanation of how to determine which whole number.

Go to the next page to finish question 41.

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

Kelsey continues making right triangles following the same pattern she used to make the first five right triangles.

C. Explain why none of the right triangles Kelsey makes will have a hypotenuse with a rational number length.

Hypotenuses are never rational. Only legs of triangles can be rational.

The student has given an incorrect explanation.

SECOND OPEN-ENDED QUESTION

B-F.2.1.1
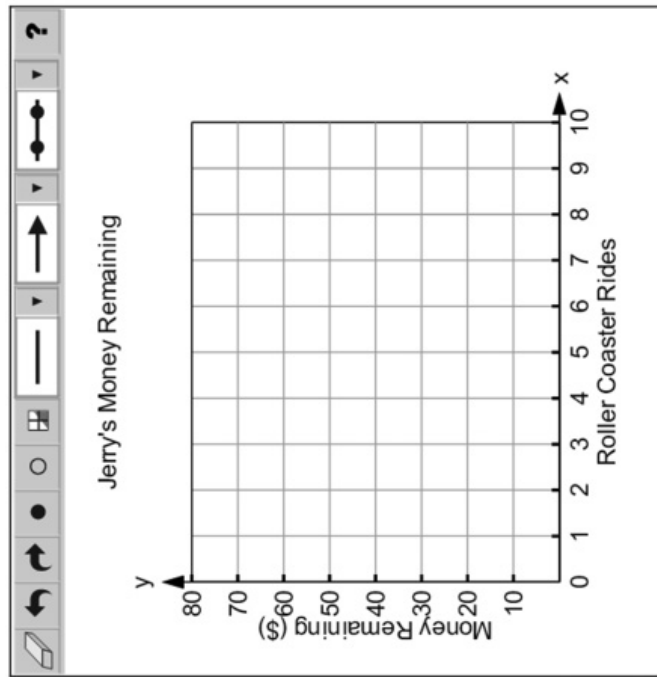
B-F.2.1.2

Question 42
Page 1 of 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

A. What are the prices, in dollars, for the entry fee and for each roller coaster ride?

entry fee: $ ___
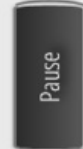
one roller coaster ride: $ ___

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

Jerry has $70 when he goes to the theme park. He only spends the money on the entry fee and roller coaster rides.

B. On the grid shown below, draw a graph showing the amount of money Jerry has remaining after he enters the theme park and as he rides the roller coasters in the theme park.
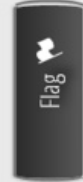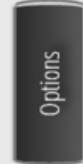
Jerry's Money Remaining

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

C. Explain how the *y*-intercept and the slope of the function in **part A** differs from the *y*-intercept and the slope of the function in **part B**. Be sure to indicate what each represents in your explanation.

0 / 1000

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Pause   Flag   Options

Review/End Test

ITEM-SPECIFIC SCORING GUIDELINE

Question #42

Grade 8

Assessment Anchor this item will be reported under:

M08.B-F.2—Use functions to model relationships between quantities.

Specific Anchor Descriptor addressed by this item:

M08.B-F.2.1—Represent or interpret functional relationships between quantities using tables, graphs and descriptions.

Scoring Guide:

Score	In this item, the student –
4	Demonstrates a thorough understanding of how to use functions to model relationships between quantities by correctly solving problems and clearly explaining procedures.
3	Demonstrates a general understanding of how to use functions to model relationships between quantities by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
2	Demonstrates a partial understanding of how to use functions to model relationships between quantities by correctly performing a significant portion of the required task.
1	Demonstrates minimal understanding of how to use functions to model relationships between quantities.
0	The response has no correct answer and insufficient evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. Response may show only information copied from the question.
Non-scorables	B – Blank, entirely erased or written refusal to respond F – Foreign Language K – Off-task U – Unreadable

Top Scoring Student Response And Training Notes:

Score	Description
4	Student earns 4 points.
3	Student earns 3.0 – 3.5 points.
2	Student earns 2.0 – 2.5 points.
1	Student earns 0.5 – 1.5 points. OR Student demonstrates minimal understanding of how to use functions to model relationships between quantities.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Question #42

Top Scoring Response:

Part A Answer	
What?	**Why?**
entry fee: $15 one roller coaster ride: $4	

(1 score point)

½ point for <u>each</u> correct answer

Part B Answer	
What?	**Why?**
Jerry's Money Remaining 	

(1 score point)

1 point for correct answer
OR ½ point for correct starting point or correct slope

Part C Answer	
What?	**Why?**
	Sample Explanation: In part A, the *y*-intercept of the function represents the entrance fee and the slope represents the price to ride each roller coaster. The slope was positive because as the number of roller coaster rides goes up, so does the total price. In part B, the *y*-intercept of the function represents the amount of money Jerry started with after he paid the entry fee and the slope represented how much he spent to ride each roller coaster. The slope was negative because as the number of roller coaster rides goes up, the amount of money Jerry has remaining goes down. **OR equivalent**

(2 score points)

1 point for complete explanation of slopes
OR ½ point for correct but incomplete explanation
1 point for complete explanation of *y*-intercepts
OR ½ point for correct but incomplete explanation

SECOND OPEN-ENDED QUESTION RESPONSES

B-F.2.1.1

B-F.2.1.2   Response Score: 4
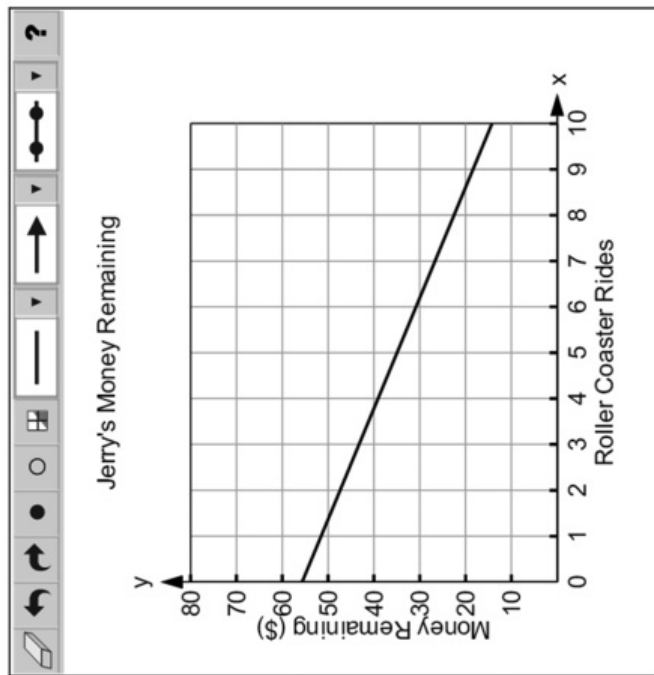
Question 42
Page 1 of 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

A. What are the prices, in dollars, for the entry fee and for each roller coaster ride?

entry fee: $ 15.00

one roller coaster ride: $ 4.00

The student has given two correct answers.

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

Jerry has $70 when he goes to the theme park. He only spends the money on the entry fee and roller coaster rides.

B. On the grid shown below, draw a graph showing the amount of money Jerry has remaining after he enters the theme park and as he rides the roller coasters in the theme park.

Jerry's Money Remaining

The student has given a correct answer.
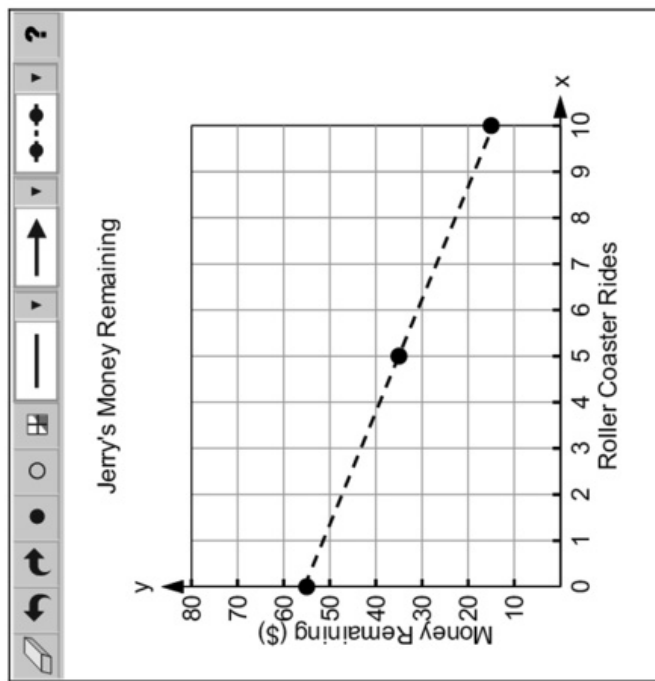
Question 42
Page 3 of 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

C. Explain how the *y*-intercept and the slope of the function in **part A** differs from the *y*-intercept and the slope of the function in **part B**. Be sure to indicate what each represents in your explanation.

In Part A, the *y*-intercept of $15 represents the entry fee. The slope of $4 represents the price of one coaster ride.

In Part B, the *y*-intercept of $55 represents the money Jerry has to spend on the rides after paying his $15 entry fee. The slope of -$4 represents how much he spent for each roller coaster ride.

The *y*-intercepts are not equal and the slopes are numerically the same, but one is positive and one is negative. The first function is about how much is spent and the second one is about how much money is left after spending money.

The student has a correct explanation of slopes.
The student has a correct explanation of *y*-intercepts.

546 / 1000

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Options   Flag   Pause   Review/End Test

B-F.2.1.1

B-F.2.1.2   Response Score: 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

A. What are the prices, in dollars, for the entry fee and for each roller coaster ride?

entry fee: $ 15

one roller coaster ride: $ 4

The student has given two correct answers.

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

Jerry has $70 when he goes to the theme park. He only spends the money on the entry fee and roller coaster rides.

B. On the grid shown below, draw a graph showing the amount of money Jerry has remaining after he enters the theme park and as he rides the roller coasters in the theme park.

Jerry's Money Remaining

The student has given a correct answer.
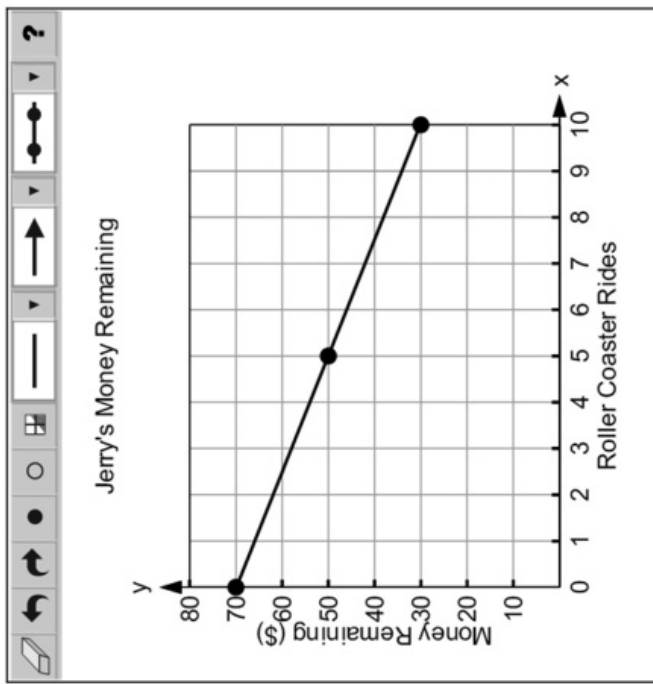
Question 42
Page 3 of 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

C. Explain how the y-intercept and the slope of the function in **part A** differs from the y-intercept and the slope of the function in **part B**. Be sure to indicate what each represents in your explanation.

Part A: y-intercept = 15; slope = 4

Part B: y-intercept = 55; slope = -4

The y-intercepts represent where the lines cross the y-axis.

The slope represents how steep the lines are and whether they go up or down.

The student has given a correct, but incomplete explanation of slopes.
The student has given a correct, but incomplete explanation of y-intercepts.

213 / 1000

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Pause

Flag

Options

Review/End Test

B-F.2.1.1
B-F.2.1.2   Response Score: 2

Question 42
Page 1 of 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

A. What are the prices, in dollars, for the entry fee and for each roller coaster ride?

entry fee: $ 35-20=15

one roller coaster ride: $ 24/6=4

The student has given two correct answers.

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

Jerry has $70 when he goes to the theme park. He only spends the money on the entry fee and roller coaster rides.

B. On the grid shown below, draw a graph showing the amount of money Jerry has remaining after he enters the theme park and as he rides the roller coasters in the theme park.

Jerry's Money Remaining

The student has given a correct slope.

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

C. Explain how the y-intercept and the slope of the function in **part A** differs from the y-intercept and the slope of the function in **part B**. Be sure to indicate what each represents in your explanation.

The y-intercepts are different because in part a, the y-intercept is 0 because you haven't spent any money and in part b, the y-intercept is 70 because that is how much you start with.

The slopes are different bceause in part a, the slope is 4 for the price of each ride and in part b, the slope is -4 for how much less money he has each time he rides the roller coaster. Its negative because you are taking it away from how much he has when he comes to the park.

The student has given a correct explanation of slopes.
The student has given an incorrect explanation of y-intercepts.

464 / 1000

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Review/End Test   Pause   Flag   Options

B-F.2.1.1
B-F.2.1.2   Response Score: 1

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

A. What are the prices, in dollars, for the entry fee and for each roller coaster ride?

entry fee: $ 4

one roller coaster ride: $ 4

The student has given one correct answer.
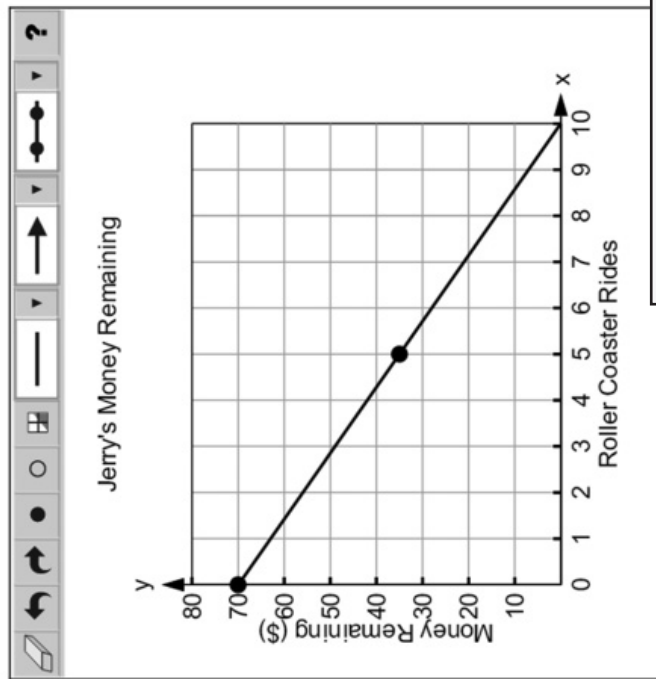
Question 42
Page 2 of 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

Jerry has $70 when he goes to the theme park. He only spends the money on the entry fee and roller coaster rides.

B. On the grid shown below, draw a graph showing the amount of money Jerry has remaining after he enters the theme park and as he rides the roller coasters in the theme park.

Jerry's Money Remaining

The student has given an incorrect answer.

Options   Flag   Pause   Review/End Test

Back   Next

Question 42
Page 3 of 3

Line Guide

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

C. Explain how the *y*-intercept and the slope of the function in **part A** differs from the *y*-intercept and the slope of the function in **part B**. Be sure to indicate what each represents in your explanation.

EQ

The y-intercept is 70. You find teh slope by the change in prices divided by the change in rides. I divided 24 by 6 and got 4 for my slope.

The student has given an incorrect explanation of slopes.
The student has given an incorrect explanation of y-intercepts.

139 / 1000

Back

Review/End Test   Pause   Flag   Options

B-F.2.1.1
B-F.2.1.2   Response Score: 0

Question 42
Page 1 of 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

A. What are the prices, in dollars, for the entry fee and for each roller coaster ride?

entry fee: $ 35 or 59

one roller coaster ride: $ 7 or $5\frac{4}{11}$

The student has given two incorrect answers.

Question 42
Page 2 of 3

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

Jerry has $70 when he goes to the theme park. He only spends the money on the entry fee and roller coaster rides.

B. On the grid shown below, draw a graph showing the amount of money Jerry has remaining after he enters the theme park and as he rides the roller coasters in the theme park.

Jerry's Money Remaining

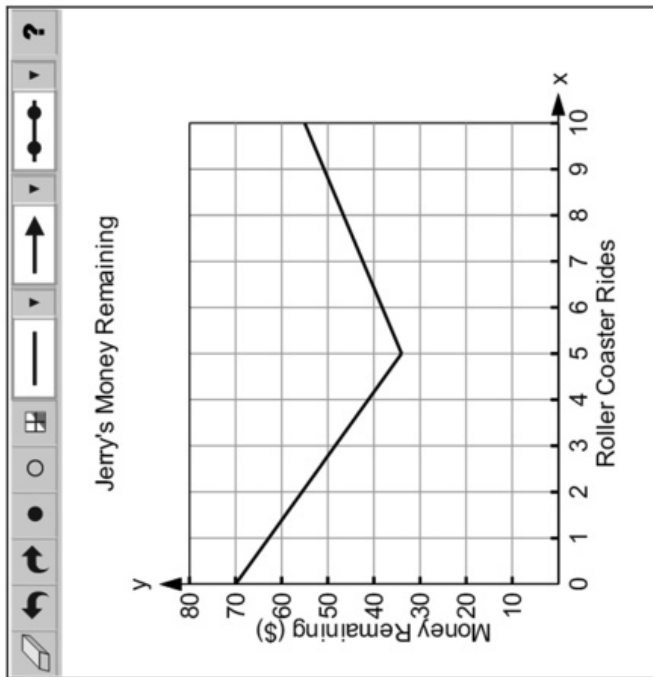The student has given an incorrect answer.

Jerry goes to a theme park to ride the roller coasters. The theme park charges an entry fee in addition to a fee for each roller coaster ride. The table below represents the total price for two different numbers of roller coaster rides.

Theme Park

Number of Roller Coaster Rides	Total Price
5	$35
11	$59

C. Explain how the *y*-intercept and the slope of the function in **part A** differs from the *y*-intercept and the slope of the function in **part B**. Be sure to indicate what each represents in your explanation.

The *y*-intercept is 70 because that is where you start. The slope goes down before it goes up.

The student has given an incorrect explanation of slopes.
The student has given an incorrect explanation of *y*-intercepts.

93 / 1000

THIRD OPEN-ENDED QUESTION
D-S.1.1.1
D-S.1.1.2

43. The scatter plot below shows the results of a survey of 16 people. They were asked how many days per week they eat breakfast and how many days per week they go to the gym.

**Eating Breakfast and
Going to the Gym Each Week**
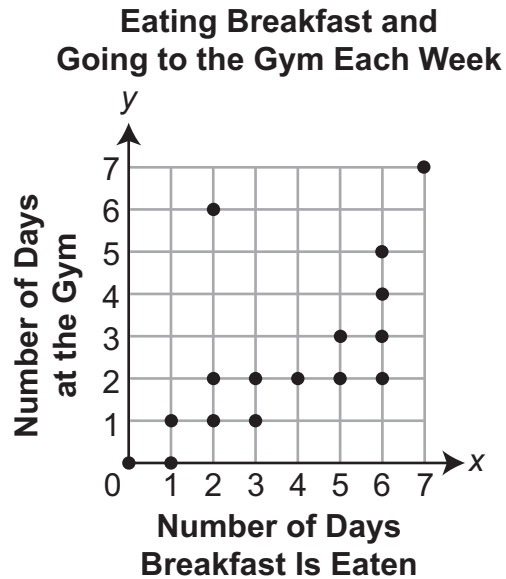
A. What are the coordinates of the point that is the outlier of the data? Explain what the point represents.

Go to the next page to finish question 43.

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

Jeff drew a line through (0, 0) and (7, 7) and said it was the line of best fit for the data.

B. Explain why Jeff's line is **not** a line of best fit.

C. How does the actual line of best fit compare with Jeff's line?

ITEM-SPECIFIC SCORING GUIDELINE

Question #43

Grade 8

Assessment Anchor this item will be reported under:

> M08.D-S.1—Investigate patterns of association in bivariate data.

Specific Anchor Descriptor addressed by this item:

> M08.D-S.1.1—Analyze and interpret bivariate data displayed in multiple representations.

Scoring Guide:

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

Top Scoring Student Response And Training Notes:

Score	Description
4	Student earns 4 points.
3	Student earns 3.0 – 3.5 points.
2	Student earns 2.0 – 2.5 points.
1	Student earns 0.5 – 1.5 points. OR Student demonstrates minimal understanding of patterns of association in bivariate data.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Question #43

Top Scoring Response:

Part A Answer	
What?	**Why?**
(2, 6)	**Sample Explanation:** The point represents someone who eats breakfast 2 days a week and goes to the gym 6 days a week.

(2 score points)

> 1 point for correct answer
> 1 point for correct explanation
>> OR ½ point for correct but incomplete explanation

Part B Answer	
What?	**Why?**
	Sample Explanation: A line through (0, 0) and (7, 7) would be above almost all the points and wouldn't pass through the "middle" of the data.

(1 score point)

> 1 point for complete explanation
>> OR ½ point for correct but incomplete explanation

| Part C Answer	
What?	**Why?**
Answers may vary. Accept any answer which describes the slope of the actual line of best fit (~0.58) as being less than the slope of Jeff's line (1) or the actual y-intercept (~0.41) as being greater than 0. **Sample Response:** The slope of the actual line of best fit would be less than the slope of Jeff's line.	

(1 score point)

> 1 point for correct answer

THIRD OPEN-ENDED QUESTION RESPONSES
D-S.1.1.1
D-S.1.1.2   **Response Score: 4**

43. The scatter plot below shows the results of a survey of 16 people. They were asked how many days per week they eat breakfast and how many days per week they go to the gym.

**Eating Breakfast and
Going to the Gym Each Week**

**Number of Days
Breakfast Is Eaten**
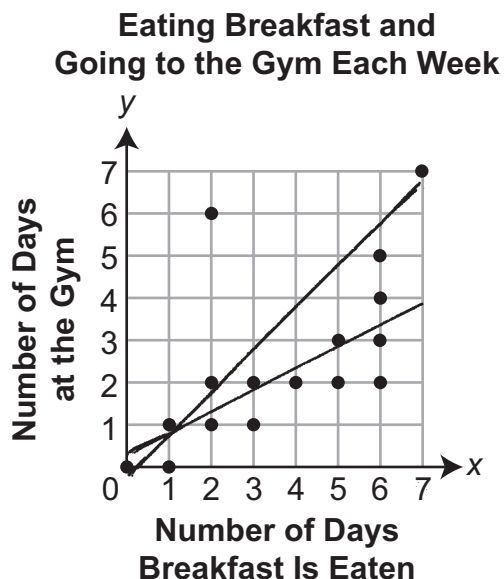
A. What are the coordinates of the point that is the outlier of the data? Explain what the point represents.

(2,6) is the outlier

The "2" is the number of days that one of the students eats breakfast.

The "6" is the number of days that same student is at the gym each week.

> The student has given a correct answer.
> The student has given a correct explanation.

Go to the next page to finish question 43.

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

Jeff drew a line through (0, 0) and (7, 7) and said it was the line of best fit for the data.

B. Explain why Jeff's line is **not** a line of best fit.

The line through those 2 points does not represent all the points, but just those 2 points. You want the least amount of distance between the 16 points and the line of best fit. I drew both lines on the graph.

> The student has given a correct explanation.

**C.** How does the actual line of best fit compare with Jeff's line?

Jeff's line is too steep and his y-intercept is at (0,0) where it is actually at about (0, .4). Look at my graph.

> The student has given a correct answer.

D-S.1.1.1
D-S.1.1.2   Response Score: 3

43. The scatter plot below shows the results of a survey of 16 people. They were asked how many days per week they eat breakfast and how many days per week they go to the gym.

**Eating Breakfast and
Going to the Gym Each Week**
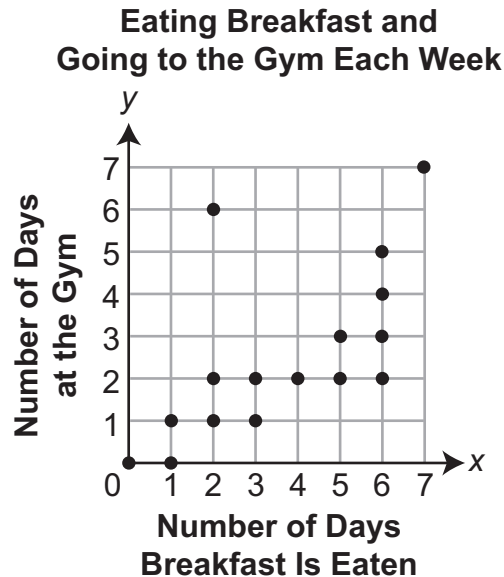
A. What are the coordinates of the point that is the outlier of the data? Explain what the point represents.

(2,6) IS AN OUTLIER BECAUSE IT IS NOT REALLY VERY CLOSE TO THE REST OF THE DATA. IT'S REALLY SEPARATE.

HERE ONE OF THE STUDENTS EATS BREAKFAST TWO DAYS OF THE WEEK AND GOES TO THE GYM SIX DAYS OF THE WEEK.

> The student has given a correct answer.
> The student has given a correct explanation.

Go to the next page to finish question 43.

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

Jeff drew a line through (0, 0) and (7, 7) and said it was the line of best fit for the data.

B. Explain why Jeff's line is **not** a line of best fit.

JEFF'S LINE PASSES WAY ABOVE MOST OF THE POINTS. OF THE 16 POINTS, 11 ARE BELOW HIS LINE AND ONLY 1 POINT ABOVE IT.

> The student has given a correct explanation.

**C.** How does the actual line of best fit compare with Jeff's line?

THE ACTUAL LINE OF BEST FIT IS LOWER THAN JEFF'S LINE.

> The student has given an incomplete answer.

D-S.1.1.1
D-S.1.1.2   Response Score: 2

43. The scatter plot below shows the results of a survey of 16 people. They were asked how many days per week they eat breakfast and how many days per week they go to the gym.

Eating Breakfast and
Going to the Gym Each Week

Number of Days
Breakfast Is Eaten
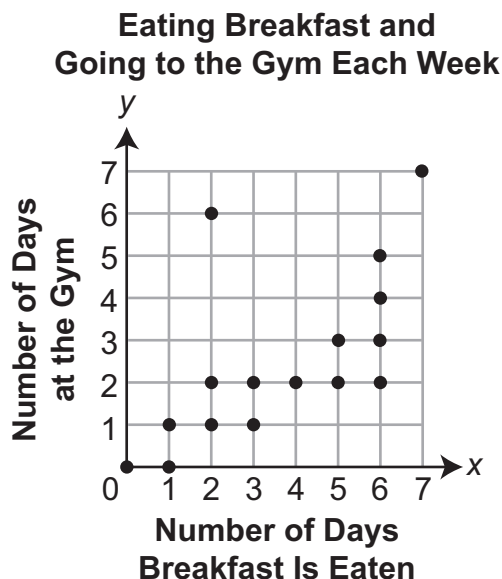
A. What are the coordinates of the point that is the outlier of the data? Explain what the point represents.

$(2, 6)$ are the coordinates of a point that is not close to all the other points.

> The student has given a correct answer.
> The student has given an incorrect explanation.

Go to the next page to finish question 43.

43. **_Continued._** Please refer to the previous page for task explanation.

Jeff drew a line through (0, 0) and (7, 7) and said it was the line of best fit for the data.

B. Explain why Jeff's line is **not** a line of best fit.

Jeff's line is like the outlier except it's a line, It doesn't pass through much of the middle of the points.

The student has given a correct explanation.

**C.** How does the actual line of best fit compare with Jeff's line?

the actual line of best fit would be parallel to Jeff's line but under it.

The student has given an incorrect answer.

D-S.1.1.1
D-S.1.1.2 Response Score: 1

43. The scatter plot below shows the results of a survey of 16 people. They were asked how many days per week they eat breakfast and how many days per week they go to the gym.

**Eating Breakfast and
Going to the Gym Each Week**
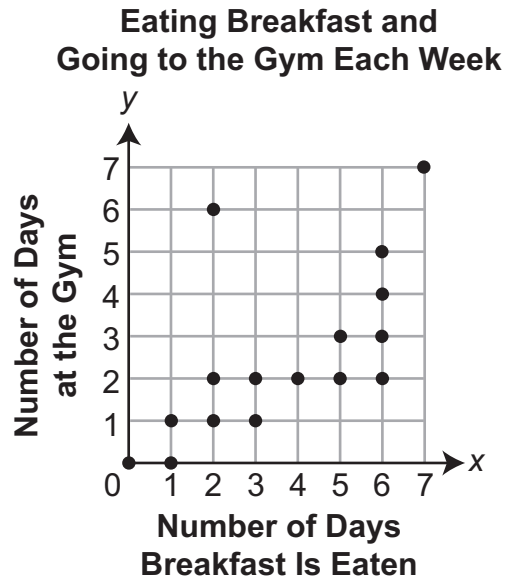
A. What are the coordinates of the point that is the outlier of the data? Explain what the point represents.

The x-coordinate is 2 and the y-coordinate is 6.
2 is the number of breakfast days and 6 is the number of gym days.

> The student has given a correct answer.
> The student has given an incorrect explanation.

Go to the next page to finish question 43.

43. **_Continued._** Please refer to the previous page for task explanation.

Jeff drew a line through (0, 0) and (7, 7) and said it was the line of best fit for the data.

B. Explain why Jeff's line is **not** a line of best fit.

a line of best fit is supposed to go through all the points, not just two points.

> The student has given an incorrect explanation.

C. How does the actual line of best fit compare with Jeff's line?

The actual line of best fit would go through all the points and not miss as many as Jeff's line did.

> The student has given an incorrect answer.

D-S.1.1.1
D-S.1.1.2   Response Score: 0

43. The scatter plot below shows the results of a survey of 16 people. They were asked how many days per week they eat breakfast and how many days per week they go to the gym.

Eating Breakfast and
Going to the Gym Each Week

Number of Days
Breakfast Is Eaten
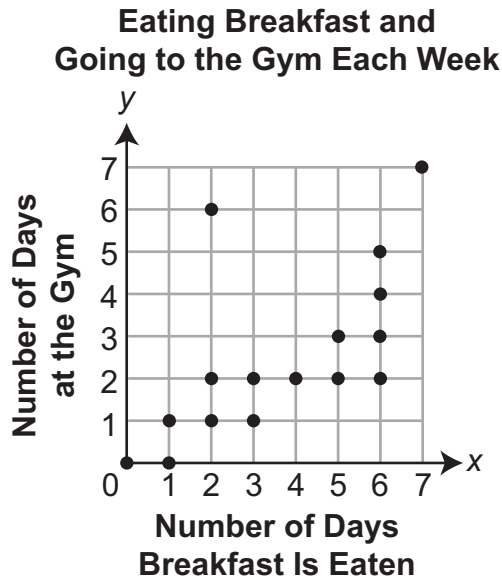
A. What are the coordinates of the point that is the outlier of the data? Explain what the point represents.

(7,7) is the point that is the farthest away.

> The student has given an incorrect answer.
> The student has given an incorrect explanation.

Go to the next page to finish question 43.

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

Jeff drew a line through (0, 0) and (7, 7) and said it was the line of best fit for the data.

B. Explain why Jeff's line is **not** a line of best fit.

The line of best Fit goes through the points (2,2) and (2,3) and (2,4) and (2,5) and (2,6) because that's where most of the points are.

The student has given an incorrect explanation.

C. How does the actual line of best fit compare with Jeff's line?

The actual line is steeper.

The student has given an incorrect answer.

PSSA Grade 8 Mathematics
Preliminary Item and Scoring Sampler