



State of Texas Assessments of Academic Readiness

# Algebra I

## Practice Assessment



# STAAR ALGEBRA I REFERENCE MATERIALS



## FACTORING

Perfect square trinomials

$$a^2 + 2ab + b^2 = (a + b)^2$$
$$a^2 - 2ab + b^2 = (a - b)^2$$

Difference of squares

$$a^2 - b^2 = (a - b)(a + b)$$

## PROPERTIES OF EXPONENTS

Product of powers

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

Quotient of powers

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

Power of a power

$$(a^m)^n = a^{mn}$$

Rational exponent

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

Negative exponent

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

## LINEAR EQUATIONS

Standard form

$$Ax + By = C$$

Slope-intercept form

$$y = mx + b$$

Point-slope form

$$y - y_1 = m(x - x_1)$$

Slope of a line

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

## QUADRATIC EQUATIONS

Standard form

$$f(x) = ax^2 + bx + c$$

Vertex form

$$f(x) = a(x - h)^2 + k$$

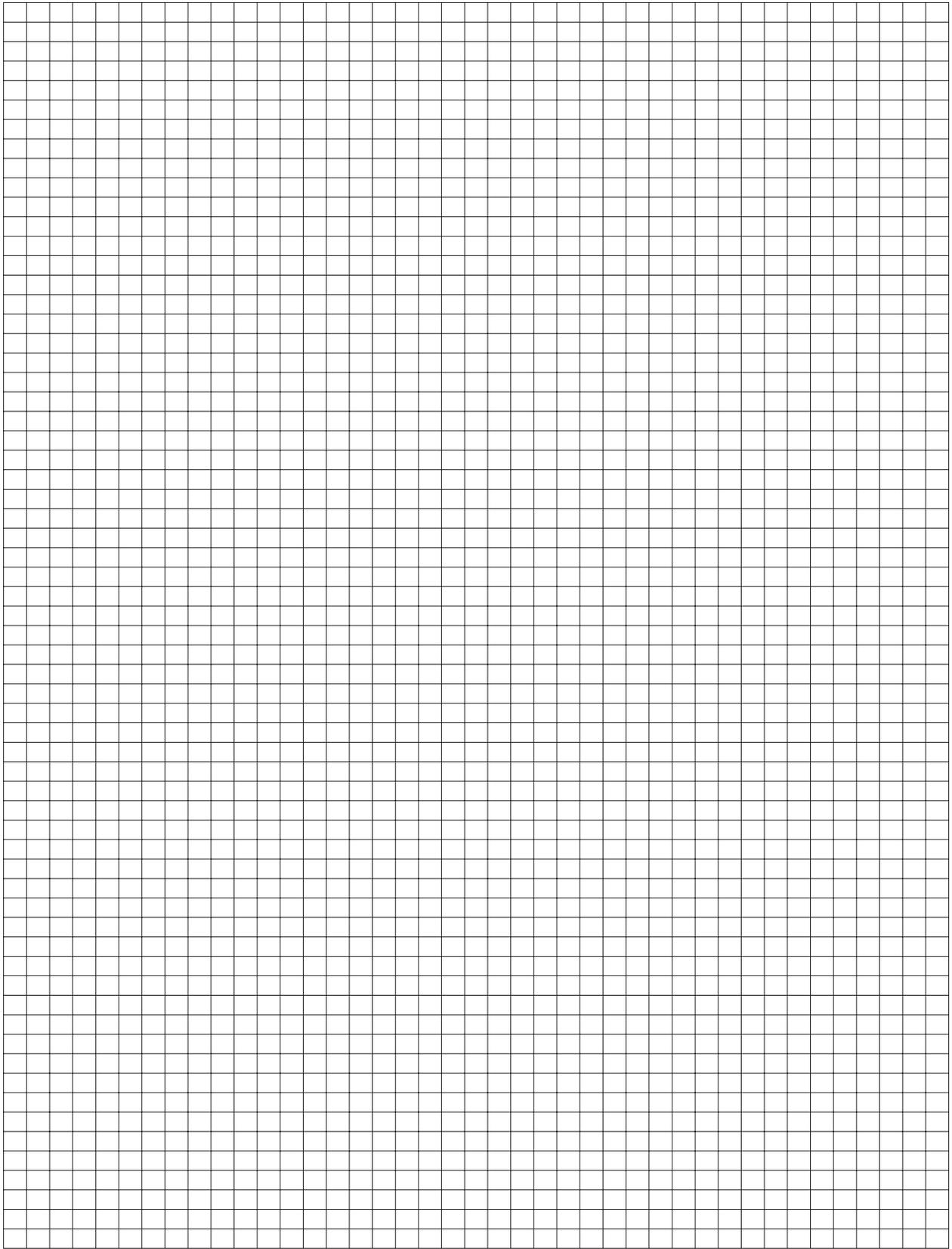
Quadratic formula

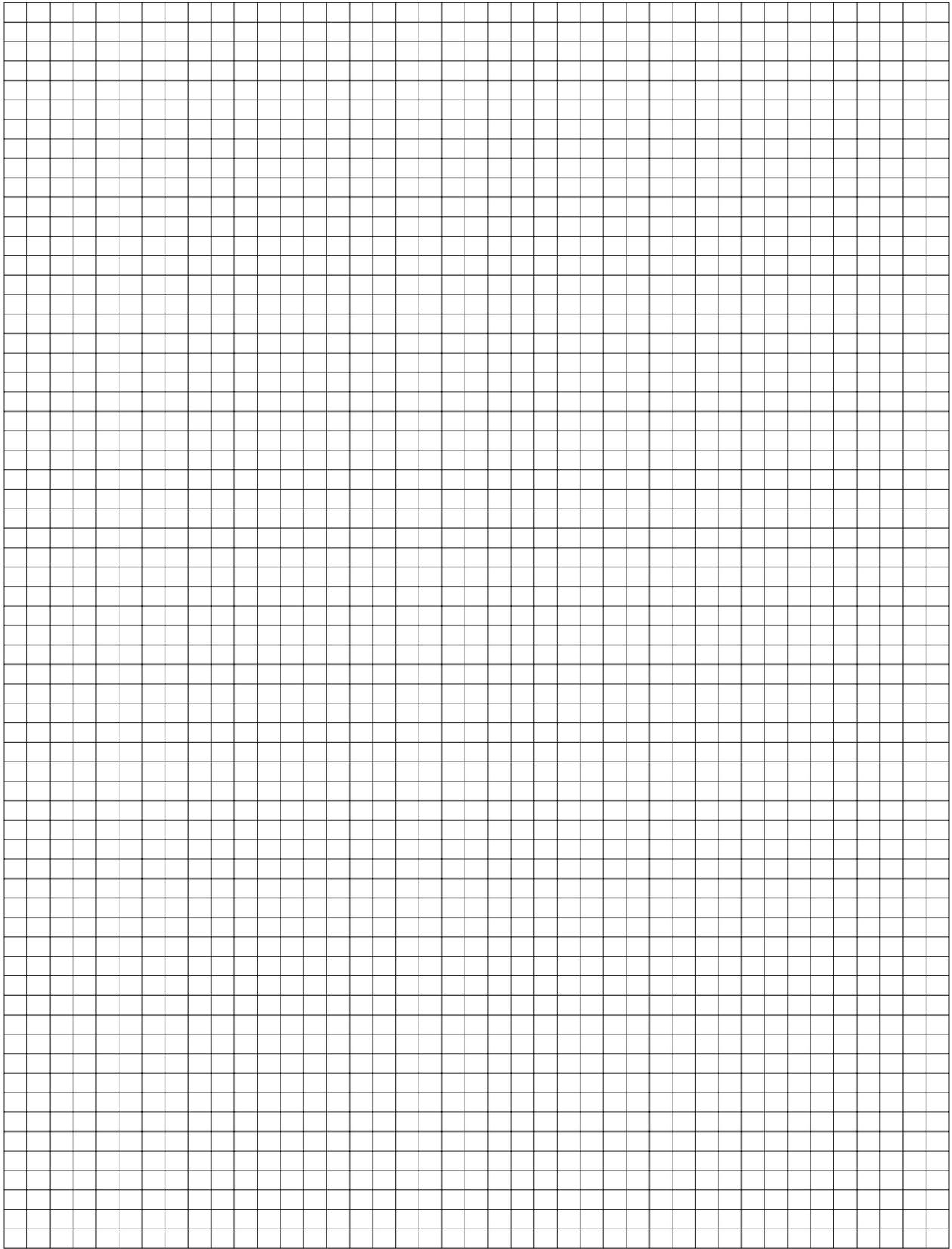
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Axis of symmetry

$$x = \frac{-b}{2a}$$







# ALGEBRA I

## DIRECTIONS

Read each question carefully. Choose the best answer to each question. For open-response questions, determine the best answer to the question.

1 Which expression is equivalent to  $(2m^4)(5m^8)$ ?

- (A)  $7m^{12}$
  - (B)  $10m^{12}$
  - (C)  $7m^{32}$
  - (D)  $10m^{32}$
- 

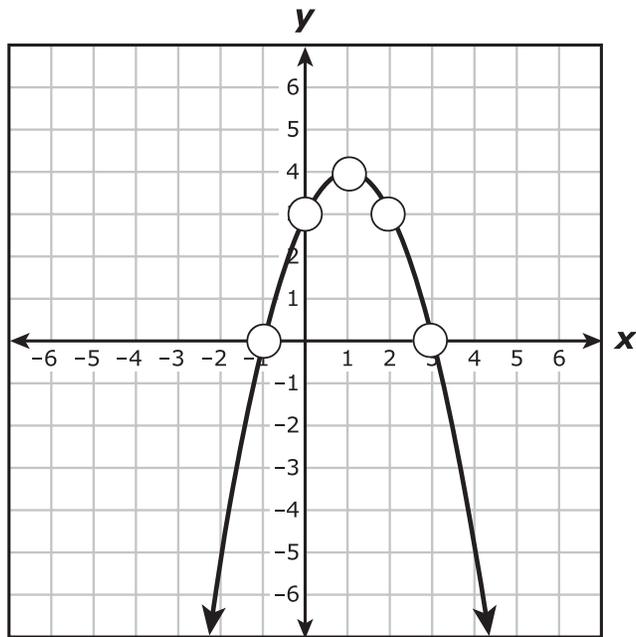
2 The function  $f(x) = x$  was transformed to form  $g(x) = f(x) - 23$ .

Which statement is true about the graphs of  $f$  and  $g$ ?

- (A) The graphs of  $f$  and  $g$  are not parallel, and the graph of  $f$  is translated 23 units up to create the graph of  $g$ .
- (B) The graphs of  $f$  and  $g$  are not parallel, and the graph of  $f$  is translated 23 units down to create the graph of  $g$ .
- (C) The graphs of  $f$  and  $g$  are parallel, and the graph of  $f$  is translated 23 units up to create the graph of  $g$ .
- (D) The graphs of  $f$  and  $g$  are parallel, and the graph of  $f$  is translated 23 units down to create the graph of  $g$ .

- 3 A graph of a quadratic function is shown. What are the  $x$ -intercepts of the function?

Shade the **TWO** correct circles that represent the points.



- 4 An artist bought a set of 10 paintbrushes that contained  $x$  small paintbrushes and  $y$  large paintbrushes. The number of small paintbrushes in the set was 4 times the number of large paintbrushes in the set.

Which system of equations can be used to find the numbers of small paintbrushes and large paintbrushes in the set?

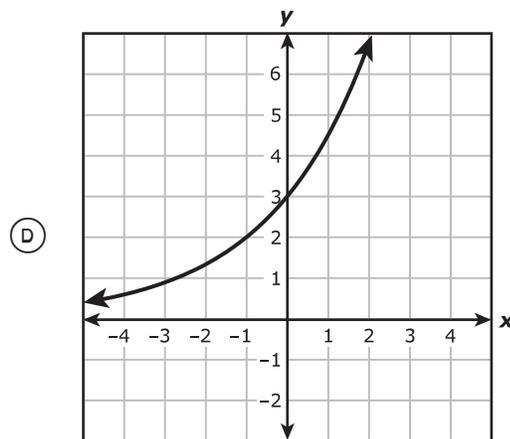
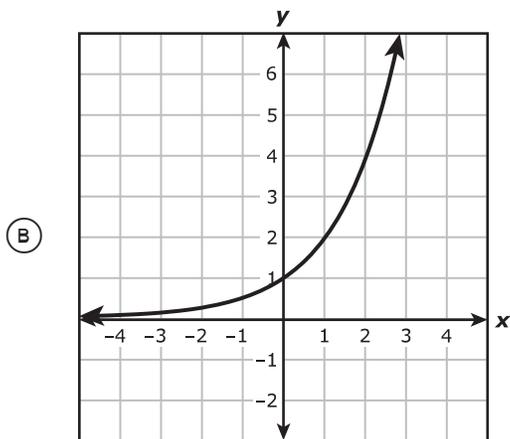
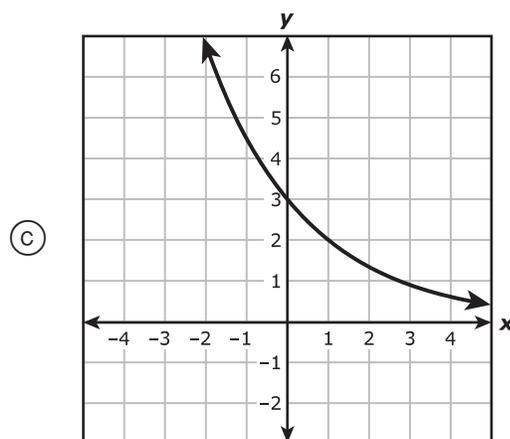
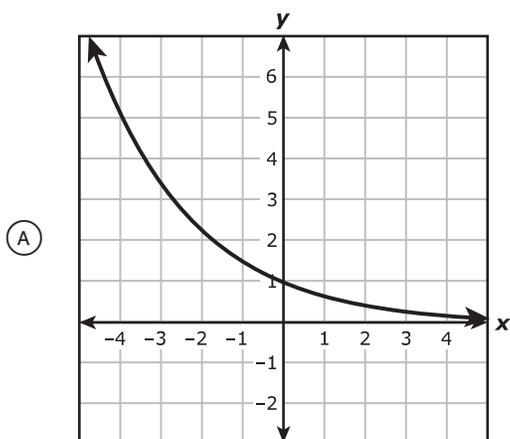
(A)  $x + y = 10$   
 $x = 4y$

(B)  $x - y = 10$   
 $x = 4y$

(C)  $x + y = 10$   
 $y = 4x$

(D)  $x - y = 10$   
 $y = 4x$

5 Which graph represents  $f(x) = 3\left(\frac{2}{3}\right)^x$ ?



- 6 For quadratic function  $f$ , the solutions to the equation  $f(x) = 0$  are  $x = \frac{7}{5}$  and  $x = -\frac{2}{3}$ .

Which function could represent  $f$ ?

- (A)  $f(x) = 14x^2 + 11x - 15$   
(B)  $f(x) = 15x^2 - 11x - 14$   
(C)  $f(x) = 14x^2 - 11x - 15$   
(D)  $f(x) = 15x^2 + 11x - 14$
- 

- 7 A store manager adjusts the price of an item each week that the item goes unsold. The price of the unsold item, in dollars, after  $x$  weeks can be modeled by the exponential function  $f(x) = 320(0.90)^x$ .

Select **ONE** correct answer in each box to complete each sentence.

The initial price of the item before the store manager made any

adjustments was 

(A) \$288
(B) \$320
(C) \$352

.

The price of the item 

(A) increases
(B) decreases

 at a rate of 

(A) 10%
(B) 90%
(C) 110%

 each week.

8 Which expression is equivalent to  $\sqrt{75}$ ?

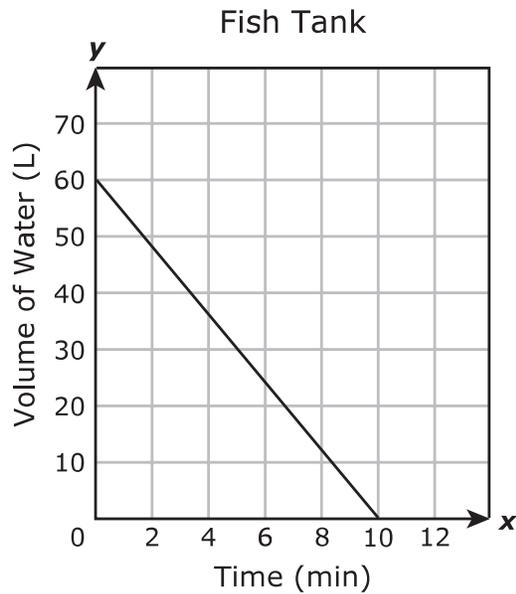
(A)  $5\sqrt{3}$

(B)  $15\sqrt{5}$

(C)  $3\sqrt{5}$

(D)  $5\sqrt{15}$

- 9 A fish tank is being drained at a constant rate. The graph shows the linear relationship between the volume of water in the fish tank in liters and the time in minutes the tank has been draining.



Which value best represents the rate of change of the volume of water in the fish tank with respect to time?

- (A)  $-6$  L/min
- (B)  $6$  L/min
- (C)  $-\frac{1}{6}$  L/min
- (D)  $\frac{1}{6}$  L/min

**10** What is the solution set for  $12 - 4w > 2(w - 18)$ ?

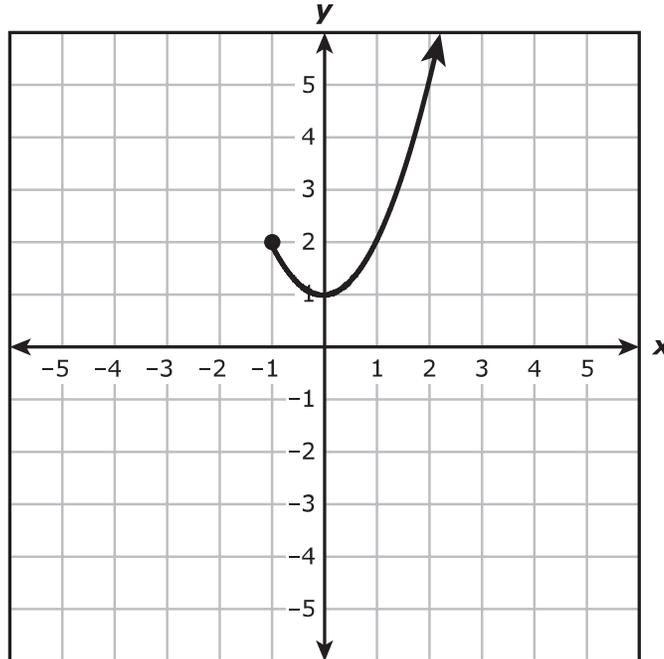
- (A)  $w > 8$
  - (B)  $w < 5$
  - (C)  $w < 8$
  - (D)  $w > 5$
- 

**11** What are the factors of  $2x^2 + x - 15$ ?

Select **TWO** correct answers.

- $x + 3$
- $2x - 3$
- $x + 5$
- $2x - 5$
- $x - 3$
- $2x + 5$

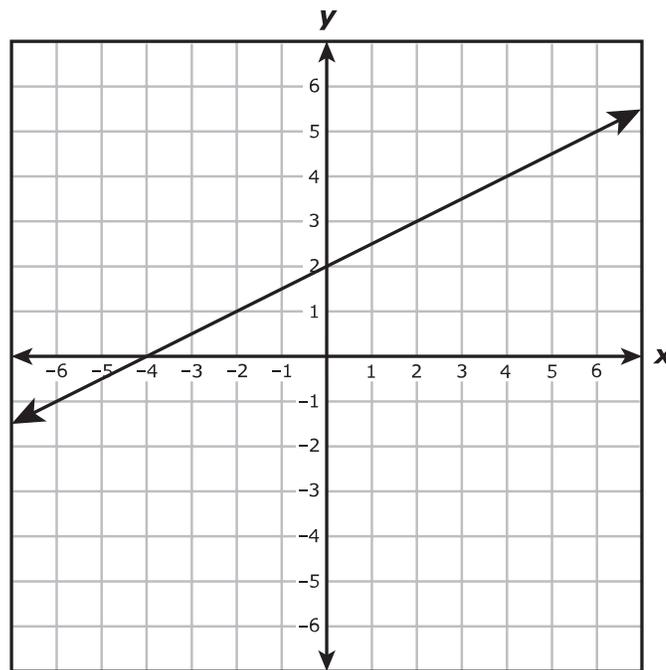
**12** A part of quadratic function  $f$  is graphed on the grid.



What is the domain of the part of the function shown?

- (A) All real numbers greater than or equal to  $-1$
- (B) All real numbers greater than or equal to  $1$
- (C) All real numbers
- (D) All real numbers greater than or equal to  $-1$  and less than or equal to  $5$

13 The graph of a linear function is shown on the coordinate plane.



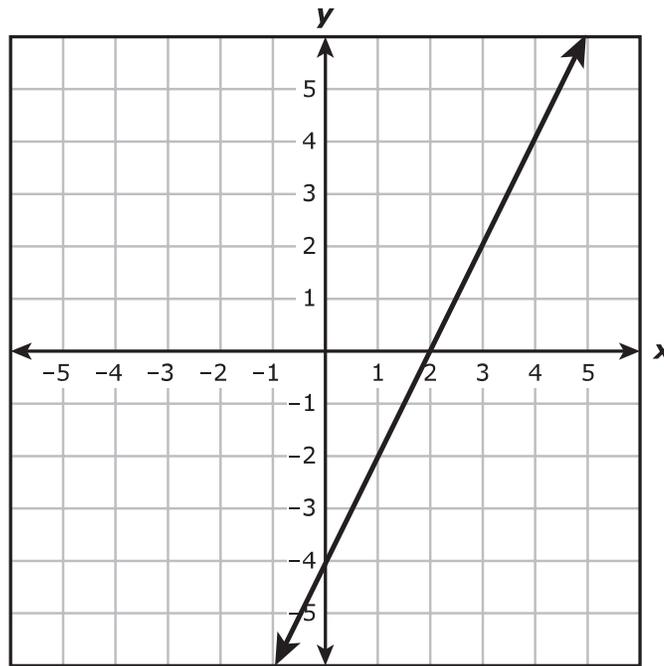
Which function best represents the relationship shown in the graph?

- (A)  $y = 2x - 4$
- (B)  $y = 2x + 2$
- (C)  $y = \frac{1}{2}x - 4$
- (D)  $y = \frac{1}{2}x + 2$

**14** Which statement about  $f(x) = 12x^2 - 36x + 27$  is true?

- Ⓐ The zeros are  $\pm \frac{2}{3}$  because  $f(x) = 3(2x - 3)(2x + 3)$ .
- Ⓑ The zeros are  $\pm \frac{3}{2}$  because  $f(x) = 3(2x - 3)(2x + 3)$ .
- Ⓒ The only zero is  $\frac{2}{3}$  because  $f(x) = 3(2x - 3)^2$ .
- Ⓓ The only zero is  $\frac{3}{2}$  because  $f(x) = 3(2x - 3)^2$ .

15 The graph of a linear function is shown.



What are the slope and the  $y$ -intercept that best represent this linear function?

Select the correct answer for each box. Each answer may be used more than once. Not all answers will be used.

**A** -4   **B** -2   **C** -0.5   **D** 0.5   **E** 2   **F** 4

Slope:

(A) (B) (C) (D) (E) (F)

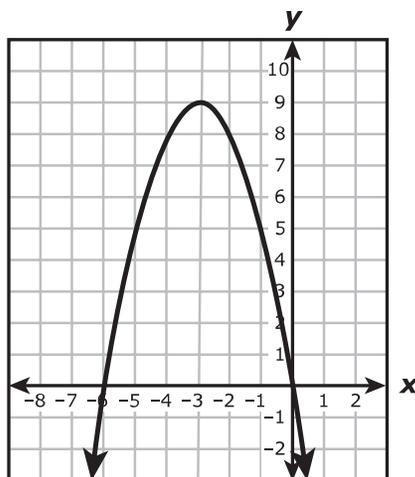
$y$ -intercept:

(A) (B) (C) (D) (E) (F)

16 Which expression is equivalent to  $(z + 5)(z^2 - 4z + 6)$ ?

- (A)  $z^3 + 5z^2 + 6z + 30$
- (B)  $z^2 + z + 11$
- (C)  $z^3 + z^2 - 14z + 30$
- (D)  $z^2 - 3z + 11$

17 The graph of a quadratic function is shown on the grid.



Which statement is best supported by the graph?

- (A) The function has a zero at 6.
- (B) The minimum value of the function is 9.
- (C) The vertex of the graph is  $(9, -3)$ .
- (D) The equation of the axis of symmetry of the graph is  $x = -3$ .

- 18** New houses are being built in a neighborhood. The table shows the exponential change in the number of houses in the neighborhood over the last 6 years.

Houses in Neighborhood

Year, $x$	Number of Houses, $f(x)$
1	27
2	35
3	45
4	68
5	93
6	124

Which exponential function best models the data?

- (A)  $f(x) = 1.4(18.9)^x$
- (B)  $f(x) = 27(1.3)^x$
- (C)  $f(x) = 18.9(1.4)^x$
- (D)  $f(x) = 1.3(27)^x$

**19** What is the solution to  $10 - 3(m - 5) = 2(5 - m)$ ?

Record your answer in the space provided.

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**20** Which value represents the rate of change of  $y$  with respect to  $x$  for this function?

$$\frac{2}{5}x - \frac{4}{7}y = \frac{3}{2}$$

- (A)  $-\frac{21}{8}$
- (B)  $\frac{8}{35}$
- (C)  $-\frac{6}{7}$
- (D)  $\frac{7}{10}$

**21** A system of linear equations is shown.

$$\begin{aligned}x - 3y &= 7 \\x - 2y &= 2\end{aligned}$$

What is the value of  $x$  in the solution to this system of equations?

- (A) 5
  - (B) -5
  - (C) 8
  - (D) -8
- 

**22** A shipping company started with 40 employees. The number of employees at the shipping company increases at a rate of 7.5% each year.

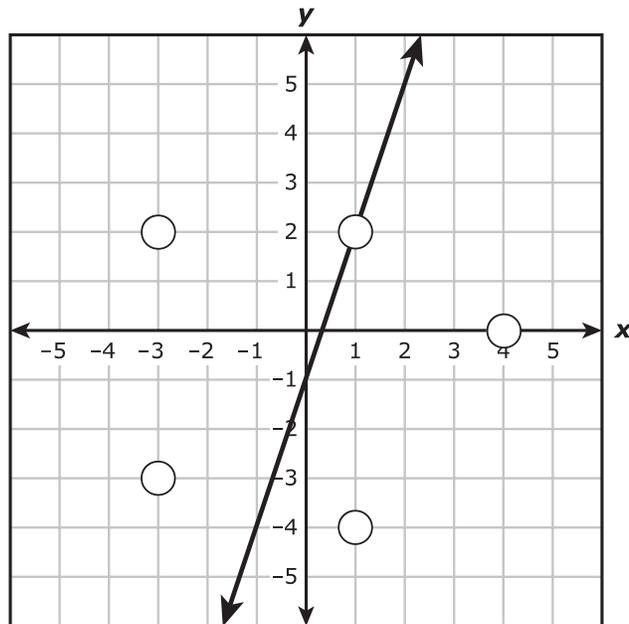
Which function can be used to model the number of employees,  $f(x)$ , at the shipping company after  $x$  years?

- (A)  $f(x) = 43(1.075)^x$
- (B)  $f(x) = 40(1.075)^x$
- (C)  $f(x) = 43(0.075)^x$
- (D)  $f(x) = 40(0.075)^x$

**23** The graph of  $3x - y = 1$  is shown on the grid.

Which points are in the solution set of  $3x - y \geq 1$ ?

Shade the **THREE** correct circles that represent the points.



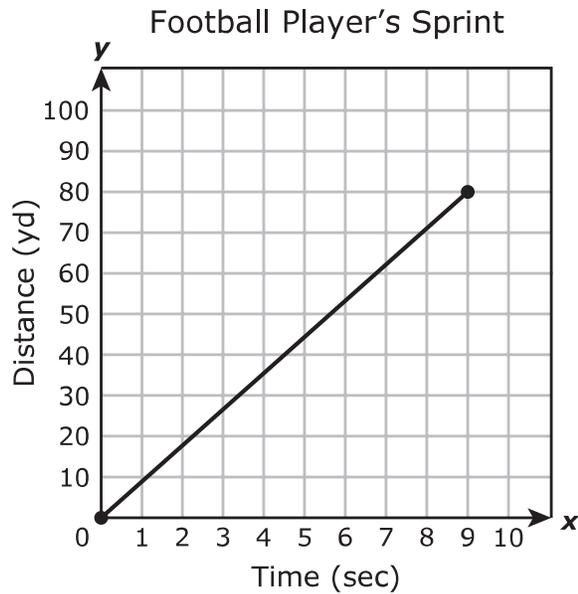
- 24** A sequence can be generated by using the equation shown, where  $a_1 = 5$  and  $n$  is a whole number greater than 1.

$$a_n = -3 + a_{(n-1)}$$

What are the first four terms in the sequence?

- (A) -3 2 7 12
- (B) 5 2 -1 -4
- (C) -3 -15 -75 -375
- (D) 5 8 11 14

- 25** A football player sprinted at a constant rate. The part of the linear function shown represents the distance the football player sprinted in yards,  $y$ , as a function of the time in seconds,  $x$ .



What is the range of the function for this situation?

- (A)  $0 \leq y \leq 9$
- (B)  $0 \leq x \leq 9$
- (C)  $0 \leq y \leq 80$
- (D)  $0 \leq x \leq 80$

- 
- 26** Which expression is a factor of  $-6x^2 - 19x + 20$ ?

- (A)  $3x - 5$
- (B)  $6x - 5$
- (C)  $x - 5$
- (D)  $2x - 5$

- 27** The function  $f(x) = x^2$  was transformed to create the function  $g(x) = f(x - 2) + 5$ . Complete the sentence about this transformation.

Select **ONE** correct answer in each box to complete the sentence.

The graph of  $f$  is translated 2 units 

(A) down
(B) up
(C) left
(D) right

 and

5 units 

(A) down
(B) up
(C) left
(D) right

 to create the graph of function  $g$ .

- 
- 28** Which expression is equivalent to  $\frac{x^{-6}y^4}{x^3y}$  for all values of  $x$  and  $y$  where the expression is defined?

- (A)  $\frac{y^3}{x^9}$
- (B)  $\frac{y^4}{x^9}$
- (C)  $\frac{y^5}{x^3}$
- (D)  $\frac{y^4}{x^2}$

- 29** The tables of ordered pairs represent some points on the graphs of two lines.

Line 1

$x$	$y$
-1	-12
1	-2
5	18

Line 2

$x$	$y$
-1	16
2	4
6	-12

Which system of equations is represented by the two lines?

- (A)  $y = 5x - 7$   
 $4x - y = 4$
- (B)  $y = 5x - 7$   
 $4x + y = 12$
- (C)  $y = 7x - 9$   
 $4x - y = 4$
- (D)  $y = 7x - 9$   
 $4x + y = 12$

- 
- 30** A function is shown.

$$f(x) = \frac{2}{5}(x - 25)^2 + 13$$

What is the range of the function?

- (A) All real numbers
- (B) All real numbers greater than or equal to 25
- (C) All real numbers greater than or equal to 10
- (D) All real numbers greater than or equal to 13

- 31** Indicate whether each statement is an example of association, causation, both association and causation, or neither association nor causation.

Select **ONE** correct answer in each row.

Statement	Association Only	Causation Only	Both Association and Causation	Neither Association nor Causation
As the outside temperature in degrees Celsius increases, the number of minutes it takes for a bowl of ice cream to melt decreases.	(A)	(B)	(C)	(D)
As the sales of winter coats increase, the outside temperature decreases.	(A)	(B)	(C)	(D)

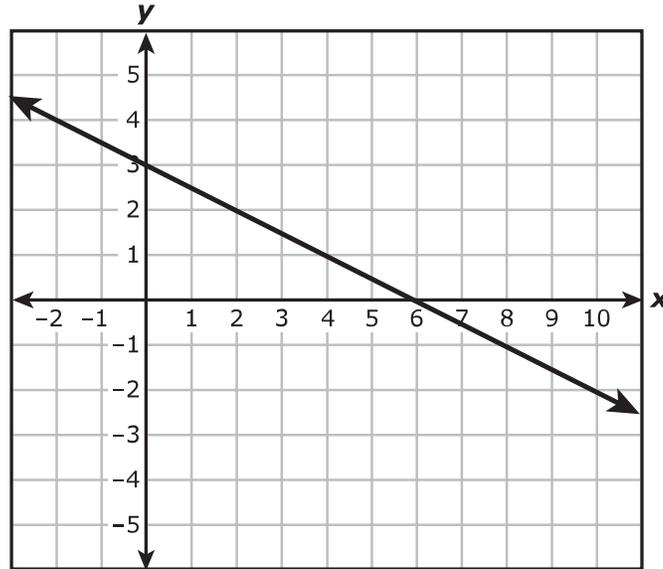
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- 32** Dance lessons are offered at two studios. The cost of dance lessons at each studio is shown.

- Studio Q charges a \$30 registration fee plus \$80 per month.
- Studio R charges a \$105 registration fee plus \$65 per month.

After how many months will the total cost of the dance lessons be equal at the two studios?

- (A) 5
- (B) 280
- (C) 9
- (D) 430

**33** The graph of a linear function is shown on the grid.



Which statement is best supported by the graph of the function?

- (A) The slope of the graph is  $\frac{1}{2}$ .
- (B) The x-intercept of the graph is 6.
- (C) The zero of the function is  $\frac{1}{2}$ .
- (D) The y-intercept of the graph is 6.

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**34** Which expression is a factor of  $16m^2 - 81$ ?

- (A)  $2m - 9$
- (B)  $16m + 9$
- (C)  $8m - 9$
- (D)  $4m + 9$

- 35** The equation of line  $k$  is  $y = -x + 17$ . Line  $n$  is parallel to line  $k$  and passes through the point  $(-5, 7)$ .

Determine an equation that represents the relationship between  $x$  and  $y$  for line  $n$ .

Record your answer in the space provided.

- 36** A bicycle rental company charges a fixed rental fee for the first 30 minutes and a cost per minute for each additional minute. The table shows the linear relationship between the total cost in dollars to rent a bicycle and the number of additional minutes a bicycle is rented.

Bicycle Rental

Number of Additional Minutes	Total Cost (dollars)
15	3.05
20	3.40
35	4.45
55	5.85

What is the rate of change of the total cost in dollars with respect to the number of additional minutes?

- (A) \$0.17 per min
- (B) \$0.35 per min
- (C) \$0.07 per min
- (D) \$0.56 per min

- 37** A student borrowed \$480 from a friend. He agreed to make monthly payments of \$96 with no interest until the loan balance was paid off. The function shown models this situation, where  $f(x)$  represents the remaining loan balance in dollars after the student has made  $x$  monthly payments.

$$f(x) = 480 - 96x$$

Which statements are true about the domain and range of the function for this situation?

Select **TWO** correct answers.

- The domain of the function is the set of all real numbers.
  - The domain of the function is  $\{0, 1, 2, 3, 4, 5\}$ .
  - The domain of the function is  $\{0, 96, 192, 288, 384, 480\}$ .
  - The range of the function is the set of all real numbers.
  - The range of the function is  $\{0, 1, 2, 3, 4, 5\}$ .
  - The range of the function is  $\{0, 96, 192, 288, 384, 480\}$ .
- 

- 38** What are the solutions to the equation  $(x + 13)(x - 6) = 0$ ?

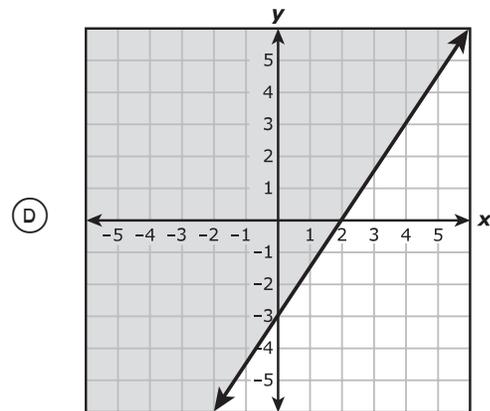
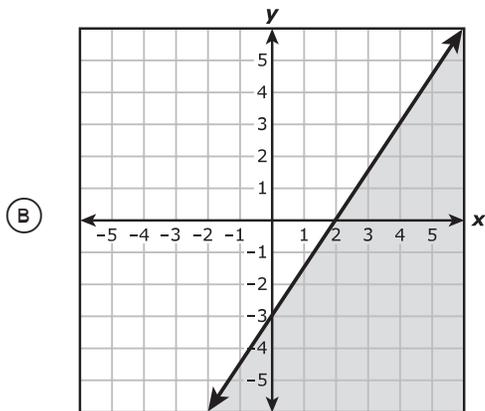
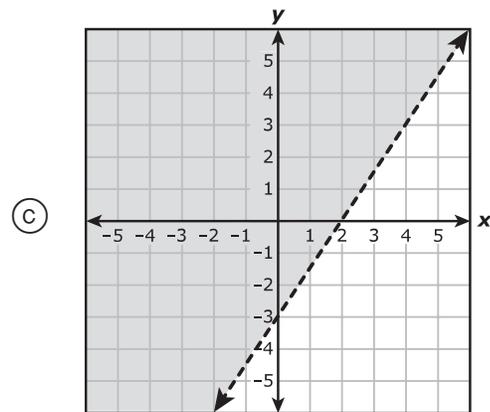
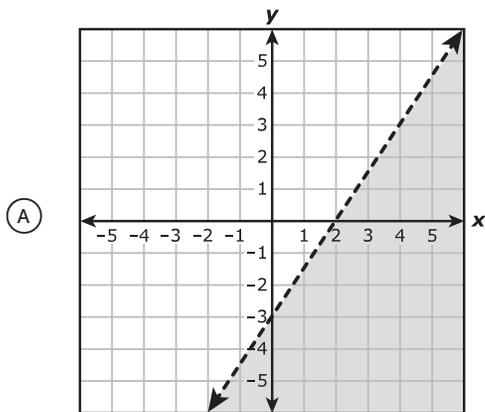
- (A)  $x = 6$  and  $x = 13$
- (B)  $x = -13$  and  $x = 6$
- (C)  $x = -6$  and  $x = 13$
- (D)  $x = -13$  and  $x = -6$

- 39** A sample of a substance with an initial mass of 963 grams is decaying at a rate of 27% per hour.

Create a function that can be used to find  $y$ , the mass of the substance in grams remaining after  $x$  hours.

Record your answer in the space provided.

40 Which graph best represents the solution set of  $3x < 2y + 6$ ?



**41** What is the slope of the line that passes through the points (10, 18) and (-5, -12)?

- (A)  $\frac{1}{2}$
  - (B) 2
  - (C) -2
  - (D)  $-\frac{1}{2}$
- 

**42** What are the solutions to the equation  $x^2 - 2 = -3x$ ?

- (A)  $\frac{3 \pm \sqrt{17}}{2}$
- (B) -1 and 2
- (C)  $\frac{-3 \pm \sqrt{17}}{2}$
- (D) -2 and 1

**43** In the expression shown,  $x$  is a value where the expression is defined.

$$(2x^8)(3x^{-1})^2$$

What is the simplest form of the expression? Write your answer in the form  $ax^b$ .

Record your answer in the space provided.

44 The table represents some points on the graph of a linear function.

x	y
-1	$\frac{27}{7}$
3	$\frac{11}{7}$
6	$-\frac{1}{7}$
10	$-\frac{17}{7}$

Which function represents this relationship?

- (A)  $y = -\frac{4}{7}x + \frac{23}{7}$
- (B)  $y = -\frac{4}{7}x + \frac{31}{7}$
- (C)  $y = \frac{19}{7}x + \frac{8}{7}$
- (D)  $y = \frac{19}{7}x + \frac{46}{7}$

**45** Quadratic function  $f$  has vertex  $(4, 15)$  and passes through the point  $(1, 20)$ . Which equation represents  $f$ ?

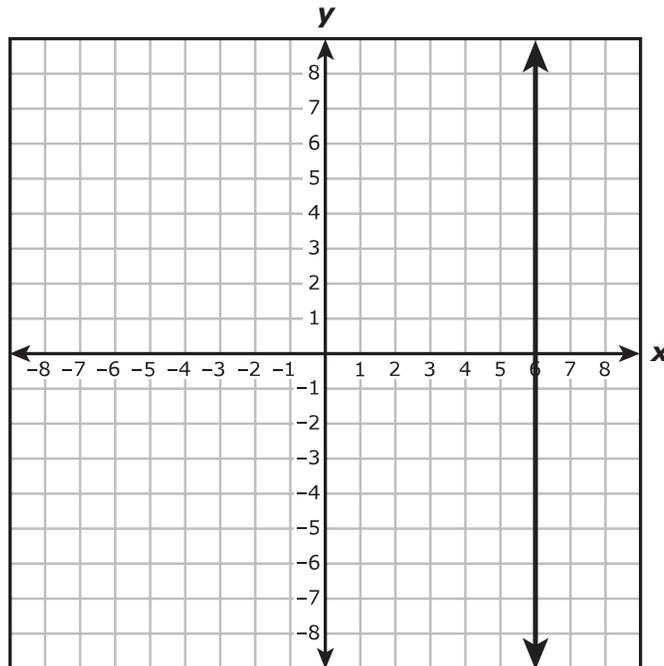
Ⓐ  $f(x) = -\frac{5}{9}(x - 4)^2 + 15$

Ⓑ  $f(x) = \frac{5}{9}(x - 4)^2 + 15$

Ⓒ  $f(x) = -\frac{35}{9}(x - 4)^2 - 15$

Ⓓ  $f(x) = \frac{35}{9}(x - 4)^2 - 15$

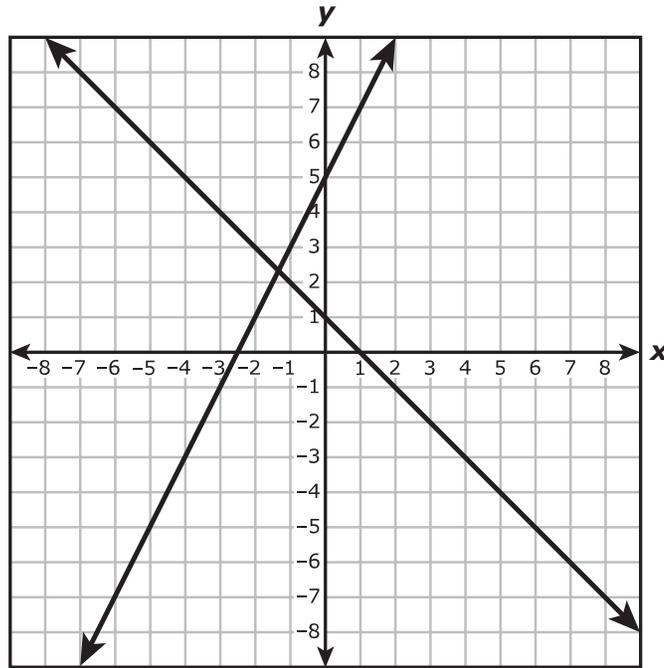
46 A line is graphed on a coordinate grid.



Which statement best describes the line?

- (A) The equation of the line is  $x = 6$ , and the slope is equal to 0.
- (B) The equation of the line is  $y = 6$ , and the slope is undefined.
- (C) The equation of the line is  $y = 6$ , and the slope is equal to 0.
- (D) The equation of the line is  $x = 6$ , and the slope is undefined.

- 47 The graph shows two lines representing the equations  $y = 2x + 5$  and  $x + y = 1$ .



Which ordered pair is in the solution set for the system of inequalities  $y \geq 2x + 5$  and  $x + y \leq 1$ ?

- (A)  $(-5, 0)$
- (B)  $(0, 7)$
- (C)  $(5, 0)$
- (D)  $(0, -7)$

**48** For linear function  $f$ ,  $f(-3) = 0$  and  $f(5) = -4$ .

Complete function  $f$  in slope-intercept form.

Select the correct answer for each box. Not all answers will be used.

**A** -3   **B** -2   **C** -1.5   **D** -0.5   **E** 0.5   **F** 1.5   **G** 2   **H** 3

$$f(x) = \boxed{\text{A } \text{B } \text{C } \text{D } \text{E } \text{F } \text{G } \text{H}} x + \boxed{\text{A } \text{B } \text{C } \text{D } \text{E } \text{F } \text{G } \text{H}}$$

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**49** Which statement about the graph of the function  $f(x) = 35(1.4)^x$  is true?

- (A) The  $y$ -intercept of the function is  $(0, 35)$ .
- (B) The  $x$ -intercept of the function is  $(1.4, 0)$ .
- (C) The graph of the function is decreasing for all values of  $x$ .
- (D) The asymptote of the function is  $y = 0.4$ .

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**50** Which expression is equivalent to  $k^2 - 5k - 6$ ?

- (A)  $(k - 1)(k + 6)$
- (B)  $(k - 3)(k + 2)$
- (C)  $(k - 6)(k + 1)$
- (D)  $(k - 2)(k + 3)$





**STAAR  
Algebra I  
PRACTICE**

