

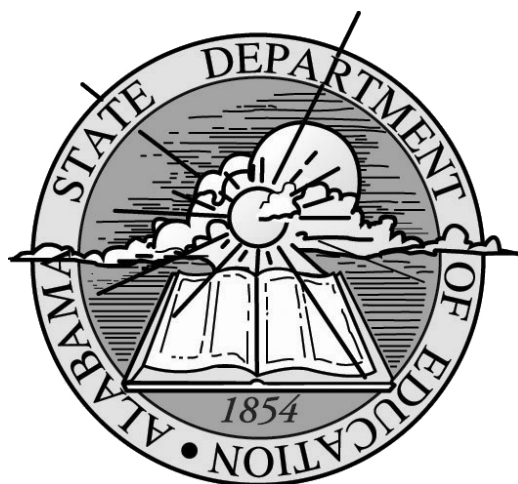
Alabama Reading and Mathematics Test⁺

Item Specifications

for

Mathematics

Grade 8



**Alabama State Department of Education
Montgomery, Alabama
December 2011**

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INTRODUCTION

This document provides specific information about the *Alabama Reading and Mathematics Test*⁺ (ARMT⁺). Educators representing each State Board of Education district as well as both city and county school systems served on committees to determine the content standards on which the ARMT⁺ is based. In addition, educators from throughout the state of Alabama served on committees to review the content of the tests, including selecting and reviewing specific mathematics test items, and determining achievement levels.

Teachers must be familiar with the information in this document so that they may incorporate effective teaching of the mathematics content standards with classroom assessments. Using classroom assessments with similar test formats from time to time will help to enable students to demonstrate proficiency on the various content standards in mathematics.

Three item types are included in the ARMT⁺. Multiple-choice, gridded, and open-ended items assess student performance on the ARMT⁺ in mathematics. Multiple-choice items and gridded items carry a point value of 1, while open-ended items carry a point value of 3. In this document, teachers will see representative item types for each mathematics content standard.

Content Standard	A statement of what students should know and be able to do by the end of the academic year
Item Type	Multiple-choice, gridded, open-ended items
Additional Information	Further information about the test items for the content standard
Sample Items	A collection of item types for each content standard
Answer Key	Answers for multiple-choice items and gridded items
Scoring Rubrics for Open-Ended Items	Scoring guide for open-ended items

CONTENT STANDARDS


Grade 8

CONTENT STANDARD	POINTS POSSIBLE
Number and Operations 1- Use various strategies and operations to solve problems involving real numbers. 2- Simplify expressions containing natural number exponents by applying one or more of the laws of exponents. 3- Use order of operations to evaluate and simplify algebraic expressions.	7 4 <u>4</u> 15
Algebra 4- Graph linear relations by plotting points or by using the slope and y -intercept. 5- Solve problems involving linear functions. 6- Solve multi-step linear equations, including equations requiring the use of the distributive property.	9 4 <u>4</u> 17
Geometry 7- Solve problems using the Pythagorean Theorem. 8- Compare quadrilaterals, triangles, and solids using their properties and characteristics.	6 <u>4</u> 10
Measurement 9- Determine the measures of special angle pairs, including adjacent, vertical, supplementary, and complementary angles, and angles formed by parallel lines cut by a transversal. 10- Find the perimeter and area of regular and irregular plane figures. 11- Determine the surface area and volume of rectangular prisms, cylinders, and pyramids. 12- Determine the lengths of missing sides and measures of angles in similar and congruent figures.	4 4 6 <u>4</u> 18
Data Analysis and Probability 13- Interpret data from populations using given and collected data. 14- Determine the theoretical probability of an event.	6 <u>4</u> 10
TOTAL POINTS POSSIBLE	70

REFERENCE PAGE

Use the information below to answer the questions in this test booklet.

Some Abbreviations Used in Formulas

b_1, b_2 = bases of a trapezoid	C = circumference	$S.A.$ = surface area
b = base of a polygon	r = radius	V = volume
h = height or altitude	d = diameter	B = area of a base
l = length	$\pi \approx 3.14$	S = sum of interior angles of a convex polygon
w = width	P = perimeter of a base	n = number of sides of a convex polygon
 = symbol for a right angle	D = distance	m = slope
$m\angle$ = the measure of an angle	M = midpoint	
A = area	$L.A.$ = lateral area	

Formulas

Triangle: $A = \frac{1}{2}bh$

Parallelogram: $A = bh$

Rectangle: $A = lw$

Trapezoid: $A = \frac{1}{2}h(b_1 + b_2)$

Interest = principal \times rate \times time

Distance = rate \times time

Slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Sum of Measures of Interior Angles of a Convex Polygon: $S = 180(n - 2)$

Pythagorean Theorem: $c^2 = a^2 + b^2$

Circle: $C = \pi d$

$C = 2\pi r$

$A = \pi r^2$

Shape	Surface Area	Volume
Rectangular Prism	$L.A. = Ph$ $S.A. = Ph + 2B$ or $S.A. = 2(wh + lh + lw)$	$V = Bh$ or $V = lwh$
Cylinder	$L.A. = 2\pi rh$ $S.A. = 2\pi rh + 2\pi r^2$	$V = \pi r^2 h$
Square Pyramid	NA	$V = \frac{1}{3}Bh$
Triangular Pyramid	NA	$V = \frac{1}{3}Bh$

Forms of Equations

Standard form of an equation of a line: $Ax + By = C$

Slope-intercept form of an equation of a line: $y = mx + b$

Point-slope form of an equation of a line: $y - y_1 = m(x - x_1)$

ITEMS BY CONTENT STANDARD

DIRECTIONS (These are the directions read by students and the test administrator for Parts 1 and 2.)

Read the problem and find the answer.

Calculators may be used for Part 1 (or Part 2) of the test.

If the problem has a multiple-choice answer, darken the bubble in the correct space in your answer document.

If the problem has an answer grid:

- Write your answer in the boxes at the top of the grid.
- Darken the correct bubble of the number or symbol in the column below.

If your answer is a non-terminating decimal, round to the nearer hundredth.

For the problems that ask you to show your work, use the space given in your answer document.

- Be sure to show all of your work or explain how you got your answer in the space given.
- If you use your calculator to get your answer, explain the steps you take.

For all problems, be sure to check your answers.

NUMBER AND OPERATIONS**Content Standard 1**

Use various strategies and operations to solve problems involving real numbers.

Item Type

Multiple-choice

Gridded

Additional Information

Estimation may be required.

Word problems/real-life situations may be used.

Proportional reasoning may be required.

Any representation of a real number may be used.

Sample Multiple-Choice Items

1. As the team's fundraisers, Agnes and Betty both sold candy bars. At the end of the fundraiser, Agnes determined that she sold 8 more candy bars than Betty sold.

If Agnes and Betty sold a total of 348 candy bars, how many did Betty sell?

170

121

117

81

A *

B

C

D

2. Mrs. Salinas is making a test for her history class. There are these types of questions on the test: fill-in-the-blank, multiple-choice, and essay. So far, Mrs. Salinas has written 10 fill-in-the-blank, 21 multiple-choice, and 3 essay questions for the test.

Which of the following can be added to the test so that exactly $\frac{3}{5}$ of the test will be multiple-choice questions?

- A** 3 fill-in-the-blank and 2 essay questions
- B** 2 fill-in-the-blank, 3 multiple-choice, and 1 essay question *
- C** 4 multiple-choice and 3 essay questions
- D** 2 fill-in-the-blank, 1 multiple-choice, and 3 essay questions

3. A sporting goods store sells soccer balls for a regular price of \$40 each. If a team buys 20 or more soccer balls, the store offers a discount of 15% off the price of each soccer ball.

How much more will it cost a team to buy 20 soccer balls than to buy 15 soccer balls?

- A** \$80 *
- B** \$100
- C** \$170
- D** \$200

4. Marina's school filled $4\frac{5}{6}$ buses to take people on a trip to the country. Each bus holds 72 people.

How many people rode the buses on the trip?

432

348

300

288

A

B *

C

D

5. Which number is *closest* to 33% of 700?

400 330 210 100
A **B** **C *** **D**

8. Jennifer sold an antique desk at a store. The store takes 20% of the total selling price of the desk. The part of the total selling price Jennifer received was \$400.

What was the total selling price of the desk?

A \$480
B \$500 *
C \$720
D \$2,000

6. Diana has 4 quarts of water. She poured all the water into pint containers. Each pint container was filled to capacity.

How many pint containers did she use?

2 8 16 40
A **B *** **C** **D**

9. Ingrid's favorite number is a prime number between 0 and 50. If 8 is subtracted from the number, it becomes a multiple of 9.

What is Ingrid's favorite number?

17 19 26 53
A * **B** **C** **D**

7. Each student in Mr. Hoffman's class needs 3 sheets of graph paper for the math project. Each packet of graph paper holds 25 sheets. There are 28 students in his class.

What is the fewest number of packets of graph paper Mr. Hoffman will need for his students?

2 3 4 5
A **B** **C *** **D**

10. Mark shrunk a picture to $\frac{3}{4}$ of its original size. The height of the original picture was $8\frac{1}{4}$ inches.

What is the height of the copy?

- A** $6\frac{3}{16}$ inches *
- B** $6\frac{1}{4}$ inches
- C** $6\frac{3}{4}$ inches
- D** $7\frac{1}{2}$ inches

11. Peter used $\frac{3}{8}$ of a 25-fluid-ounce bottle of dishwashing soap.

How many fluid ounces of dishwashing soap remain?

$9\frac{3}{8}$

A

$15\frac{5}{8}$

B *

$24\frac{3}{8}$

C

$24\frac{5}{8}$

D

Sample Gridded Items

1. Sydney played a video game 43 times last year. He did *not* lose more than 2 games in a row last year.

What is the *greatest* possible number of video games that Sydney could have lost last year?

Mark your answer in the answer grid.

4. A company that rents cars will rent a small car for \$30 per day. Another company will rent the same type of car for \$20 per day plus \$0.08 for each mile driven.

What is the number of miles per day at which the rental fees will be the same?

Mark your answer in the answer grid.

2. Lydia, Sarah, and Denise collected campaign buttons. Lydia had 20 more buttons than Sarah. Denise had 3 times as many buttons as Sarah.

If the total number of campaign buttons the 3 girls had was 120, how many buttons did Lydia have?

Mark your answer in the answer grid.

5. A group of 5 adults and 4 children went to the movies. The price for each movie ticket was a whole number dollar amount with tax included. Each adult ticket cost more than each child ticket. A total of \$50 was paid for the tickets.

What is the cost of a child's ticket?

Mark your answer in the answer grid.

3. Larry has 66 music CDs. He has 2 times as many rock CDs as country CDs. He has 3 times as many rock CDs as hip-hop CDs.

How many rock CDs does Larry have?

Mark your answer in the answer grid.

6. A movie-rental company has two plans.

The first plan has a charge of \$7 per month and then \$1 per movie rented.

The second plan has a charge of \$20 per month and then \$0.50 per movie rented.

Bill has the first plan and Deanna has the second plan.

Last month, they both paid exactly the same amount of money and rented the same number of movies.

Exactly how much money did Bill and Deanna each pay last month for their movie rentals?

Mark your answer in the answer grid.

7. A basketball team played 35 games last year. The team won 80% of their games. Of the team's wins, $\frac{1}{4}$ went into overtime.

How many of the basketball team's wins went into overtime?

Mark your answer in the answer grid.

8. There are three different flavors of fruit juice in a cooler. There is the same number of bottles of apple juice as bottles of grapefruit juice. There are 4 more bottles of orange juice than the other kinds of juice combined. There is a total of 60 bottles of juice.

How many bottles of orange juice are in the cooler?

Mark your answer in the answer grid.

Answer Key

Content Standard 1

Sample Multiple-Choice

1. A
2. B
3. A
4. B
5. C
6. B
7. C
8. B
9. A
10. A
11. B

Sample Gridded

1. 29
2. 40
3. 36
4. 125
5. \$5
6. \$33
7. 7
8. 32

NUMBER AND OPERATIONS

Content Standard 2

Simplify expressions containing natural number exponents by applying one or more of the laws of exponents.

Item Type

Multiple-choice

Additional Information

Word problems/real-life situations may be used.

Scientific notation may be used.

Fractions as bases may be used.

Answers may have negative exponents.

Sample Multiple-Choice Items

1. Which of the following is equivalent to $6^8 \div 6^2$?

6^{16}

6^{10}

6^6

6^4

A

B

C *

D

3. Which of the following is an equivalent way of expressing $2^4 \cdot 2 \cdot 2^2$?

2^6

2^7

2^8

2^9

A

B *

C

D

2. Which of the following is equivalent to $\frac{2^{15}}{2^3}$?

2^5

2^{12}

2^{15}

2^{18}

A

B *

C

D

4. Which is equivalent to the expression shown below?

$$\frac{2^3 \cdot 5^3 \cdot 5^2}{2 \cdot 5^2}$$

A $2^4 \cdot 5^7$

C $2^2 \cdot 5^5$

B $2^4 \cdot 5^3$

D $2^2 \cdot 5^3 *$

5. Which of the following is equivalent to 3^9 ?

- A** $3^3 \cdot 3^6$ * **C** $\frac{3^{18}}{3^2}$
- B** $3^3 \cdot 3^3$ **D** $\frac{3^6}{3^3}$

6. After 3 years, the value of a savings bond was $(1.02^4)^3$ times larger than its original value.

What is the simplified form of $(1.02^4)^3$?

- A** 1.02^7
- B** 1.02^{12} *
- C** $3 \cdot 1.02^4$
- D** $3 \cdot 1.02^{12}$

7. Which of the following is equivalent to 7^4 ?

- A** $7^5 \div 7^4$ **C** $7^5 \div 7$ *
- B** $7^4 \div 7$ **D** $7^8 \div 7^2$

8. Natalie drew a square and marked the lengths of the sides using exponential notation. She then wrote the expression $5^4 \times 5^4$ to represent the area of the square.

Which of the following is equivalent to the area, in square units, of Natalie's square?

- 5 5^8 5^{16} 5^{20}
- A** **B** * **C** **D**

9. Which of the following is equivalent to 4^{16} ?

- A** $\frac{4^{12}}{4^4}$ **C** $4^9 \cdot 4^7$ *
- B** $\frac{4^{32}}{4^2}$ **D** $4^4 \cdot 4^4$

10. Which is equivalent to the expression shown below?

$$\frac{4^3 \cdot 4^4 \cdot 4^8}{4^5 \cdot 4}$$

4^9

4^{20}

12^9

12^{20}

A *

B

C

D

12. Which of the following could be the length and width of a rectangular-shaped parking lot with an area of 4^{10} square feet?

A 40^5 ft long by 40^5 ft wide

B 16^4 ft long by 16^6 ft wide

C 8^5 ft long by 8^5 ft wide

D 4^4 ft long by 4^6 ft wide *

11. Which is equivalent to the expression shown below?

$$\frac{7^2 \cdot 7^6 \cdot 7^2}{7 \cdot 7}$$

7^8

7^{12}

49^8

49^{12}

A *

B

C

D

13. Which of the following could be the dimensions of a rectangular prism-shaped fish tank with a volume of 3^6 cubic feet?

A 3^6 by 3^6 by 3^6

B 3^3 by 3^3 by 3^3

C 3^3 by 3^2 by 3 *

D 3^2 by 3^2 by 3

14. Which of the following is equivalent to $\left(\frac{5}{2}\right)^2$?

$$\frac{5}{2}$$

A

$$\frac{5}{2^2}$$

B

$$\frac{5^2}{2}$$

C

$$\frac{5^2}{2^2}$$

D *

16. Which of the following is equivalent to $(3^4)^2$?

$$3^2$$

A

$$3^6$$

B

$$3^8$$

C *

$$3^{16}$$

D

15. Which is equivalent to the expression shown below?

$$\frac{1}{7^6} \cdot 7 \cdot 7^3$$

A $\frac{1}{7^{10}}$

B $\frac{1}{7^9}$

C $\frac{1}{7^3}$

D $\frac{1}{7^2} *$

17. Which is equivalent to the expression shown below?

$$\frac{5^2}{5^3}$$

$$5^{-1}$$

A *

$$5$$

B

$$5^5$$

C

$$5^6$$

D

18. A parking lot has an area of 2^{18} square feet.

Which of the following is equivalent to 2^{18} ?

A $2^{19} \cdot 2^1$

B $2^6 \cdot 2^3$

C $2^6 \cdot 2^6 \cdot 2^6 *$

D $2^9 \cdot 2^2 \cdot 2^1$

Answer Key

Content Standard 2

Sample Multiple-Choice

1. C
2. B
3. B
4. D
5. A
6. B
7. C
8. B
9. C
10. A
11. A
12. D
13. C
14. D
15. D
16. C
17. A
18. C

NUMBER AND OPERATIONS

Content Standard 3

Use order of operations to evaluate and simplify algebraic expressions.

Item Type

Multiple-choice
Gridded

Additional Information

Substitution may be required.

Raising a number to a power may be required.

Word problems may be used.

Sample Multiple-Choice Items

1. Which is equivalent to the expression below?

$$4(12m \div 3) + 9 - 2(3m)$$

- | | |
|--------------------|----------------------|
| A $16m + 9$ | C $10m + 9$ * |
| B $31m$ | D $19m$ |

3. Each side of a square measures $(3k + 5)$ units, and its perimeter can be expressed as $4(3k + 5)$ units.

Which of the following is another way of expressing this perimeter?

- | | |
|-----------------------|--------------------|
| A $3k + 9$ | C $12k + 5$ |
| B $12k + 20$ * | D $7k + 9$ |

2. If the denominator is not zero, which expression is equivalent to $\frac{6m^2n}{24mn}$?

- | | | | |
|---------------|--------------------|-----------------|---------------|
| $\frac{m}{4}$ | $\frac{m^3n^2}{4}$ | $\frac{m^3}{4}$ | $\frac{1}{4}$ |
| A * | B | C | D |

4. Which is equivalent to the expression shown below?

$$4y - 2y(y) + 10y \div 2y$$

- A** $y + 5y$
B $2y^2 + 5y$
C $-2y + 3y + 12$
D $-2y^2 + 4y + 5$ *

6. Which is equivalent to the expression shown below?

$$4 \cdot 3b - 6 \cdot 4b$$

- $-12b$ $-3b$ $6b$ $2b$
A * **B** **C** **D**

5. Which is equivalent to the expression shown below?

$$14 + 7(4r) - 20$$

- A** $3r - 35$ **C** $11r + 6$
B $4r + 1$ **D** $28r - 6$ *

7. What is the value of the expression below if $x = 4$, $p = 9$, and $q = 12$?

$$\frac{x^4 + 8}{2p + q} - 5$$

- .95 3.8 4.1 7.4
A **B** * **C** **D**

8. What is the value of the expression below if $x = 4$ and $y = 3$?

$$3x^3 + 6xy$$

- 99 108 153 264
A **B** **C** **D** *

9. Karl makes a rectangle with a length that is 4 inches longer than its width. He divides the rectangle into 3 smaller rectangles of equal size. The expression below can be used to determine the area of each of the smaller rectangles when the original rectangle has a width of w inches.

$$\frac{w^2 + 4w}{3}$$

What is the area, in square inches, of each of the smaller rectangles when $w = 6$ inches?

- A** 12
- B** 20 *
- C** 36
- D** 60

10. Thomas and Audrey ordered 1 salad for \$8, 2 pizzas for x dollars each, and 2 glasses of juice for \$3 each. Their total cost in dollars can be represented by the expression $8 + 2(x + 3)$.

Which expression is equivalent to $8 + 2(x + 3)$?

- A** $2x + 11$
- B** $2x + 14$ *
- C** $10x + 3$
- D** $10x + 30$

Sample Gridded Items

1. If $x = 5$, $y = 2$, and $z = 3$, what is the value of the expression below?

$$2(x + y) - \frac{2z}{5} + 3x^2$$

Mark your answer in the answer grid.

3. If $p = 3$ and $q = 2$, what is the value of the expression below?

$$(p + q)^3$$

Mark your answer in the answer grid.

2. If $m = 4$ and $n = 5$, what is the value of the expression below?

$$2m^3 - 3n^2$$

Mark your answer in the answer grid.

4. If $k = 5$ and $m = 16$, what is the value of the expression below?

$$k^3 + [(m \div 4) + 3^2 \cdot 20]$$

Mark your answer in the answer grid.

5. If $m = 4$, $n = -2$, and $q = 2$, what is the value of the expression below?

$$(2m - n)^2 + q \div 2$$

Mark your answer in the answer grid.

Answer Key

Content Standard 3

Sample Multiple-Choice

1. C
2. A
3. B
4. D
5. D
6. A
7. B
8. D
9. B
10. B

Sample Gridded

1. 87.8 OR $\frac{439}{5}$ OR $87\frac{4}{5}$
2. 53
3. 125
4. 309
5. 101

ALGEBRA

Content Standard 4

Graph linear relations by plotting points or by using the slope and y -intercept.

Item Type

Multiple-choice

Open-ended

Additional Information

Identification of a graph given either the slope and y -intercept, x -intercept and y -intercept, ordered pairs, a table of values for x and y , or equation may be required.

Constructing a graph of a linear equation on a coordinate plane may be required.

Word problems/real-life situations may be used.

Equations may be expressed in standard form.

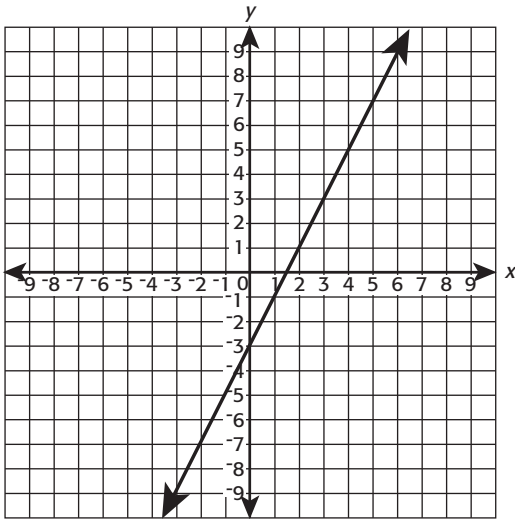
Determining the slopes and y -intercepts of a line may be required.

Options may be four graphs.

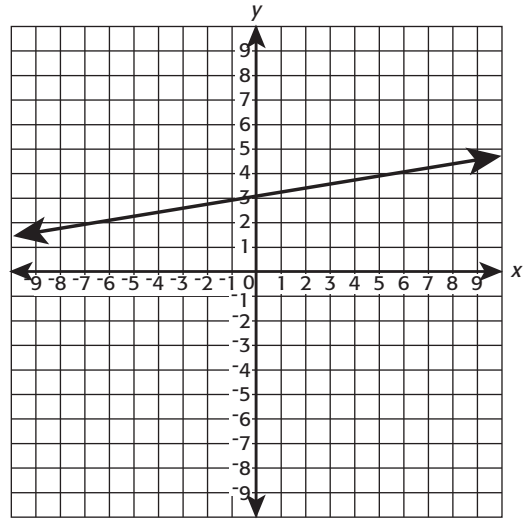
Sample Multiple-Choice Items

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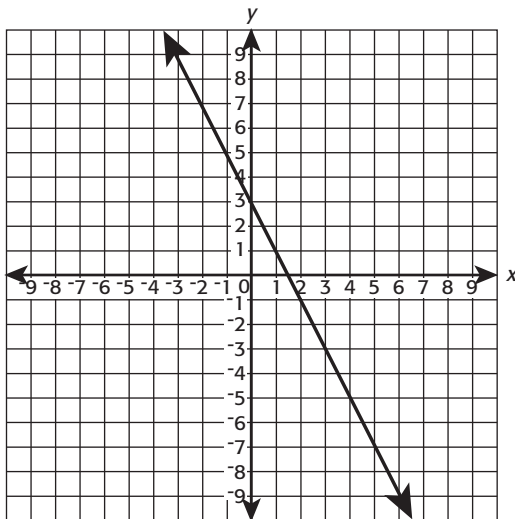
1. Which graph *best* represents the line that contains the points $(4, 5)$ and $(0, -3)$?



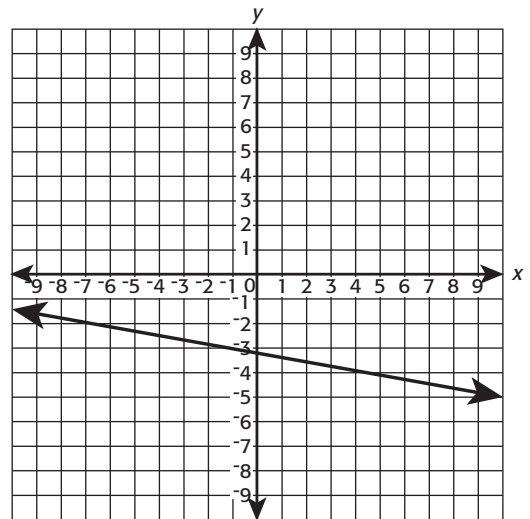
A *



C

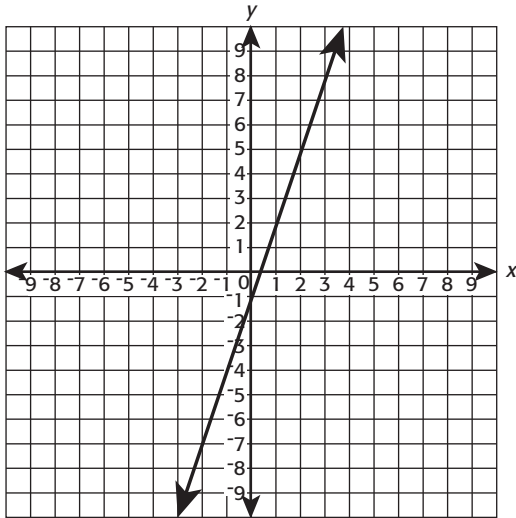


B

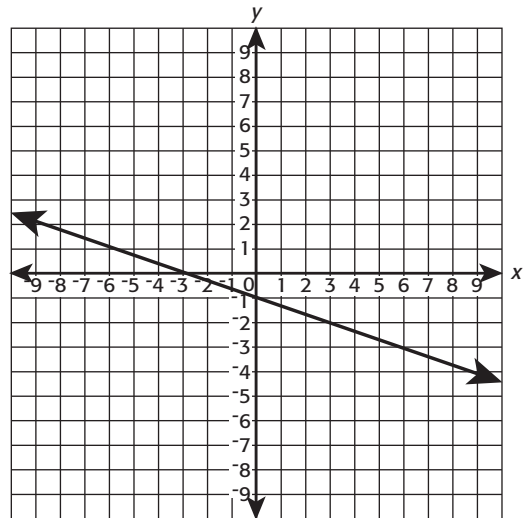


D

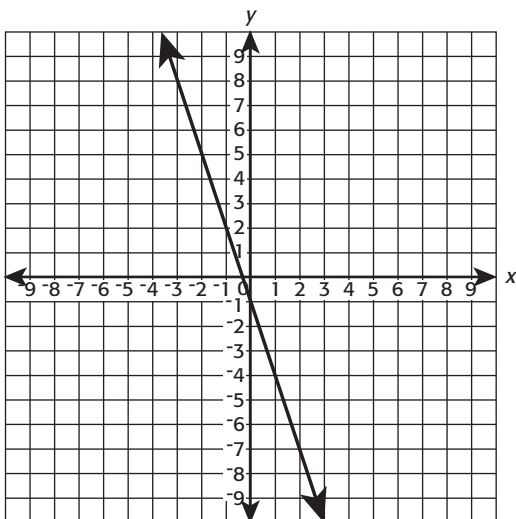
2. Which graph *best* represents the equation of the line that has a y -intercept of -1 and a slope of $\frac{1}{3}$?



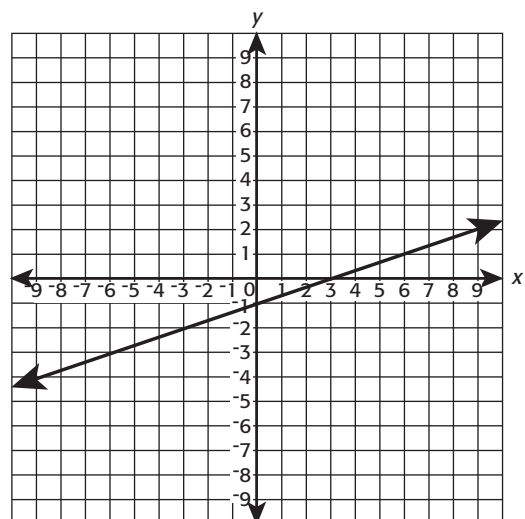
A



C

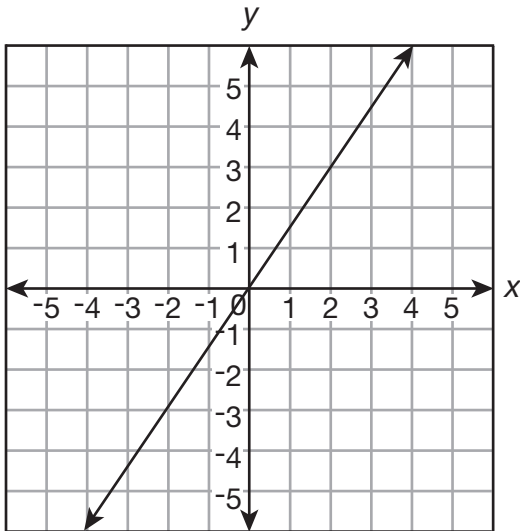


B

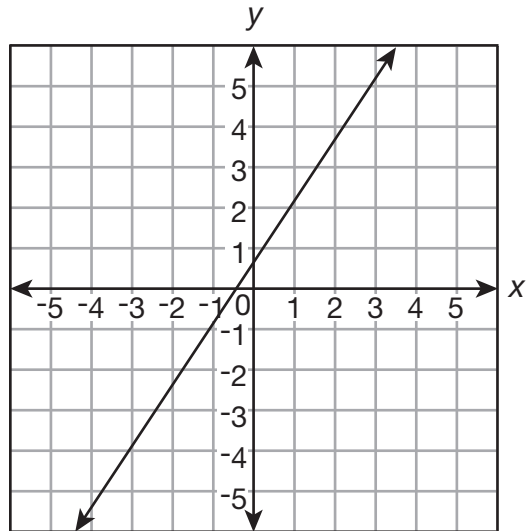


D *

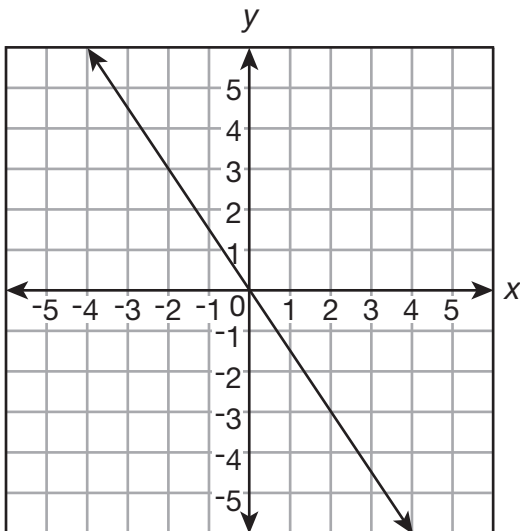
3. Which graph *best* represents the linear function $y = 1.50x + 0.75$?



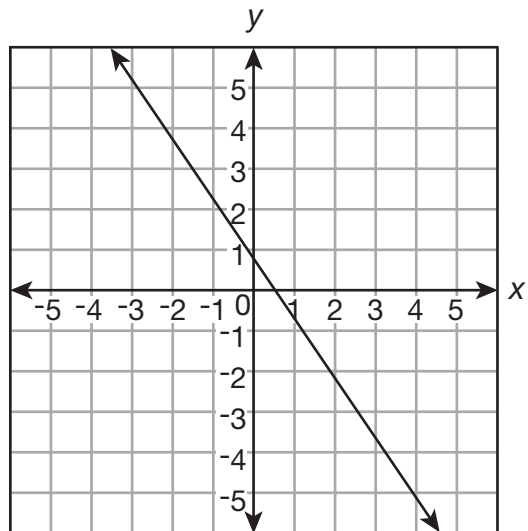
A



C *

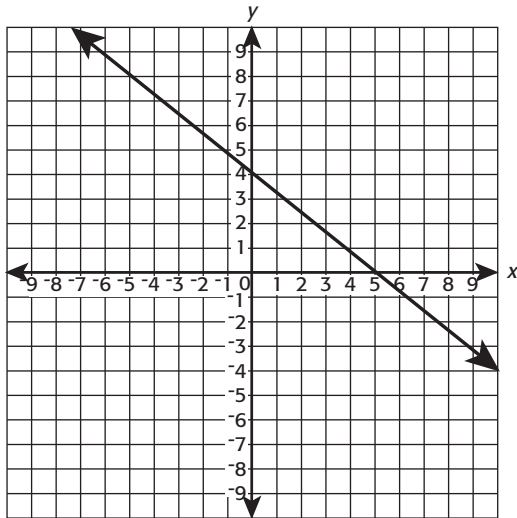


B

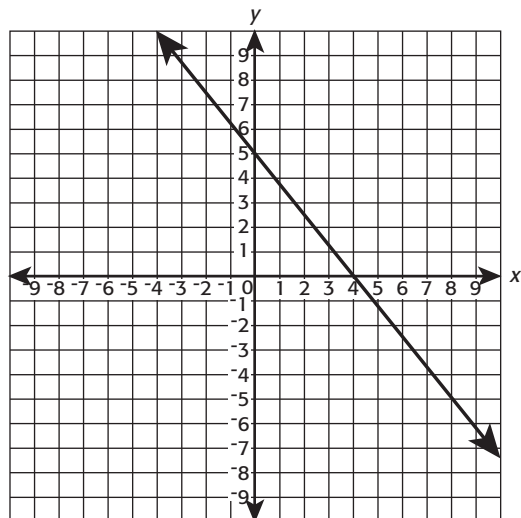


D

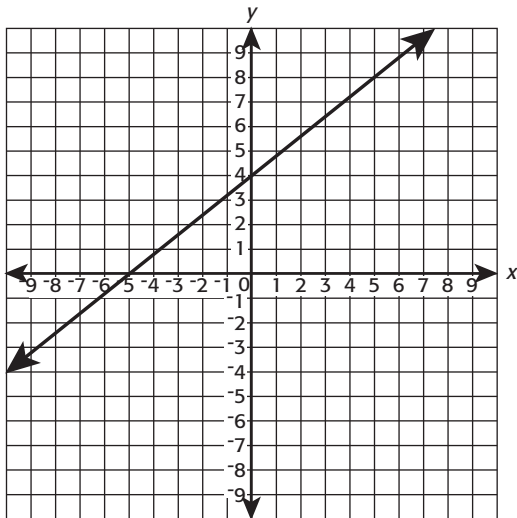
4. Which graph *best* represents a line with an x -intercept of 4 and a y -intercept of 5?



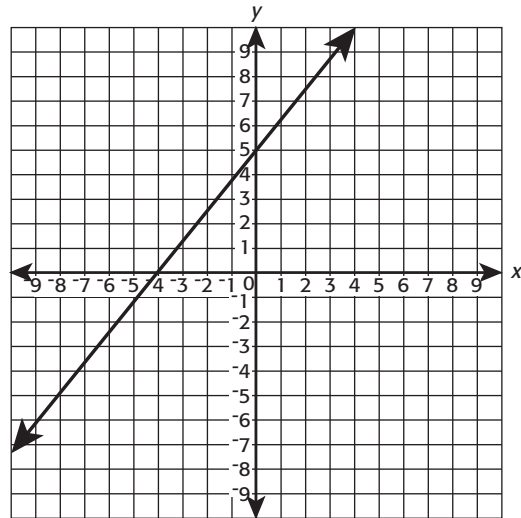
A



C *

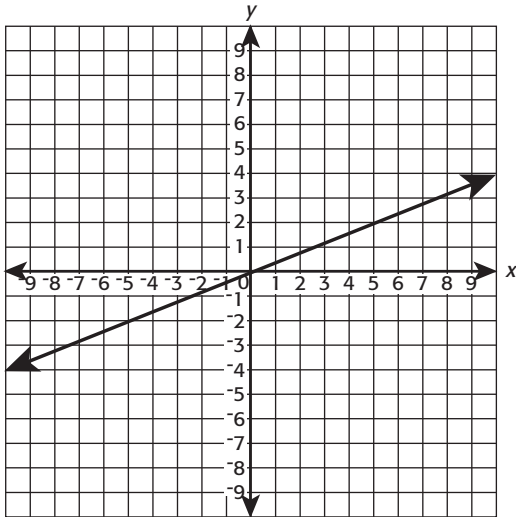


B

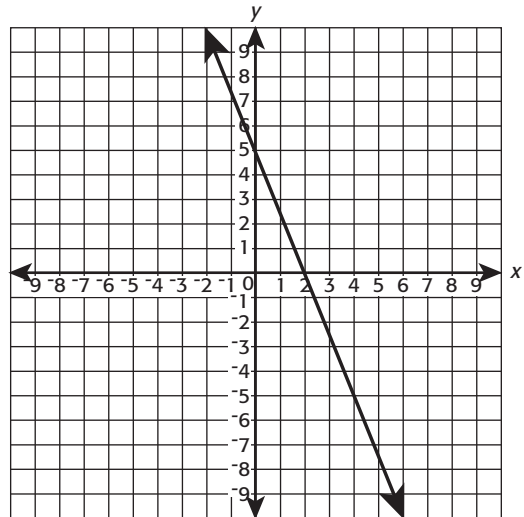


D

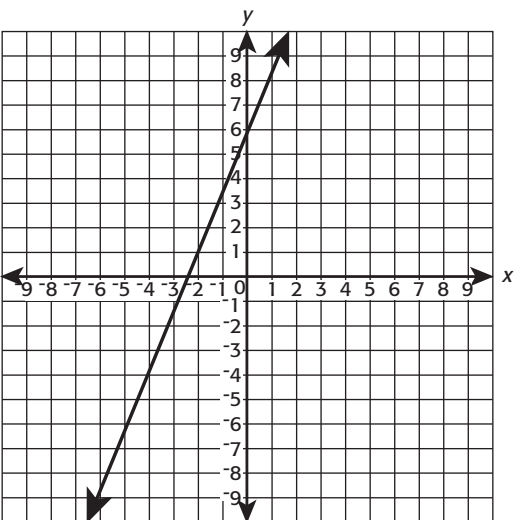
5. Which graph *best* represents a line with a slope of $\frac{5}{2}$?



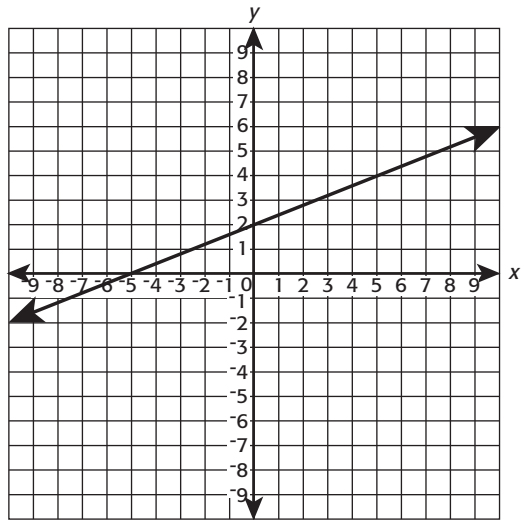
A



C

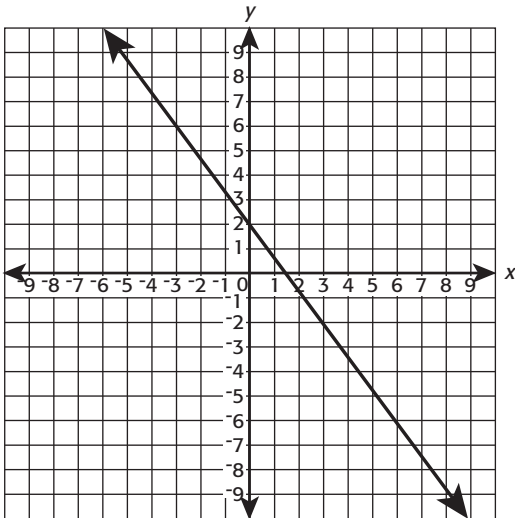


B *

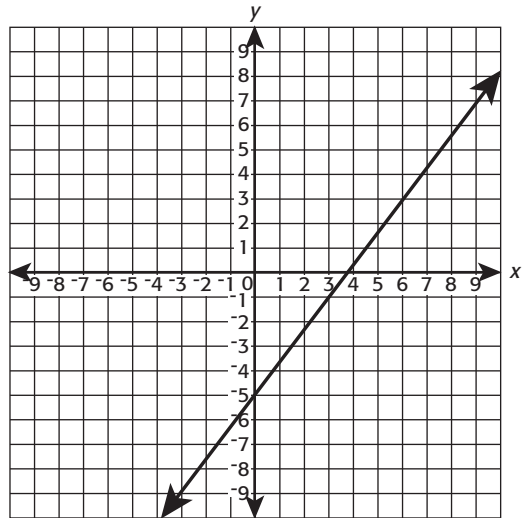


D

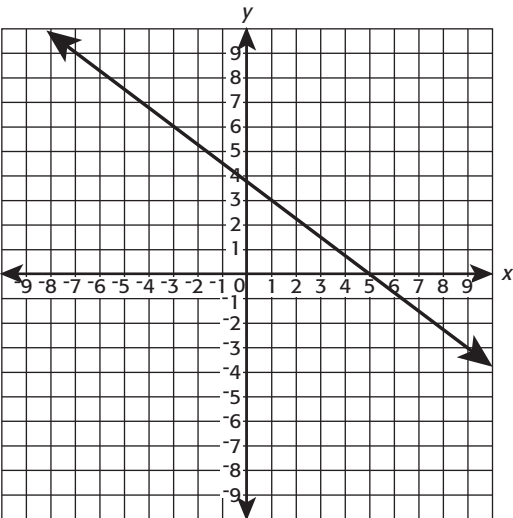
6. Which graph *best* shows a slope of $-\frac{4}{3}$ and a y -intercept of 2?



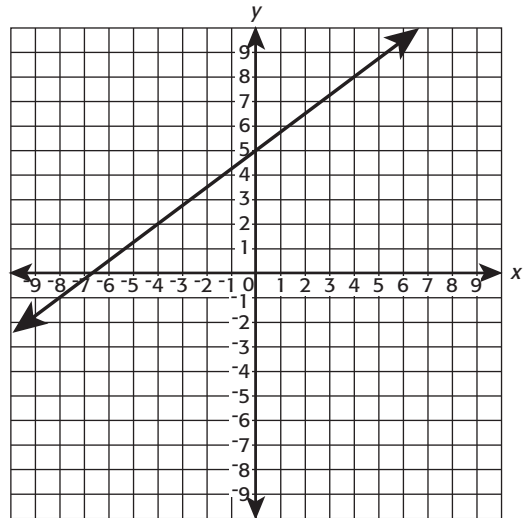
A *



C

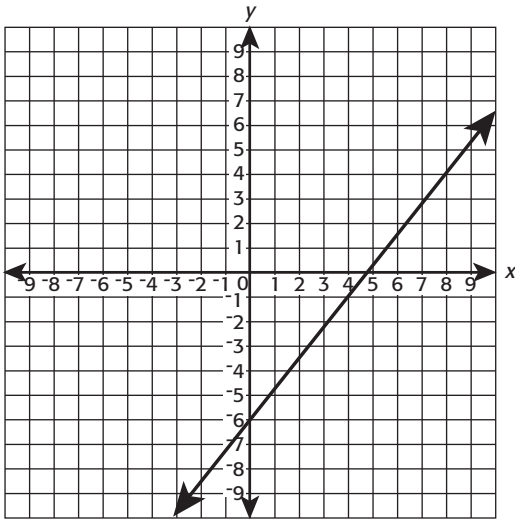


B

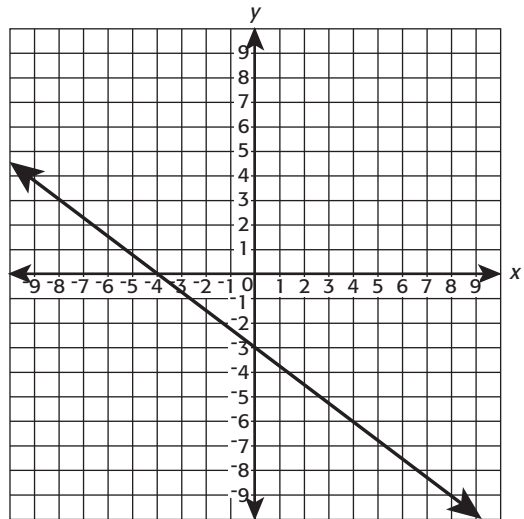


D

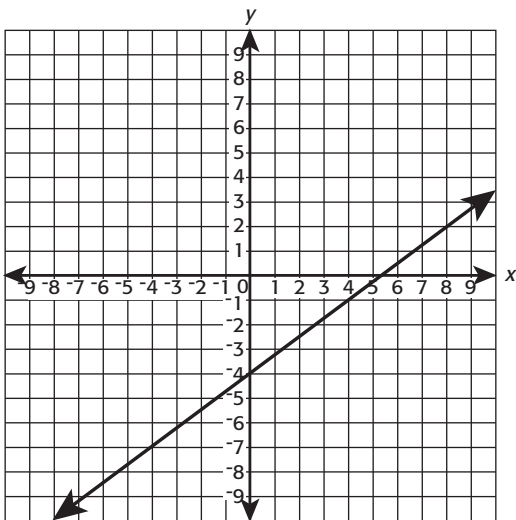
7. Which of the following *best* represents the graph of a line that contains the point $(4, -6)$ and has a slope of $\frac{3}{4}$?



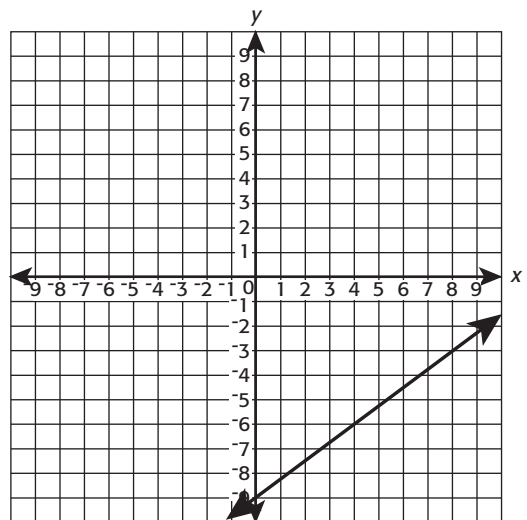
A



C

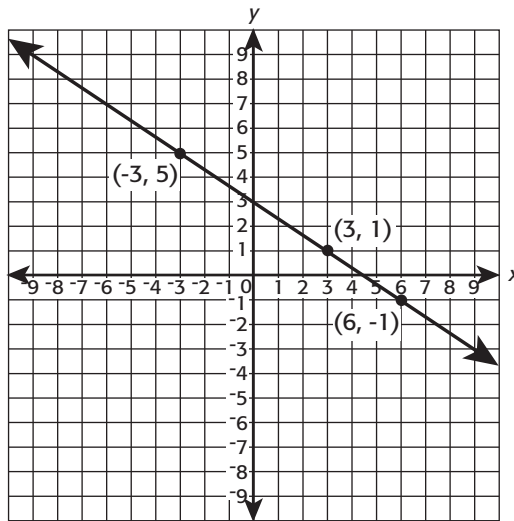


B



D *

8. Which equation represents the line below?



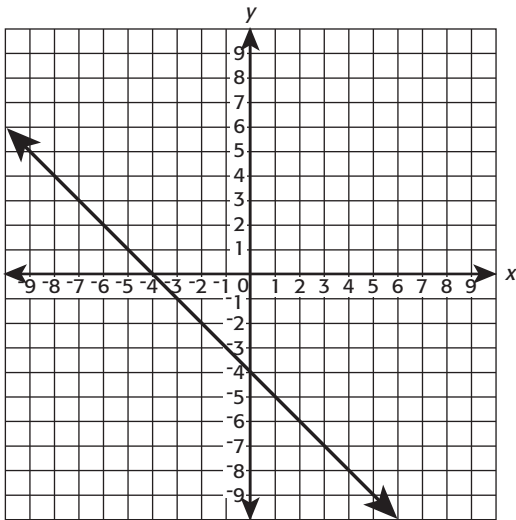
A $y = -\frac{2}{3}x + 3$ *

B $y = 2x - 6$

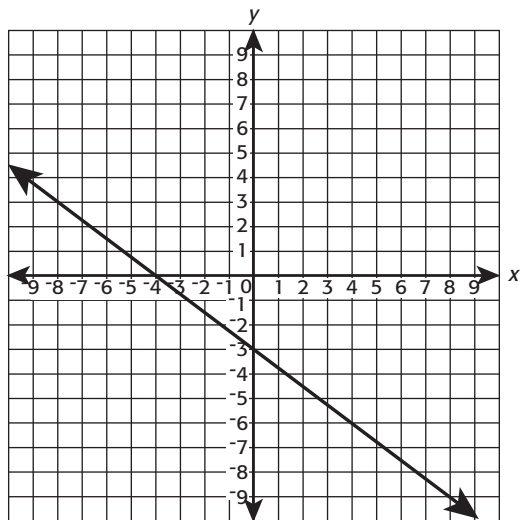
C $y = -x + 4$

D $y = \frac{1}{2}x - 3$

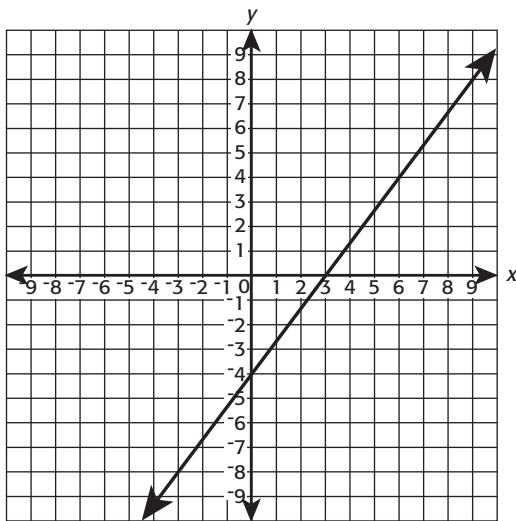
9. Which graph *best* represents the linear function $4x - 3y = 12$?



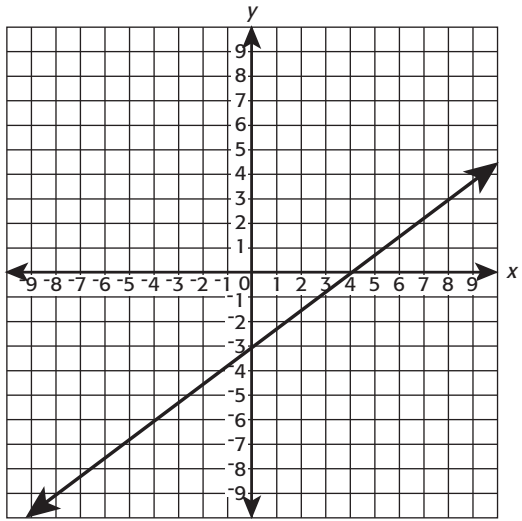
A



C



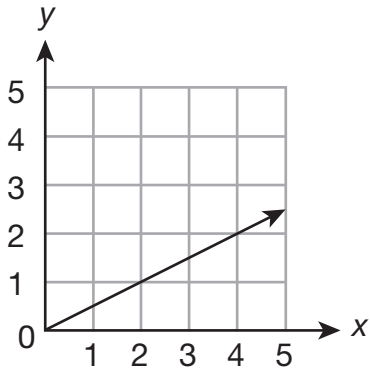
B *



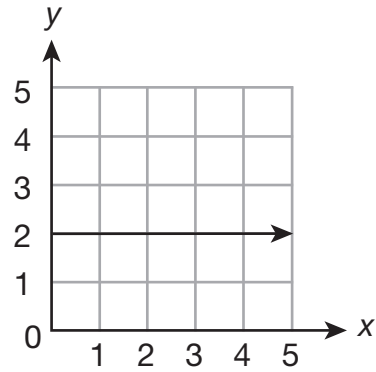
D

10. Carrie walks 2 miles every day. The linear equation $y = 2x$ represents the total miles, y , she walks after x days.

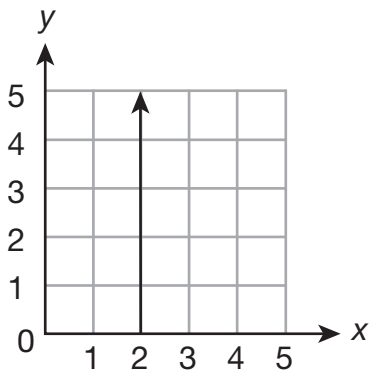
Which is the graph of $y = 2x$?



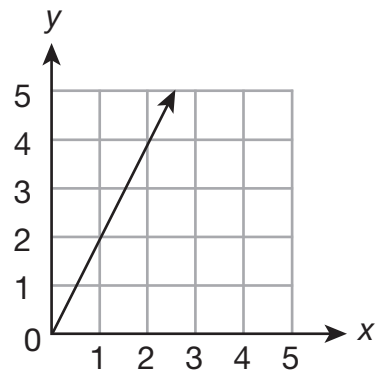
A



C



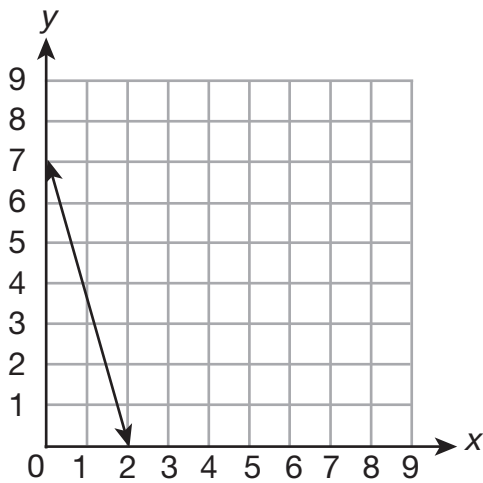
B



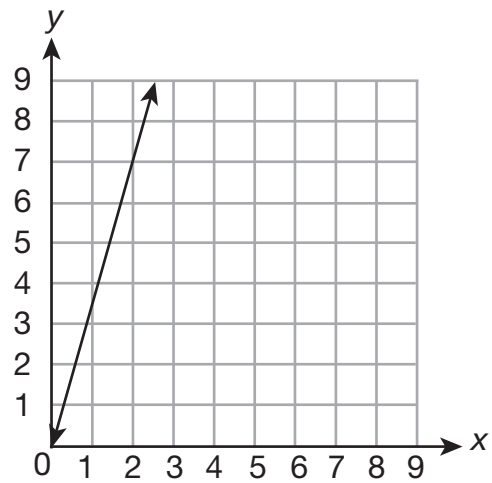
D *

11. Grace starts 7 miles from her home and walks $\frac{7}{2}$ miles every hour. Her distance from home, y , after walking x hours, can be modeled by the equation $y = -\frac{7}{2}x + 7$.

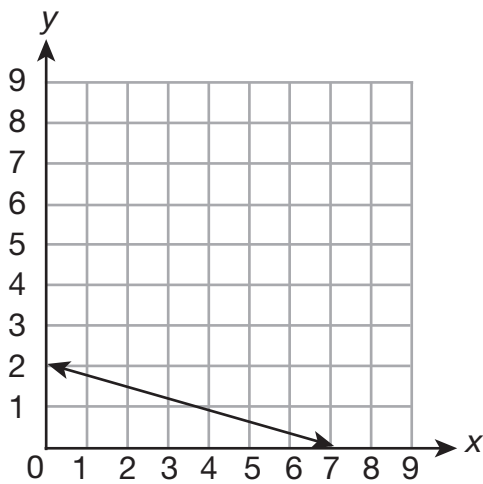
Which is the graph for $y = -\frac{7}{2}x + 7$?



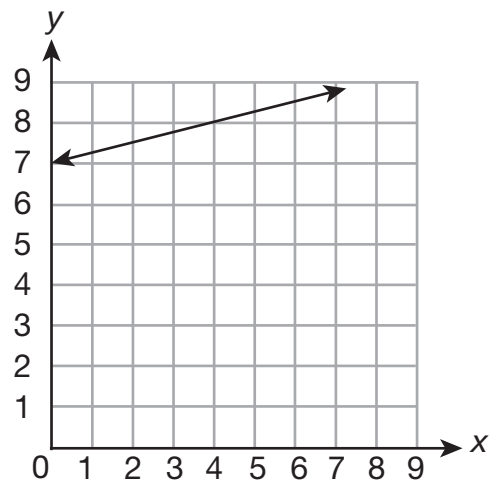
A *



C



B



D

Sample Open-Ended Items

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

1. Construct a coordinate plane and label the axes. Plot the points $M(4, 3)$, $N(0, 5)$, and $K(-2, 6)$ on the coordinate plane. Draw a line through the points.
 - a. What are the slope and y -intercept of the line?
 - b. Write the equation of the line in slope-intercept form.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

2. Wilson is making chocolate milk by adding chocolate syrup to white milk. The table below shows the amount of chocolate syrup needed for the amount of white milk.

Chocolate Milk	
Chocolate Syrup (in teaspoons)	White Milk (in cups)
6	2
9	3
12	4

- a. Create a coordinate plane and label the axes. Graph the data shown in the table *as a line*.
- b. What is the slope of the line?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

3. Jenalysa was asked to graph the equation $3x + y = -4$.
- Create a table with 4 ordered pairs that are on the line of the equation.
 - Create a coordinate plane and label the axes. Graph the equation $3x + y = -4$ using the ordered pairs from the table.
 - What are the slope and y -intercept of the line?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

4. A movie rental store charges \$5 for a monthly membership and \$3 for every movie rented during the month. The monthly rental cost can be represented by the equation $y = 3x + 5$, where x is the number of movies rented and y is the total cost for the month.
- Create a table that shows 4 ordered pairs that make the equation true.
 - Construct a coordinate plane and label the axes. Graph the equation $y = 3x + 5$ using the ordered pairs from the table.
 - Explain why the function, for this situation, should only exist in Quadrant I.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

5. Malcolm wants to graph the equation $y = x - 6$.
 - a. What are the slope and y -intercept of Malcolm's equation?
 - b. Create a coordinate plane and label the axes. Draw the line of the equation $y = x - 6$ using the slope and y -intercept.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

6. A line has a slope of 2 and a y -intercept of -4 .
 - a. Create a coordinate plane and label the axes. Draw a line with a slope of 2 and a y -intercept of -4 .
 - b. Write the equation of the line from **part a** in slope-intercept form.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

7. Lou created the table below to show the amount of money he earns, y , for mowing a person's lawn based on the number of hours, x , he spends mowing. He charges \$15 at the beginning of the summer for expenses.

Lou's Lawn Mowing Service

Number of Hours Spent Mowing	Amount Earned (in dollars)
0	15
2	35
4	55
6	75

- Create a coordinate plane and label the axes. Graph the data shown in the table *as a line*.
- What is the equation of the line in slope-intercept form?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

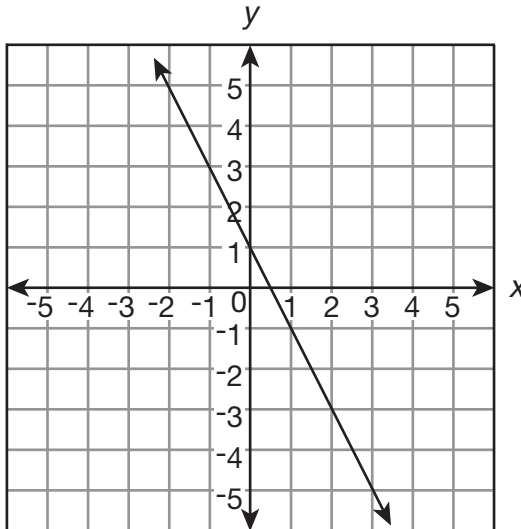
This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

8. Abby wants to graph the equation $y + 4 = 3x$.
- What are the slope and y -intercept of the equation?
 - Create a coordinate plane and label the axes. Draw the line of the equation $y + 4 = 3x$ using the slope and y -intercept.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

9. Dan drew the line on the coordinate grid shown below.



- Construct a coordinate plane and label the axes. Draw a line on the coordinate plane with the same slope as Dan's line but a different y -intercept.
- Write the equation of the line from **part a** in slope-intercept form.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

10. An outdoor fish pond is losing water. The table below shows the number of gallons remaining in the pond each week.

Fish Pond

Week	Gallons Remaining
0	30
1	$29\frac{3}{4}$
2	$29\frac{1}{2}$
3	$29\frac{1}{4}$

- Create a coordinate plane and label the axes. Graph the data shown in the table *as a line*.
- What is the equation of the line in slope-intercept form?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

11. A taxicab company charges a \$2 fee when a rider enters the taxicab plus \$4 for each mile traveled. The cost for a taxicab ride can be represented by the equation, $y = 4x + 2$, where x is the number of miles traveled and y is the total cost for the taxicab ride.
- Create a table that shows 4 ordered pairs that make the equation true.
 - Construct a coordinate plane and label the axes. Graph the equation $y = 4x + 2$ using the ordered pairs from the table.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

12. Kyle started with 8 baseball figurines. He collects new baseball figurines each month. At the end of each month, he has added a total of 3 new baseball figurines to his collection. He made the table below to show how many baseball figurines he had in his collection after each of the first 3 months.

Baseball Figurines Collected

Month	Figurines Collected
0	8
1	11
2	14
3	17

- Construct a coordinate plane and label the axes. Plot the points in the table and draw a line through the points.
- What is the slope of the line?
- Draw a new line to show the number of baseball figurines Kyle will have collected if he still starts with 8 baseball figurines and adds 2 baseball figurines to his collection each month.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

Answer Key

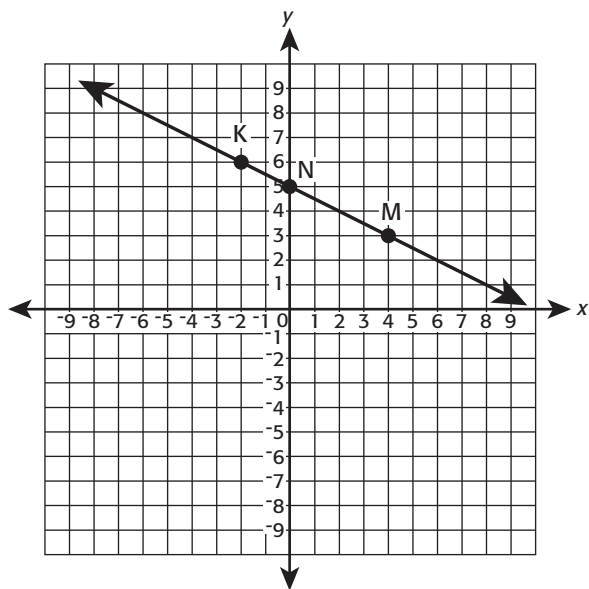
Content Standard 4

Sample Multiple-Choice

1. A
2. D
3. C
4. C
5. B
6. A
7. D
8. A
9. B
10. D
11. A

Sample Open-Ended

1. Sample Response(s):



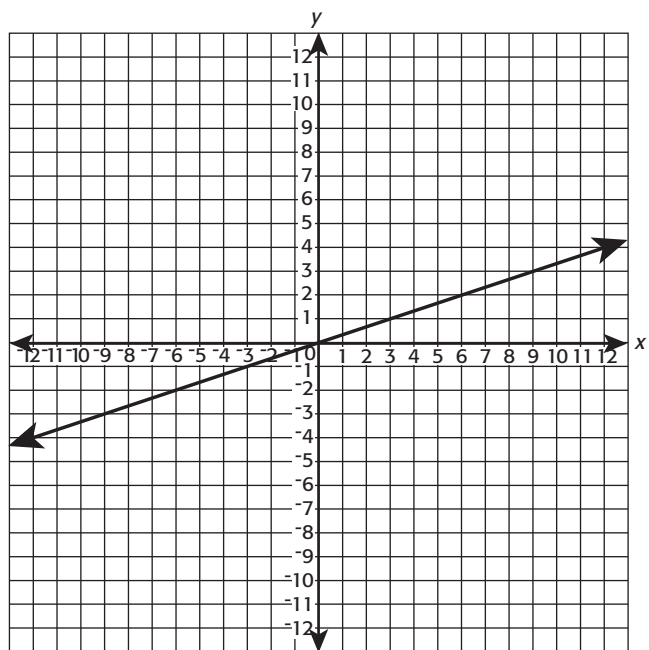
a. $m = -\frac{1}{2}$, y -intercept = 5

b. $y = -\frac{1}{2}x + 5$

Score Point	Response Attributes
3	All is correct.
2	The drawing with labels is correct except for a ray or segment instead of a line, and either the slope, y -intercept, or equation is correct.
1	<p>The drawing is correct except for a ray or segment instead of a line.</p> <p>OR</p> <p>The slope or y-intercept is correct.</p> <p>OR</p> <p>The equation is correct.</p> <p>OR</p> <p>The slope, y-intercept, and equation are correct.</p>
0	No parts are correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

2. Sample Response(s):

a.



The graph shows that x is the amount of chocolate syrup (in teaspoons) and y is the amount of white milk (in cups).

b. The slope is $\frac{1}{3}$.

Score Point	Response Attributes
3	All is correct.
2	Four of four parts are correct.
1	At least one part is correct.
0	Either the slope or y-intercept is correct or no parts are correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

Note: For a score point 2, the student must correctly draw a coordinate plane with labels and correctly complete all four parts.

The four parts are:

Part 1—scaling along horizontal axis must be uniform; scaling along the vertical axis must be uniform; the same scale along both axes is not required.

Parts 2, 3, and 4—correctly plotted points.

3. Sample Response(s):

a.

x	y
-2	2
-1	-1
0	-4
1	-7

$$3(-2) + y = -4 \rightarrow y = 2$$

$$3(-1) + y = -4 \rightarrow y = -1$$

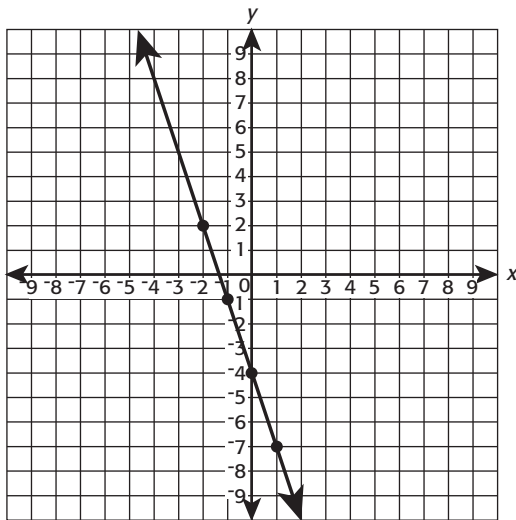
$$3(0) + y = -4 \rightarrow y = -4$$

$$3(1) + y = -4 \rightarrow y = -7$$

OR

Equivalent (numerous tables are possible)

- b. Constructs a coordinate plane, labels the axes, and graphs the equation $3x + y = -4$ using the ordered pairs from the table.



- c. When rearranged into slope-intercept form, the equation of the line is $y = -3x - 4$. The slope is -3 and the y -intercept is -4 .

Score Point	Response Attributes
3	All is correct.
2	Correct table but errors in graphing. OR An error in the table but graphing for the incorrect table is correct or has a minor error.
1	Created correct table. OR Graph is correct. OR Minor errors on the table and the graph.
0	None correct (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

4. Sample Response(s):

a.

Movie Rental Store

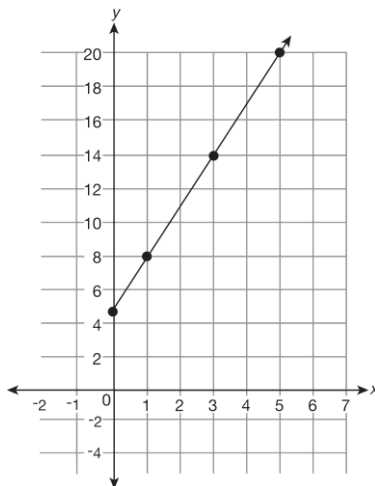
Number of Movies Rented (x)	Total Cost for Month (y)
0	\$5
1	\$8
3	\$14
5	\$20

$$y = 3(0) + 5 = 5 \text{ and } y = 3(1) + 5 = 8 \text{ and } y = 3(3) + 5 = 14 \text{ and } y = 3(5) + 5 = 20$$

OR

Equivalent (numerous tables are possible)

- b. Constructs a coordinate plane, labels the axes, and graphs the equation $y = 3x + 5$ using the ordered pairs from the table.



- c. Quadrant I is positive for both the x and y values. One couldn't have a negative number of movies rented.

OR

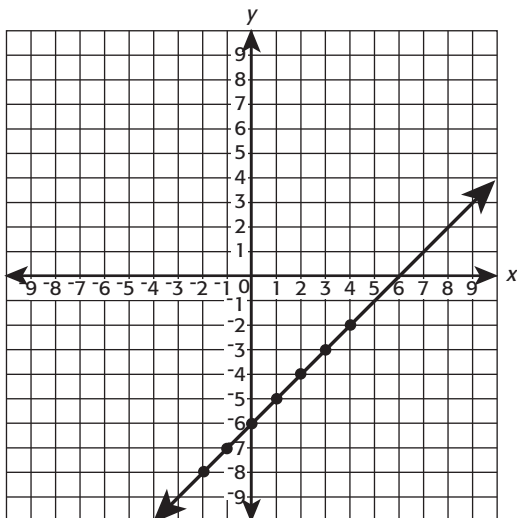
Equivalent

Score Point	Response Attributes
3	All is correct.
2	Two of three parts are correct. OR Part c is correct, and Part a and Part b have one to three errors each.
1	One of three parts is correct without logic. OR Part b has more than three errors. OR Parts a, b, or c are partially correct.
0	No parts are correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off task, etc., scored as invalid.)

5. Sample Response(s):

a. The slope = $\frac{1}{1}$ or 1, and the y -intercept is -6 .

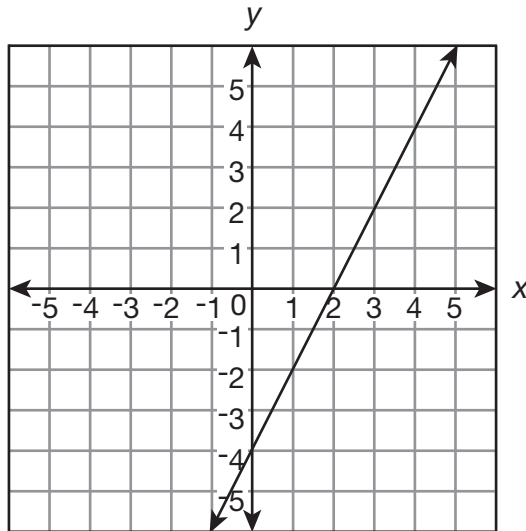
b.



Score Point	Response Attributes
3	All is correct.
2	<p>Determine wrong slope or y-intercept but graph correctly using the wrong slope or y-intercept.</p> <p>OR</p> <p>Don't identify slope or y-intercept and correctly graph the equation.</p> <p>OR</p> <p>The drawing is correct except for a ray or a segment instead of a line, and either the slope or y-intercept is correct.</p>
1	<p>The slope and y-intercept are correct.</p> <p>OR</p> <p>The drawing is correct except for a ray or segment instead of a line.</p> <p>OR</p> <p>The slope or y-intercept is correct and the graph has minor errors.</p>
0	Either the slope or y -intercept is correct or no parts are correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

6. Sample Response(s):

- a. Creates a coordinate plane and labels the axes. Draws a line with a slope of 2 and a y-intercept of -4 . {Crosses the y-axis at $(0, -4)$ and passes through $(2, 0)$.}

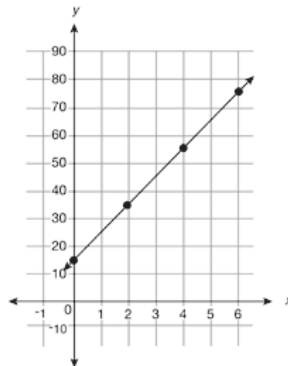


- b. $y = 2x - 4$ or $y = 2x + (-4)$

Score Point	Response Attributes
3	All is correct.
2	Part a has one to three errors and the equation is correct. OR All of Part a is correct and either the slope or y-intercept is correct.
1	Part a has more than 3 errors. OR The equation is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

7. Sample Response(s):

- a. Creates a coordinate plane, labels the axes, and graphs the data shown in the table as a line (\leftrightarrow).



- b. The equation of a straight line, in slope-intercept form, is $y = mx + b$ where m is the slope and b is the y-intercept. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{35 - 15}{2 - 0} = \frac{20}{2} = 10$ and then substitute a point on the line into the equation and solve for b : $35 = 10(2) + b$ and $[b = 35 - 20; b = 15]$ and so the equation of the line is:
 $y = 10x + 15$

OR

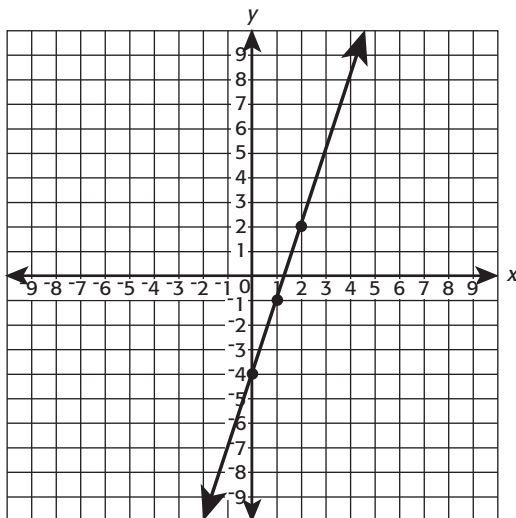
Equivalent

Score Point	Response Attributes
3	All is correct.
2	Part a has one to three errors and equation is correct. OR All of Part a is correct and either slope or y-intercept is correct with logic.
1	The equation is correct. OR Logic in Part b is correct. OR Part a has more than three errors.
0	No parts are correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off task, etc., scored as invalid.)

8. Sample Response(s):

a. The slope = 3 or $\frac{3}{1}$ and the y -intercept = -4 .

b.

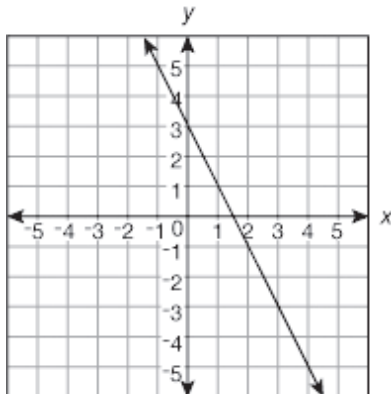


Score Point	Response Attributes
3	All is correct.
2	<p>Determine wrong slope or y-intercept but graph correctly using the wrong slope or y-intercept.</p> <p>OR</p> <p>Don't identify slope or y-intercept and correctly graph the equation.</p> <p>OR</p> <p>The drawing is correct except for a ray or segment instead of a line, and either the slope or y-intercept is correct.</p>
1	<p>The slope and y-intercept are correct.</p> <p>OR</p> <p>The drawing is correct except for a ray or segment instead of a line.</p> <p>OR</p> <p>The slope or y-intercept is correct and the graph has minor errors.</p>
0	Either the slope or y -intercept is correct or no parts are correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

9. Sample Response(s):

- a. The given line is $y = -2x + 1$. Student needs to construct a coordinate plane, label the axes and draw a line (\leftrightarrow) on the plane with the *same* slope (slope is -2) as Dan's line but with a *different* y -intercept (i.e., a different y -intercept than 1).

Example shown with the y -intercept at 3:



- b. $y = mx + b$ is the “slope-intercept” form of a straight line equation. m is the slope, and b is the y -intercept where m is rise/run = $(-3 - 1)/(2 - 0) = -4/2 = -2$ (per the given information), and to find the y -intercept, substitute a point in the formula and solve for b . $1 = -2(1) + b$ and $b = 3$, so $y = -2x + 3$ is the slope-intercept form of the line in Part a.

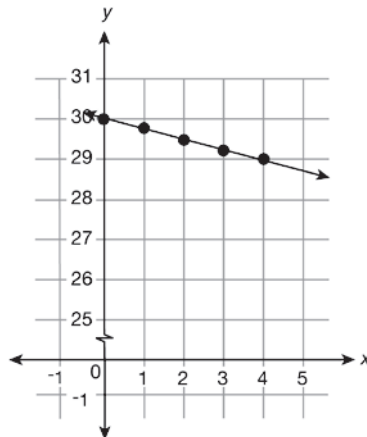
OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	Part a has one to three errors and the equation in Part b is correct. OR All of Part a is correct and either the slope or y -intercept in Part b is correct.
1	The equation is correct without logic. OR Part of Part b is correct. OR Part a has more than three errors and the slope of the line in Part a is drawn correctly.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off task, etc., scored as invalid.)

10. Sample Response(s):

- a. Creates a coordinate plane and labels the axes. Graphs the data shown in the table *as a line*. (Equation of line is $y = -\frac{1}{4}x + 30$.)



- b. The equation of a straight line, in slope-intercept form, is $y = mx + b$ where m is the slope, and b is the y -intercept. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{29\frac{1}{2} - 30}{2 - 0} = \frac{-\frac{1}{2}}{2} = -\frac{1}{4}$, and then substitute a point on the line into the equation and solve for b :

$$30 = -\frac{1}{4}(0) + b \text{ and } b = 30 + 0 = 30, \text{ so the equation of the line is:}$$

$$y = -\frac{1}{4}x + 30$$

Score Point	Response Attributes
3	All is correct.
2	Part a has one to three errors and the equation or logic is correct. OR All of Part a is correct and either the slope or y -intercept is correct with logic.
1	The equation is correct. OR Logic in Part b is correct. OR Part a has more than three errors.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off task, etc., scored as invalid.)

Note: Each plotted point is counted as a separate error.

11. Sample Response(s):

a.

Taxicab Charges

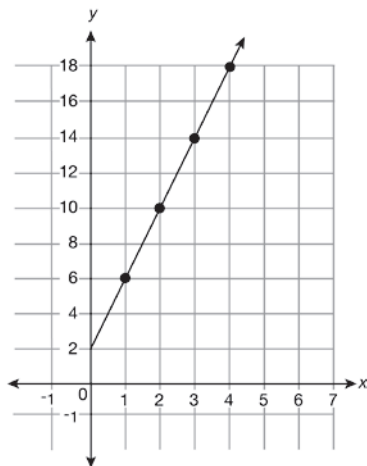
Miles Traveled	Cost for Ride (\$)
1	6
2	10
3	14
4	18

$$y = 4(1) + 2 = 6 \text{ and } y = 4(2) + 2 = 10 \text{ and } y = 4(3) + 2 = 14 \text{ and } y = 4(4) + 2 = 18$$

OR

Equivalent (numerous tables are possible)

- b. Constructs a coordinate plane and labels the axes. Graphs the equation $y = 4x + 2$ using the ordered pairs from the table.



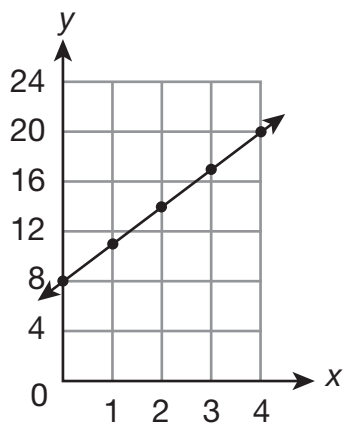
Score Point	Response Attributes
3	All is correct.
2	All of Part a is correct and Part b has one to three errors. OR Part a has one to three errors and all of Part b is correct.
1	Part a or Part b has more than three errors.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off task, etc., scored as invalid.)

12. Sample Response(s):

- a. Constructs a coordinate plane, labels the axes, plots the points from the table, and draws a line through the points. (Equation of line: $y = 3x + 8$)

OR

Equivalent



- b. Slope of a line is a rate of change. (The number of figurines added to the collection each month.) The rate here is 3 figurines each month, thus a slope of 3.

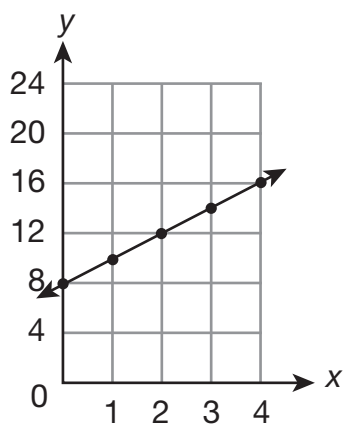
OR

Slope = ratio of the vertical change to the horizontal change or $\frac{y_2 - y_1}{x_2 - x_1} = \frac{11 - 8}{1 - 0} = \frac{3}{1} = 3$

OR

Equivalent

- c. Draws a new line that has the same y-intercept as the first but has a slope of 2. (Equation of line: $y = 2x + 8$)

**OR**

Equivalent

ARMT⁺ Grade 8 MATHEMATICS

Score Point	Response Attributes
3	All is correct.
2	Part a has one to three errors and all of Part b or Part c is correct.
1	All of Part b is correct. OR Part a has more than three errors.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off task, etc., scored as invalid.)

ALGEBRA

Content Standard 5

Solve problems involving linear functions.

Item TypeMultiple-choice
Gridded**Additional Information**Equations may be expressed in terms of $f(x)$.

Determining the value of a variable in a linear equation given the values of other variables in the linear equation may be required.

A special relationship between lines on a coordinate plane may be required (same line, intersecting lines, parallel lines, and perpendicular lines).

Word problems/real-life situations may be used.

Determining the equation of a line given two ordered pairs or set of points may be required.

Determining the equation of a line given the line graphed on the coordinate plane may be required.

The options may be four equations.

Sample Multiple-Choice Items

1. The table below shows values of x and y .

x	y
-2	-5
-1	-3
0	-1
2	3

Which equation is true for all values of x and y shown in the table?

- A** $y = -x + 3$ **C** $y = 3 + x$
B $y = 2x - 1$ * **D** $y = -4x + 6$

2. What is the range of the function $f(x) = \frac{1}{2}x + 3$ when the domain is $\{-3, 1, 2\}$?

- A** $\{4\frac{1}{2}, 2\frac{1}{2}, 4\}$ **C** $\{2\frac{1}{2}, 4, 3\frac{1}{2}\}$
B $\{1\frac{1}{2}, 3\frac{1}{2}, 5\}$ **D** $\{1\frac{1}{2}, 3\frac{1}{2}, 4\}$ *

3. The cost, in dollars, for x students to go to the art museum is represented by the equation $c = 2x + 30$.

How much does it cost for 76 students to go to the art museum?

\$68 \$152 \$182 \$212

A **B** **C *** **D**

5. After canoeing for 5 miles, Andrea hiked at a rate of 4 miles per hour for x hours.

Which linear function represents the total distance, $f(x)$, that Andrea traveled?

A $f(x) = 4(x + 5)$

B $f(x) = 4x + 5 *$

C $f(x) = 5(x + 4)$

D $f(x) = 5x + 4$

4. Kelly uses the equation $y = 12 - \frac{2}{3}x$ to keep a record of how many cups of cereal, y , remain after a specified number of servings, x .

Which ordered pair is a solution to the equation?

A (4, 6)

B (8, 6)

C (9, 6) *

D (16, 6)

6. If $(x, 5)$ is a solution to the equation $3x + 5y = -5$, what is the value of x ?

A $-10 *$

B -4

C 2

D $6\frac{2}{3}$

7. Which statement describes the relationship between the line graphs of the equations below?

$$y = -2x + 4$$

$$y = \frac{1}{2}x + 4$$

- A** The line graphs are the same line.
B The line graphs are parallel lines.
C The line graphs are perpendicular lines. *
D The line graphs intersect, but are not perpendicular.

8. Alex used the equation $y = 2x + 4$ to find his cost in dollars, y , for downloading x songs. The coordinate pair $(x, 30)$ represents the \$30 he spent to download x songs.

What is the value of x ?

- 13 15 17 64
A * **B** **C** **D**

9. Jason practices the trumpet $3\frac{2}{5}$ hours each week. The table below shows the total hours he had practiced at the end of each week.

Jason's Trumpet Practice

Week	Total Hours
1	$3\frac{2}{5}$
2	$6\frac{4}{5}$
3	$10\frac{1}{5}$

In total, how many hours will Jason have practiced at the end of 7 weeks?

- $14\frac{1}{5}$ $20\frac{2}{5}$ $23\frac{4}{5}$ $27\frac{1}{5}$
A **B** **C** * **D**

10. When purchasing a bus pass, the total cost for riding the bus x times is represented by the linear function $f(x) = 1.25x + 40$.

What is the value of $f(24)$?

- 30 64 70 80
A **B** **C** * **D**

Sample Gridded Items

1. Vivian is driving from Alabama to Georgia. She is driving at a constant speed on the highway. The table below shows her distance from the Alabama state line.

Distance by Time

Time of Day	Distance from Alabama State Line (in miles)
1:00 P.M.	20
1:04 P.M.	15

How many minutes after 1:00 P.M. will it be when Vivian drives across the Alabama state line?

Mark your answer in the answer grid.

2. Cassidy's pickup truck decreased in value at a constant rate at the start of each successive year. The pickup truck was worth \$16,500.00 in 1996 and \$10,100.00 in 1998. When the pickup truck was worth \$500.00, Cassidy sold it.

In what year did Cassidy sell the pickup truck?

Mark your answer in the answer grid.

3. What is the greatest number in the range of the function $f(x) = 3x - 5$ when the domain is $\{-3, -2, -1, 0, 1, 2, 3\}$?

Mark your answer in the answer grid.

4. The cost of a magazine subscription increases each year by the same amount. In the first year, the cost of the subscription is \$22. In the fourth year, the cost of the subscription is \$26.50.

In how many years will the subscription cost \$34?

Mark your answer in the answer grid.

Answer Key

Content Standard 5

Sample Multiple-Choice

1. B
2. D
3. C
4. C
5. B
6. A
7. C
8. A
9. C
10. C

Sample Gridded

1. 16
2. 2001
3. 4
4. 9

ALGEBRA**Content Standard 6**

Solve multi-step linear equations, including equations requiring the use of the distributive property.

Item Type

Multiple-choice
Gridded

Additional Information

Coefficients may be simple fractions or decimals.
One or two sets of parentheses may be used.
The solution to the equation may be a fraction or a decimal.
“No solution” may be a choice.

Sample Multiple-Choice Items

1. What is the value of m in the equation below?

$$\frac{1}{2}(3m + 2) = \frac{1}{3}(5m + 10)$$

- | | | | |
|----------|------------|------------------|-----------------|
| -26 | -14 | $-\frac{14}{19}$ | $1\frac{7}{19}$ |
| A | B * | C | D |

2. What is the value of k in the equation below?

$$\frac{k + 4}{5} = 11$$

- | | | | |
|------------|----------|----------|----------|
| 51 | 35 | 12 | 2 |
| A * | B | C | D |

3. What is the value of s in the equation below?

$$0.3s + 0.8(s - 12) = 33.3$$

4.29 34 39 41.2

A **B** **C *** **D**

6. What is the value of x in the equation below?

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

A 0

B $\frac{8}{5}$

C 4 *

D No solution

4. In the equation below, what is the value of m when $k = 9$?

$$\frac{2}{3}k = 4m - 18$$

$5\frac{1}{4}$ 6 $6\frac{3}{4}$ 9

A **B *** **C** **D**

7. What is the value of t that makes the equation true?

$$\frac{13-t}{4} + 2.5 = 11$$

4.5 28.5 -8.5 -21

A **B** **C** **D ***

5. What is the value of q that makes the equation true?

$$3(q + 4) - 10q = 2q + 3$$

A 1 * **C** No solution

B 2 **D** All real numbers

8. If $\frac{1}{5}(m - 7) = 10$, what is the value of m ?

9 17 22 57

A **B** **C** **D ***

Sample Gridded Items

1. What is the value of m in the equation below?

$$2m - 3 = -m + 6$$

Mark your answer in the answer grid.

4. What is the value of y in the equation below?

$$2\left(\frac{55 - y}{3}\right) = 24$$

Mark your answer in the answer grid.

2. What is the value of x in the equation below?

$$2(x + 5) = 16 - 4x$$

Mark your answer in the answer grid.

5. What is the value of k in the equation below?

$$6(k - 2) = \frac{1}{3}(9 + 3k)$$

Mark your answer in the answer grid.

3. What is the value of g in the equation below?

$$9(g) - 13 = \frac{115}{5}$$

Mark your answer in the answer grid.

6. What value of t makes the equation below true?

$$3t = t + 24$$

Mark your answer in the answer grid.

9. What value of h makes the equation below true?

$$78 - h = 5h$$

Mark your answer in the answer grid.

7. What is the value of d in the equation $5d = 8d - 36$?

Mark your answer in the answer grid.

10. What is the value of x in the equation below?

$$2.1(x + 3) = 4x + 1.74$$

Mark your answer in the answer grid.

8. What value of y makes the equation below true?

$$7y = 4(y + 33)$$

Mark your answer in the answer grid.

11. What is the value of c in the equation below?

$$0.8(35 - c) = 16$$

Mark your answer in the answer grid.

Answer Key**Content Standard 6****Sample Multiple-Choice**

1. B
2. A
3. C
4. B
5. A
6. C
7. D
8. D

Sample Gridded

1. 3
2. 1
3. 4
4. 19
5. 3
6. 12
7. 12
8. 44
9. 13
10. 2.4 OR $2\frac{4}{10}$ OR $\frac{24}{10}$ OR $2\frac{2}{5}$ OR $\frac{12}{5}$
11. 15

GEOMETRY

Content Standard 7

Solve problems using the Pythagorean Theorem.

Item Type

Multiple-choice

Gridded

Open-ended

Additional Information

Word problems/real-life situations may be used.

Diagrams may be included.

Determining the missing leg or hypotenuse of a right triangle may be required.

Determining whether a figure is a right triangle may be required.

No radical will be included.

Extracting a perfect square root may be required.

Sample Multiple-Choice Items

1. Jamie's rectangular garden has a length of 12 feet and a width of 9 feet. What is the length of the diagonal, in feet, of the garden?

42

36

21

15

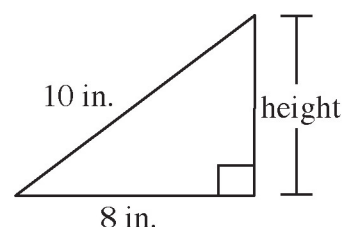
A

B

C

D *

2. Jeb built a ramp like the one pictured below.



What is the height, in inches, of Jeb's ramp?

6

12

18

36

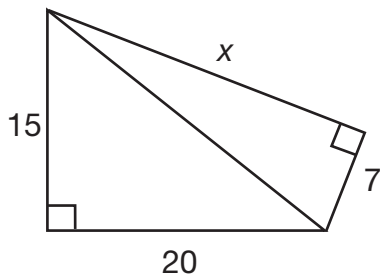
A *

B

C

D

3. What is the value of x in the diagram below?

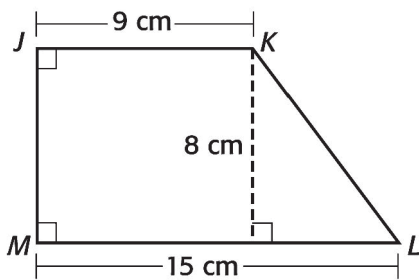


- 15 24 26 28
- A** **B *** **C** **D**

5. A right triangle has a hypotenuse measuring 15 inches and one leg measuring 9 inches. What is the length, in inches, of the other leg of the triangle?

- 3 6 10 12
- A** **B** **C** **D ***

4. Trapezoid $JKLM$ is shown below.



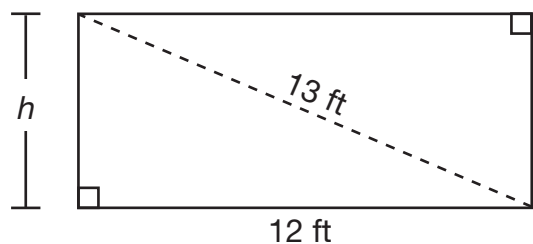
What is the length, in centimeters, of \overline{KL} ?

- 12 cm 10 cm 9 cm 6 cm
- A** **B *** **C** **D**

6. Cameron walked 8 blocks due east and then 6 blocks due north. What is the shortest distance, in blocks, from the point where Cameron started to where she ended?

- 2 9 10 14
- A** **B** **C *** **D**

7. The dimensions of a painting are shown below.

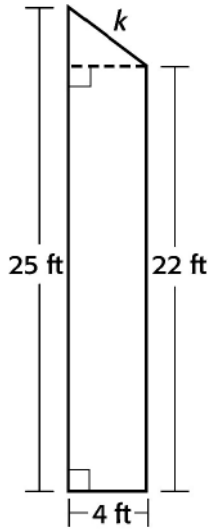


What is the height, h , of the painting, in feet?

- 1 5 6 12
- A** **B *** **C** **D**

Sample Gridded Items

1. The dimensions of a trapezoid are shown in the diagram below.



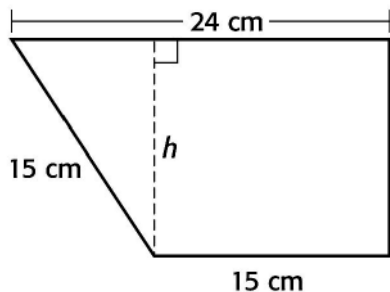
What is the length, in feet, of k ?

Mark your answer in the answer grid.

3. From the front door of his house, Darren walked 9 yards due east and 12 yards due south. What is the shortest distance, in yards, from Darren's starting point to where he stopped?

Mark your answer in the answer grid.

2. The dimensions of a trapezoid-shaped flag are shown below.



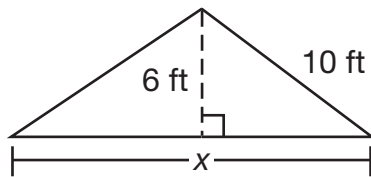
What is the length, in centimeters, of h ?

Mark your answer in the answer grid.

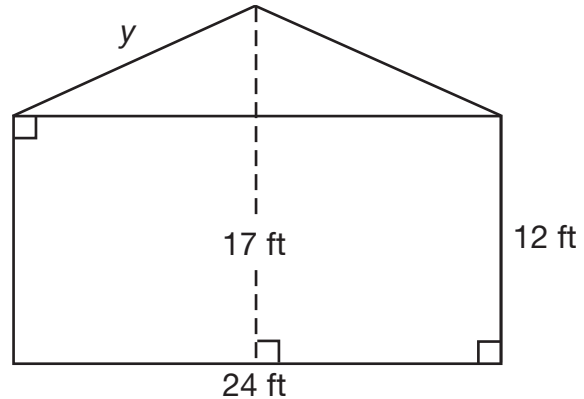
Sample Open-Ended Items

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

1. A company sells two different types of tents. The figures below represent the size and shape of the tents.



Two-person tent



Party tent

- a. For the two-person tent, the height of the tent is 6 feet, and the diagonal side of the tent is 10 feet. What is the width in feet, x , of the tent?
- b. For the party tent, the height of the tent is 17 feet, and the width of the tent is 24 feet. What is the length in feet, y , of the diagonal side of the tent?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

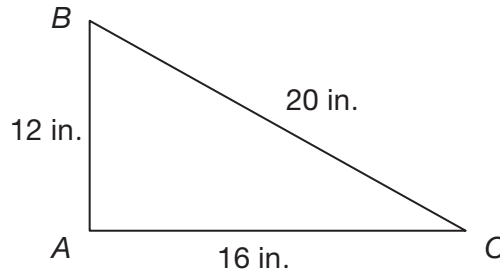
This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

2. Devon designed a sign for his company. The sign is in the shape of a triangle with side lengths of 7 feet, 9 feet, and 15 feet.
 - a. Explain how you know that Devon's sign is *not* a right triangle.
 - b. Devon wants to redesign the sign so that it is a right triangle with a hypotenuse of 15 feet. Describe the changes that Devon could make to either or both of the other two sides of the sign.
 - c. Devon wants to design a second sign that is a right triangle with a hypotenuse of 26 feet and a leg of 10 feet. What should be the length, in feet, of the other leg of Devon's second sign?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

3. Mr. Keene drew and labeled triangle ABC , shown below, on the board for his students.

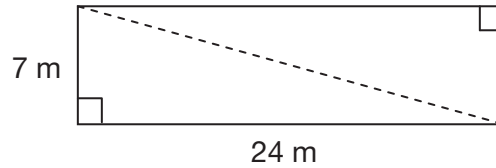


- Using the side lengths, explain why triangle ABC is a right triangle.
- Mr. Keene erased and relabeled the side lengths of triangle ABC . The new lengths were each 5 inches less than the original lengths. Explain why triangle ABC can no longer be called a right triangle.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

4. A picture of Jerome's rectangular driveway is shown below.



- What is the length, in meters, of the diagonal of Jerome's driveway?
- Heather's rectangular driveway has a diagonal of 15 meters. The length of her driveway is 12 meters. Based on these measurements, she assumes the width of her driveway is 3 meters. Explain why Heather's assumption is *not* correct.
- What is the correct width, in meters, of Heather's driveway?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

Answer Key

Content Standard 7

Sample Multiple-Choice

1. D
2. A
3. B
4. B
5. D
6. C
7. B

Sample Gridded

1. 5
2. 12
3. 15

Sample Open-Ended

(continued on next page)

1. Sample Response(s):

- a. Using the Pythagorean Theorem, $a^2 + b^2 = c^2$, $\left(\frac{x}{2}\right)^2 + 6^2 = 10^2$.

Solving for x : $x = 2(\sqrt{10^2 - 6^2}) = 2(\sqrt{100 - 36}) = 2(\sqrt{64}) = 2(8) = 16$ ft

OR

The triangle in the two-person tent is a multiple of a 3-4-5 right triangle. Twice 3 is 6, and twice 5 is 10, so twice 4 is 8; since legs from both right triangles are needed to make x , the base, then twice 8 is 16 ft.

OR

Equivalent

- b. Isolating the right triangle at the top of the “Party tent”, one has a right triangle with a hypotenuse of y , a short leg of 17 minus 12, or 5, and a long leg of 24 divided by 2, or 12.

Using the Pythagorean Theorem, $y = \sqrt{5^2 + 12^2} = \sqrt{25 + 144} = \sqrt{169} = 13$ ft.

OR

The hypotenuse, y , is of a 5-12-13 right triangle. (A common Pythagorean Triple)
Thus, $y = 13$ ft.

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	Two logics are correct. OR One logic and one or more answers are correct.
1	One or more answers to problems are correct without logic. OR One logic is correct.
0	None correct (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

2. Sample Response(s):

- a. If Devon's sign was a right triangle, then the Pythagorean Theorem would hold true and $7^2 + 9^2$ would equal 15^2 , and $49 + 81$ would equal 225, which it does *not*.
($49 + 81 = 130$)

OR

Equivalent

- b. Devon could change the side of length 7 ft to a length of 12 ft.
Then $9^2 + 12^2 = 15^2$ (or $81 + 144 = 225$) holds true.

OR

Equivalent

(Note: Accept any combination of a and b such that $a^2 + b^2 = 15^2$.)

- c. The other leg would be 24 feet because the hypotenuse squared minus one leg squared equals the other leg squared: $26^2 - 10^2 = 676 - 100 = 576$; and the square root of 576 is 24.

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	All logics are correct. OR Two logics and the answer are correct.
1	The answer is correct. OR One logic is correct.
0	None correct (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

3. Sample Response(s):

- a. Mr. Keene's triangle is a right triangle because it satisfies the Pythagorean Theorem ($a^2 + b^2 = c^2$). Specifically, $12^2 + 16^2 = 144 + 256 = 400$, which is equal to 20^2 .

OR

Equivalent

- b. The relabeled triangle has side lengths of 7 in., 11 in., and 15 in., which do *not* satisfy the Pythagorean Theorem. Specifically, $7^2 + 11^2 = 49 + 121 = 170$, which is *not* equal to 15^2 (or 225).

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	<p>All of Part a is correct.</p> <p style="text-align: center;">OR</p> <p>All of Part b is correct.</p>
1	One or two logics are partially correct.
0	None correct (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

4. Sample Response(s):

a. 25 meters ($\sqrt{7^2 + 24^2} = \sqrt{49 + 576} = \sqrt{625} = 25$)

OR

Equivalent

- b. Heather's assumption is *not* correct because, if it were correct, the dimensions she used would satisfy the Pythagorean Theorem since she has a right triangle. $a^2 + b^2 = c^2$ and $3^2 + 12^2$ would equal 15^2 , but $9 + 144 = 153$, not 225.

OR

In any triangle, it is always true that the length of each side is less than the sum of the lengths of the other two sides. 15 is *not* less than $3 + 12$, so the width *cannot* be 3 meters.

OR

Equivalent

c. $a^2 = c^2 - b^2 = 15^2 - 12^2 = 225 - 144 = 81$, so $a = \sqrt{81} = 9$ meters

OR

Heather has a triangle that is a multiple of a 3-4-5 right triangle. 12 is 3×4 and 15 is 3×5 so the width would be $3 \times 3 = 9$ meters.

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	Three logics are correct. OR All of Part a and all of Part c are correct. OR All of Part b is correct and correct answers for Part a and Part c.
1	One or more answers to problems are correct without logic. OR One logic is correct.
0	None correct (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

GEOMETRY**Content Standard 8**

Compare quadrilaterals, triangles, and solids using their properties and characteristics.

Item Type

Multiple-choice

Additional Information

Identifying the properties and characteristics of all types of quadrilaterals, triangles, and solids will be required.

Identifying the relationships between types of quadrilaterals, triangles, and solids will be required.

Sample Multiple-Choice Items

1. Which of the following statements about quadrilaterals is *always* true?

- A** All parallelograms are similar.
- B** All squares are rhombuses. *
- C** All rectangles are congruent.
- D** All trapezoids are parallelograms.

2. How much greater is the sum of the interior angles of a rhombus than the sum of the interior angles of a right triangle?

- | | | | |
|----------|----------|----------|------------|
| 0° | 45° | 90° | 180° |
| A | B | C | D * |

3. Which figure below does *not* have at least 1 rectangular face?

- A** Triangular pyramid *
- B** Triangular prism
- C** Square pyramid
- D** Pentagonal prism

4. If the base angles of two isosceles triangles are congruent, which statement is *always* true?

- A** The triangles are right triangles.
- B** The triangles are congruent.
- C** The triangles are equilateral.
- D** The triangles are similar. *

5. Which of these statements about triangles is *not* true?

- A** An isosceles triangle can also be a right triangle.
- B** An acute triangle can also be an equilateral triangle.
- C** A right triangle can also be an obtuse triangle. *
- D** An obtuse triangle can also be an isosceles triangle.

6. The measure of the side of rhombus $GHIJ$ is equal to the measure of the side of square $RSTU$. Which statement about the two quadrilaterals must be true?

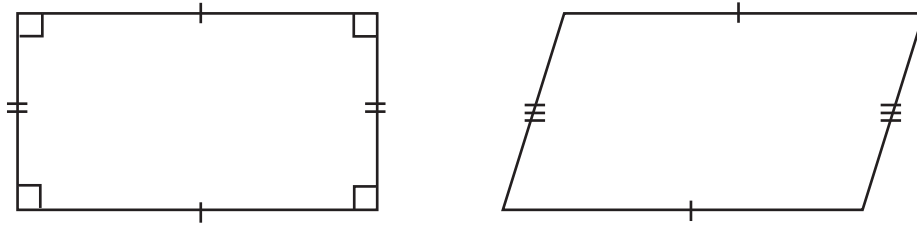
- A** Their angle measures are equal.
- B** Their diagonal measures are equal.
- C** Their areas are equal in measure.
- D** Their perimeters are equal. *

7. The perimeters of an equilateral triangle and a square are the same.

Which is *always* true about the length of a side of the triangle and the length of a side of the square?

- A** The length of a side of the triangle is equal to the length of a side of the square.
- B** The length of a side of the triangle is less than the length of a side of the square.
- C** The length of a side of the triangle is two times the length of a side of the square.
- D** The length of a side of the triangle is greater than the length of a side of the square. *

8. The rectangle and parallelogram shown below have the same base and height.



Which statement about the two quadrilaterals must be true?

- A** Their areas are equal. *
- B** Their perimeters are equal.
- C** They both have 4 congruent sides.
- D** They both have the same number of lines of symmetry.

9. Which special quadrilateral could be constructed with the side lengths shown below?



- A** Rhombus
- B** Rectangle
- C** Parallelogram
- D** Isosceles trapezoid *

10. Which describes a geometric solid with *exactly* 5 faces, 9 edges, and 6 vertices?

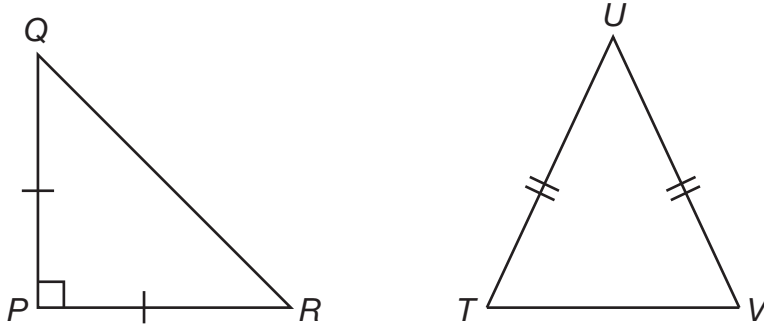
- A** Triangular pyramid
- B** Rectangular pyramid
- C** Triangular prism *
- D** Rectangular prism

11. Drew has a sticker in the shape of a quadrilateral with *exactly* 2 right angles, *exactly* 1 pair of parallel sides, and no sides that are the same length.

What is the shape of Drew's sticker?

- A** Rhombus
- B** Trapezoid *
- C** Rectangle
- D** Parallelogram

12. Two isosceles triangles are shown below. The measure of angle U is 50° .



What is the sum of the measures of angle T and angle R ?

- A** 65°
- B** 95°
- C** 110° *
- D** 155°

Answer Key

Content Standard 8

Sample Multiple-Choice

1. B
2. D
3. A
4. D
5. C
6. D
7. D
8. A
9. D
10. C
11. B
12. C

MEASUREMENT**Content Standard 9**

Determine the measures of special angle pairs, including adjacent, vertical, supplementary, and complementary angles, and angles formed by parallel lines cut by a transversal.

Item Type

Multiple-choice
Gridded

Additional Information

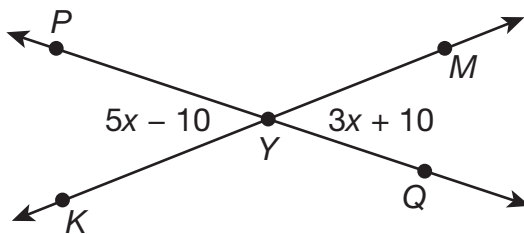
Diagrams may be included.

Knowledge of the sum of angles may be required.

Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.

Sample Multiple-Choice Items

1. In the figure below, \overleftrightarrow{KM} and \overleftrightarrow{PQ} intersect at Y as shown.



What is the measure of $\angle KYQ$?

280°

145°

140°

72.5°

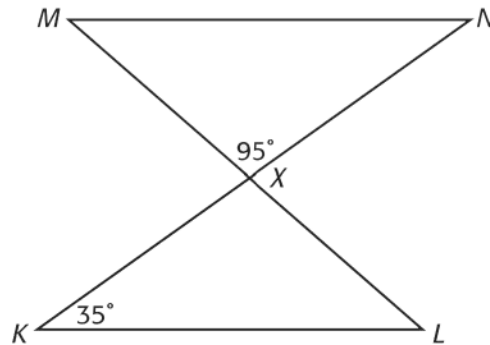
A

B

C *

D

2. In the figure below, $\overline{MN} \parallel \overline{KL}$ and are intersected by transversals \overline{ML} and \overline{KN} .



What is the measure of $\angle XMN$?

130°

A

85°

B

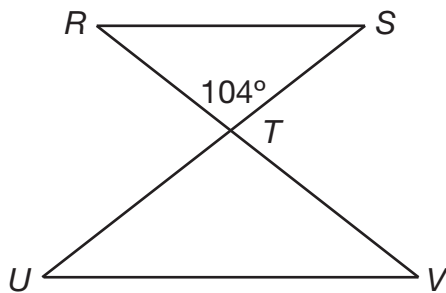
55°

C

50°

D *

3. In the figure below, $\overline{RS} \parallel \overline{UV}$ and $\angle RST$ is congruent to $\angle SRT$.



What is the measure of $\angle TUV$?

14°

A

38°

B *

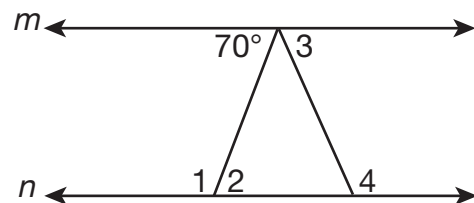
76°

C

104°

D

4. In the figure below, m and n are parallel lines.



Which angle in the figure must have a measure of 70°?

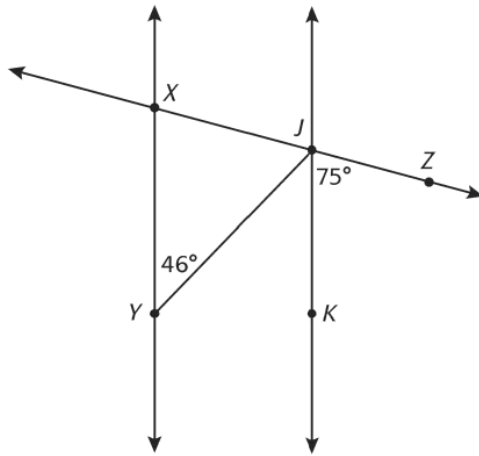
A $\angle 1$

B $\angle 2 *$

C $\angle 3$

D $\angle 4$

5. In the figure below, $\overleftrightarrow{XY} \parallel \overleftrightarrow{JK}$ and are cut by transversals \overleftrightarrow{XZ} and \overleftrightarrow{YJ} to form the angles shown.



If $\angle XYJ = 46^\circ$ and $\angle KJZ = 75^\circ$, what is the measure of $\angle ZJY$?

134°

A

121°

B *

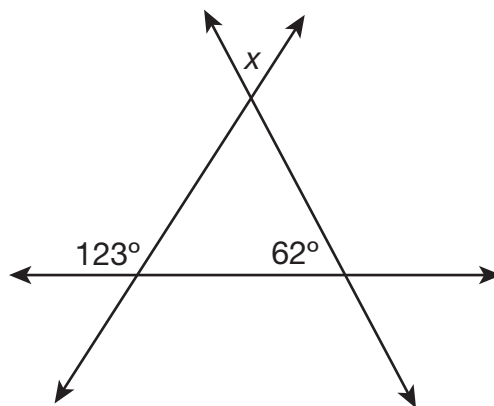
75°

C

46°

D

6. In the figure shown below, what is the measure of angle x ?



57°

A

61°

B *

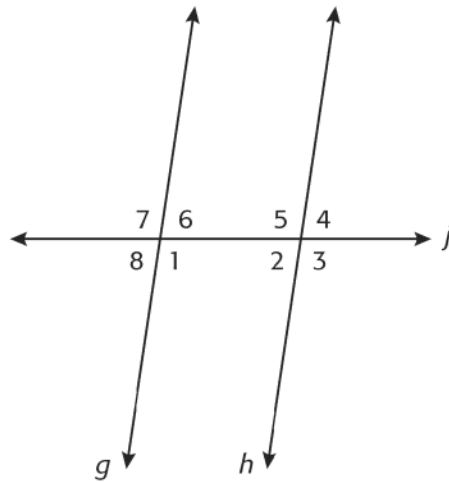
62°

C

118°

D

7. In the figure below, lines g and h are parallel and are cut by transversal j to form the angles shown.



If the measure of $\angle 8$ is 82° , what is the measure of $\angle 4$?

180°

98°

82°

8°

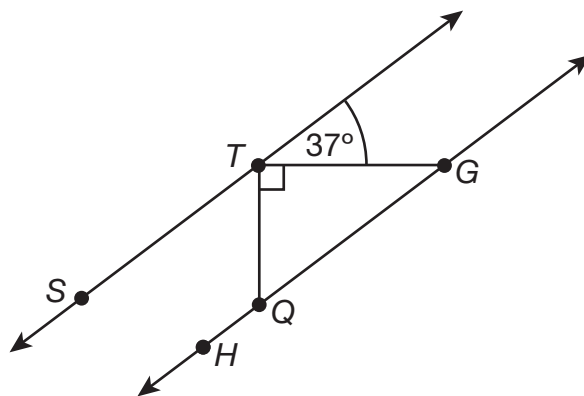
A

B

C *

D

8. In the figure below, $\overleftrightarrow{ST} \parallel \overleftrightarrow{QG}$ and are intersected by transversals \overline{TQ} and \overline{TG} as shown.



What is the measure of $\angle TQH$?

37°

53°

127°

143°

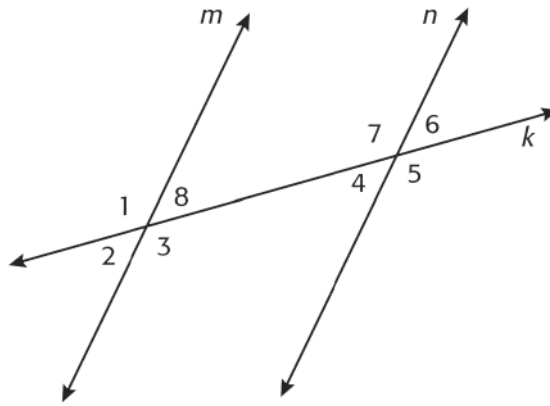
A

B

C *

D

9. In the figure below, lines m and n are parallel and are cut by transversal k to form the angles shown.



If the measure of $\angle 8$ is 28° , what is the measure of $\angle 5$?

152°

118°

62°

56°

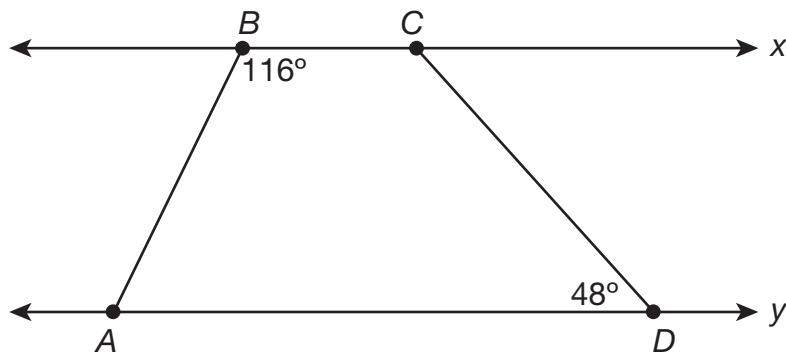
A *

B

C

D

10. The figure below shows trapezoid $ABCD$ between parallel lines x and y .



What is the measure of angle BCD ?

48°

64°

116°

132°

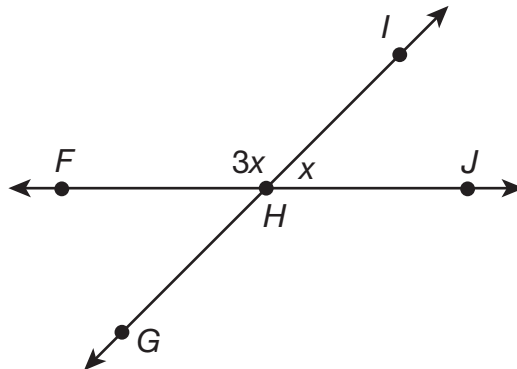
A

B

C

D *

11. In the figure below, \overleftrightarrow{FJ} and \overleftrightarrow{GI} intersect at H to form the angles shown.



What is the measure of $\angle FHI$?

45°

90°

135°

180°

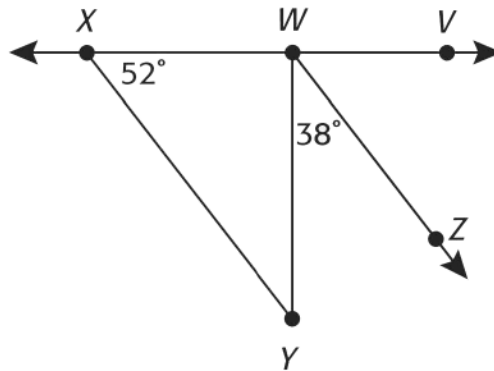
A

B

C *

D

12. In the figure below, $\overline{XY} \parallel \overline{WZ}$ and are cut by transversals \overline{XV} and \overline{YW} .



What is the measure of $\angle VWZ$?

90°

52°

38°

14°

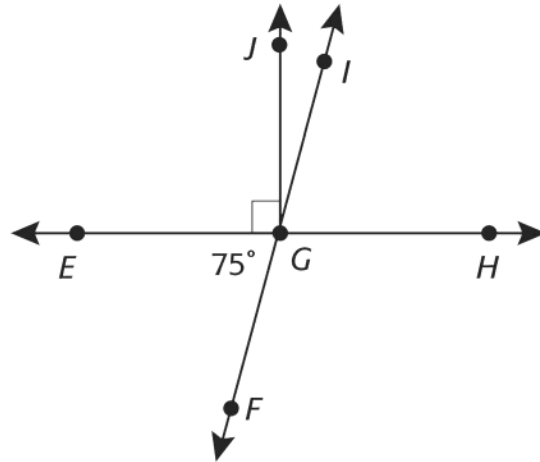
A

B *

C

D

13. In the figure below, $\overleftrightarrow{EH} \perp \overleftrightarrow{GJ}$ and \overleftrightarrow{FI} intersects \overleftrightarrow{EH} at G as shown below.



What is the measure of $\angle JGI$?

105°

A

90°

B

75°

C

15°

D *

14. Angle R and angle P are vertical angles. The measure of angle R is 43° .

What is the measure of angle P ?

43°

A *

47°

B

133°

C

137°

D

15. What is the measure of the angle that is supplementary to a 55° angle?

35°

A

55°

B

125°

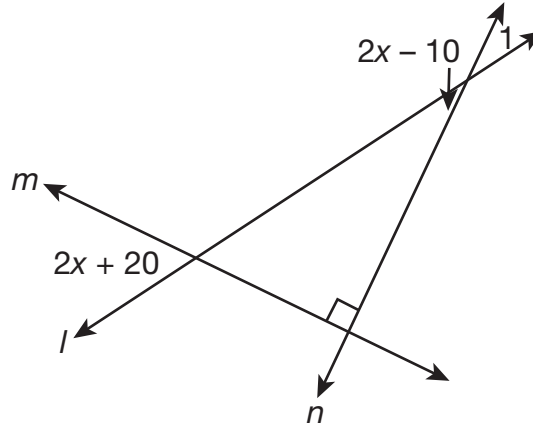
C *

305°

D

Sample Gridded Items

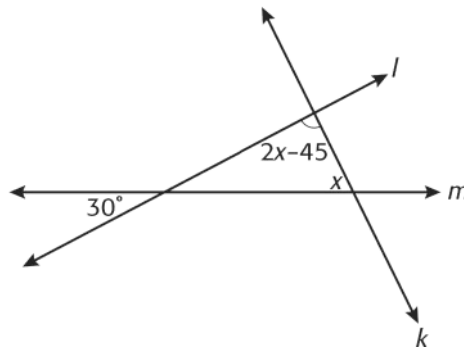
1. In the figure below, lines l , m , and n intersect to form the angles shown.



What is the measure, in degrees, of angle 1?

Mark your answer in the answer grid.

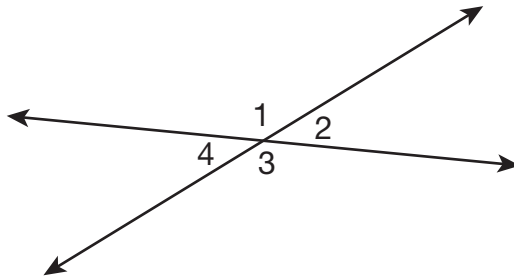
2. In the figure below, lines l , m , and k intersect as shown.



What is the value, in degrees, of x ?

Mark your answer in the answer grid.

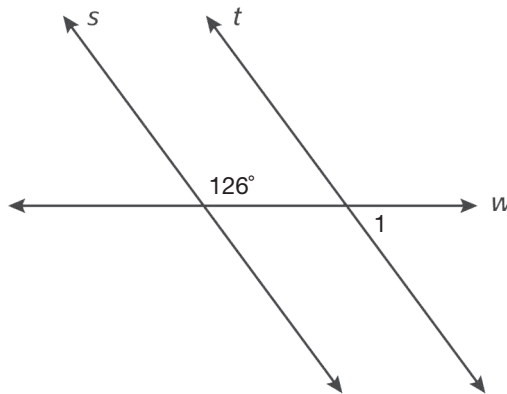
3. In the figure shown below, two lines intersect to form the angles shown, and the measures of $\angle 1$, $\angle 2$, and $\angle 3$ add up to 323° .



What is the measure, in degrees, of $\angle 1$?

Mark your answer in the answer grid.

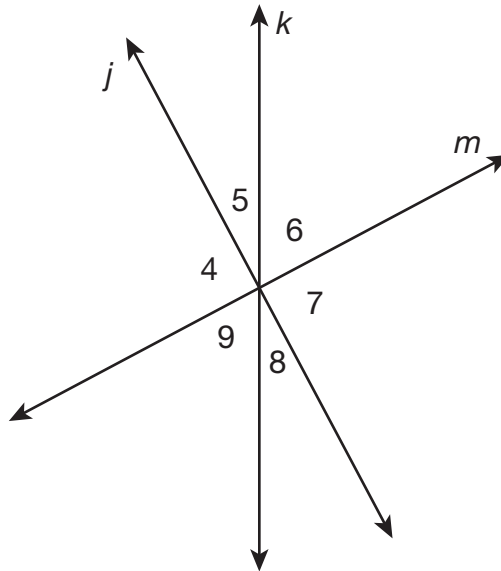
4. In the figure below, lines s and t are parallel to one another and are both intersected by transversal w .



What is the measure, in degrees, of angle 1?

Mark your answer in the answer grid.

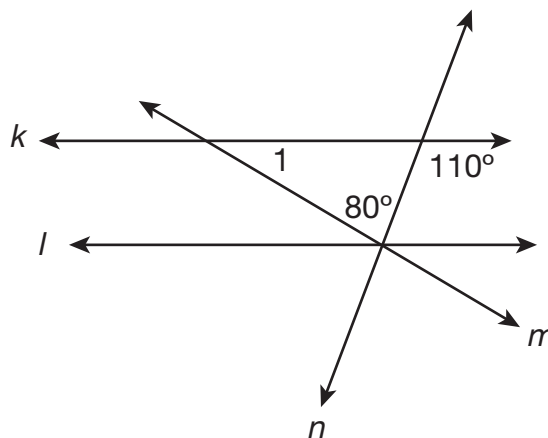
5. In the figure below, lines j , k , and m intersect and form the angles shown.



If $m\angle 5 = 28^\circ$ and $\angle 8$ and $\angle 9$ are complementary, what is the measure, in degrees, of $\angle 9$?

Mark your answer in the answer grid.

6. In the figure below, lines k and l are parallel.



What is the measure, in degrees, of angle 1?

Mark your answer in the answer grid.

Answer Key

Content Standard 9

Sample Multiple-Choice

1. C
2. D
3. B
4. B
5. B
6. B
7. C
8. C
9. A
10. D
11. C
12. B
13. D
14. A
15. C

Sample Gridded

1. 30
2. 65
3. 143
4. 54
5. 62
6. 30

MEASUREMENT**Content Standard 10**

Find the perimeter and area of regular and irregular plane figures.

Item Type

Multiple-choice

Gridded

Additional Information

Determining the area of a figure when given the perimeter of the figure may be required.

Word problems may be used.

Drawings may be used.

Determining the area of a part of a circle may be required.

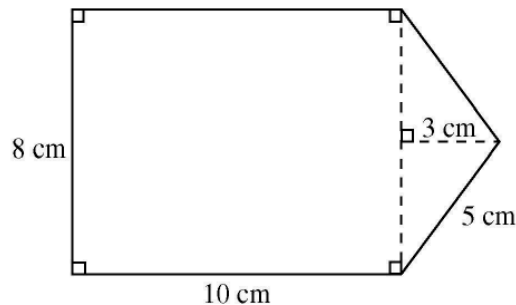
Options may be left in terms of π .

Unnecessary dimensions may be given.

Inscribed figures may be used.

Sample Multiple-Choice Items

1. What is the area of the figure below?



38 sq cm

A

80 sq cm

B

92 sq cm

C *

104 sq cm

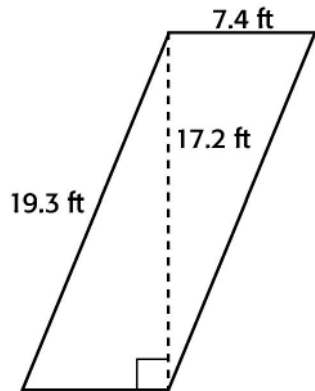
D

2. The radius of a certain wheel is 7 inches.

Which of the following is *closest* to the circumference of the wheel?

- A** 10.99 inches **C** 21.98 inches
B 14.21 inches **D** 43.96 inches *

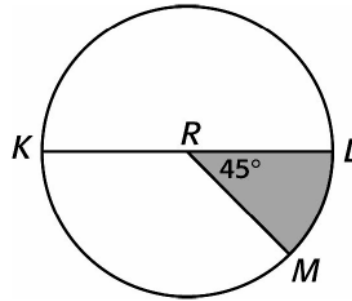
3. What is the perimeter, in feet, of the parallelogram below?



- 142.82 70.6 53.4 43.9

- A** **B** **C** * **D**

4. Points K , L , and M all lie on circle R .

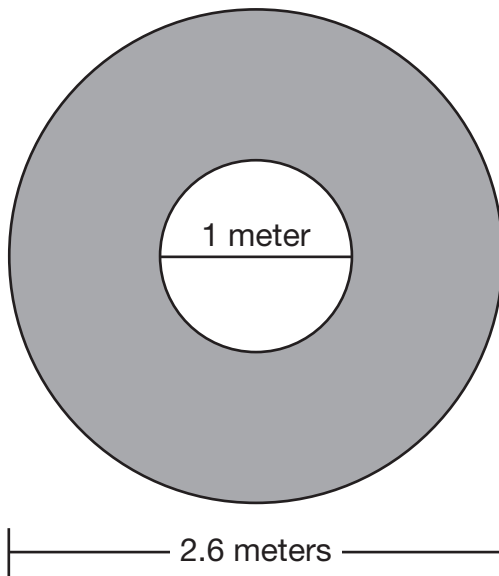


The radius of circle R is 4 centimeters. What is the area, in square centimeters, of the shaded region of the circle?

- 2π 4π 12π 16π

- A** * **B** **C** **D**

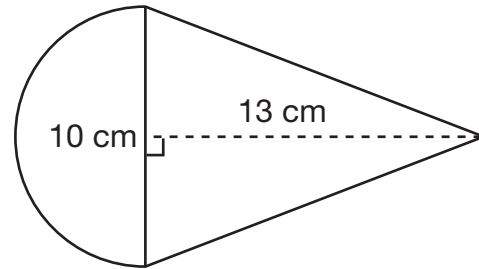
5. The figure below shows a painted ring on a basketball court.



Which is *closest* to the area, in square meters, of the painted ring?

- A** 1.44
B 2.51
C 4.52 *
D 5.02

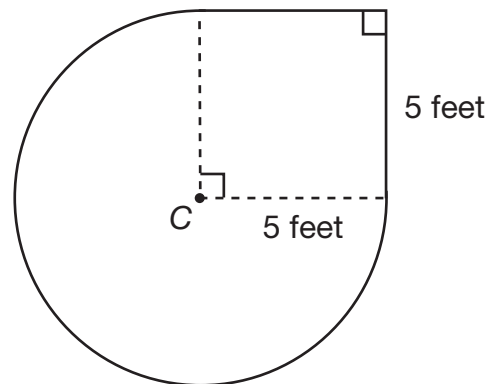
6. Aaron's sticker is made up of a semicircle and a triangle, as shown in the figure below.



Which is *closest* to the area, in square centimeters, of the sticker?

- 104 144 169 209
A * **B** **C** **D**

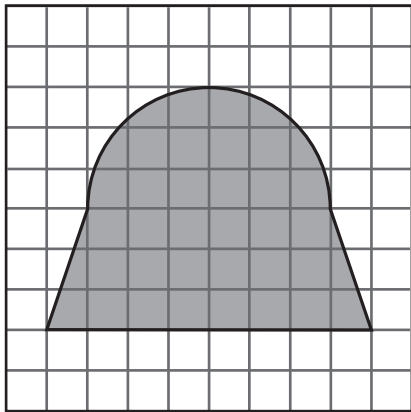
7. Mr. O'Neill bought a rug in the shape shown below. Point C is the center of the circle.



Which is *closest* to the area, in square feet, of the rug?

- 79 84 104 130
A **B** * **C** **D**

8. Which is *closest* to the area, in square units, of the figure shown below?



35.13

38.13

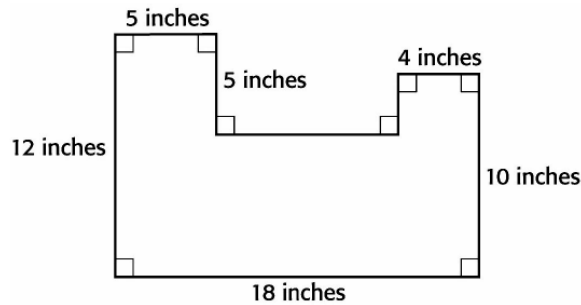
49.26

52.26

A ***B****C****D**

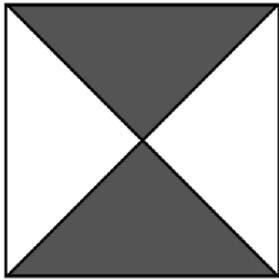
Sample Gridded Items

1. Find the area, in square inches, of the figure shown below.



Mark your answer in the answer grid.

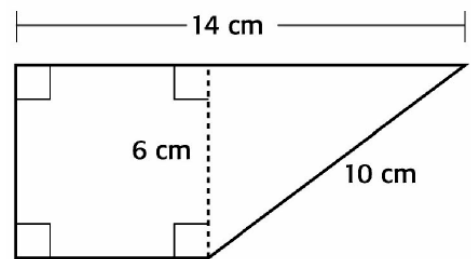
2. The figure below shows two shaded isosceles triangles in a square. The square has a perimeter of 32 inches.



What is the area, in square inches, of the two shaded isosceles triangles in the square?

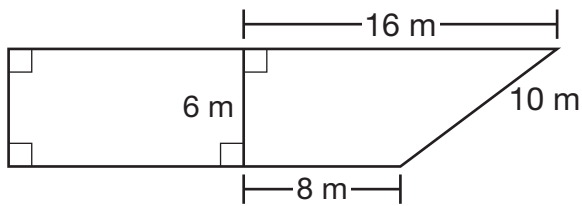
Mark your answer in the answer grid.

3. The trapezoid shown below has an area of 60 square centimeters. What is the perimeter, in centimeters, of the trapezoid?



Mark your answer in the answer grid.

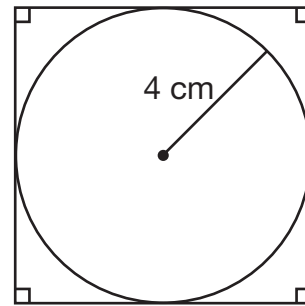
4. In the figure below, the rectangle and the trapezoid have the same area.



What is the perimeter, in meters, of the entire shape?

Mark your answer in the answer grid.

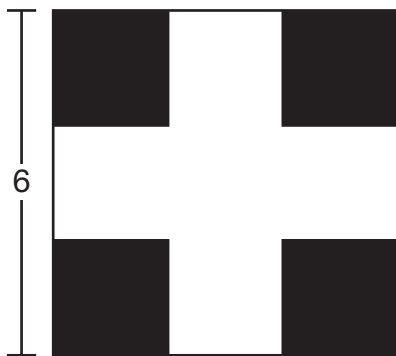
6. In the figure below, the circle is inscribed inside the square.



What is the area, in square centimeters, of the square?

Mark your answer in the answer grid.

5. The figure below shows 4 identical shaded squares inside a larger square with a side length of 6 units. The area of the larger square is 9 times the area of each shaded square.



What is the total perimeter, in units, of all the shaded squares *combined*?

Mark your answer in the answer grid.

Answer Key

Content Standard 10

Sample Multiple-Choice

1. C
2. D
3. C
4. A
5. C
6. A
7. B
8. A

Sample Gridded

1. 163
2. 32
3. 36
4. 64
5. 32
6. 64

MEASUREMENT**Content Standard 11**

Determine the surface area and volume of rectangular prisms, cylinders, and pyramids.

Item Type

Multiple-choice

Open-ended

Additional Information

Word problems/real-life situations may be used.

Drawings may be used.

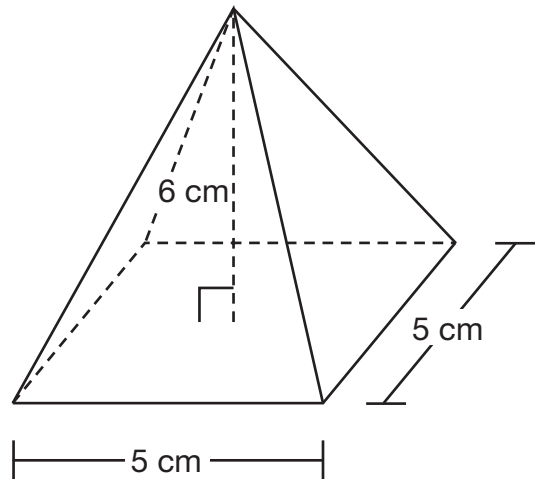
A fractional representation of a real number may be used.

Sample Multiple-Choice Items

1. What is the effect on the volume of a right cylinder if its radius is tripled?

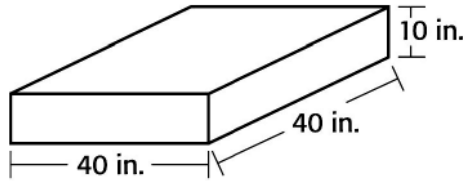
- A** The volume is 3 times greater.
- B** The volume is 6 times greater.
- C** The volume is 9 times greater. *
- D** The volume is 12 times greater.

2. What is the volume, in cubic centimeters, of the square pyramid shown below?



- | | | | |
|------------|----------|----------|----------|
| 50 | 60 | 75 | 150 |
| A * | B | C | D |

3. Marshall has a sandbox in the shape of a square prism, as shown below. The height of the sandbox is 10 inches.



If Marshall fills the sandbox with sand to a level height of 8 inches, what number of cubic inches of sand will be in the sandbox?

16,000 12,800 3,200 2,560

A **B *** **C** **D**

4. A planter box in the shape of a rectangular prism has a length of 4 feet, a height of $1\frac{1}{2}$ feet, and a width of 3 feet.

If the dirt level in the planter box is $\frac{1}{4}$ foot from the top, what is the number of cubic feet of dirt in the planter box?

3 8 12 15

A **B** **C** **D ***

5. Jennifer stores her fishing pole in a cylindrical case. The cylinder has a diameter of 5 inches and a height of 50 inches.

Which is *closest* to the volume, in cubic inches, of the cylinder?

A 824.25
B 981.25 *
C 1,727.00
D 3,925.00

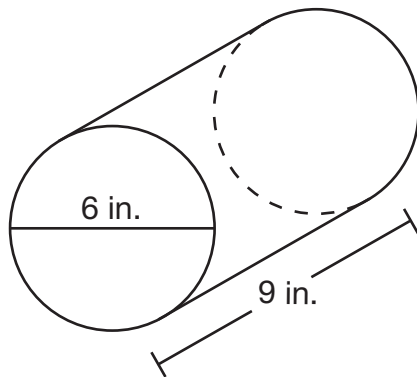
6. A solid block with dimensions of 4 centimeters by 4.5 centimeters by 5 centimeters is placed inside a rectangular prism.

If the prism is 7 centimeters by 5 centimeters by 6 centimeters, what is the volume, in cubic centimeters, of the space *not* occupied by the solid block?

80 90 120 210

A **B** **C *** **D**

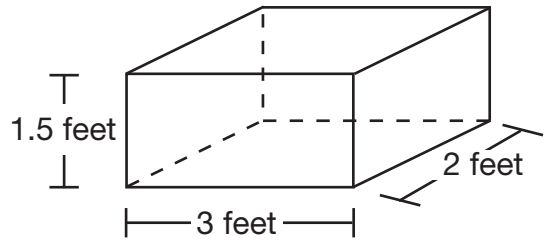
7. Darius is decorating the cylinder shown below.



Which is *closest* to the surface area, in square inches, of the cylinder?

- A** 197.82
B 226.08 *
C 254.34
D 365.20

9. Jayden painted the rectangular prism shown below.



What is the surface area, in square feet, of the prism?

- 6.5 9 13.5 27
A **B** **C** **D** *

8. The box for Bryan's frozen meal is in the shape of a rectangular prism. It is 12 centimeters wide, 18 centimeters long, and 4 centimeters high.

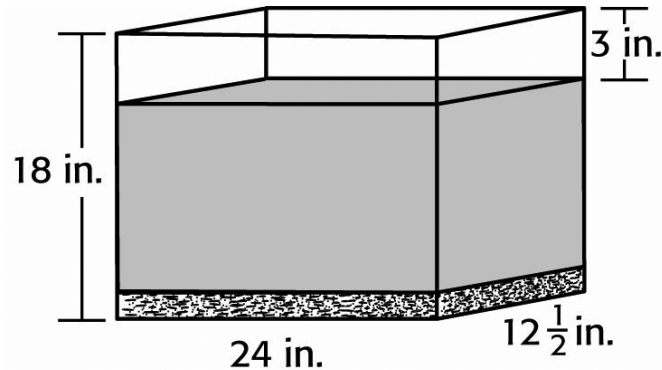
What is the surface area, in square centimeters, of the box?

- 204 336 672 864
A **B** **C** * **D**

Sample Open-Ended Items

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

1. Yolanda bought a fish tank in the shape of a right rectangular prism like the one pictured below.

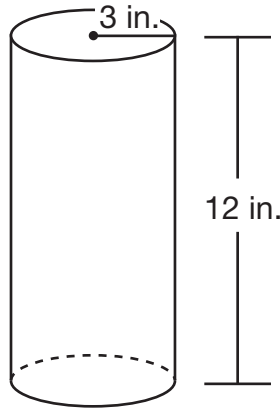


- a. Yolanda wants to put 2 inches of sand evenly in the bottom of the tank. What is the volume of the sand Yolanda will put in her fish tank?
- b. After Yolanda puts 2 inches of sand in the bottom of the fish tank, she will put water in the tank, leaving 3 inches of space at the top. What is the volume of the water Yolanda will put into her fish tank?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

2. The drawing shown below represents the cylindrical container a company uses to package a game.



- What is the volume of the cylinder?
- The lateral surface of the container will be covered with a label. The circular bases will not be covered with the label. What is the *least* area of a label that will cover the lateral surface of the container?
- The company is also making a larger version of the game. It will be packaged in a cylinder with the same height as the original, but the radius will be doubled. How many times greater will the volume of the larger cylinder be compared to the original cylinder?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

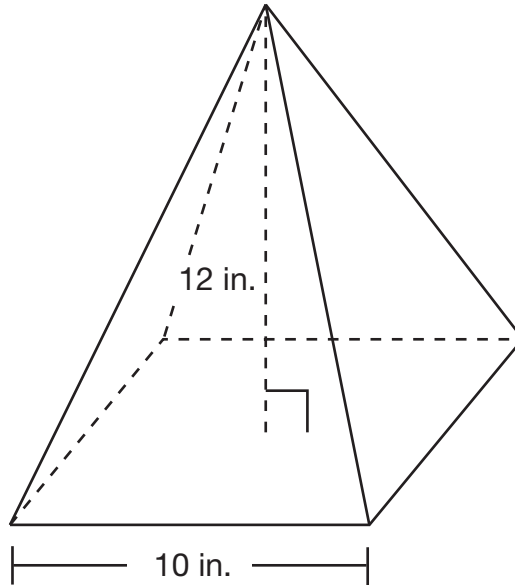
This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

3. A puzzle comes in a plastic package in the shape of a rectangular prism. The base of the rectangular prism is a square with side lengths of 5 inches. The package has a height of 2 inches.
- The company that makes the puzzle needs to know the surface area of the package to find the amount of plastic that is needed. What is the surface area of the package?
 - What is the volume of the package?
 - The puzzle also will come in a package in the shape of a square pyramid. The square pyramid package will have the same base as that of the rectangular prism package. It will also have the same volume as the rectangular prism. What will be the height of the square pyramid package?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

4. Hannah is building a model of a square pyramid as shown below.



- The base of the pyramid is a square that measures 10 inches on a side. What is the area of the base in square inches?
- Hannah decides to build the model out of clay. What is the volume of clay, in cubic inches, needed to build the model?
- Hannah will put her model in a box in the shape of a rectangular prism. The box has the same dimensions for the base and the same height as the square pyramid. How many times greater is the volume of the box than the square pyramid?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

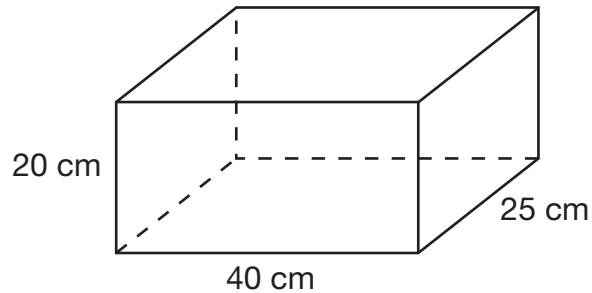
This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

5. Mrs. Grimes is planning to paint the four walls of her classroom. Some information about the classroom is given below.
- The four walls are each 8 feet high.
 - The floor is rectangular and is 40 feet long and 30 feet wide.
 - There is one door that is 3 feet wide and 7 feet high.
 - There are 3 windows that are each 3 feet wide and 4 feet high.
- a. What is the total surface area of the four walls, *including* the door and the windows?
- b. One can of paint covers 450 square feet. If Mrs. Grimes does not paint the door or the windows, what is the minimum number of cans of paint she will need?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

6. Jeremy stores his autographed football in a rectangular prism-shaped container like the one shown below.



- What is the surface area of the football container?
- What is the volume of the football container?
- Jeremy also has an autographed basketball in the shape of a sphere with a diameter of 24 cm. He wants to buy a rectangular prism-shaped container for the basketball with 1.5 times the volume of the football container. Draw or describe a possible container that will hold Jeremy's basketball. Include the lengths of the edges of the container.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

Answer Key

Content Standard 11

Sample Multiple-Choice

1. C
2. A
3. B
4. D
5. B
6. C
7. B
8. C
9. D

Sample Open-Ended**1. Sample Response(s):**

a. $2 \times 24 \times 12.5 = 600$ cubic inches

OR

I used my calculator to multiply the 2, 24, and 12.5 to get 600 cubic inches.

OR

To find out how many cubic inches of sand Yolanda wants to put in the bottom of the fish tank, she needs to multiply the length and width of the fish tank (24×12.5), and then multiply that answer by 2. So the volume of sand Yolanda will put in her fish tank is 600 cubic centimeters.

OR

Equivalent

- b. The height of the fish tank is 18 inches. Take away 2 inches from the height for the sand and take away 3 inches off the height for the space at the top. ($18 - 2 - 3 = 13$). To find the volume of water Yolanda will put into the fish tank, the length times the width times the height needs to be calculated. ($24 \times 12.5 \times 13$). The volume of water Yolanda will put into the fish tank is 3,900 cubic inches.
(Note: If the student allows for absorption of water into the sand, credit will be given.)

OR

$$24 \times 12.5(18 - 2 - 3) = 24 \times 12.5 \times 13 = 3,900 \text{ cubic inches}$$

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	Logics only are correct.
1	Both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

2. Sample Response(s):

a. $V = \pi r^2 h = \pi \times 3 \times 3 \times 12 = 108\pi$ or $108 \times 3.14 = 339.12$ cubic inches

OR

Equivalent

b. $Lateral\ surface\ area = 2\pi rh = 2 \times \pi \times 3 \times 12 = 72\pi$ or $72 \times 3.14 = 226.08$ square inches

OR

Equivalent

c. $V_{Large} = \pi r^2 h = \pi \times 6 \times 6 \times 12 = 432\pi$ and $\frac{432\pi}{108\pi} = 4$ times greater

OR

$$\frac{V_{Larger}}{V_{Original}} = \frac{\pi(2r)^2 h}{\pi r^2 h} = \frac{4r^2}{1r^2} = 4$$

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	All three logics are correct. OR Two correct logics and correct answers for one or more problems. OR One logic and all three answers to problems are correct.
1	One or more answers to problems are correct without logic. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

3. Sample Response(s):

a. $S.A. = 2(wh + lh + lw) = 2([5 \times 2] + [5 \times 2] + [5 \times 5]) = 2(10 + 10 + 25)$
 $= 2(45) = 90$ square inches

OR

Equivalent

b. $V = lwh = 5 \times 5 \times 2 = 50$ cubic inches

OR

Equivalent

c. $V = Bh \div 3$ and solve for $h = \frac{3V}{B} = (3 \times 50) \div (5 \times 5) = 150 \div 25 = 6$ in.

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	All logics are correct. OR Two logics and correct answers for one or more problems. OR One logic and all answers are correct
1	One or more answers to problems are correct without logic. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

4. Sample Response(s):

a. $A = s^2 = 10^2 = 100 \text{ sq.in.}$

OR

Equivalent

b. $V = \frac{1}{3} Bh = \frac{1}{3} \times 100 \times 12 = 400 \text{ cu.in.}$

OR

Equivalent

c. $V = Bh = 100 \times 12 = 1,200$ and 1,200 is 3 times 400. Thus, the volume of the box is three times greater than the volume of the square pyramid.

OR

$$\frac{V_{RP}}{V_{SP}} = \frac{Bh}{\frac{1}{3}Bh} = \frac{1}{\frac{1}{3}} = 3 \text{ times}$$

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	<p>All three logics are correct.</p> <p>OR</p> <p>Two correct logics and correct answers for one or more problems.</p> <p>OR</p> <p>One logic and all three answers to problems are correct.</p>
1	<p>One or more answers to problems are correct without logic.</p> <p>OR</p> <p>One logic is correct.</p>
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

5. Sample Response(s):

- a. Surface area is $2 \times 8 \times 40 = 640$ square feet for 2 walls and $2 \times 8 \times 30 = 480$ for the other two walls. The total square footage is $640 + 480 = 1,120$ square feet.

OR

The surface area of the four walls is $2(8 \times 40) + 2(8 \times 30)$.
 $2(320) + 2(240) = 640 + 480 = 1,120$ square feet.

OR

I used my calculator and formula for surface area to find the total surface area of the four walls. In my calculator I entered 8×40 and then multiplied that answer by 2 for a total of 640. Then I entered 8×30 and multiplied that answer by 2 for a total of 480. I then added 640 and 480 to get a total surface area of 1,120 square feet.

- b. $1,120 - 3 \times 7 - 3 \times 3 \times 4 = 1,120 - 21 - 36 = 1,063$; $1,063 \div 450 = 2.36$;
 3 cans minimum.

OR

Since the total surface area of the four walls is 1,120, I need to subtract out the area of the door and the windows. $(1,120 - (3 \times 7) - 3(3 \times 4)) = 1,120 - 21 - 36 = 1,063$. The total square footage is 1,063. Since one can of paint covers 450 square feet, I will divide the two numbers ($1,063 \div 450 = 2.36$). Since you have to buy the paint in whole cans, Mrs. Grimes will need 3 cans of paint.

OR

I used my calculator. I took my answer from **part a** and subtracted the area of the door and windows. That gave me an answer of 1,063 square feet. Since one can covers 450, I divided those two numbers and got a decimal of 2.36. So she will need 3 cans of paint.

Score Point	Response Attributes
3	All is correct.
2	The logics are correct. <div style="text-align: center;">OR</div> One logic is correct, and the answers to one or two problems are correct.
1	Error in logic and the answer to two problems are correct. <div style="text-align: center;">OR</div> No logic and the answer to one or two problems are correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

6. Sample Response(s):

a. $S.A. = 2(wh + lw + lh) = 2([25 \times 20] + [40 \times 25] + [40 \times 20]) =$
 $2(500 + 1,000 + 800) = 2(2,300) = 4,600$ square centimeters

OR

Equivalent

b. $V = lwh = 40 \times 25 \times 20 = 20,000$ cubic centimeters

OR

Equivalent

c. $20,000 \times 1.5 = 30,000 = lwh$, and if the basketball container was a cube, the edge of the cube would be $\sqrt[3]{30,000} \approx 31$ centimeters on each edge, which would be enough to hold the basketball (with a diameter of 24 centimeters).

OR

The height (20 cm) can be multiplied by 1.5 (increasing the height to 30 cm) while the other two dimensions remain the same: $40 \times 25 \times 30 = 30,000$ and each edge is at least 24 centimeters, so the container will hold the basketball.

OR

Equivalent description and/or drawing

Score Point	Response Attributes
3	All is correct.
2	All logics are correct. OR Two logics and one or more answers are correct. OR One logic and all answers are correct.
1	One or more answers to problems are correct without logic. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

MEASUREMENT**Content Standard 12**

Determine the lengths of missing sides and measures of angles in similar and congruent figures.

Item Type

Multiple-choice
Gridded

Additional Information

Diagrams may be included.

Fraction or decimal representation of a real number may be used.

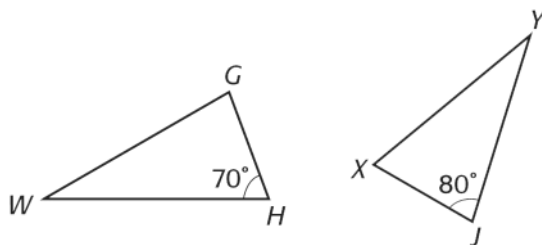
Determining the measurements of sides when the measurements of the sides are expressed as algebraic expressions may be required.

Inscribed figures may be used.

Reflected figures may be used.

Sample Multiple-Choice Items

1. Triangle GHW is similar to triangle JXY .



If $\angle WHG$ is 70° and $\angle XJY$ is 80° , what is the measure of $\angle GWH$?

10°

30°

140°

150°

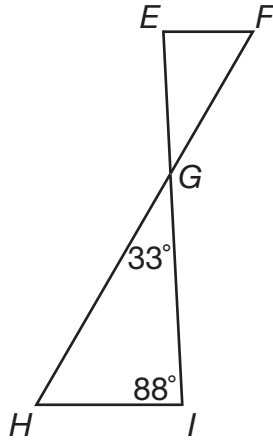
A

B *

C

D

2. Triangle EFG is similar to triangle IHG in the figure shown below.

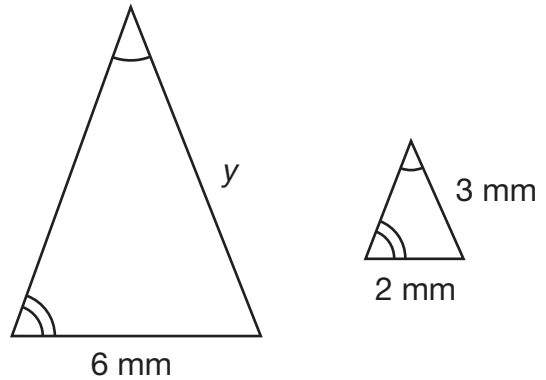


What is the measure of angle EFG ?

33° 55° 59° 88°

A **B** **C *** **D**

3. Two similar triangles are shown in the figure below.



What is the value of y in millimeters?

4 7 9 18

A **B** **C *** **D**

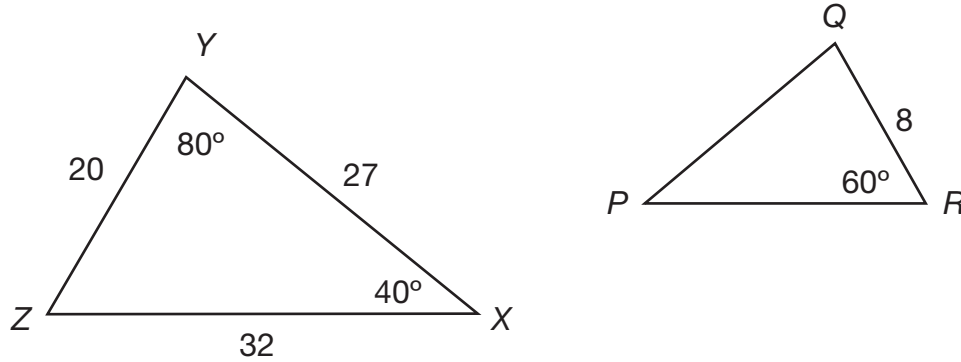
4. Manny wants to proportionally enlarge a rectangular window that has a length of 36 inches and a width of 24.5 inches.

If Manny enlarges the length of the window to 54 inches, what should be the width of the window?

A 79.0 inches **C** 36.75 inches *

B 42.5 inches **D** 24.5 inches

5. In the figures below, triangle PQR is similar to triangle XYZ .



What is the length, in units, of \overline{PR} ?

5

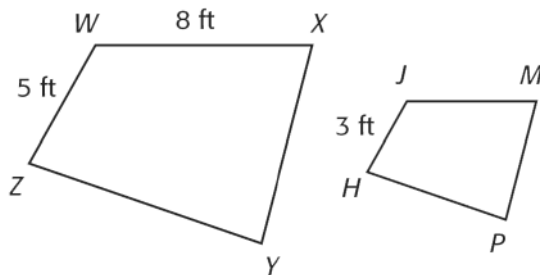
6.75

12.8

20

A**B****C *****D**

6. Quadrilateral $WXYZ$ is similar to quadrilateral $JMPH$.



What is the length, in feet, of \overline{JM} ?

1.875

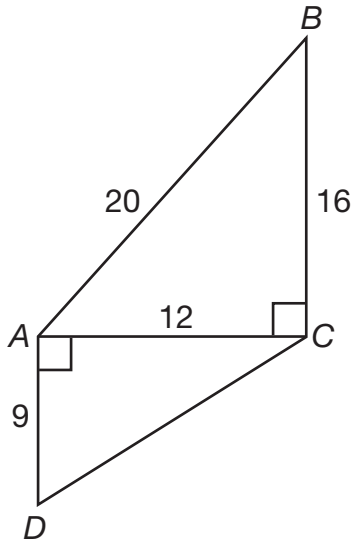
4.8

5

6

A**B *****C****D**

7. In the figure drawn below, triangle ABC is similar to triangle DCA .

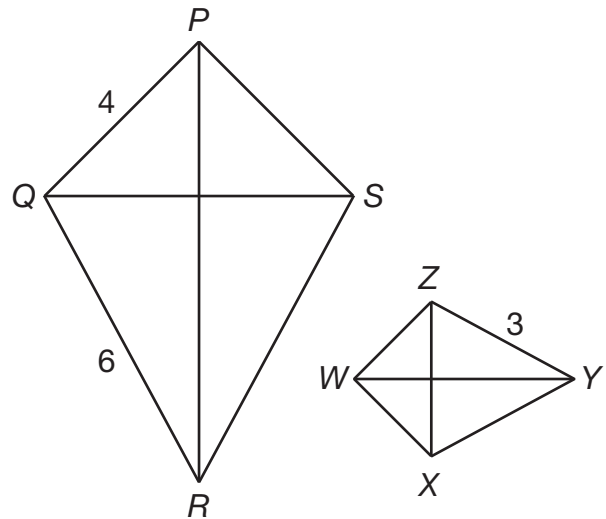


What is the length, in units, of \overline{DC} ?

11 15 17 27

A **B *** **C** **D**

8. In the figure below, quadrilateral $PQRS$ is similar to quadrilateral $WZYX$.

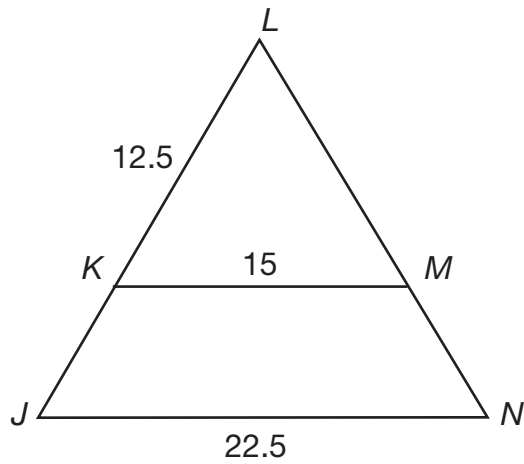


What is the length, in units, of \overline{WZ} ?

1 2 4 8

A **B *** **C** **D**

9. In the figure below, triangle JLN is similar to triangle KLM .

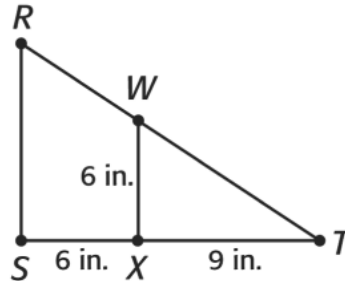


What is the length, in units, of \overline{JL} ?

- A** 6.25
- B** 18.75 *
- C** 20
- D** 27

Sample Gridded Items

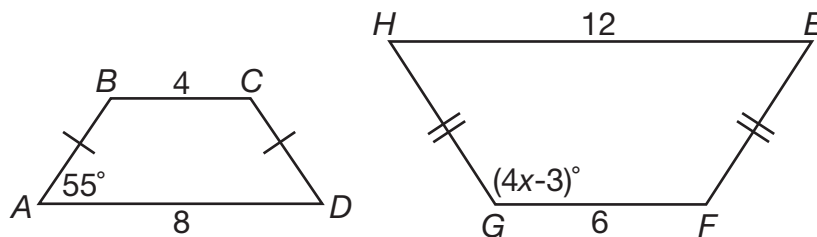
1. In $\triangle RST$, point W is on \overline{RT} , and \overline{RS} is parallel with \overline{WX} .



If $SX = 6$ inches, $XT = 9$ inches, and $WX = 6$ inches, what is the length, in inches, of \overline{RS} ?

Mark your answer in the answer grid.

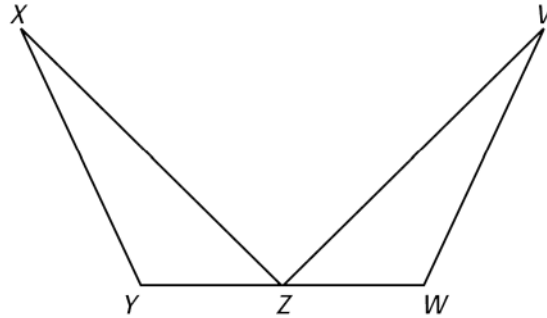
2. Isosceles trapezoids $ABCD$ and $EFGH$ are similar, as shown below.



What is the value of x in isosceles trapezoid $EFGH$?

Mark your answer in the answer grid.

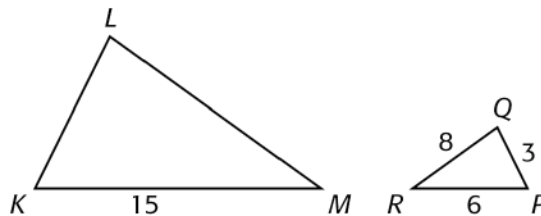
3. In the figure below, $\triangle VWZ$ is congruent to $\triangle XYZ$, and point Z is on \overline{YW} .



The measure of $\angle XZY$ is 45° , and the measure of $\angle ZWV$ is 115° . What is the measure, in degrees, of $\angle YXZ$?

Mark your answer in the answer grid.

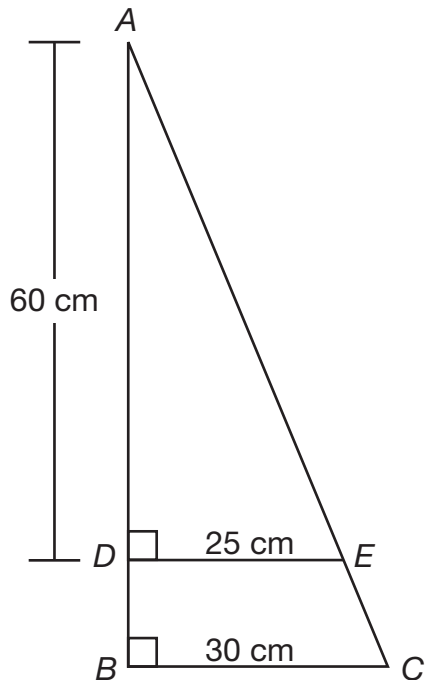
4. In triangles KLM and PQR , $\angle K$ and $\angle P$ are congruent, and the measures of $\angle L$, $\angle P$, and $\angle R$ add to 180° .



If $QP = 3$ inches, $QR = 8$ inches, $RP = 6$ inches, and $KM = 15$ inches, what is the length, in inches, of \overline{LM} ?

Mark your answer in the answer grid.

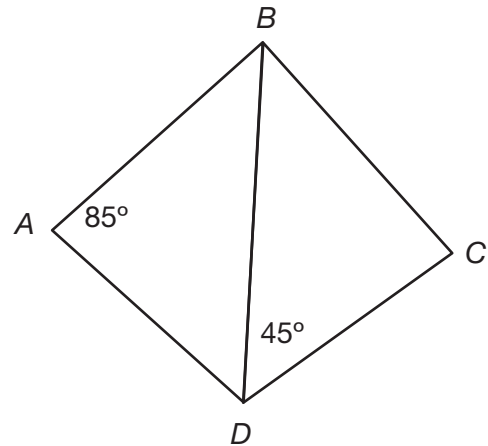
5. In the figure shown below, triangle ABC is similar to triangle ADE .



What is the length of \overline{AB} in centimeters?

Mark your answer in the answer grid.

6. Triangle ABD is congruent to triangle CDB as shown in the figure below.



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

Mark your answer in the answer grid.

Answer Key

Content Standard 12

Sample Multiple-Choice

1. B
2. C
3. C
4. C
5. C
6. B
7. B
8. B
9. B

Sample Gridded

1. 10
2. 32
3. 20
4. 20
5. 72
6. 50

DATA ANALYSIS AND PROBABILITY

Content Standard 13

Interpret data from populations using given and collected data.

Item Type

Multiple-choice

Open-ended

Additional Information

Word problems/real-life situations may be used.

Frequency tables may be used.

Constructing a graph to represent the data may be required.

Stem-and-leaf plots may be used.

Box-and-whisker plots may be used.

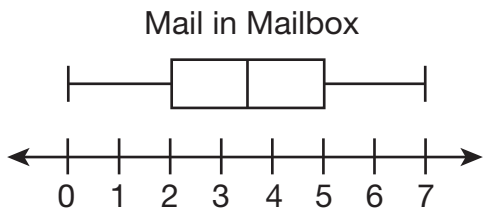
Sample Multiple-Choice Items

(continued on next page)

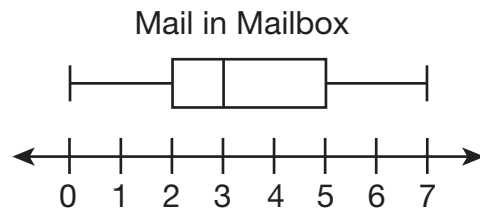
1. Janice kept a record of the number of pieces of mail her family received. The bar graph below shows how often they received each number of pieces of mail.



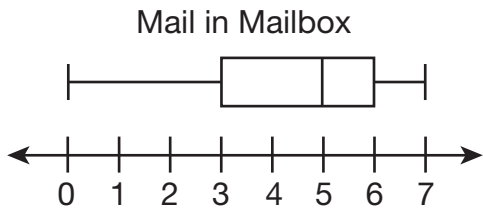
Which box-and-whisker plot displays the information shown in the bar graph?



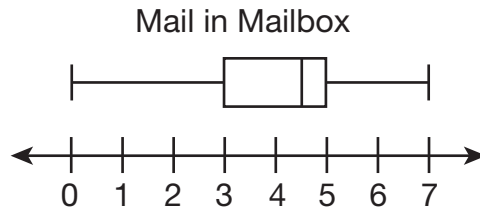
A



C



B



D *

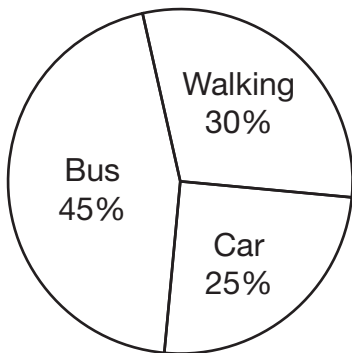
2. The table below shows the type of transportation used by different numbers of students at North Middle School.

Transportation to North Middle School

Type	Number of Students
Car	8
Bus	18
Walking	14

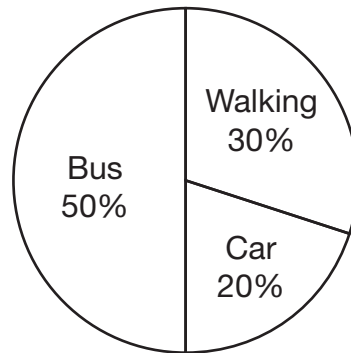
Which circle graph represents the data in the table?

Transportation to North
Middle School



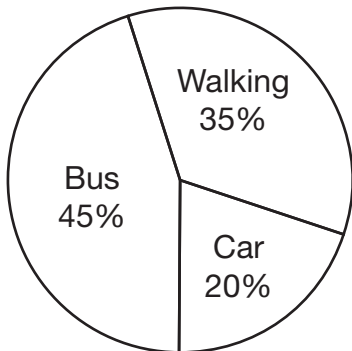
A

Transportation to North
Middle School



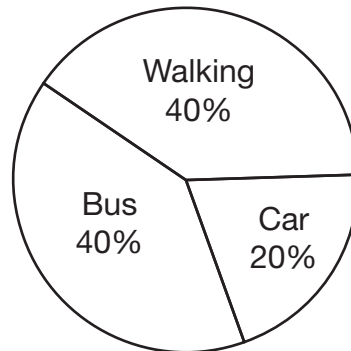
C

Transportation to North
Middle School



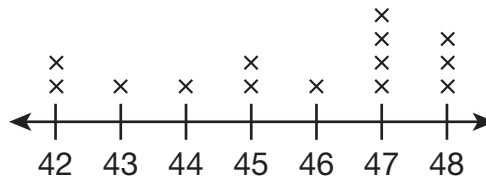
B *

Transportation to North
Middle School



D

3. For two weeks, Karl kept track of the number of pages he read in his book each day and made the line plot shown below.



Which is *closest* to the daily mean number of pages Karl read?

45

45.6

46.5

47

A

B *

C

D

4. This stem-and-leaf plot shows the number of points scored by basketball players.

Points Scored by Basketball Players

0	5 6 6 8
1	0 1 3 3 5 9
2	0 1 1 3 7
1	4 represents 14.

How many players scored more than 12 points?

6

7

8

9

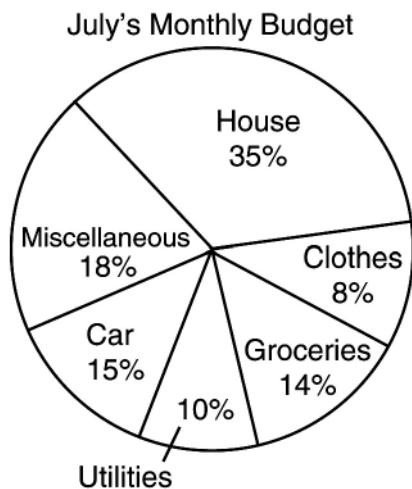
A

B

C

D *

5. The circle graph below shows the percentages of Mrs. Frederick's monthly budget for July. Her total monthly income is \$2,800.



In August's monthly budget, Mrs. Frederick spent \$126 more on clothes than she did in July. In August, what percentage of her monthly income of \$2,800 was spent on clothes?

- 15% 12.5% 11.5% 10%
- A** **B *** **C** **D**

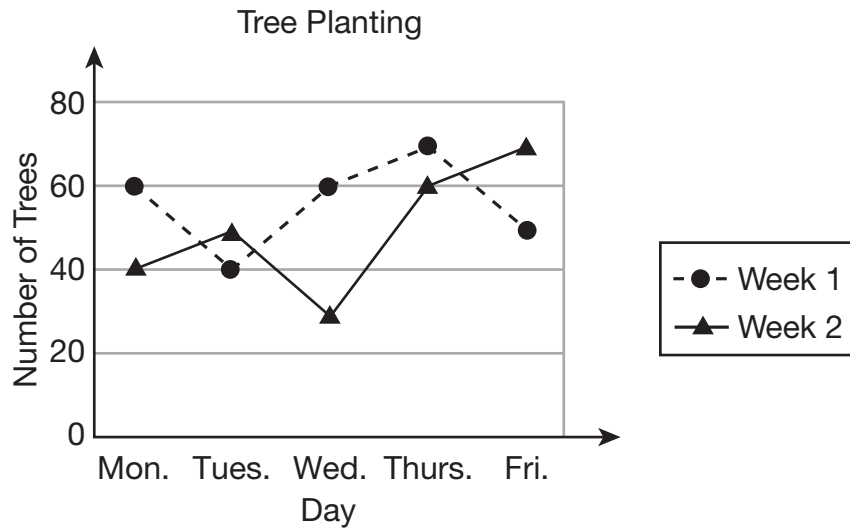
6. The stem-and-leaf plot shows the number of DVDs sold per day for 26 days at a video store.

DVDs Sold	
2	2 4 5 7 9
3	1 1 2 3 6
4	0 3 3 3 5 8
5	2 4 4 6 7
6	0 3 5 5 6
2 2 represents 22	

Which conclusion can be drawn from this stem-and-leaf plot?

- A** The mode for the number of DVDs sold per day was 65.
- B** For 50% of these days, 45 or more DVDs were sold per day.
- C** The median for the number of DVDs sold per day was 43. *
- D** There were exactly 12 days in which fewer than 40 DVDs were sold per day.

7. The graph below shows the number of trees Joseph planted during a two-week period.



Which day of the week had the *greatest* increase in the number of trees planted from Week 1 to Week 2?

- A** Monday
- B** Tuesday
- C** Wednesday
- D** Friday *

Sample Open-Ended Items

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

1. The number of people at Lula's bus stop each morning for 10 days is listed below.

12, 11, 16, 12, 13, 15, 15, 16, 18, 20

Construct a box-and-whisker plot using the data. Be sure to label the median, the lower quartile, the upper quartile, the minimum value, and the maximum value.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

2. The following table shows what Jeremiah charges to baby-sit for a given number of hours.

Baby-Sitting

Charge (in dollars)	7	12	22	27
Number of hours	1	2	4	5

- Make a scatter plot to represent this data. Clearly label your graph.
- Using your graph, indicate whether there is or is not a relationship between the charge and the number of hours Jeremiah baby-sits.
- Using this table and your graph, predict the charge if Jeremiah baby-sits for 8 hours.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

3. A store recorded the number of coats it sold each month and the average temperature for the month in the table shown below.

Monthly Coat Sales

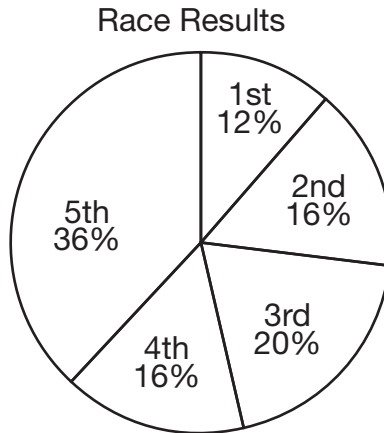
Average Monthly Temperature (in °F)	Number of Coats Sold
32	75
43	70
50	61
56	55
60	45
68	38

- Construct a scatter plot to represent the data. Clearly label your graph.
- The next month the average temperature is expected to be 72°F. Based on the data, predict the number of coats sold by the store and justify your prediction.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

4. The circle graph below shows the results of the last 25 races for a runner.



Create a table with the data in the circle graph. Label the columns "Place" and "Number of Times."

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

Answer Key

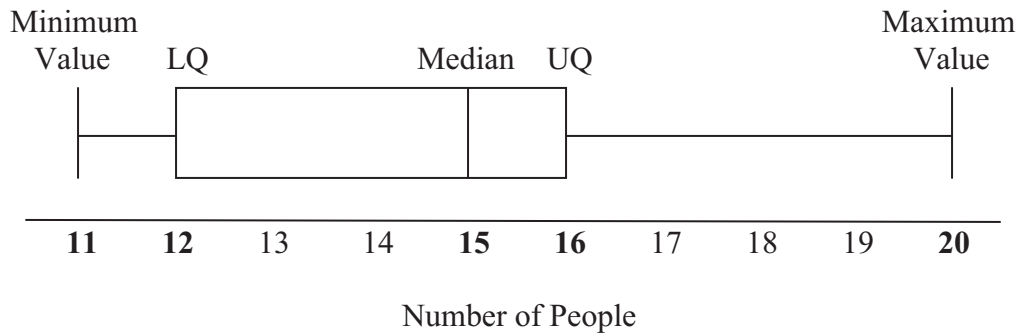
Content Standard 13

Sample Multiple-Choice

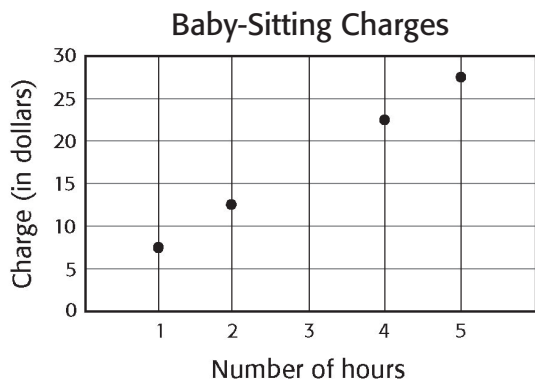
1. D
2. B
3. B
4. D
5. B
6. C
7. D

Sample Open-Ended

1. Sample Response(s):



Score Point	Response Attributes
3	All is correct.
2	Box-and-whisker plot has one to three errors.
1	Box-and-whisker plot has more than three errors.
0	No box-and-whisker plot or none correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off task, etc., scored as invalid.)

2. Sample Response(s):**a.**

b. Yes, there is a relationship. The graph of the data makes a straight line, and the line has positive slope.

OR

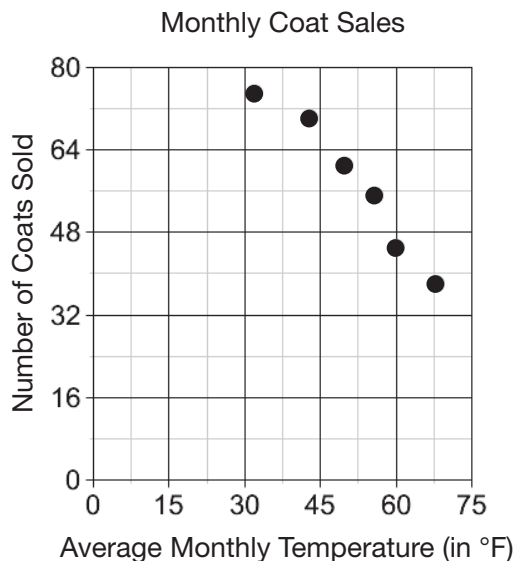
Equivalent

c. \$42; graph goes up \$5 every hour. Add \$15 ($3 \times \5) to \$27 to get \$42.

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	The logics are correct. OR One correct logic, and the answers for at least parts b and c are correct.
1	Errors in logic and the answers for two problems are correct. OR Answers are correct for two problems with no logic. OR One answer or drawing is correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

3. Sample Response(s):**a.**

b. Draws a line of best fit and then reads from that line the number of coats sold when the average temperature, t , is 72°F . 34 ± 4 coats sold

(Note: $N = -1.1t + 113 = -1.1(72) + 113 = -79.2 + 113 \approx 34$ coats)

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	Part a and answer to Part b are correct. OR Part a and logic to Part b are correct. OR Part a has one to three errors and answer to Part b is correct.
1	One logic or answer is correct. OR Part a has more than three errors.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

4. Sample Response(s):

Race Results

Place	Number of Times
1st	3
2nd	4
3rd	5
4th	4
5th	9

$$0.12 \times 25 = 3; 0.16 \times 25 = 4; 0.20 \times 25 = 5; 0.36 \times 25 = 9$$

OR

Equivalent

Score Point	Response Attributes
3	All is correct.
2	Table or logic has one to three errors.
1	Table or logic has more than three errors.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

DATA ANALYSIS AND PROBABILITY**Content Standard 14**

Determine the theoretical probability of an event.

Item Type

Multiple-choice
Gridded

Additional Information

Both “and” and “or” situations may be included.
Fraction and percent may be used.
Word problems/real-life situations may be used.

Sample Multiple-Choice Items

1. Mrs. Zepeda has 11 boys and 9 girls in her history class. She will randomly select 1 student to help her grade papers.

What is the probability Mrs. Zepeda will select a girl to help her grade papers?

$$\frac{11}{100}$$

A

$$\frac{11}{20}$$

B

$$\frac{9}{10}$$

C

$$\frac{9}{20}$$

D *

2. Callie has 8 red marbles, 6 green marbles, 5 yellow marbles, and 6 blue marbles in a bag. There are no other marbles in the bag. All the marbles are the same size and shape.

Without looking, Callie will randomly select 1 marble from the bag.

What is the probability that Callie will select either a green or a blue marble from the bag?

$$\frac{3}{25}$$

A

$$\frac{6}{25}$$

B

$$\frac{12}{25}$$

C *

$$\frac{13}{25}$$

D

3. There are 12 players on Justin's basketball team. The coach randomly selects 2 of the players to lead warm-ups before practice today.

What is the probability that Justin is selected to lead warm-ups today?

$\frac{1}{12}$

A

$\frac{1}{6}$

B *

$\frac{1}{5}$

C

$\frac{1}{2}$

D

5. Kerrie places 6 red jelly beans, 5 blue jelly beans, 4 green jelly beans, and 5 black jelly beans in a jar. All jelly beans are the same shape and size.

If Kerrie chooses 1 jelly bean at random from the jar, what is the probability that she will choose a red jelly bean?

$\frac{6}{11}$

A

$\frac{3}{10}$

B *

$\frac{1}{4}$

C

$\frac{1}{5}$

D

4. John's quiz team coach has 4 geography and 6 current events questions written on note cards. The coach randomly selects 1 question to read to the team.

What is the probability that the coach selects a geography question?

$\frac{1}{10}$

A

$\frac{1}{4}$

B

$\frac{2}{5}$

C *

$\frac{2}{3}$

D

6. Annie has 6 green, 4 red, 4 blue, 2 purple, and 8 black pencils in her pencil case. Annie randomly selects one of the pencils.

What is the probability that Annie selects a purple or a black pencil?

$\frac{1}{36}$

A

$\frac{1}{10}$

B

$\frac{2}{5}$

C

$\frac{5}{12}$

D *

7. Zach said he would help Stuart clean his room if Stuart flips a coin 4 times and gets heads all 4 times.

What is the probability that Stuart will flip a coin 4 times and get heads all 4 times?

$$\frac{1}{16}$$

A *

$$\frac{1}{8}$$

B

$$\frac{1}{4}$$

C

$$\frac{1}{2}$$

D

9. For breakfast Amanda has oatmeal with fruit. She has 3 flavors of oatmeal: brown sugar, maple, and cinnamon. She has 3 types of fruit: raisins, cranberries, and blueberries. Each flavor of oatmeal and each type of fruit has an equal chance of being selected.

What is the probability that Amanda randomly selects cinnamon oatmeal with raisins?

$$\frac{1}{9}$$

A *

$$\frac{1}{6}$$

B

$$\frac{4}{9}$$

C

$$\frac{2}{3}$$

D

8. A restaurant has a soup-and-salad lunch with the choices listed in the table below. A soup and a salad are selected at random.

Lunch Choices

Soup	Salad
Vegetable Beef Tomato Chicken Noodle	Garden Caesar

What is the probability that tomato soup and a garden salad are selected?

$$\frac{1}{6}$$

A *

$$\frac{1}{5}$$

B

$$\frac{1}{3}$$

C

$$\frac{5}{6}$$

D

Sample Gridded Items

1. Caleb has 11 red marbles, 15 green marbles, 8 yellow marbles, 5 white marbles, 9 blue marbles, and 2 black marbles in a bag. There are no other marbles in the bag.

What is the probability that Caleb will select at random either a red or a black marble?

Mark your answer in the answer grid.

2. In Mr. Jackson's class, 70% of the students turned in their homework early, and 50% of those students are male.

If a student is selected at random from Mr. Jackson's class, what is the probability the student will be a male who turned his homework in early?

Mark your answer in the answer grid.

3. In Mrs. Troyer's class, 20% of the girls wear glasses, and 15% of these girls have red hair.

If one girl is selected at random from Mrs. Troyer's class, what is the probability the girl will have red hair and wear glasses?

Mark your answer in the answer grid.

4. Peter has 4 Alabama, 1 New York, and 2 Minnesota state quarters in his pocket. He reaches into his pocket and randomly takes out 1 quarter.

What is the probability that Peter takes out an Alabama or a Minnesota state quarter?

Mark your answer in the answer grid.

5. Jenna has 5 shirts: 1 red, 1 yellow, 1 blue, 1 green, and 1 black.

She also has 3 pairs of pants: 1 black, 1 brown, and 1 blue.

If Jenna selects 1 shirt and 1 pair of pants at random, what is the probability she will select a black shirt and a pair of black pants?

Mark your answer in the answer grid.

Answer Key**Content Standard 14****Sample Multiple-Choice**

1. D
2. C
3. B
4. C
5. B
6. D
7. A
8. A
9. A

Sample Gridded

1. $\frac{13}{50}$ OR 0.26 OR 26%
2. $\frac{7}{20}$ OR $\frac{35}{100}$ OR 0.35 OR 35%
3. $\frac{3}{100}$ OR 0.03 OR 3%
4. $\frac{6}{7}$ OR 0.857 OR 85.7%
5. $\frac{1}{15}$ OR 0.067 OR 6.7%

SAMPLE RESPONSE FORMAT

SAMPLE RESPONSE: MULTIPLE-CHOICE**Page** _____

1	(A)	(B)	(C)	(D)
2	(A)	(B)	(C)	(D)
3	(A)	(B)	(C)	(D)
4	(A)	(B)	(C)	(D)
5	(A)	(B)	(C)	(D)

Page _____

6	(A)	(B)	(C)	(D)
7	(A)	(B)	(C)	(D)
8	(A)	(B)	(C)	(D)

Page _____

9	(A)	(B)	(C)	(D)
10	(A)	(B)	(C)	(D)

SAMPLE RESPONSE: GRIDDED

1

—	%
\$		/	/	/	/	/	
0	0	0	0	0	0	0	
1	1	1	1	1	1	1	
2	2	2	2	2	2	2	
3	3	3	3	3	3	3	
4	4	4	4	4	4	4	
5	5	5	5	5	5	5	
6	6	6	6	6	6	6	
7	7	7	7	7	7	7	
8	8	8	8	8	8	8	
9	9	9	9	9	9	9	

2

—	%
\$		/	/	/	/	/	
0	0	0	0	0	0	0	
1	1	1	1	1	1	1	
2	2	2	2	2	2	2	
3	3	3	3	3	3	3	
4	4	4	4	4	4	4	
5	5	5	5	5	5	5	
6	6	6	6	6	6	6	
7	7	7	7	7	7	7	
8	8	8	8	8	8	8	
9	9	9	9	9	9	9	

3

—	%
\$		/	/	/	/	/	
0	0	0	0	0	0	0	
1	1	1	1	1	1	1	
2	2	2	2	2	2	2	
3	3	3	3	3	3	3	
4	4	4	4	4	4	4	
5	5	5	5	5	5	5	
6	6	6	6	6	6	6	
7	7	7	7	7	7	7	
8	8	8	8	8	8	8	
9	9	9	9	9	9	9	

4

—	%
\$		/	/	/	/	/	
0	0	0	0	0	0	0	
1	1	1	1	1	1	1	
2	2	2	2	2	2	2	
3	3	3	3	3	3	3	
4	4	4	4	4	4	4	
5	5	5	5	5	5	5	
6	6	6	6	6	6	6	
7	7	7	7	7	7	7	
8	8	8	8	8	8	8	
9	9	9	9	9	9	9	

5

—	%
\$		/	/	/	/	/	
0	0	0	0	0	0	0	
1	1	1	1	1	1	1	
2	2	2	2	2	2	2	
3	3	3	3	3	3	3	
4	4	4	4	4	4	4	
5	5	5	5	5	5	5	
6	6	6	6	6	6	6	
7	7	7	7	7	7	7	
8	8	8	8	8	8	8	
9	9	9	9	9	9	9	

SAMPLE RESPONSE: OPEN-ENDED

Be sure to leave room in your answer space for all parts of this test question.

Answer question ___ in this box.

DO NOT WRITE OUTSIDE THE BOX.

DO NOT WRITE OUTSIDE THE BOX.

DO NOT WRITE OUTSIDE THE BOX.