

2012-13 NAEP Training

8th Grade Mathematics Sample Items

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2012-13 NAEP Training

8th Grade Mathematics Sample Items

Part 1:
Prior Year New York State Test Items



New York State Testing Program

Mathematics Test Book 2

Grade **8**

May 5–7, 2010

Name _____

28

Rowan raised \$640 in a charity walk last year. This year he raised 15% **more** than he raised last year. How much money did Rowan raise this year?

Show your work.

Answer \$ _____

Go On

29Complete the table below with the missing values for y .

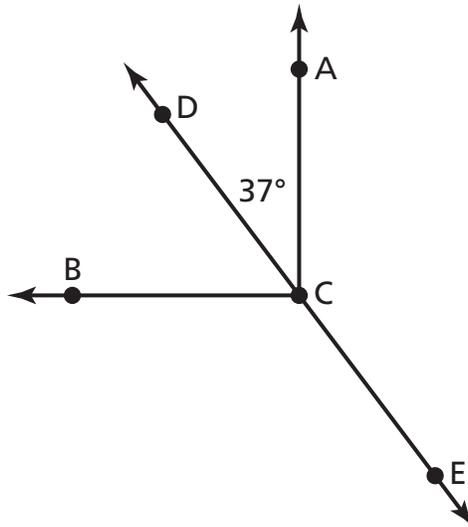
x	y
-1	1
0	4
1	7
2	10
3	
4	

Based on the data in the table, write the equation that represents the relationship between x and y .

Answer $y =$ _____

30

In the diagram below, right angle ACB is intersected by \overleftrightarrow{DE} .



[not drawn to scale]

What are the measures of $\angle DCB$ and $\angle ACE$?

Show your work.

Answer $\angle DCB =$ _____ degrees

$\angle ACE =$ _____ degrees

Go On

31

Bob has a container with a capacity of 12 quarts. He wants to express this capacity in gallons. Write a proportion to find the number of gallons of water Bob's container can hold.

$$4 \text{ quarts} = 1 \text{ gallon}$$

Proportion _____

Solve the proportion.

Show your work.

Answer _____ gallons

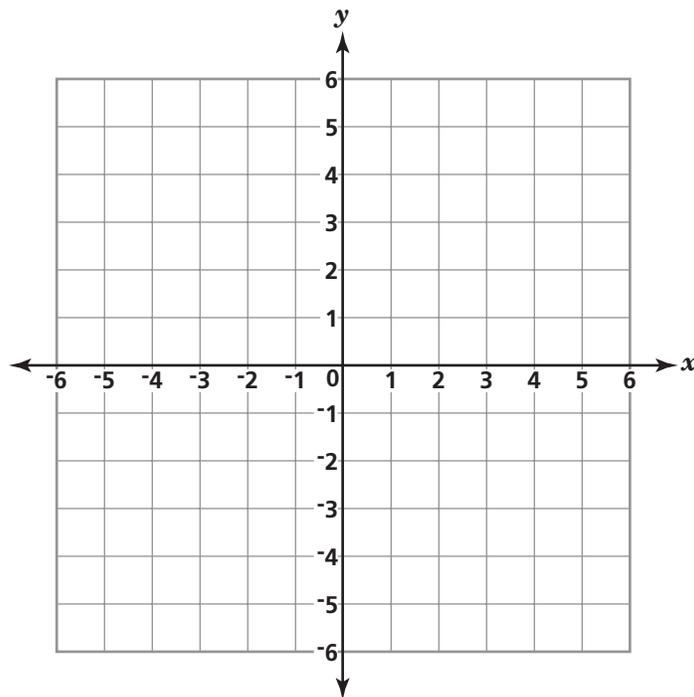
32

Erika is assigned to graph the line of the equation $y = 2x - 3$.

Use Erika's equation to complete the table below for the given values of x .

x	y
-1	
1	
3	

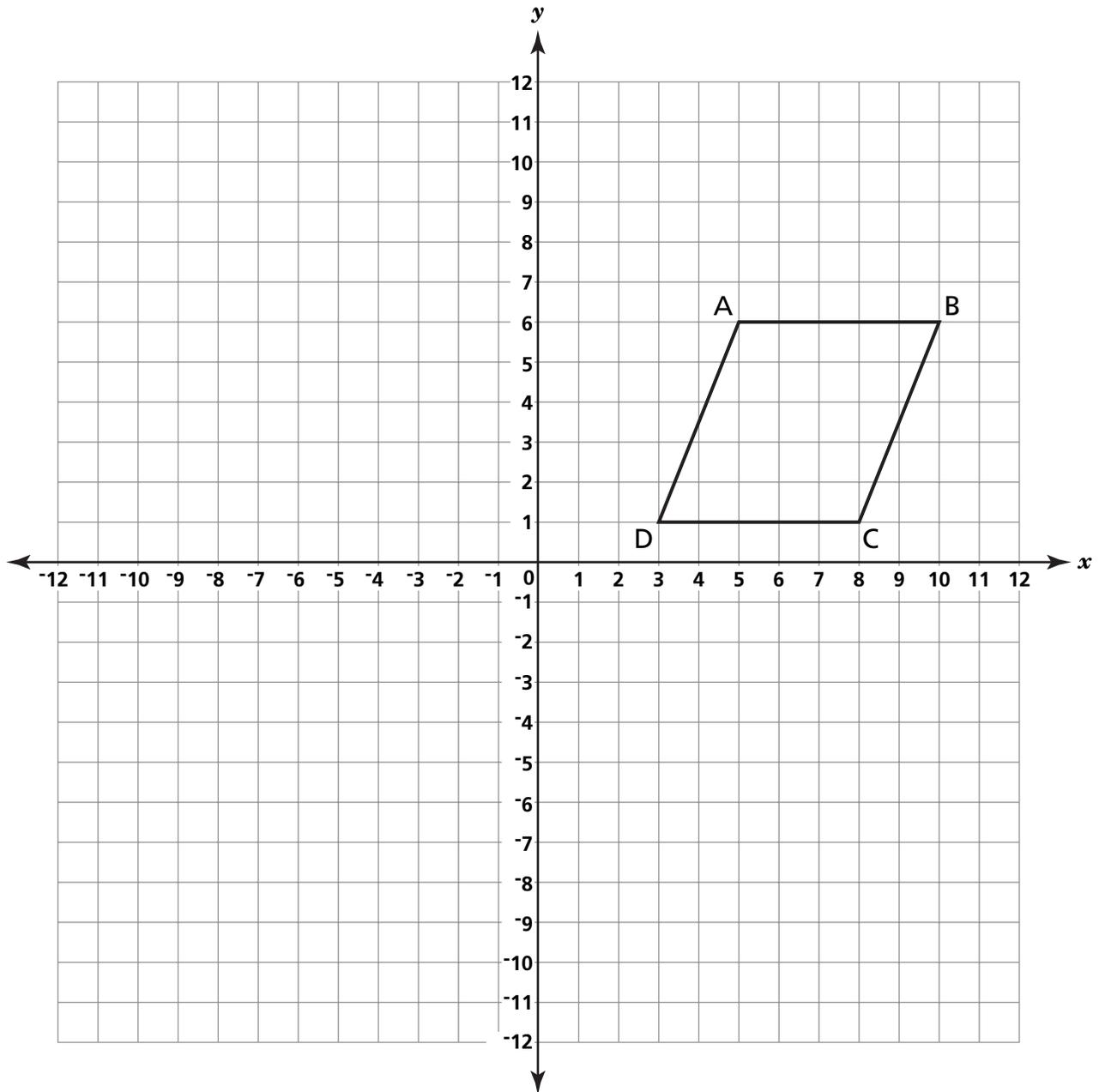
Using the information from the table, graph the line of the equation $y = 2x - 3$ on the coordinate plane below. Be sure to plot all points from the table and draw a line connecting the points.



Go On

33

On the coordinate plane below, draw the image of quadrilateral ABCD reflected over the x -axis. Label the image $A'B'C'D'$.



On the lines below, explain how you determined the location of A'.

STOP

2012-13 NAEP Training

8th Grade Mathematics Sample Items

Part 2:
Common Core-aligned 2012-13 New
York State Sample Items



New York State Testing Program

Mathematics Common Core Sample Questions

Grade 8

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Domain: Functions

Item: CR

1

A trainer for a professional football team keeps track of the amount of water players consume throughout practice. The trainer observes that the amount of water consumed is a linear function of the temperature on a given day. The trainer finds that when it is 90°F the players consume about 220 gallons of water, and when it is 76°F the players consume about 178 gallons of water.

Part A: Write a linear function to model the relationship between the gallons of water consumed and the temperature.

Part B: Explain the meaning of the slope in the context of the problem.

Key:

Part A: $y = 3x - 50$

Part B: For every one degree increase in temperature, the number of gallons consumed increases by 3.

Aligned CCLS: 8.F.4

Commentary: This question aligns to CCLS 8.F.4 because it assesses a student's ability to construct a function that models a linear relationship from a description of a relationship between two values (x,y) and interpret the rate of change.

Rationale: The correct answer indicates the ability to construct a function to model a linear relationship. Given that water consumption is a function of temperature, the values cited in the problem are understood as coordinate pairs that can be related by a linear function.

Part A:

$$\frac{220-178}{90-76} = \frac{42}{14} = 3$$

$$y = 3x + b$$

$$220 = 3(90) + b$$

$$-50 = b$$

Part B: The slope indicates 3 gallons per degree ($\frac{3}{1}$), which shows that for every temperature increase in one degree, the number of gallons of water consumed would increase by three.

Domain: Expressions and Equations

Item: MC

2 Which of the following expressions is **not** equivalent to $\frac{1}{25}$?

- A** $5^3 \times 5^{-5}$
- B** $5^{-1} \times 5^{-1}$
- C** $5^{-3} \times 5$
- D** $5^{-2} \times 5^4$

Key: D

Aligned CCLS: 8.EE.1

Commentary: This question aligns to CCLS 8.EE.1 because it assesses a student's ability to apply properties of exponents to rewrite exponential expressions.

Rationale: Selecting Option D could indicate that student recognizes the incorrect addition of exponents or confusion on the concept of equivalence ($5^4 \times 5^{-2} = 25$). Options A, B, and C involve the correct application of the properties of integer exponents.

Domain: Expressions and Equations

Item: CR

3

A computer can do 1000 operations in 4.5×10^{-6} seconds. How many operations can be done by this computer in one hour? Express your answer in scientific notation.

Key: 8×10^{11}

Aligned CCLS: 8.EE.4

Commentary: This question aligns to CCLS 8.EE.4 because it assesses a student's ability to perform operations with numbers expressed in scientific notation.

Rationale: The computer works at the rate of the 1000 operations in 4.5×10^{-6} seconds, or 2.2×10^8 multiplications per second ($1000/4.5 \times 10^{-6}$). Application of the conversion of 1 hour = 3600 seconds [$(2.2 \times 10^8) \times 3600$] gives the number of operations (8×10^{11}) the computer can complete in one hour.

Domain: Expressions and Equations

Item: MC

x	y
-8	-42
-3	-17
0	-2
6	28

4

If a line contains the points in the table above, the equation of the line is

- A $y = -2x + 5$
- B $y = 2x - 5$
- C $y = 5x - 2$
- D $y = -5x - 2$

Key: C

Aligned CCLS: 8.EE.6

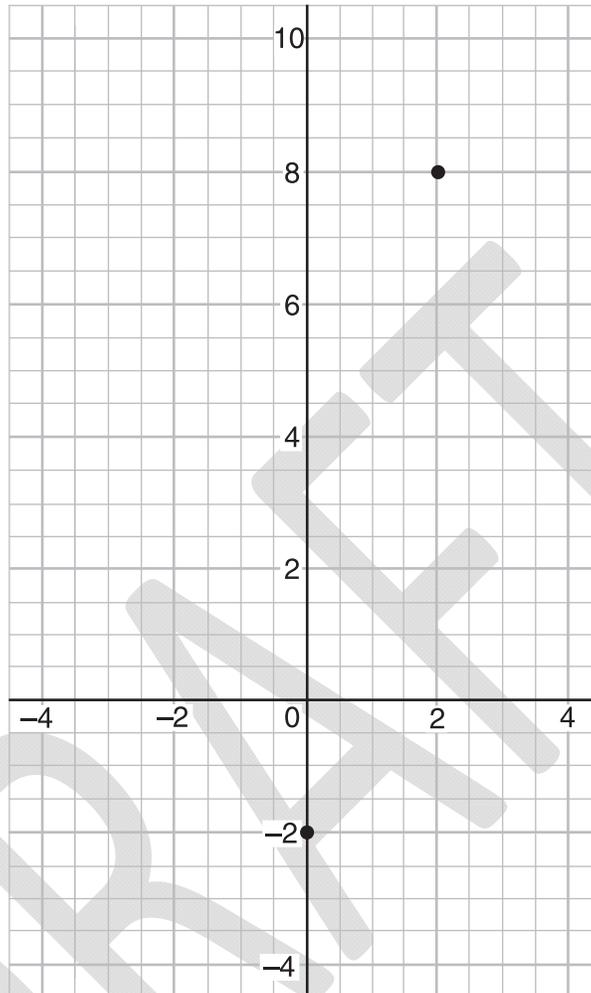
Commentary: This question aligns to CCLS 8.EE.6 because a student uses $y = mx + b$ to write the equation of a line given its slope and the y -intercept.

Rationale: Option C is correct. The equation of a line can be represented in slope-intercept form ($y = mx + b$) if the slope and y -intercept is known or can be found. The slope, m , can be found by performing the following with any two pairs of the given points: $m = \frac{28 - (-2)}{6 - 0} = \frac{30}{6} = 5$. The y -intercept, b , is given in the table as -2 (0,-2).

Accurately substituting these values into the slope-intercept form of the equation gives $y = 5x - 2$. Option C can also be determined by testing each of the options to determine which equation is satisfied by the set of points in the table. Selecting Option A indicates confusion in the proper location of these two values in a slope-intercept form. Selecting Option B also indicates confusion in the proper location of these two values in a slope-intercept form, as well as possible sign errors for the values of both the slope and the y -intercept. Selecting Option D indicates an incorrect calculation of slope from the given table.

Domain: Expressions and Equations

Item: MC



5

If a line passes through the two points above, the equation of the line is

- A $y = -2x + 5$
- B $y = 2x - 5$
- C $y = 5x - 2$
- D $y = -5x - 2$

Key: C

Aligned CCLS: 8.EE.6

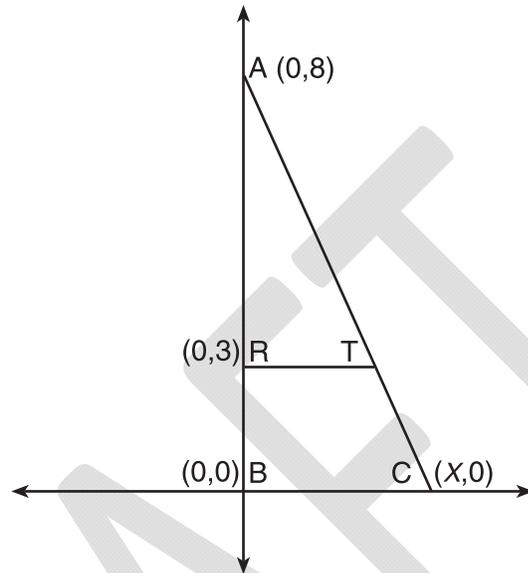
Commentary: This question aligns to CCLS 8.EE.6 because a student uses $y = mx + b$ to write the equation of a line given its slope and the y-intercept.

Rationale: Option C is correct. The student can determine the slope graphically or algebraically and can identify (0, -2) as the y-intercept from the graph. Algebraically the slope can be determined by $m = \frac{8 - (-2)}{2 - 0} = \frac{10}{2} = 5$. Accurately substituting these values into the slope-intercept form of a linear equation gives $y = 5x - 2$.

DRAFT

6

In the diagram below, $\triangle ABC$ is similar to $\triangle ART$.



Part A: What is the scale factor from $\triangle ABC$ to $\triangle ART$?

Part B: If the slope of AC is -2 , what is the value of x for coordinate C ?

Part C: Using the information from parts A and B, what is the length of RT ?

Key:

Part A: $\frac{AB}{AR} = \frac{8}{5}$

Part B: 4

Part C: 2.5

Aligned CCLS: 8.G.4, 8.EE.6, and 8.EE.7b

Commentary: This question aligns to CCLS 8.G.4, 8.EE.6, and 8.EE.7b because it assesses the construction and application of a similarity ratio, the creation of a linear equation, and solving a linear equation with one variable.

Rationale:

Part A: The ratio of side AB to side AR is determined by

$$\frac{AB}{AR} = \frac{8-0}{8-3} = \frac{8}{5}$$

Part B: The y -intercept is $(0,8)$ and the given slope of -2 yields the resulting linear equation for segment AB of $y = -2x + 8$. Solving this equation for $y = 0$ yields the following value for C :

$$\begin{aligned} 0 &= -2x + 8 \\ -8 &= -2x \\ 4 &= x \\ x &= 4 \end{aligned}$$

Part C: The length of side BC is the difference in x -values between point B and point C , $4 - 0 = 4$. The ratio of side BC to side RT is $\frac{8}{5}$. Using these two pieces of information the solution to side RT can be found by solving the

proportion $\frac{8}{5} = \frac{4}{x}$.

$$\frac{8}{5} = \frac{4}{x}$$

$$8x = 20$$

$$x = \frac{20}{8} = \frac{5}{2} = 2.5$$

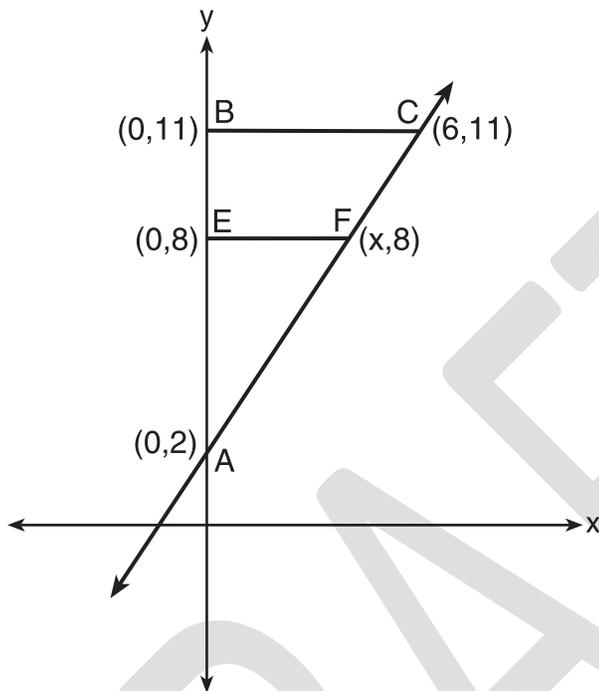
Domain: Expressions and Equations

Item: CR

7

In the coordinate plane below, $\triangle ABC$ is similar to $\triangle AEF$.

What is the value of x ?



Key: $x = 4$

Aligned CCLS: 8.EE.6

Commentary: This question aligns to CCLS 8.EE.6 because it assesses the student's understanding that slope is the same along a line between any two distinct points.

Rationale: The student can compute $\frac{11-2}{6-0}$ to find the slope of $\overline{AC} = \frac{3}{2}$. Next, the student finds the slope, $\overline{FA} = \frac{8-2}{x-0} = \frac{6}{x}$, and then the student will set ratios equal $\frac{3}{2} = \frac{6}{x}$ to find $x = 4$.

Domain: Expressions and Equations

Item: MC

8 $\frac{2}{3}(2x-1) + 2\frac{1}{3} = 7 + \frac{1}{2}x$

Which step would **not** be a possible first step for solving this equation algebraically?

- A multiplying every term in the equation by six
- B subtracting $2\frac{1}{3}$ from 7
- C subtracting $\frac{1}{2}x$ from $2x$
- D multiplying -1 by $\frac{2}{3}$

Key: C

Aligned CCLS: 8.EE.7b

Commentary: This question aligns to CCLS 8.EE.7b because it assesses the student's ability to use the distributive property and to combine like terms when solving an equation.

Rationale: Option C is correct. Given that $2x$ is multiplying a factor of $\frac{2}{3}$, distribution or some other algebraic beginning that would be necessary before subtracting $\frac{1}{2}x$ from $2x$. Options A, B, and D all represent reasonable starting points.

Domain: Expressions and Equations

Item: CR

9

David currently has a square garden. He wants to redesign his garden and make it into a rectangle with a length that is 3 feet shorter than twice its width. He decides that the perimeter should be 60 feet.

Determine the dimensions, in feet, of his new garden.

Show your work.

Key: 11 feet wide and 19 feet long

Aligned CCLS: 8.EE.7b

Commentary: This question aligns to CCLS 8.EE.7b because it assesses the student's ability to find the perimeter of a rectangle by expanding expressions using the distributive property and collecting terms.

Rationale: Width = 11 and length = 19 produces a rectangle with a perimeter of 60. The length is 3 feet shorter than twice the width.

Let w = width

$2w - 3$ = length

$$2(w + 2w - 3) = 60$$

$$2w + 4w - 6 = 60$$

$$6w = 66$$

$$w = 11$$

$$2w - 3 = 19$$

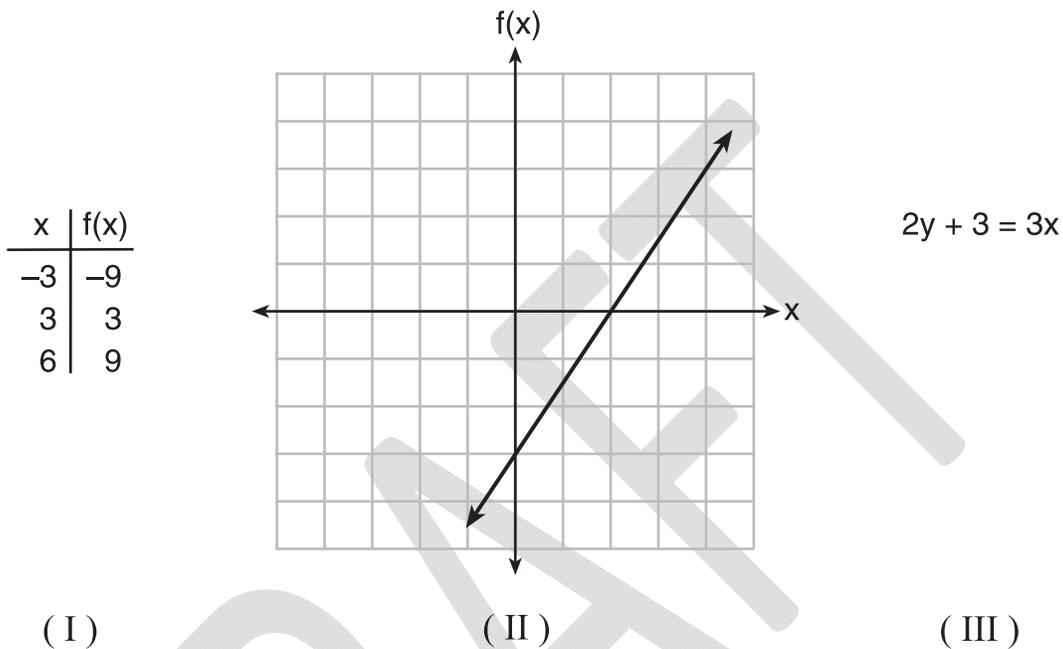
Other processes may also result in the correct answer.

Domain: Functions

Item: CR

10

The three different linear functions below are represented in three different ways, as shown.



Which function has the greatest rate of change? Does any pair of functions have the same rate of change? **Justify your answer.**

Key: The linear function in I has the greatest rate of change of the three given functions.

The linear functions in II and III each have a rate of change of $\frac{3}{2}$.

Aligned CCLS: 8.F.2

Commentary: This question aligns to CCLS 8.F.2 because it assesses a student's ability to recognize and compare properties of functions represented in different ways: table of values, graphically, and algebraically.

Rationale: I – The rate of change is 2.

II and III – The rate of change for each is $\frac{3}{2}$.

Domain: Functions

Item: MC

11

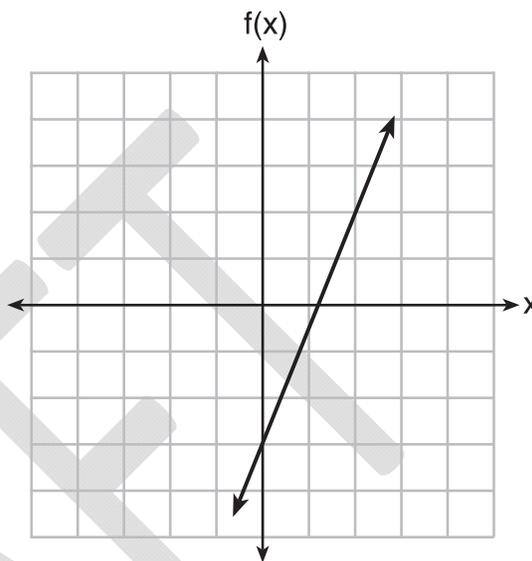
Of the four linear functions represented below, which has the greatest rate of change?

(A) A number, y , is two less than twice a number, x .

x	$h(x)$
-6	-10
-3	-3
3	11

(B) $3y - 4x = 3$

(C)



(D)

Key: D

Aligned CCLS: 8.F.2

Commentary: This question aligns to CCLS 8.F.2 because it assesses a student's ability to compare rates of changes for functions represented in different ways.

Rationale: Option D is correct because the rate of change is $\frac{5}{2}$; in Option A it is 2, in Option B it is $\frac{4}{3}$, and in Option C it is $\frac{7}{3}$.

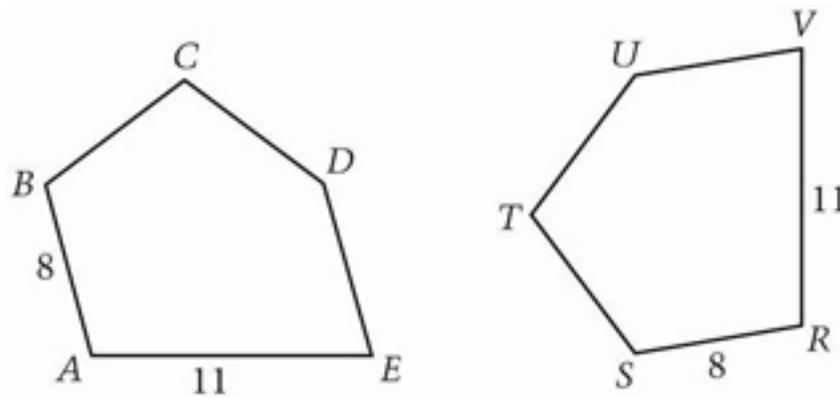
2012-13 NAEP Training

8th Grade Mathematics Sample Items

Part 3: NAEP Sample Questions

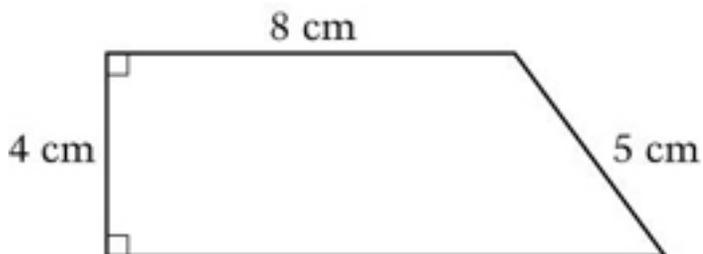
Grade 8 Mathematics Sample Items

1. Which of the following equations has the same solution as the equation $2x + 6 = 32$?
 - A. $2x = 38$
 - B. $x - 3 = 16$
 - C. $x + 6 = 16$
 - D. $2(x - 3) = 16$
 - E. $2(x + 3) = 32$
2. Megan drew a rectangle that has an area of 24 square centimeters. Which of the following could be the dimensions of her rectangle?
 - A. 2 centimeters by 12 centimeters
 - B. 3 centimeters by 9 centimeters
 - C. 4 centimeters by 20 centimeters
 - D. 6 centimeters by 6 centimeters
 - E. 12 centimeters by 12 centimeters

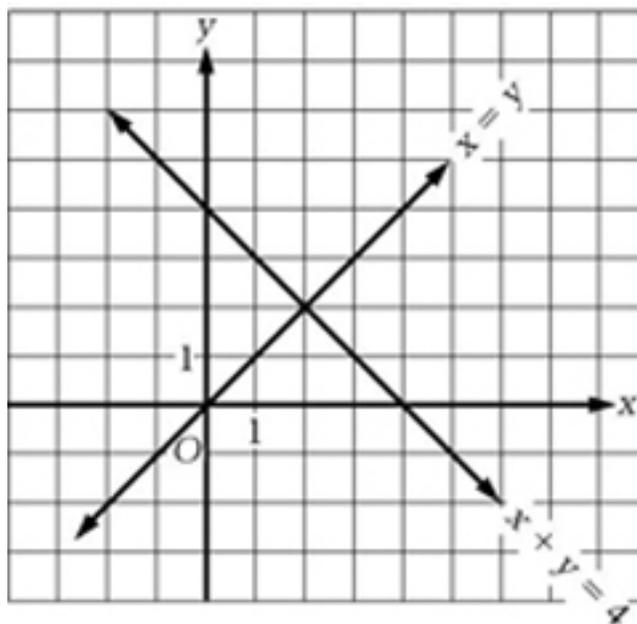


3. In the figure above, polygons $ABCDE$ and $RSTUV$ are congruent. Which side must have the same length as side BC ?
 - A. CD
 - B. DE
 - C. ST
 - D. TU
 - E. UV
4. In which of the following numbers is the digit 6 in the hundredths place?
 - A. 682.3
 - B. 382.6
 - C. 6.832
 - D. 4.836
 - E. 2.862

5. The school carnival committee sold a total of 200 tickets for the grand prize drawing. Sue bought enough tickets so that she had a 20 percent chance of winning the grand prize. How many tickets did Sue buy?
- 20
 - 40
 - 160
 - 400
 - 1,000



6. What is the area of the figure shown above?
- 28 square centimeters
 - 32 square centimeters
 - 38 square centimeters
 - 44 square centimeters
 - 64 square centimeters

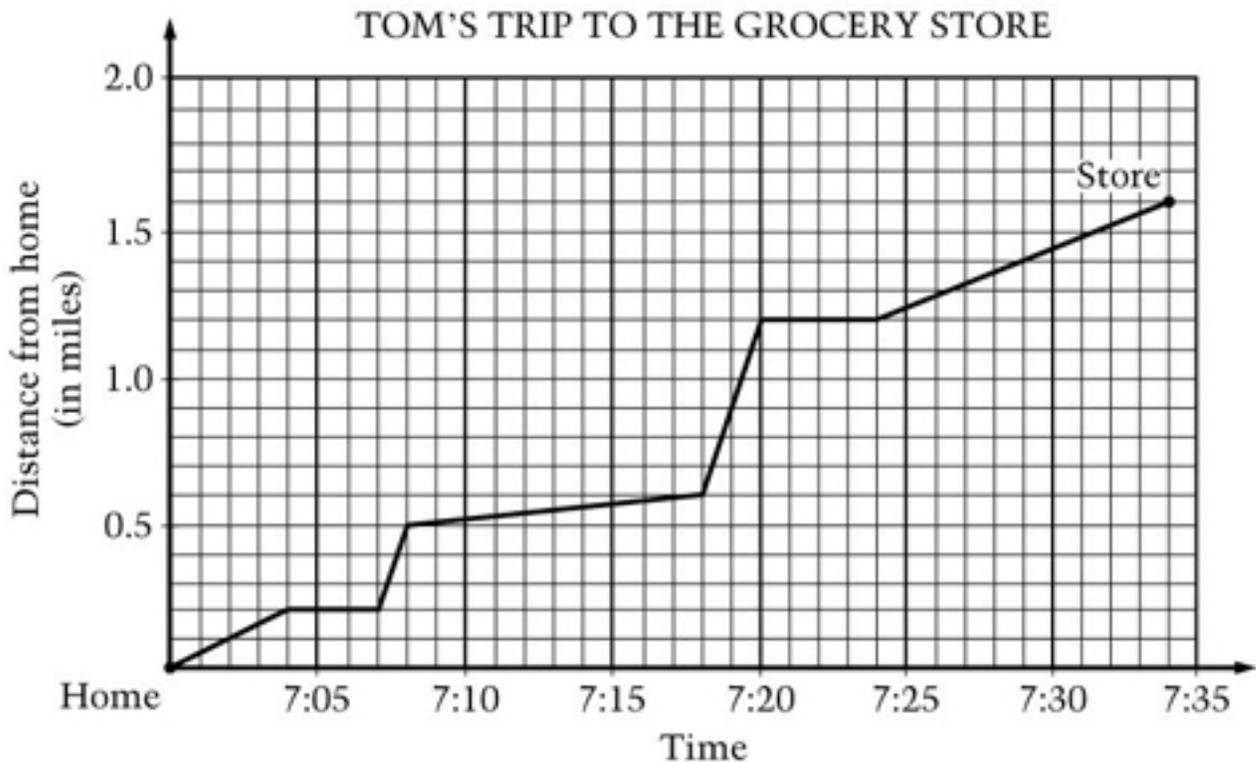


7. Which point is the solution to both equations shown on the graph above?
- (0, 0)
 - (0, 4)
 - (1, 1)
 - (2, 2)
 - (4, 0)

8. The length of a rectangle is 3 feet less than twice the width, w (in feet). What is the length of the rectangle in terms of w ?
- $3 - 2w$
 - $2(w + 3)$
 - $2(w - 3)$
 - $2w + 3$
 - $2w - 3$

9. In the sequence below, the ratio of each term to the term immediately following it is constant. What is the next term of this sequence after 2240?
 35, 280, 2240, _____

10. Tom went to the grocery store. The graph below shows Tom's distance from home during his trip.



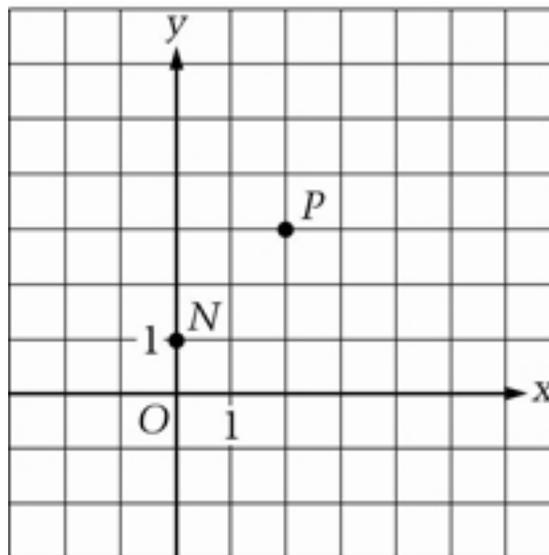
Tom stopped twice to rest on his trip to the store. What is the total amount of time that he spent resting?

- 5 minutes
 - 7 minutes
 - 8 minutes
 - 10 minutes
 - 25 minutes
11. For a school report, Luke contacted a car dealership to collect data on recent sales. He asked, "What color do buyers choose most often for their car?" White was the response. What statistical measure does the response "white" represent?
- Mean
 - Median
 - Mode
 - Range
 - Interquartile range

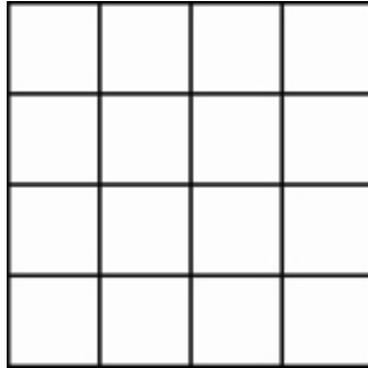


12. How many degrees are in the acute angle formed by the hands of the clock in the figure above?
- A. 10°
 - B. 30°
 - C. 36°
 - D. 60°
 - E. 120°

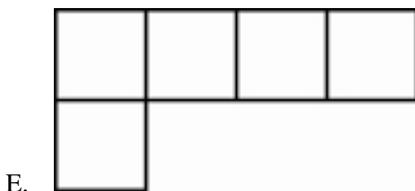
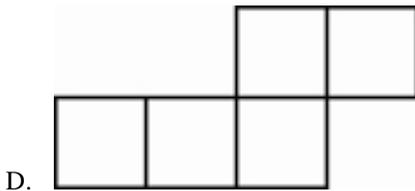
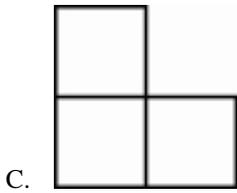
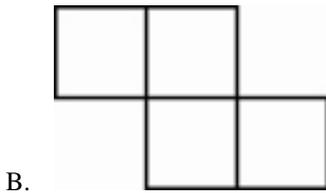
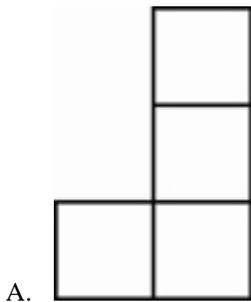
13. A certain even number is divisible by 9. This number is between 100 and 120. What is the number?



14. For the figure above, which of the following points would be on the line that passes through points N and P ?
- A. $(-2, 0)$
 - B. $(0, 0)$
 - C. $(1, 1)$
 - D. $(4, 5)$
 - E. $(5, 4)$



15. Identical puzzle pieces have been put together to form the large square shown above. Which of the following could be the shape of each puzzle piece?



16. The Morrisons are going to build a new one-story house. The floor of the house will be rectangular with a length of 30 feet and a width of 20 feet.

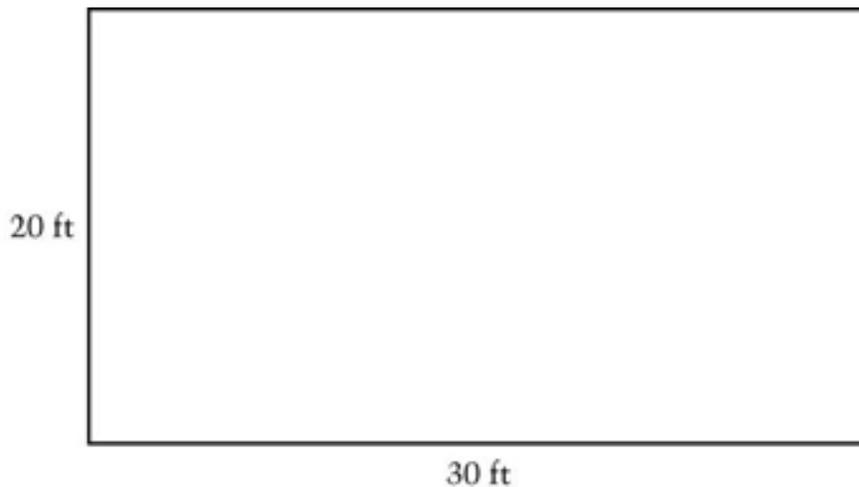
The house will have a living room, a kitchen, two bedrooms, and a bathroom. In part (a) below create a floor plan that shows these five rooms by dividing the rectangle into rooms.

Your floor plan should meet the following conditions.

- Each one of the five rooms must share at least one side with the rectangle in part (a); that is, each room must have at least one outside wall.
- The floor area of the bathroom should be 50 square feet.
- Each of the other four rooms (not the bathroom) should have a length of at least 10 feet and a width of at least 10 feet.

Be sure to label each room by name (living room, kitchen, bedroom, etc.) and include its length and width, in feet. (Do not draw any hallways on your floor plan.)

(a) Draw your floor plan on the figure below. Remember to label your rooms by name and include the length and width, in feet, for each room.



(b) Complete the table below by filling in the floor area, in square feet, for each room in your floor plan.

Room	Floor Area (in square feet)
Living	
Kitchen	
Bedroom	
Bedroom	
Bathroom	
Total Floor Area	600