

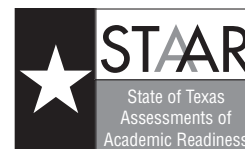
# **Algebra I**

**Administered May 2016**

**RELEASED**



# 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

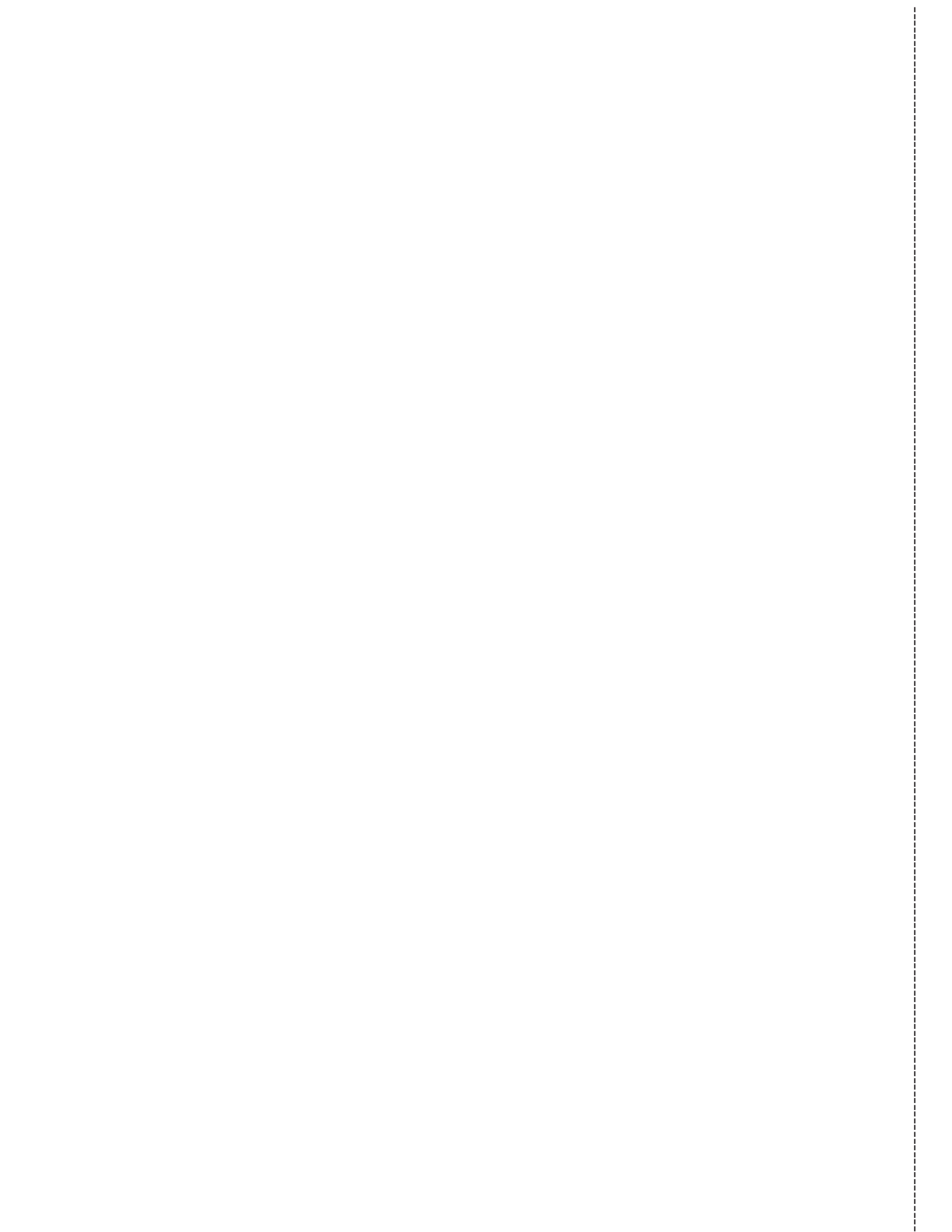
$$f(x) = a(x - h)^2 + k$$

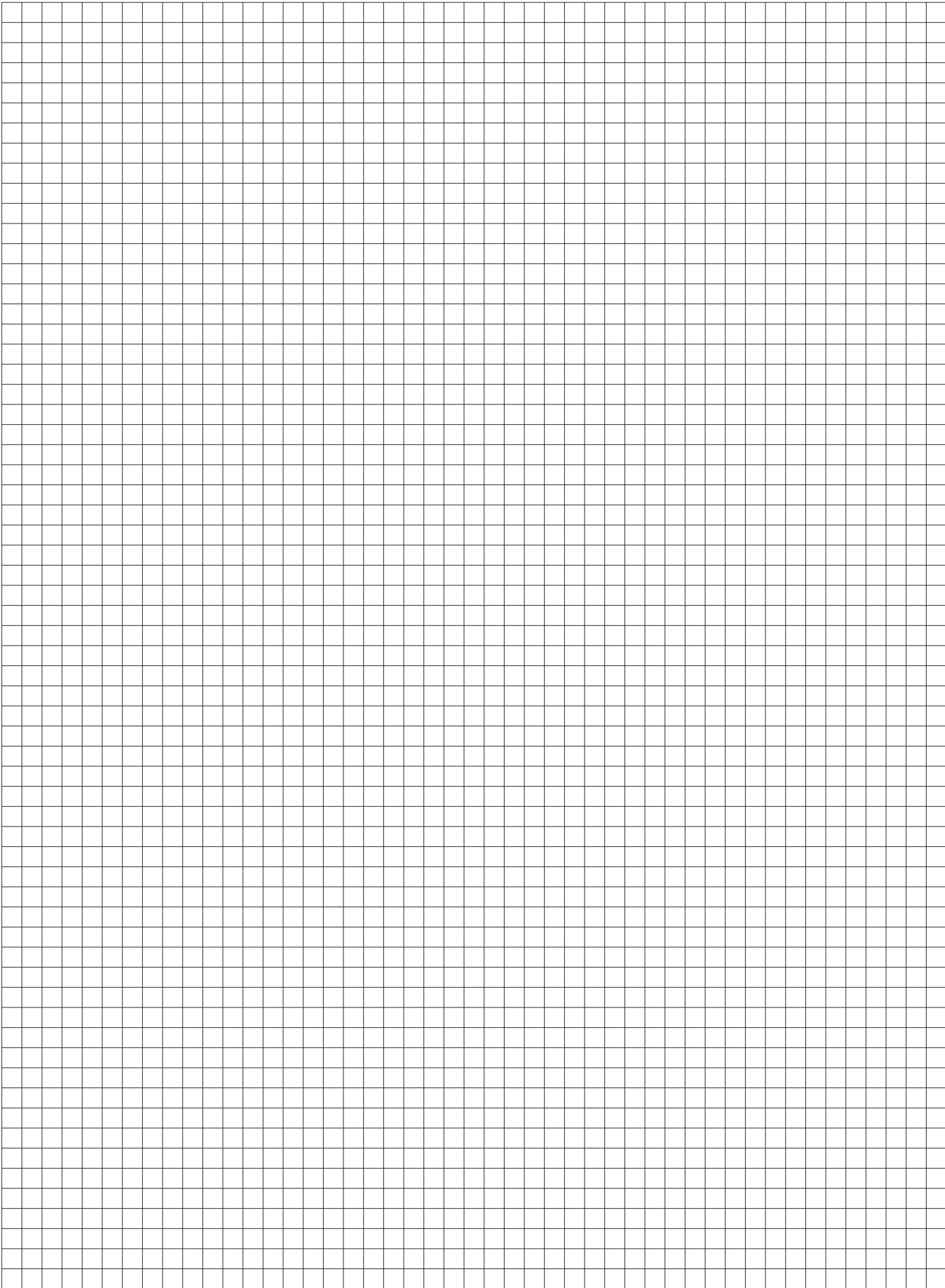
Quadratic formula

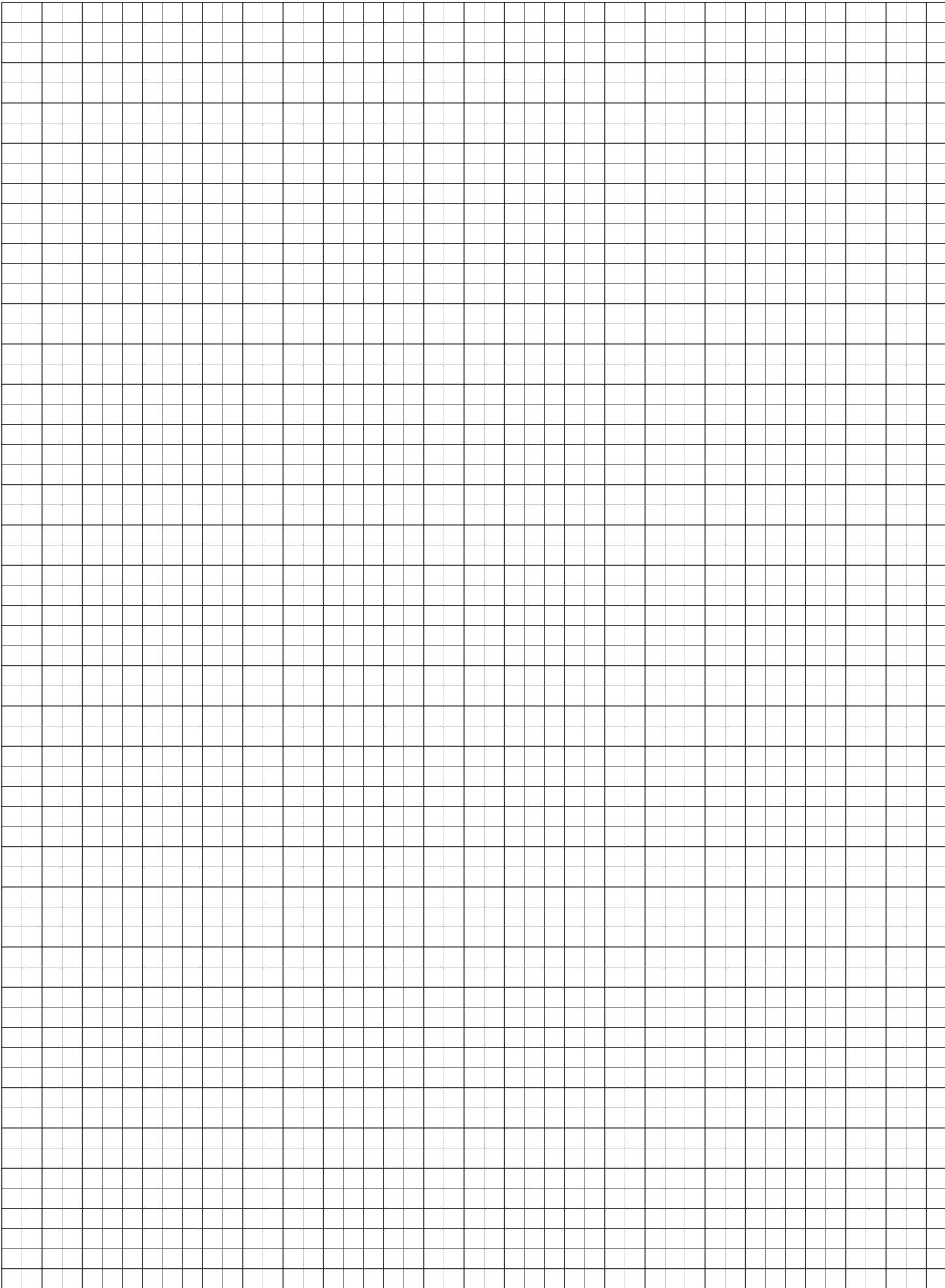
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Axis of symmetry

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





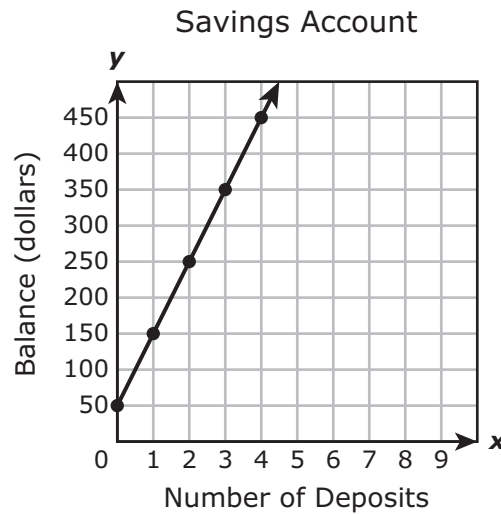


# ALGEBRA I

## DIRECTIONS

Read each question carefully. For a multiple-choice question, determine the best answer to the question from the four answer choices provided. For a griddable question, determine the best answer to the question. Then fill in the answer on your answer document.

- 1 A savings account balance can be modeled by the graph of the linear function shown on the grid.



What is the rate of change of the balance with respect to the number of deposits?

- A \$100 per deposit
- B \$50 per deposit
- C \$0.50 per deposit
- D \$2 per deposit



2 Which expression is equivalent to  $2x^2 + (4x - 6x^2) + 9 - (6x + 3)$ ?

F  $-4x^2 - 2x + 12$

G  $-4x^2 - 2x + 6$

H  $-10x + 6$

J  $18x + 12$

---

3 Baseball fans can buy tickets for seats in the lower deck or upper deck of the stadium. Tickets for the lower deck cost \$42 each. Ticket prices for the upper deck are 75% of the cost of tickets for the lower deck. Which inequality represents all possible combinations of  $x$ , the number of tickets for the lower deck, and  $y$ , the number of tickets for the upper deck, that someone can buy for no more than \$800?

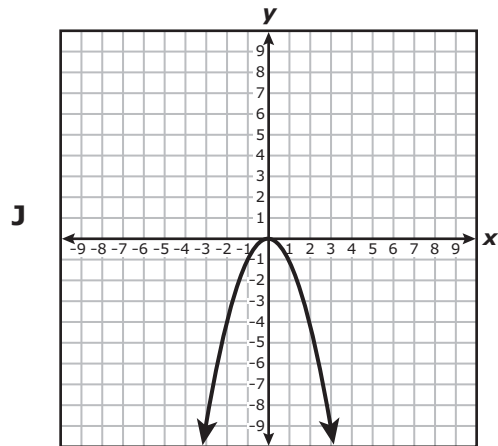
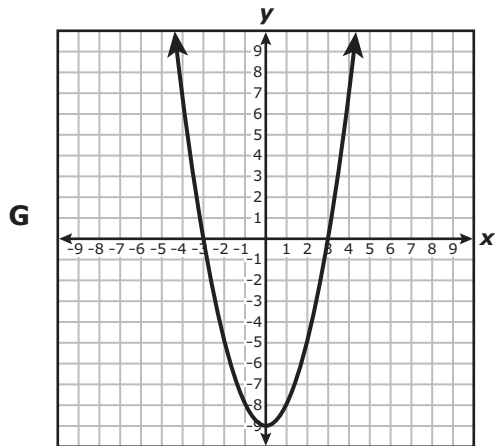
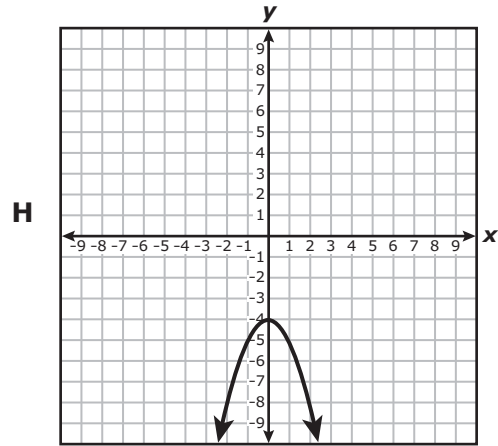
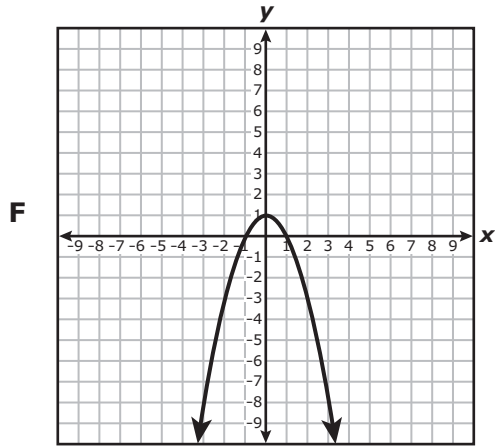
A  $42x + 56y \leq 800$

B  $42x + 31.5y \leq 800$

C  $42x + 56y > 800$

D  $42x + 31.5y > 800$

- 4 Function  $p$  is in the form  $y = ax^2 + c$ . If the values of  $a$  and  $c$  are both less than 0, which graph could represent  $p$ ?



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

<b>x</b>	-7.5	-3.5	-1	2	3.5
<b>y</b>	12	0	-7.5	-16.5	-21

Which function represents the same relationship?

**A**  $h(x) = -3x - 10.5$

**B**  $h(x) = -x - 3.5$

**C**  $h(x) = 3x - 10.5$

**D**  $h(x) = x - 3.5$

---

6 Which expression is equivalent to  $2x^2 + 7x + 4$ ?

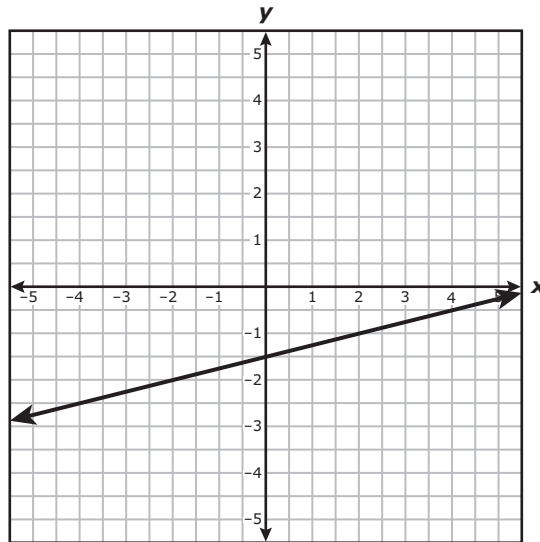
**F**  $(2x - 1)(x + 4)$

**G**  $(2x + 1)(x - 4)$

**H**  $(2x + 1)(x + 4)$

**J** None of these

- 7 The graph of  $0.5x - 2y = 3$  is shown on the grid.



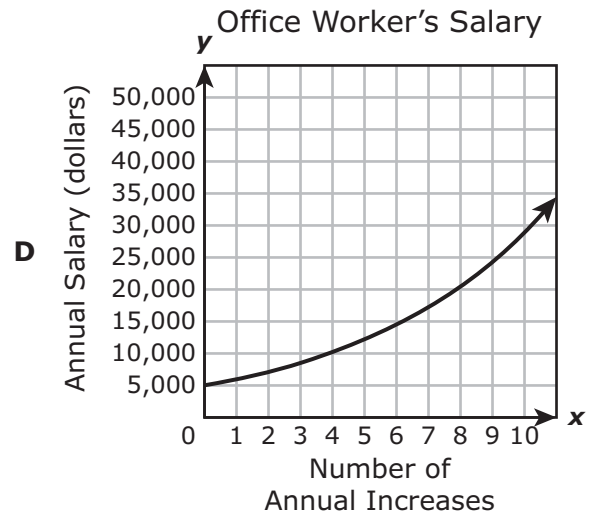
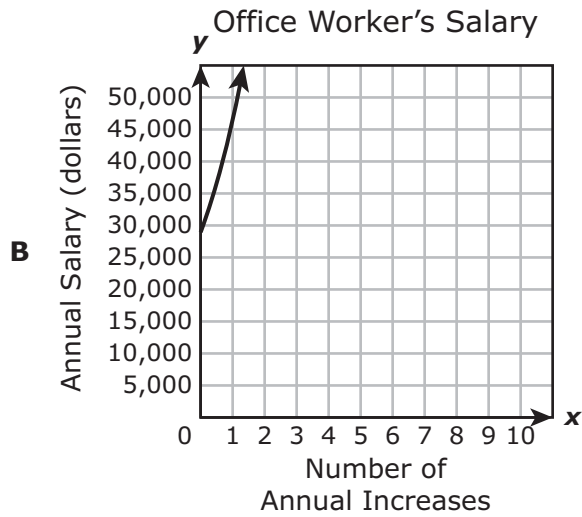
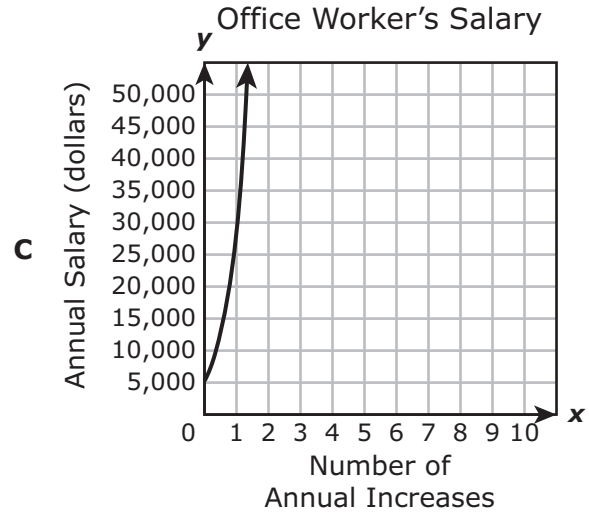
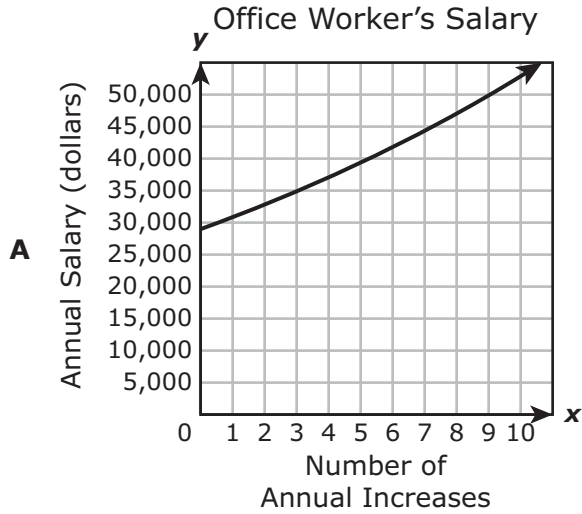
Which ordered pair is in the solution set of  $0.5x - 2y \geq 3$ ?

- A  $(-2, 0.5)$
  - B  $(2, 1)$
  - C  $(2, -1)$
  - D  $(-2, -0.5)$
- 

- 8 What value of  $x$  makes the equation  $-5x - (-7 - 4x) = -2(3x - 4)$  true?

- F  $x = 3$
- G  $x = 5$
- H  $x = \frac{1}{3}$
- J  $x = \frac{1}{5}$

- 9 The starting annual salary for an office worker at a company is \$29,000. If the company awards an annual increase of 6.2%, which graph models this situation after the office worker receives  $x$  annual increases?



10 Which expression is equivalent to  $\frac{14a^4b^6c^{-10}}{8a^{-2}b^3c^{-5}}$ ?

F  $\frac{7a^2b^3}{4c^{15}}$

G  $\frac{6a^2b^9}{c^{15}}$

H  $\frac{7a^6b^3}{4c^5}$

J  $\frac{7b^2c^2}{4a^2}$

---

11 Linear function  $f(x) = x$  is graphed on a coordinate plane. The graph of a new line is formed by changing the slope of the original line to  $\frac{2}{3}$  and the  $y$ -intercept to 4. Which statement about the relationship between these two graphs is true?

- A The graph of the new line is steeper than the graph of the original line, and the  $y$ -intercept has been translated down.
- B The graph of the new line is less steep than the graph of the original line, and the  $y$ -intercept has been translated up.
- C The graph of the new line is steeper than the graph of the original line, and the  $y$ -intercept has been translated up.
- D The graph of the new line is less steep than the graph of the original line, and the  $y$ -intercept has been translated down.

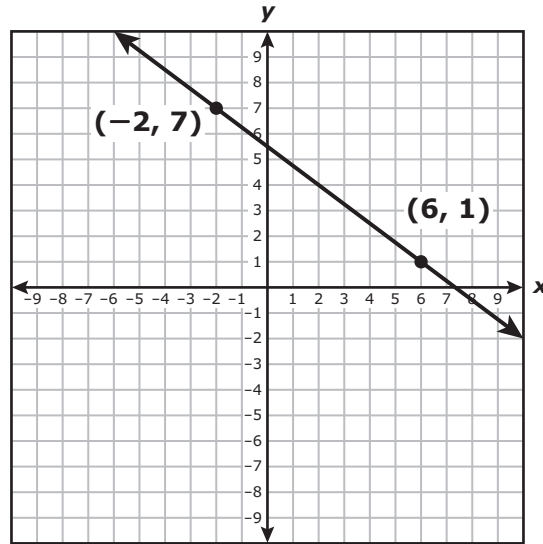
- 12 The table shows some ordered pairs that belong to quadratic function  $h$ .

$x$	-4	-2	0	2	3	4	6
$h(x)$	41	17	1	-7	-8	-7	1

What is the range of  $h$ ?

- F** All real numbers
- G** All real numbers greater than or equal to  $-7$
- H** All real numbers greater than or equal to  $-8$
- J** All real numbers greater than or equal to 0
- 
- 13 A sports magazine prints 12 issues per year, and a technology magazine prints 10 issues per year. The total number of pages in all the issues of the sports magazine for one year is 32 more than the total number of pages in all the issues of the technology magazine for one year. Each issue of the sports magazine has 18 fewer pages than each issue of the technology magazine. Which system of equations can be used to find  $s$ , the number of pages in each issue of the sports magazine, and  $t$ , the number of pages in each issue of the technology magazine?
- A**  $s = t - 18$   
 $12s = 10t + 32$
- B**  $t = s - 18$   
 $10t = 12s + 32$
- C**  $s = t - 18$   
 $10s = 12t + 32$
- D**  $t = s - 18$   
 $12t = 10s + 32$

14 What is the  $y$ -intercept of the line graphed on the grid?



Record your answer and fill in the bubbles on your answer document.

15 Which expression is equivalent to  $9q^2 - \frac{2}{3}(3q - 7) + 5q^2$ ?

A  $9q^2 - \frac{5}{3}q - 3$

B  $9q^2 - 2q - 3$

C  $14q^2 - 2q + \frac{14}{3}$

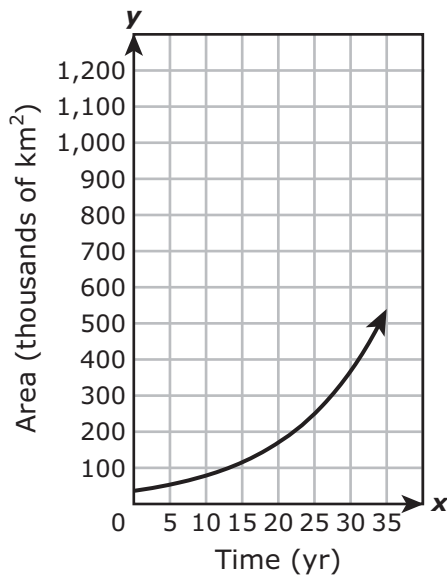
D  $14q^2 - \frac{5}{3}q - \frac{14}{3}$



- 16** Which statement about  $k(x) = -x^2 - 2x + 15$  is true?
- F** The zeros are  $-3$  and  $5$ , because  $k(x) = -(x + 3)(x - 5)$ .
- G** The zeros are  $-5$  and  $3$ , because  $k(x) = -(x + 5)(x - 3)$ .
- H** The zeros are  $-5$  and  $-3$ , because  $k(x) = -(x + 5)(x + 3)$ .
- J** The zeros are  $3$  and  $5$ , because  $k(x) = -(x - 3)(x - 5)$ .

- 17** The exponential function modeled below represents the number of square kilometers of land occupied by cane toads  $x$  years after this animal was first introduced into Australia.

Area Occupied by Cane Toads



Time (yr)	Area (km <sup>2</sup> )
0	36,500
5	53,600
10	78,800
15	115,780
20	170,120
25	250,000
30	367,300
35	539,700

Based on the data, which measurement is closest to the number of square kilometers of land that will be occupied by cane toads 40 years after this animal was first introduced into Australia?

- A** 550,000 km<sup>2</sup>
- B** 1,250,000 km<sup>2</sup>
- C** 600,000 km<sup>2</sup>
- D** 800,000 km<sup>2</sup>

18 Which of the following is equivalent to  $3x - 4y = 6$ ?

F  $y = -\frac{6}{7}x$

G  $y = -\frac{3}{4}x$

H  $y = \frac{4}{3}x + 2$

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

---

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

x	y
-2	12
0	3
3	-10.5
7	-28.5

What is the rate of change of  $y$  with respect to  $x$  for this function?

A  $\frac{2}{9}$

B  $-\frac{9}{2}$

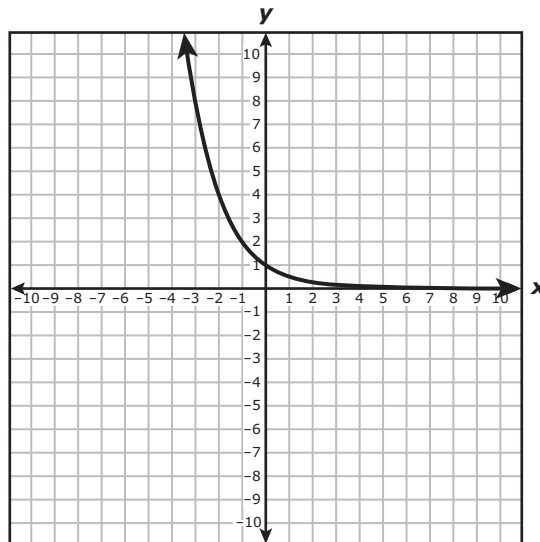
C  $\frac{9}{2}$

D  $-\frac{2}{9}$

- 20** A manager purchased a total of 21 coffee mugs and key chains. Each coffee mug cost \$8.50, and each key chain cost \$2.75. If the manager spent a total of \$132.50, how many coffee mugs did the manager purchase?

Record your answer and fill in the bubbles on your answer document.

- 21** The graph of an exponential function is shown on the grid.



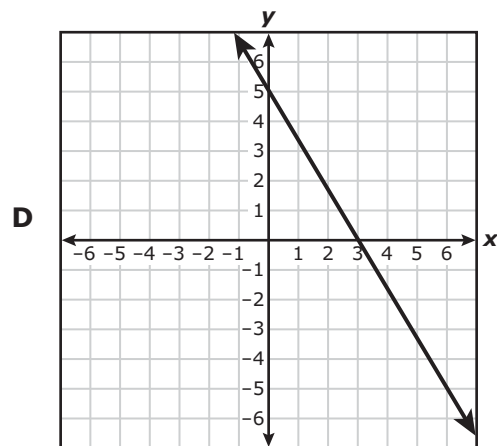
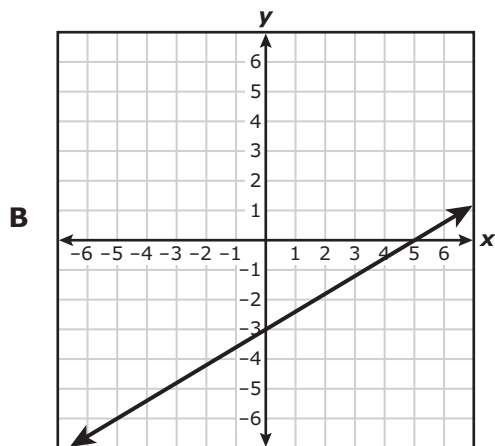
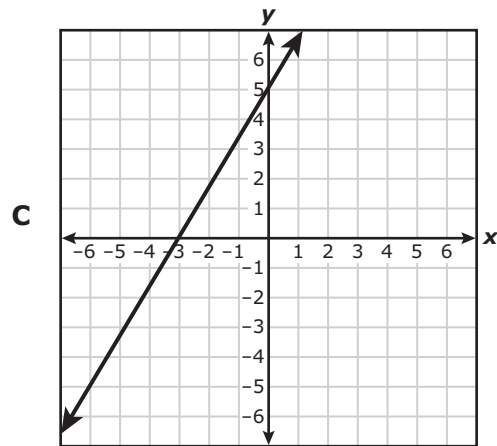
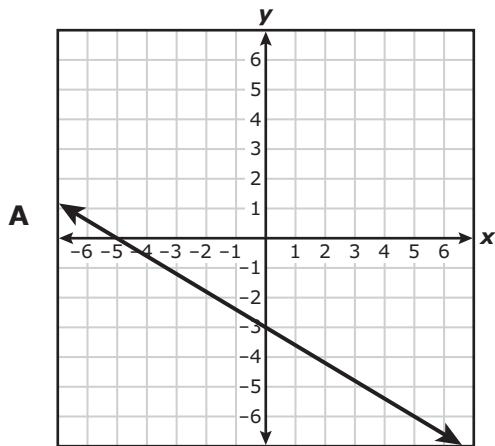
Based on the graph, which statement about the function is true?

- A** The range is the set of all real numbers less than 0.
- B** The domain is the set of all real numbers greater than  $-4$ .
- C** The range is the set of all real numbers greater than 0.
- D** The domain is the set of all real numbers less than  $-4$ .

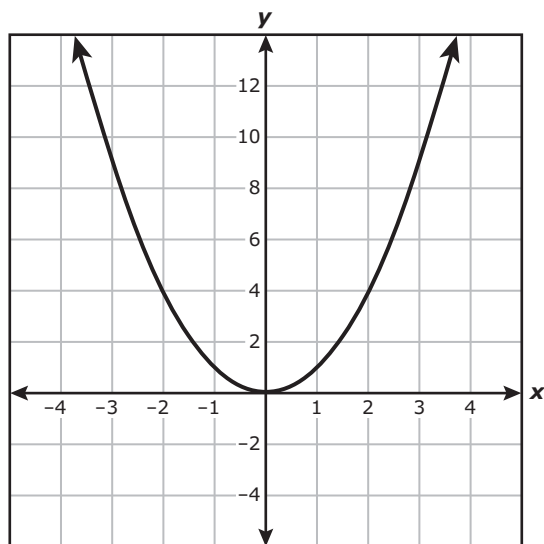
22 The sum of the first  $n$  consecutive even numbers can be found using  $S = n^2 + n$ , where  $n \geq 2$ . What is the value of  $n$  when the sum is 156?

- F 6
- G 39
- H 26
- J 12

23 Which graph represents  $-3x + 5y = -15$ ?



- 24 The graph of  $f(x) = x^2$  is shown on the grid.



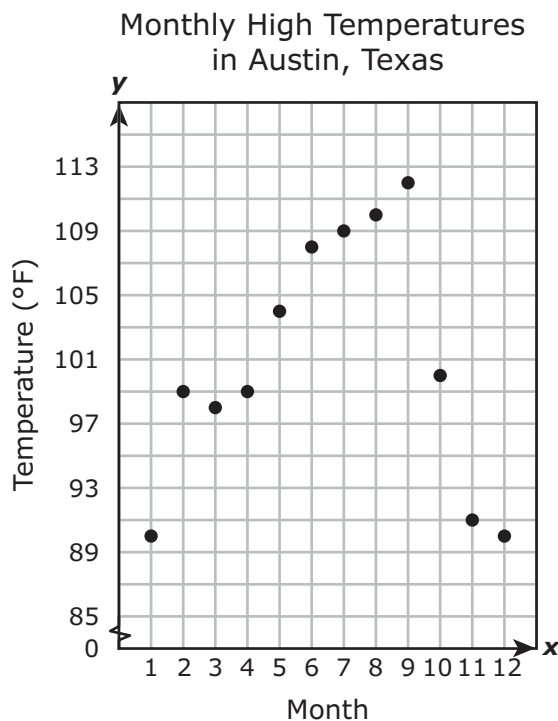
Which statement about the relationship between the graph of  $f$  and the graph of  $g(x) = 7x^2$  is true?

- F The graph of  $g$  is narrower than the graph of  $f$ .
  - G The graph of  $g$  is wider than the graph of  $f$ .
  - H The graph of  $g$  is 7 units below the graph of  $f$ .
  - J The graph of  $g$  is 7 units above the graph of  $f$ .
- 

- 25 Which expression is a factor of  $36x^2 - 49$ ?

- A  $18x - 7$
- B  $6x - 49$
- C  $18x - 49$
- D  $6x - 7$

- 26 The scatterplot shows the monthly high temperatures for Austin, Texas, in degrees Fahrenheit over a 12-month period.



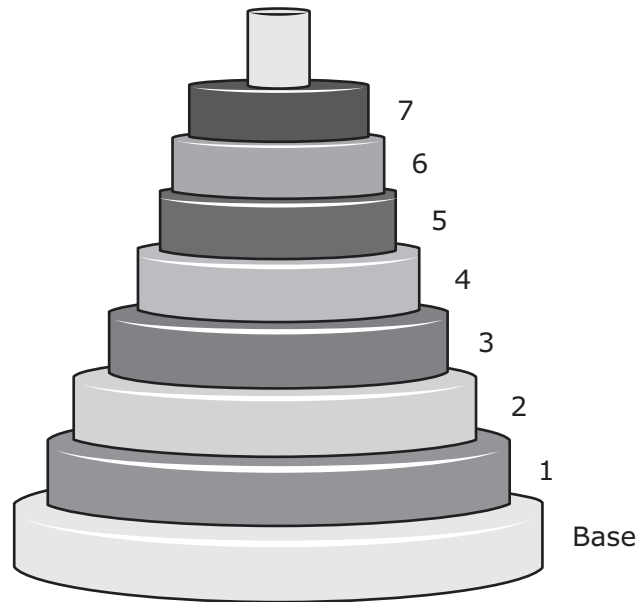
Which function best models the data from Month 1 to Month 9?

- F**  $y = -1.6x + 111$   
**G**  $y = 3.5x + 85$   
**H**  $y = 2.5x + 90$   
**J**  $y = -3.3x + 130$

- 
- 27 Given  $f(x) = 6(1 - x)$ , what is the value of  $f(-8)$ ?

Record your answer and fill in the bubbles on your answer document.

- 28** A toy is made up of cylindrical rings stacked on a base, as shown in the diagram. The diameter of Ring 1 is 87% of the diameter of the base. For Ring 2 through Ring 7, the diameter of each ring is 87% of the diameter of the ring directly below it.



The diameter of the base is 5 inches. Which function can be used to find the diameter in inches of Ring  $r$ , where  $1 \leq r \leq 7$ ?

- F**  $d(r) = 5(0.87)^r$
- G**  $d(r) = 0.87(r - 5)$
- H**  $d(r) = 0.87(5)^r$
- J**  $d(r) = 5(r - 0.87)$
- 

- 29** What are the solutions to  $2(x - 7)^2 = 32$ ?

- A**  $x = 7 \pm \sqrt{32}$
- B**  $x = \pm \sqrt{65}$
- C**  $x = 3$  and  $x = 11$
- D**  $x = -1$  and  $x = 15$

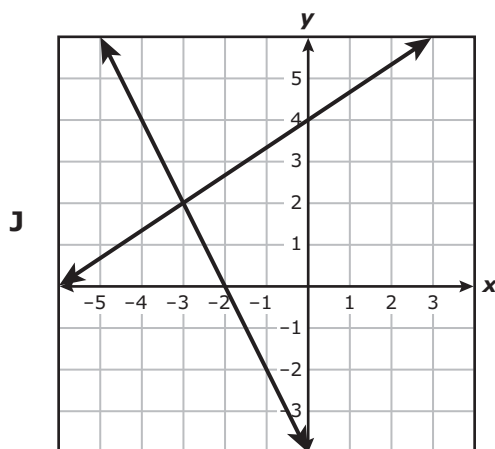
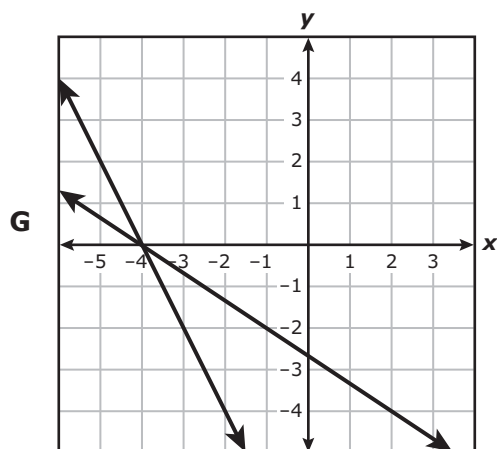
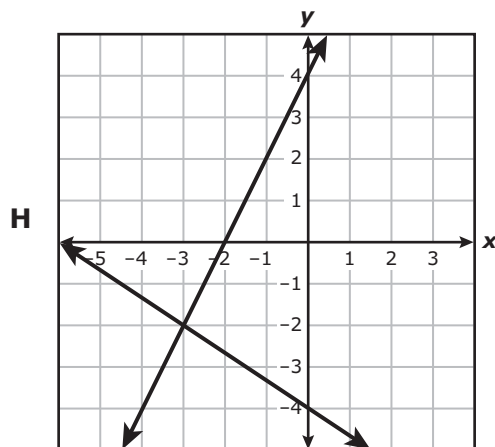
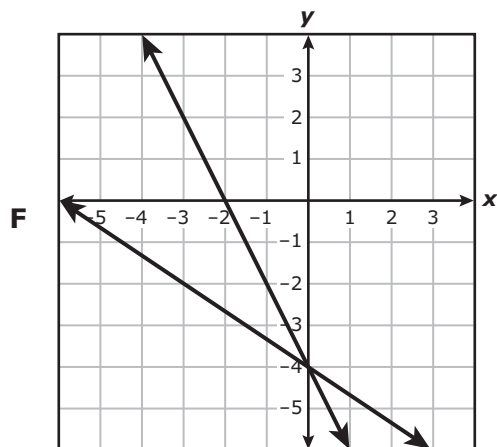
- 30** The total cost in dollars to buy uniforms for the players on a volleyball team can be found using the function  $c = 34.95u + 6.25$ , where  $u$  is the number of uniforms bought. If there are at least 8 players but not more than 12 players on the volleyball team, what is the domain of the function for this situation?
- F**  $0 < u \leq 12$
- G**  $0 < c \leq 425.65$
- H**  $\{8, 9, 10, 11, 12\}$
- J**  $\{285.85, 320.80, 355.75, 390.70, 425.65\}$
- 

- 31** A circle has a radius of  $6x^9y^5$  cm. The area of a circle can be found using  $A = \pi r^2$ . What is the area of this circle in square centimeters?
- A**  $12\pi x^{18}y^{10}$
- B**  $36\pi x^{18}y^{10}$
- C**  $36\pi x^{11}y^7$
- D**  $12\pi x^{11}y^7$



32 Which graph can be used to find the solution to the system of equations below?

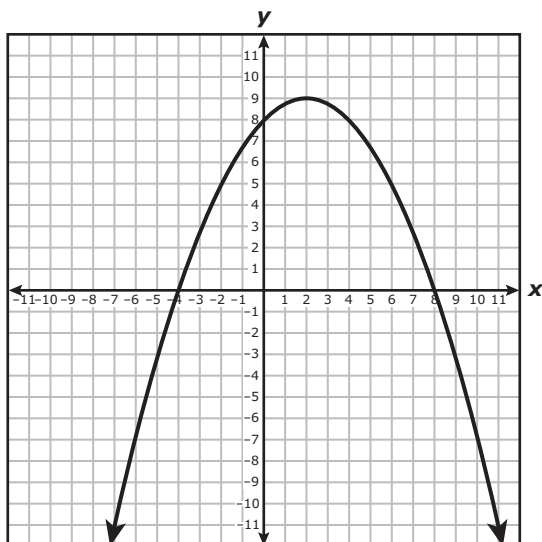
$$\begin{aligned}2x + y &= -4 \\ -3y &= 2x + 12\end{aligned}$$



33 Which inequality describes all the solutions to  $5(3 - x) < -2x + 6$ ?

- A  $x < -9$
- B  $x > 3$
- C  $x < -3$
- D  $x > 7$

- 34 The graph of quadratic function  $g$  is shown on the grid. The coordinates of the  $x$ -intercepts, the  $y$ -intercept, and the vertex are integers.



What is the maximum value of  $g$ ?

Record your answer and fill in the bubbles on your answer document.

- 
- 35 An organization has a monthly budget of  $x$  dollars. Every month \$2,070 is spent on salaries. One-fourth of the remaining budget is spent on monthly activities. Which function can be used to find the amount in dollars spent on monthly activities?

- A  $f(x) = 2,070 + \frac{x}{4}$
- B  $f(x) = 2,070 - \frac{x}{4}$
- C  $f(x) = \frac{x + 2,070}{4}$
- D  $f(x) = \frac{x - 2,070}{4}$

36 Which table represents  $y$  as a function of  $x$ ?

**F**

$x$	$y$
-5	-5
3	-2
-5	5
-3	-2

**H**

$x$	$y$
-3	-4
1	4
-3	4
1	-4

**G**

$x$	$y$
6	-6
-6	6
8	-8
-8	8

**J**

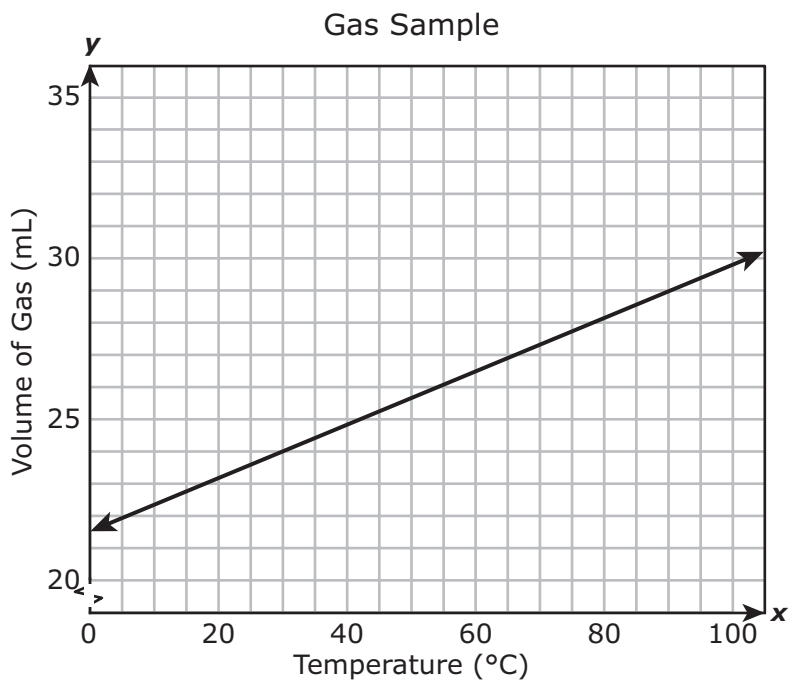
$x$	$y$
2	-1
2	-2
2	-3
2	-4

---

37 Which statement about  $f(x) = 2x^2 - 3x - 5$  is true?

- A** The zeros are  $-\frac{5}{2}$  and  $-1$ , because  $f(x) = (x + 1)(2x + 5)$ .
- B** The zeros are  $-\frac{5}{2}$  and  $1$ , because  $f(x) = (x - 1)(2x + 5)$ .
- C** The zeros are  $-1$  and  $\frac{5}{2}$ , because  $f(x) = (x + 1)(2x - 5)$ .
- D** The zeros are  $1$  and  $\frac{5}{2}$ , because  $f(x) = (x - 1)(2x - 5)$ .

- 38 The graph shows how the volume of a gas sample changes as the temperature changes and the pressure remains constant.



Which of these best represents the rate of change in the volume of the gas sample with respect to the temperature?

- F**  $\frac{7}{100}$  mL/°C
- G**  $\frac{1}{12}$  mL/°C
- H** 12 mL/°C
- J**  $22\frac{2}{5}$  mL/°C

39 What is the solution to this system of equations?

$$10x - y = 53$$

$$y = \frac{-13x + 92}{2}$$

- A (6, 7)
  - B (2, 33)
  - C (7, 6)
  - D (33, 2)
- 

40 The table contains some points on the graph of an exponential function.

$x$	$y$
0	0.0625
1	0.25
2	1
3	4

Based on the table, which function represents the same relationship?

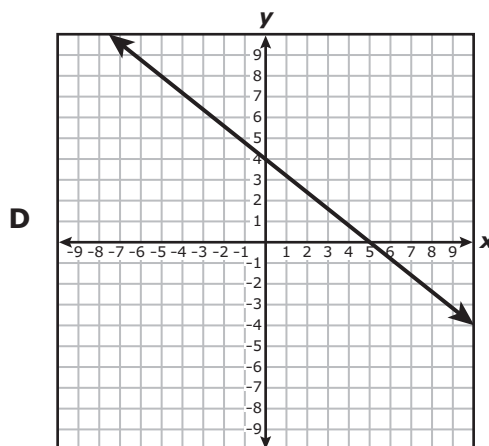
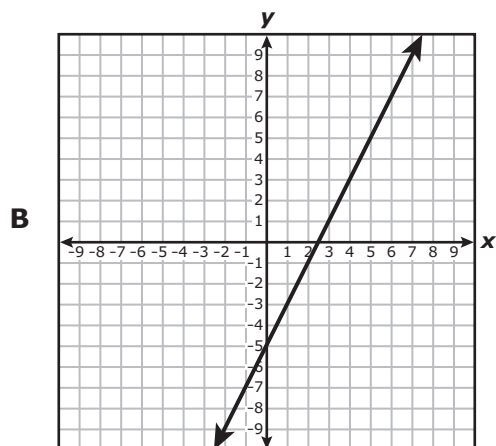
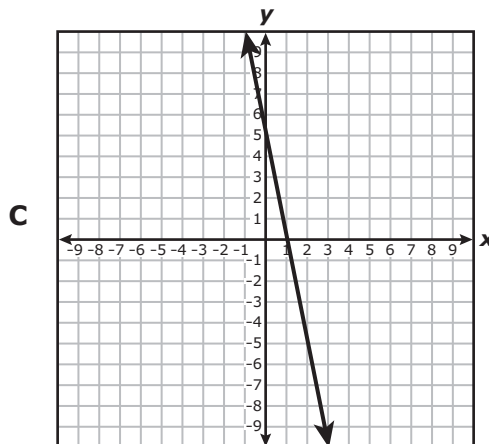
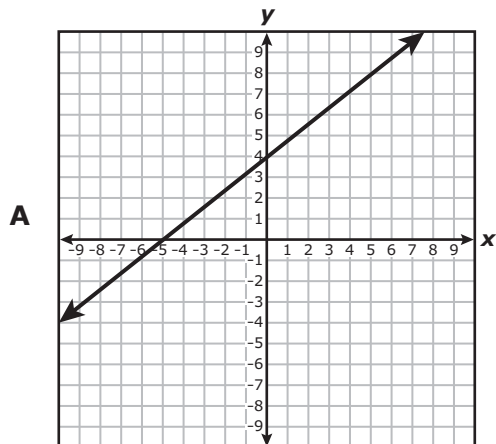
- F  $q(x) = (0.25)^x$
- G  $q(x) = 256(0.25)^x$
- H  $q(x) = 0.0625(4)^x$
- J  $q(x) = 0.5(4)^x$

- 41** Quadratic functions  $q$  and  $w$  are graphed on the same coordinate grid. The vertex of the graph of  $q$  is 18 units below the vertex of the graph of  $w$ . Which pair of functions could have been used to create the graphs of  $q$  and  $w$ ?
- A**  $q(x) = 18x^2$  and  $w(x) = x^2$
  - B**  $q(x) = x^2 + 18$  and  $w(x) = x^2$
  - C**  $q(x) = -18x^2$  and  $w(x) = x^2$
  - D**  $q(x) = x^2 - 18$  and  $w(x) = x^2$
- 

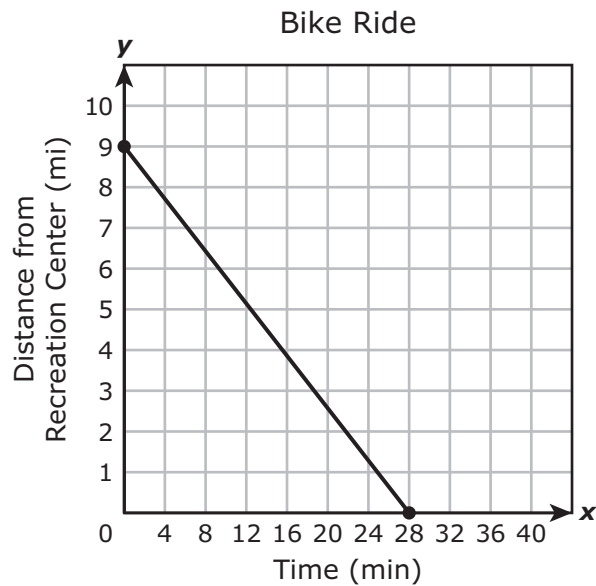
- 42** In an electrical circuit, the voltage across a resistor is directly proportional to the current running through the resistor. If a current of 12 amps produces 480 volts across a resistor, how many volts would a current of 1.5 amps produce across an identical resistor?

Record your answer and fill in the bubbles on your answer document.

43 Which graph shows a line with an x-intercept of  $-5$ ?



- 44 A student rode a bike from school to a recreation center. The graph shows the student's distance in miles from the recreation center after riding the bike for  $x$  minutes.

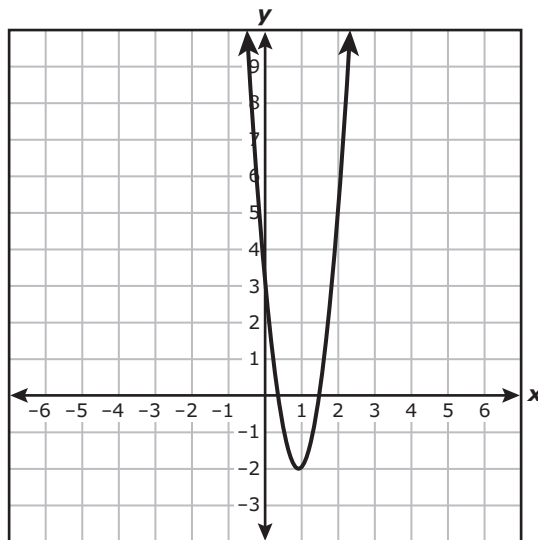


What is the range of the function for this situation?

- F All real numbers greater than or equal to 0 and less than or equal to 28
- G All real numbers greater than or equal to 0 and less than or equal to 9
- H All real numbers less than or equal to 28
- J All real numbers less than or equal to 9



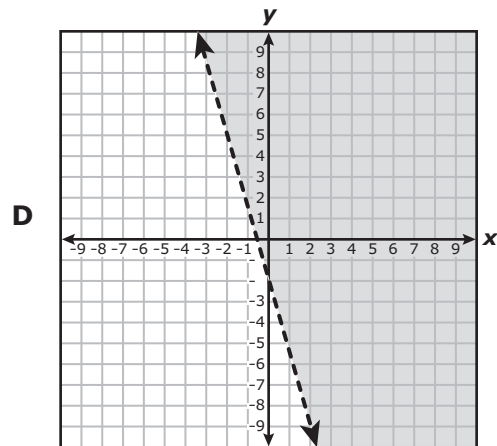
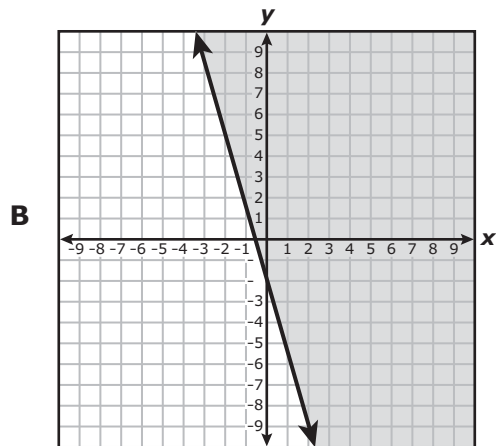
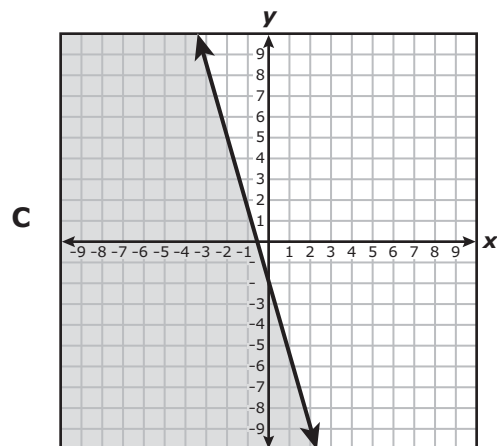
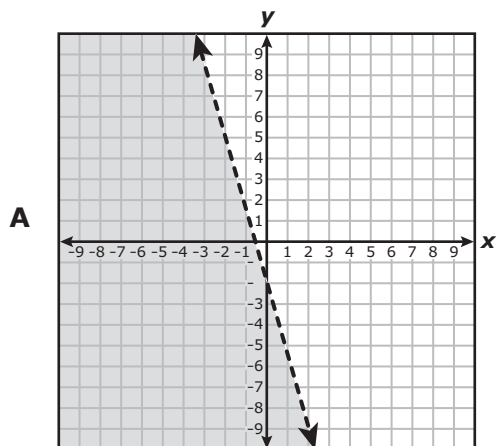
- 45 A graph of  $f(x) = 6x^2 - 11x + 3$  is shown on the grid.



What are the zeros of  $f$ ?

- A** 3
- B** 2 and 9
- C**  $\frac{11}{12}$
- D**  $\frac{1}{3}$  and  $\frac{3}{2}$
- 
- 46 Which equation in standard form has a graph that passes through the point  $(-4, 2)$  and has a slope of  $\frac{9}{2}$ ?
- F**  $9x - 2y = 36$
- G**  $9x - 2y = 26$
- H**  $9x - 2y = -40$
- J**  $9x - 2y = -10$

47 Which graph represents the solution set of  $y \geq -\frac{7}{2}x - 2$ ?



**48** A bag contains 18 coins consisting of quarters and dimes. The total value of the coins is \$2.85. Which system of equations can be used to determine the number of quarters,  $q$ , and the number of dimes,  $d$ , in the bag?

**F**  $0.10q + 0.25d = 2.85$   
 $q + d = 18$

**G**  $0.10q + 0.25d = 18$   
 $q + d = 2.85$

**H**  $0.25q + 0.10d = 2.85$   
 $q + d = 18$

**J**  $0.25q + 0.10d = 18$   
 $q + d = 2.85$

---

**49** Which expression is a factor of  $x^2 - 5x - 6$ ?

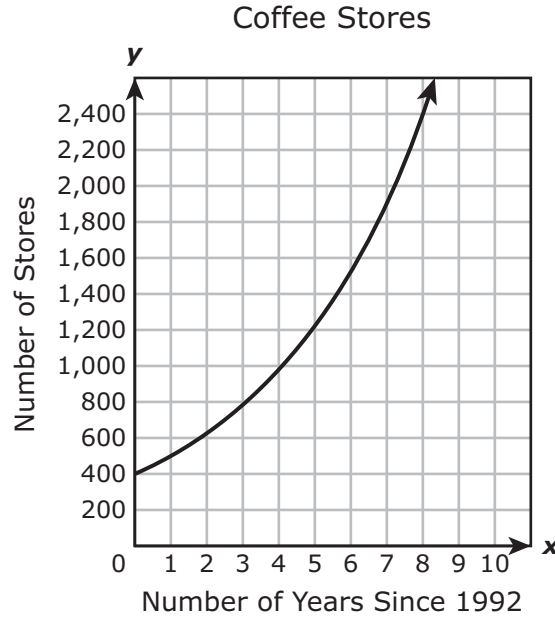
**A**  $x - 6$

**B**  $x - 2$

**C**  $x - 3$

**D**  $x - 1$

- 50 The number of stores opened by a coffee company can be modeled by the exponential function graphed on the grid, where  $x$  is the number of years since 1992.



Based on the graph, which statement does **not** appear to be true?

- F The coffee company had opened 400 stores by the end of 1992.
- G The coffee company opened 100 stores in one year.
- H Every year the number of stores the coffee company opened increased by 25%.
- J Since 1992 the coffee company has opened 250 stores each year.

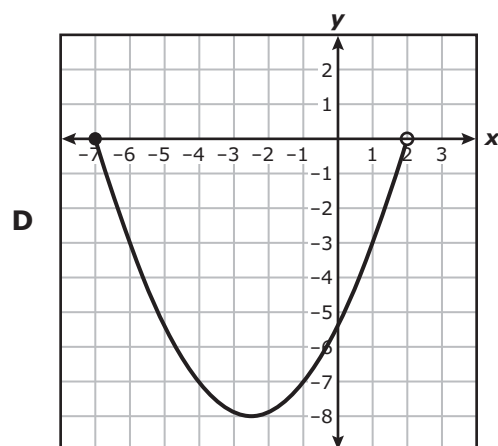
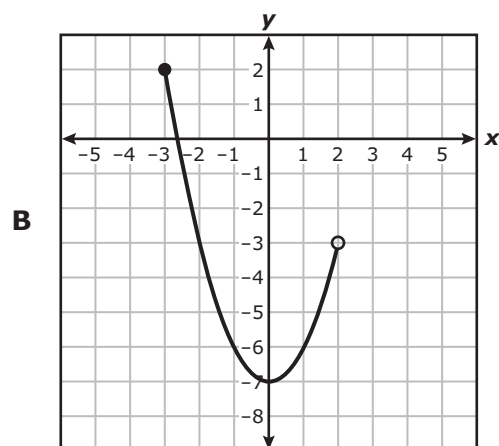
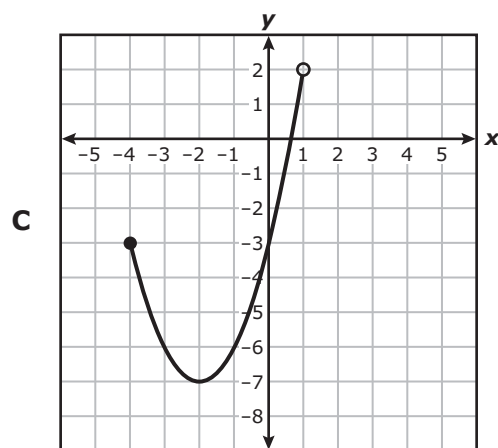
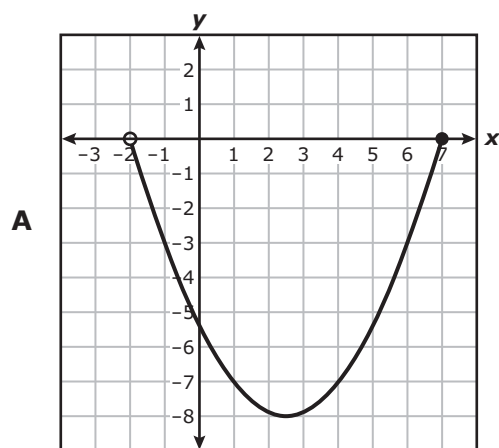
- 
- 51 What is the slope of the line that passes through the points  $(26, 7)$  and  $(-39, 12)$ ?

- A  $-\frac{1}{13}$
- B  $\frac{5}{13}$
- C  $-13$
- D  $\frac{13}{5}$

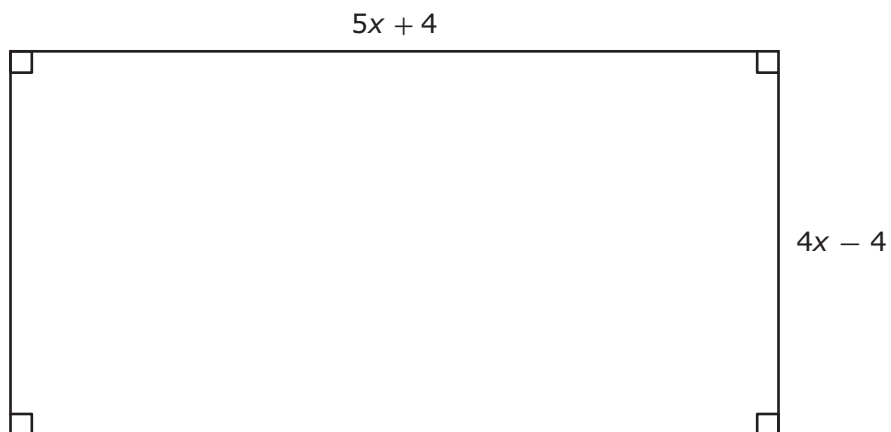
52 What is the solution to  $0.3(12x - 16) = 0.4(12 - 3x)$ ?

- F -2
- G 4
- H 2
- J -4

53 Which graph represents a function with a domain of all real numbers greater than or equal to  $-7$  and less than  $2$ ?



54 The diagram shows the floor plan of a storage facility. All dimensions are given in feet.



Which expression represents the area of the storage facility in square feet?

**F**  $20x^2 + 36x - 16$

**G**  $20x^2 - 4x - 16$

**H**  $16x^2 - 16$

**J**  $9x^2 - 16$



**STAAR  
Algebra I  
May 2016**

