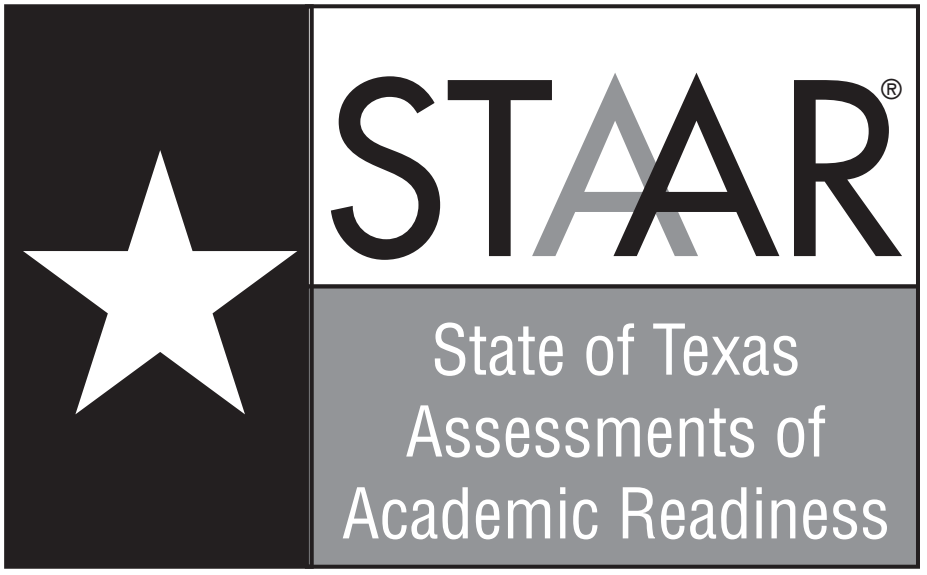

Algebra I

Administered May 2022

RELEASED

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STAAR ALGEBRA I REFERENCE MATERIALS

STAAR State of Texas Assessments of Academic Readiness

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

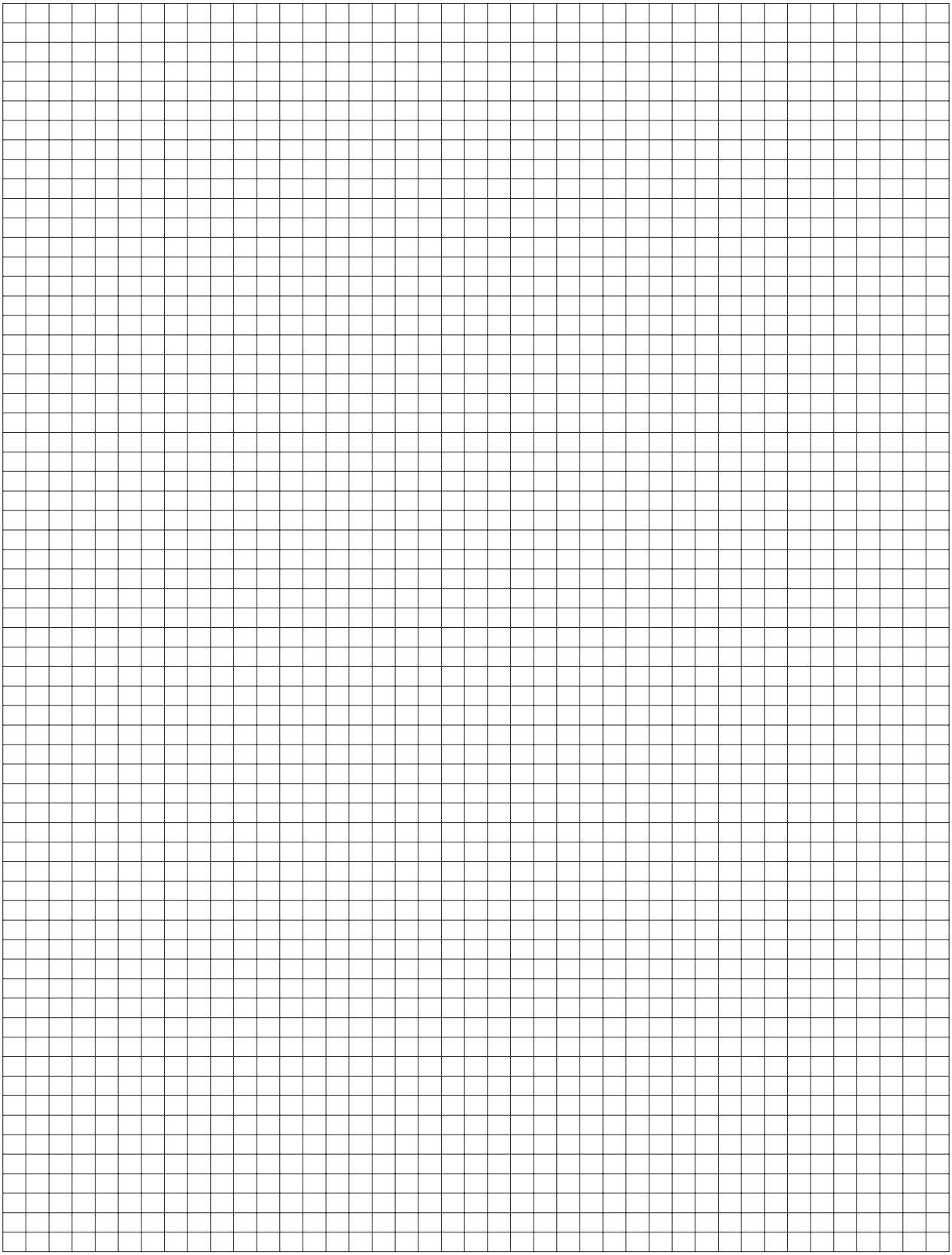
Product of powers	$a^m a^n = a^{(m + n)}$
Quotient of powers	$\frac{a^m}{a^n} = a^{(m - n)}$
Power of a power	$(a^m)^n = a^{mn}$
Rational exponent	$a^{\frac{m}{n}} = \sqrt[n]{a^m}$
Negative exponent	$a^{-n} = \frac{1}{a^n}$

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



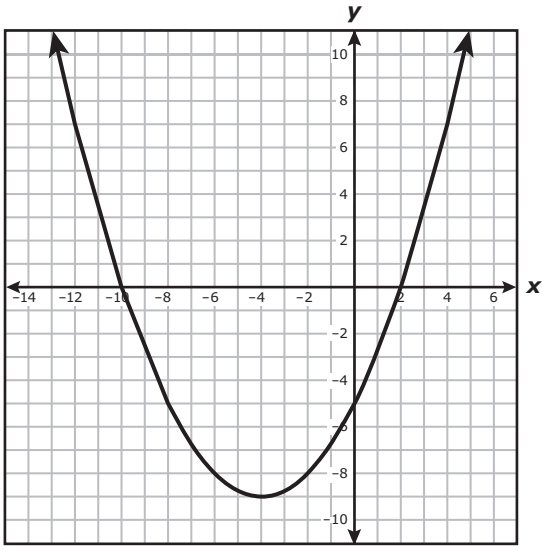
ALGEBRA I

GO ON

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 The graph of quadratic function *r* is shown on the grid.



Which answer choice best represents the intercepts of the graph of *r*?

A *x*-intercept: (5, 0)
y-intercepts: (0, 10) and (0, −2)

B *x*-intercepts: (0, −10) and (0, 2)
y-intercept: (−5, 0)

C *x*-intercept: (0, 5)
y-intercepts: (10, 0) and (−2, 0)

D *x*-intercepts: (−10, 0) and (2, 0)
y-intercept: (0, −5)

2 A worker is packing items in boxes. The table shows the linear relationship between the number of items the worker has packed in boxes after different amounts of time.

Items Packed in Boxes

Number of Minutes	Number of Items Packed
5	20
7	28
11	44
14	56

Which statement describes the rate of change of the number of items the worker packed in boxes with respect to the number of minutes the worker has been packing items in boxes?

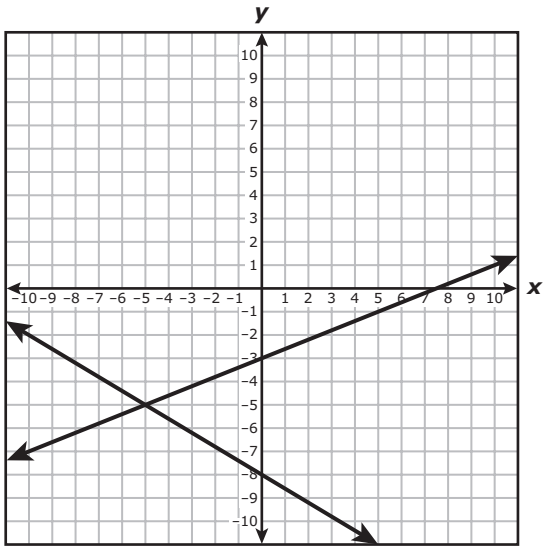
F The worker packed 8 items in boxes per minute.

G The worker packed 37 items in boxes per minute.

H The worker packed 4 items in boxes per minute.

J The worker packed 15 items in boxes per minute.

3 A system of equations is graphed on the grid.



Which system of equations is best represented by the graph?

A $y = \frac{2}{5}x - 8$

$y = -\frac{3}{5}x - 3$

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

$y = -\frac{3}{5}x - 8$

C $y = \frac{5}{2}x - 8$

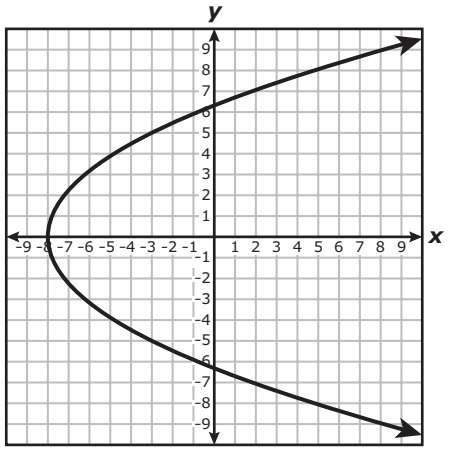
$y = -\frac{5}{3}x - 3$

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

$y = -\frac{5}{3}x - 8$

4 Which graph represents y as a function of x?

F



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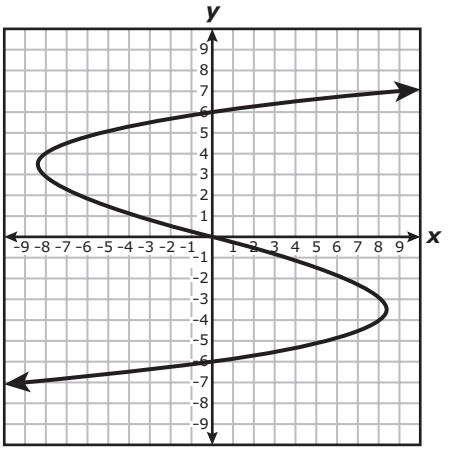

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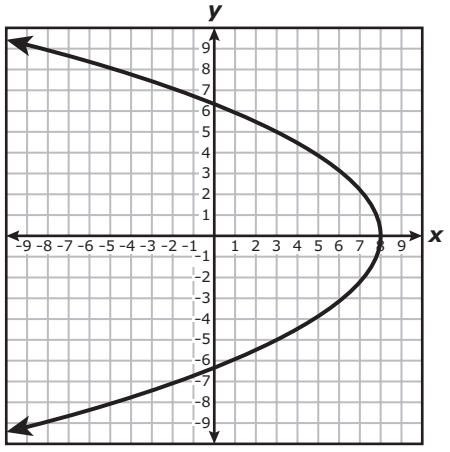

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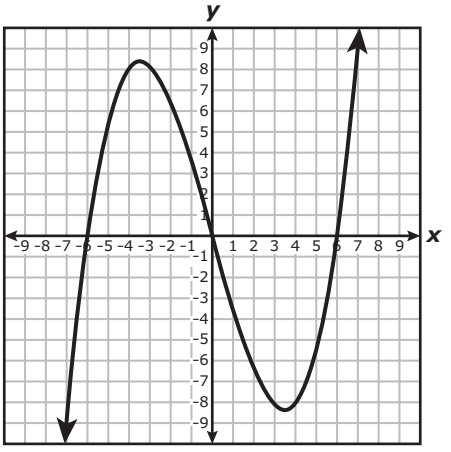


GO ON

5 What is the solution to this system of equations?

$$2x + y = 40$$
$$x - 2y = -20$$

A (12, 16)

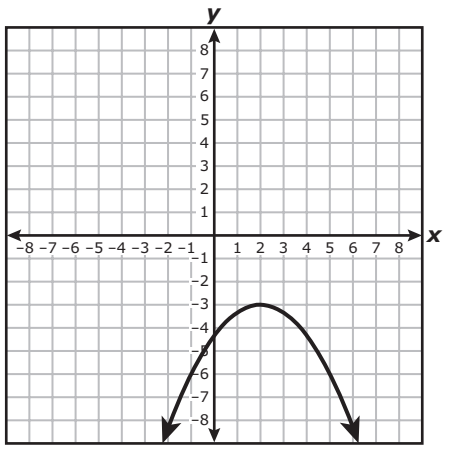
B (15, 17.5)

C There is no solution.

D There are an infinite number of solutions.

6 Which graph best represents a quadratic function with a range of all real numbers greater than or equal to 3?

F



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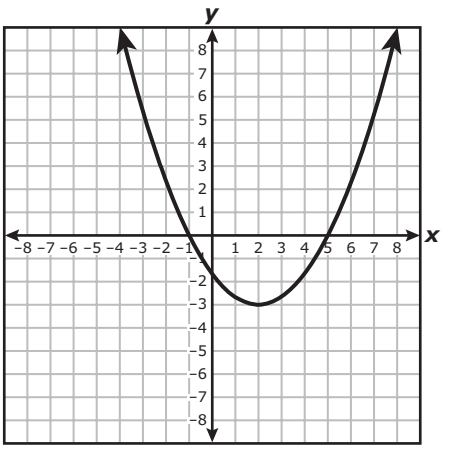

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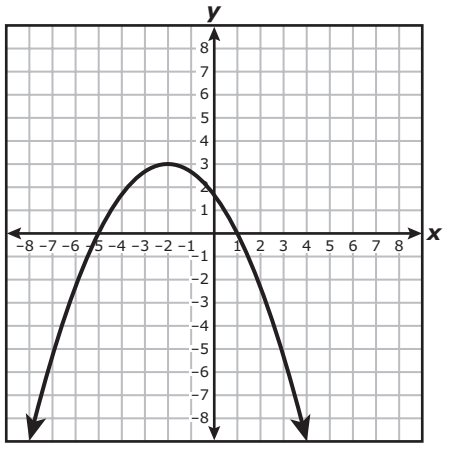

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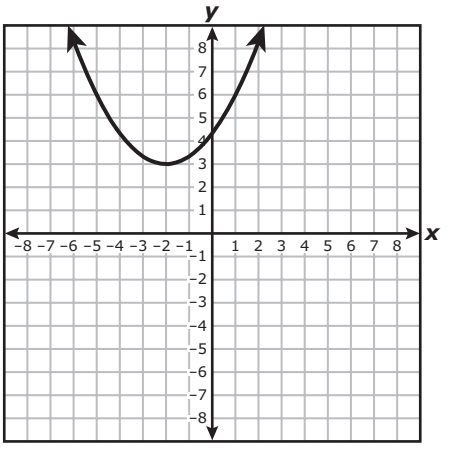


7 The value of y is directly proportional to the value of x. When $x = 512$, $y = 128$.

What is the value of y when $x = 64$?

A 256

B 32

C 16

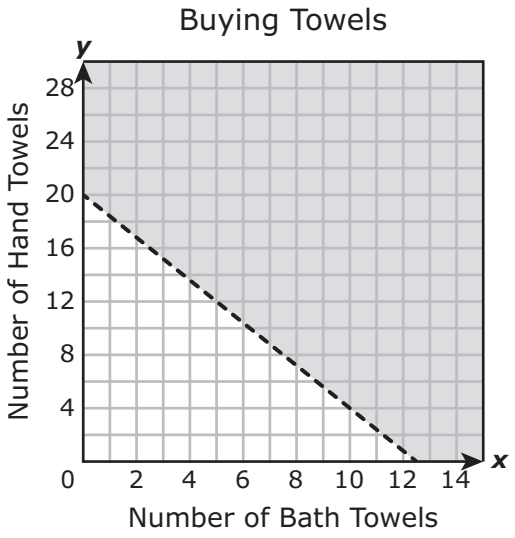
D 8

GO ON

8 A customer is buying bath towels and hand towels and can spend no more than $100. Each bath towel costs $8, and each hand towel costs $5. The inequality $8x + 5y \leq 100$ represents all possible combinations of x, the number of bath towels, and y, the number of hand towels the customer can buy.

Which graph best represents the solution set for this inequality?

F



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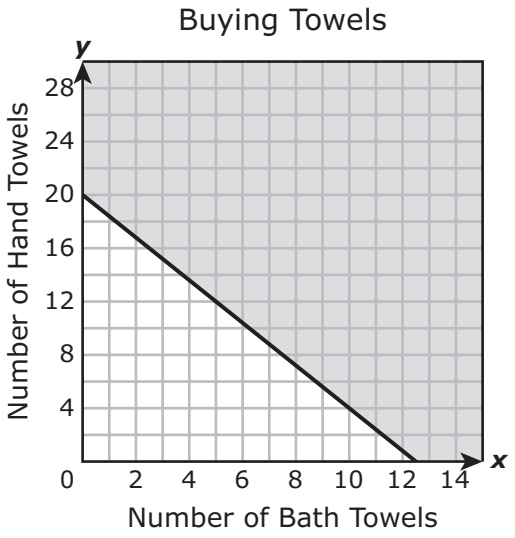

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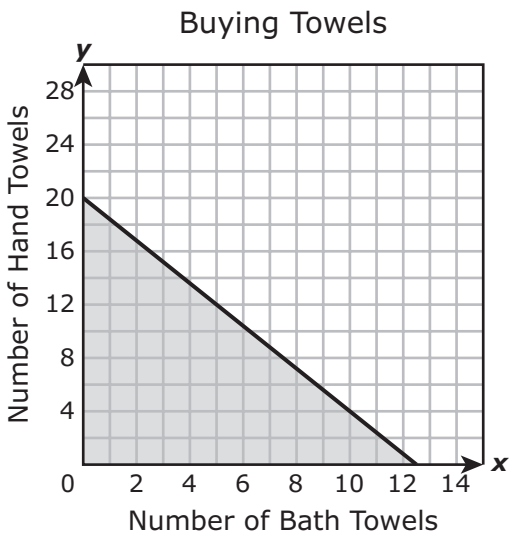

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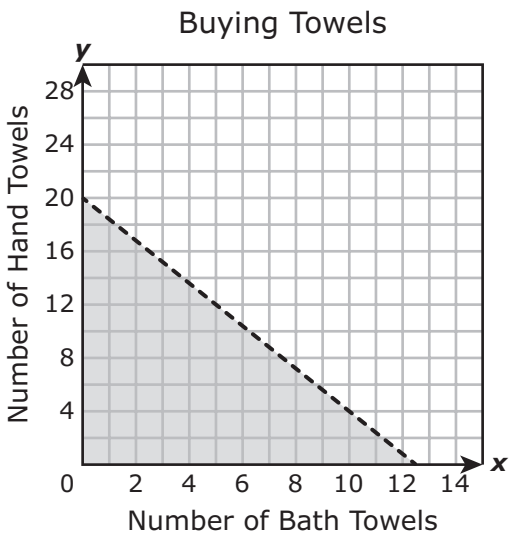
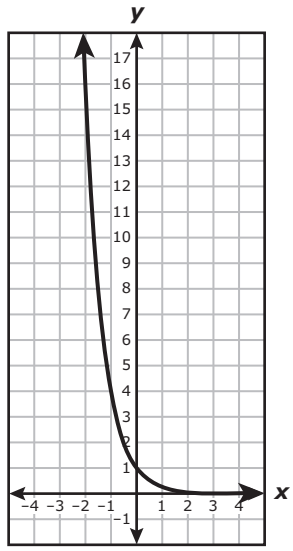


GO ON

9 An exponential function is graphed on the grid.



Which function is best represented by the graph?

A $p(x) = (0.25)^x$

B $p(x) = 2(0.5)^x$

C $p(x) = (1.25)^x$

D $p(x) = (25)^x$

10 Which expression is equivalent to $(n - 4)(2n + 7)$?

F $3n + 3$

G $n - 28$

H $2n^2 - 15n - 28$

J $2n^2 - n - 28$

---

11 Which situation shows causation?

A When the number of people in a bus increases, the number of animals in a zoo also increases.

B When the number of hours worked each week by an hourly employee decreases, the amount of money earned by the employee also decreases.

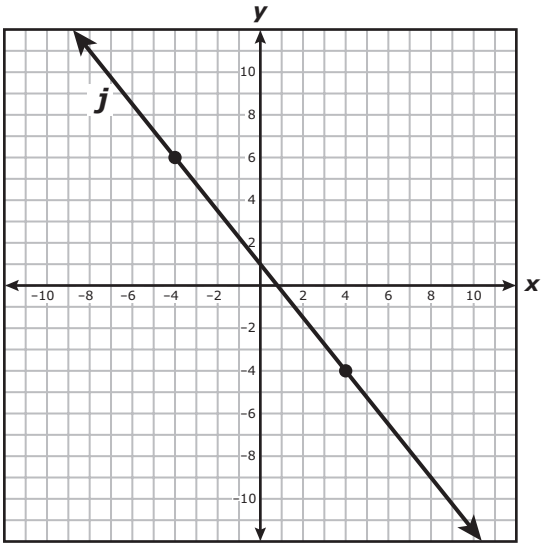
C When the amount of a discount for a sale increases, the number of items sold during the sale decreases.

D When the number of bike trails in a city decreases, the amount of rainfall in the city increases.

12 A system of linear equations is represented by line *h* and line *j*. A table representing some points on line *h* and the graph of line *j* are shown.

Line *h*

x	−16	−8	−4	12
y	7	1	−2	−14



Which system of equations is best represented by lines *h* and *j*?

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

$y = \frac{4}{5}x + 1$

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

$y = \frac{5}{4}x + 1$

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

$y = -\frac{4}{5}x + 1$

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

$y = -\frac{5}{4}x + 1$

13 Which answer choice describes how the graph of $f(x) = x^2$ was transformed to create the graph of $n(x) = x^2 - 1$?

A A vertical shift up

B A horizontal shift to the left

C A vertical shift down

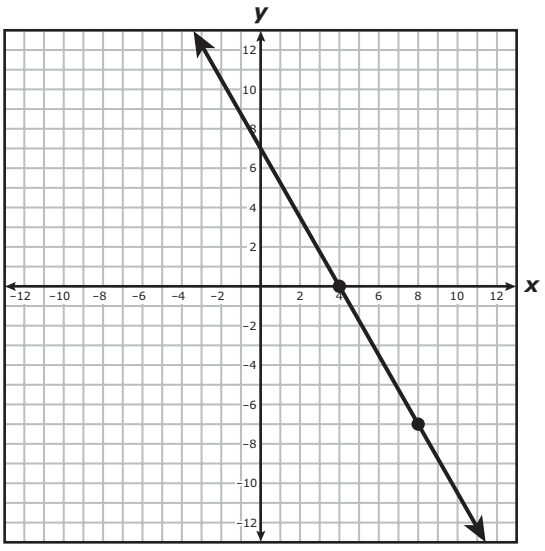
D A horizontal shift to the right

---

14 The expression $d^2 - d - 6$ can be written in factored form as $(d + 2)(d + k)$, where k represents a number. What is the value of k?

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

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



Which equation is best represented by this graph?

A $y = -\frac{7}{4}x + 4$

B $y = -\frac{7}{4}x + 7$

C $y = -\frac{4}{7}x + 4$

D $y = -\frac{4}{7}x + 7$

16 Which expression is equivalent to $\frac{c^8(d^6)^3}{c^2}$ for all values of c for which the expression is defined?

F c^4d^9

G c^4d^{18}

H c^6d^9

J c^6d^{18}

---

17 Which value of x is the solution to this equation?

$$5x^2 = 30x - 45$$

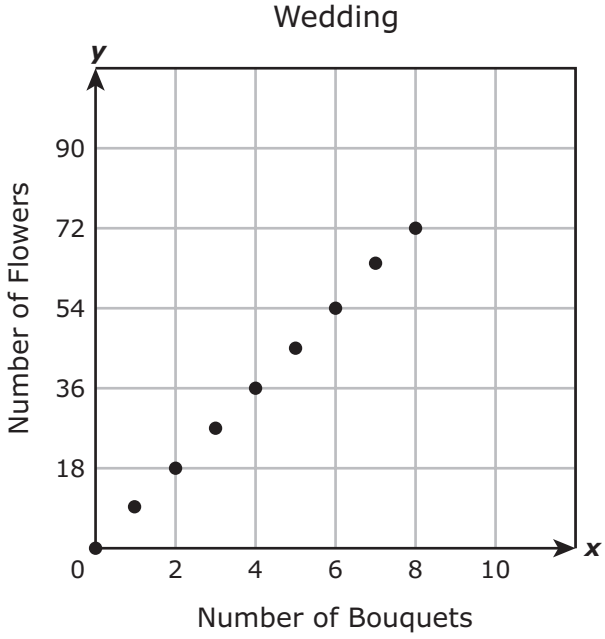
A $x = 3$

B $x = -3$

C $x = 5$

D $x = -5$

18 A florist is making bouquets of flowers for a wedding. Each bouquet will have 9 flowers. The graph shows the linear relationship between y, the number of flowers used, and x, the number of bouquets.



The florist will use no more than 8 bouquets for the wedding. Which set best represents the domain of the function for this situation?

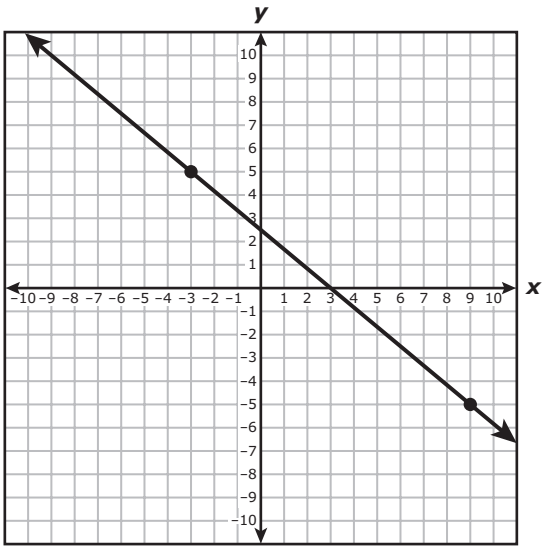
F {0, 2, 4, 6, 8, 10}

G {0, 1, 2, 3, 4, 5, 6, 7, 8}

H {0, 18, 36, 54, 72, 90}

J {0, 9, 18, 27, 36, 45, 54, 63, 72}

19 The graph of a line is shown on the grid. The coordinates of both points indicated on the graph of the line are integers.



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

A $\frac{5}{2}$

B $-\frac{6}{5}$

C $\frac{2}{3}$

D $-\frac{5}{6}$

---

20 What is the value of the y-intercept of the graph of $h(x) = 12.3(4.9)^x$?

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

21 Which expression is equivalent to $\frac{8.8 \times 10^{9}}{2.2 \times 10^{-3}}$?

A 4×10^{12}

B 4×10^{6}

C 4×10^{-3}

D 4×10^{-6}

---

22 A person dives into a pool from its edge to swim to the other side. The table shows the depth in feet of the person from the surface of the water after x seconds. The data can be modeled by a quadratic function.

Pool

Time, x (seconds)	Depth of Person from Surface of Water, $d(x)$ (feet)
1	−2.85
4	−8.28
6	−9.3
8.5	−7.65
10	−5.1
11.5	−1.38

Which function best models the data?

F $d(x) = 0.05x^2 + 0.74x$

G $d(x) = 0.05x^2 + 0.74x + 9.17$

H $d(x) = 0.26x^2 - 3.11x$

J $d(x) = 0.26x^2 - 3.11x + 1$

23 Which expression is equivalent to $(5rt - 3rw - 8tw) + (6rt - 4rw + 2tw)$?

A $11rt + rw - 10tw$

B $11rt - 7rw - 6tw$

C $11rt + rw - 6tw$

D $11rt - 7rw - 10tw$

GO ON

24 The solutions to $p(x) = 0$ are $x = -7$ and $x = 7$. Which quadratic function could represent p?

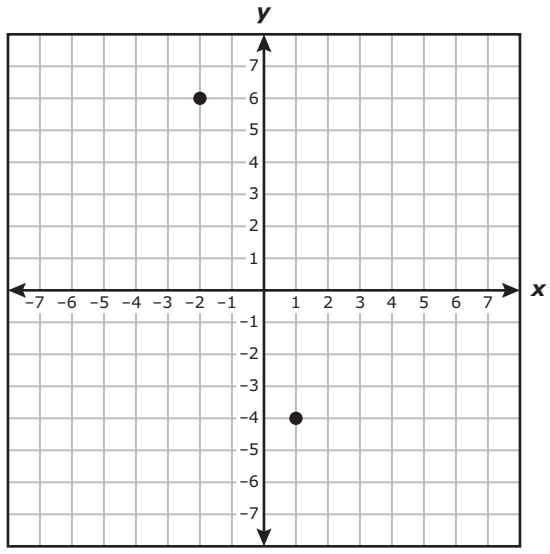
F $p(x) = x^2 - 49$

G $p(x) = x^2 + 49$

H $p(x) = x^2 - 14$

J $p(x) = x^2 + 14$

25 Two points are plotted on the grid.



Which equation in slope-intercept form best represents the line that passes through these two points?

A $y = -\frac{2}{3}x - \frac{11}{3}$

B $y = -\frac{11}{3}x - \frac{2}{3}$

C $y = -\frac{2}{3}x - \frac{10}{3}$

D $y = -\frac{10}{3}x - \frac{2}{3}$

26 The table shows the value in dollars of a motorcycle at the end of x years.

Motorcycle

Number of Years, x	0	1	2	3
Value, $v(x)$ (dollars)	9,000	8,100	7,290	6,561

Which exponential function models this situation?

F $v(x) = 9{,}000(1.1)^x$

G $v(x) = 9{,}000(0.9)^x$

H $v(x) = 8{,}100(1.1)^x$

J $v(x) = 8{,}100(0.9)^x$

---

27 What is the positive solution to $x^2 + 9x - 22 = 0$?

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

28 A university will spend at most $4,500 to buy monitors and keyboards for a computer lab. Each monitor will cost $250, and each keyboard will cost $50.

Which inequality represents all possible combinations of x, the number of monitors, and y, the number of keyboards, the university can buy for the computer lab?

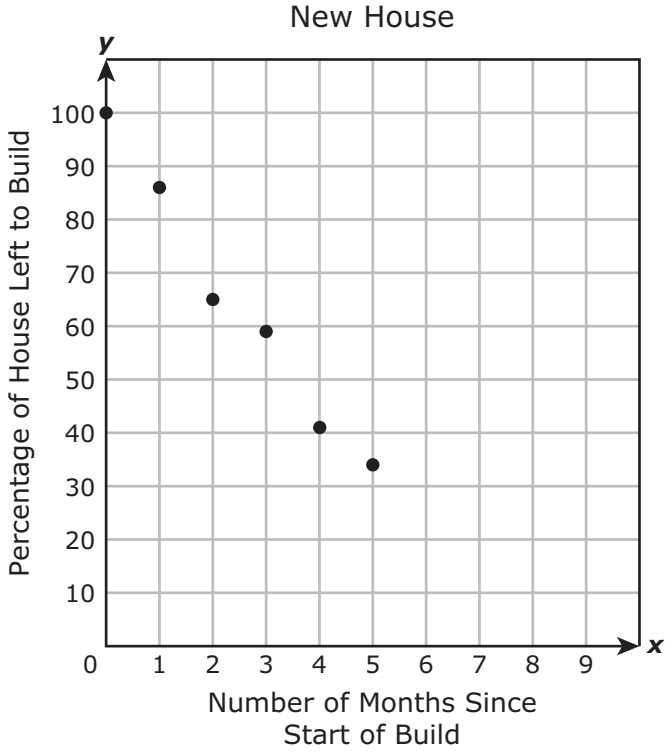
F $250x + 50y < 4{,}500$

G $250x + 50y \leq 4{,}500$

H $50x + 250y < 4{,}500$

J $50x + 250y \leq 4{,}500$

29 A construction manager is monitoring the progress of the build of a new house. The scatterplot and table show the number of months since the start of the build and the percentage of the house still left to build. A linear function can be used to model this relationship.



Number of Months Since Start of Build, x	Percentage of House Left to Build, y
0	100
1	86
2	65
3	59
4	41
5	34

Which function best models the data?

A $y = -13.5x + 97.8$

B $y = -13.5x + 7.3$

C $y = 97.8x - 13.5$

D $y = 7.3x - 97.8$

30 Given $f(x) = x^2 - 36$, which statement is true?

F The only zero, 6, can be found when $0 = (x - 6)(x - 6)$.

G The only zero, 18, can be found when $0 = (x - 18)(x - 18)$.

H The zeros, -6 and 6, can be found when $0 = (x + 6)(x - 6)$.

J The zeros, -18 and 18, can be found when $0 = (x + 18)(x - 18)$.

---

31 A function is shown.

$$f(x) = 7 - 4x$$

What is the value of $f(-5)$?

A 27

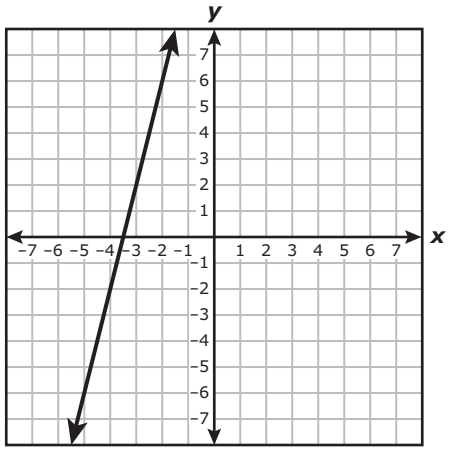
B -13

C -15

D 140

32 Which graph best represents $y = -4(x + 3) - 2$?

F



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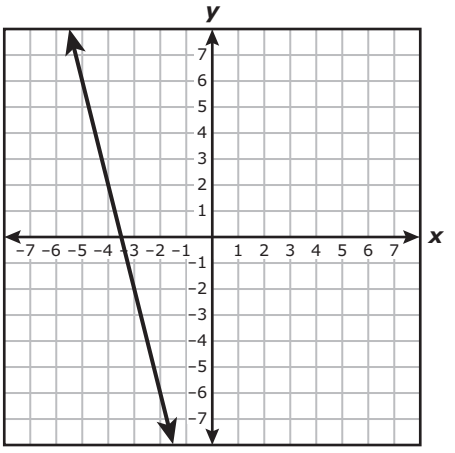

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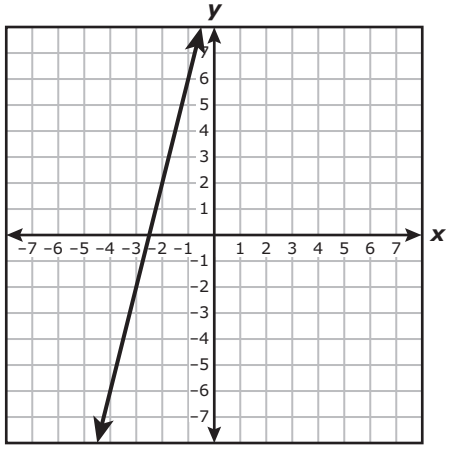

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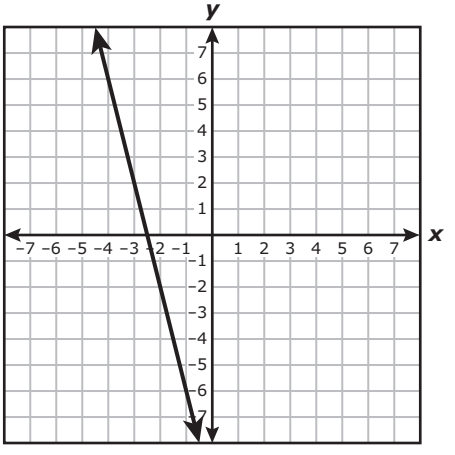


33 Which expression is a factor of $10x^2 - 19x + 6$?

A $10x - 3$

B $10x - 1$

C $5x - 3$

D $5x - 2$

---

34 The table shows the linear relationship between the distance in feet below sea level and the time in seconds traveled by a submarine.

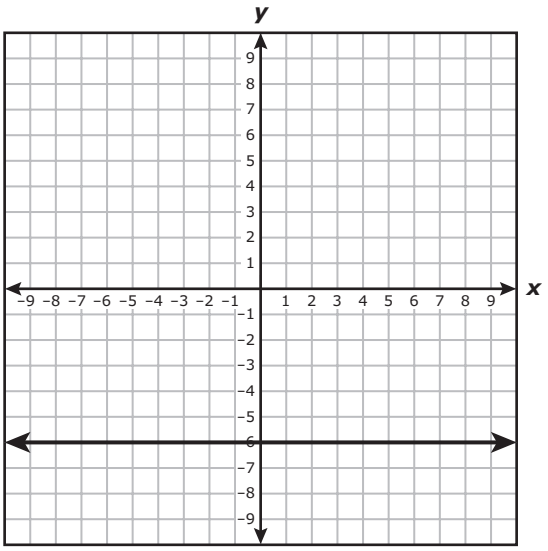
Submarine

Time (seconds)	Distance Below Sea Level (feet)
0	460
18	604
34	732
52	876
70	1,020

What is the rate of change of the distance in feet below sea level with respect to time that the submarine traveled?

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

35 Which equation best represents the line shown on the grid?



A $y = 0$

B $y = -6$

C $x = 0$

D $x = -6$

---

36 An insect population after x months can be modeled by the function $g(x) = 18(1.3)^x$. Which statement is the best interpretation of one of the values in this function?

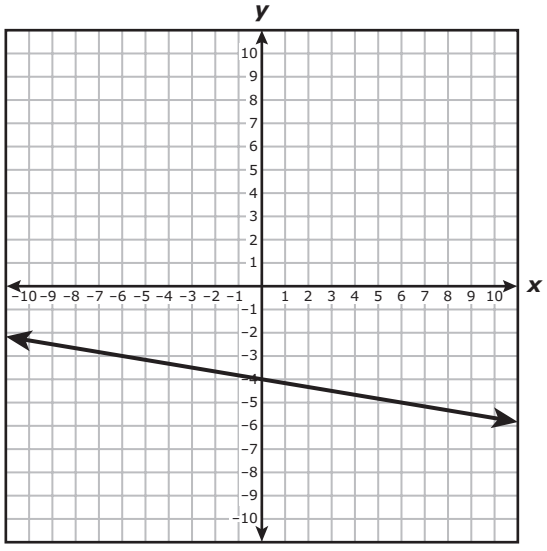
F The insect population increased by 13 insects each month.

G The insect population decreased by 13 insects each month.

H The insect population increased at a rate of 30% each month.

J The insect population decreased at a rate of 30% each month.

37 The graph of $y = -\frac{1}{6}x - 4$ is shown on the grid.



Which ordered pair is in the solution set of $y > -\frac{1}{6}x - 4$?

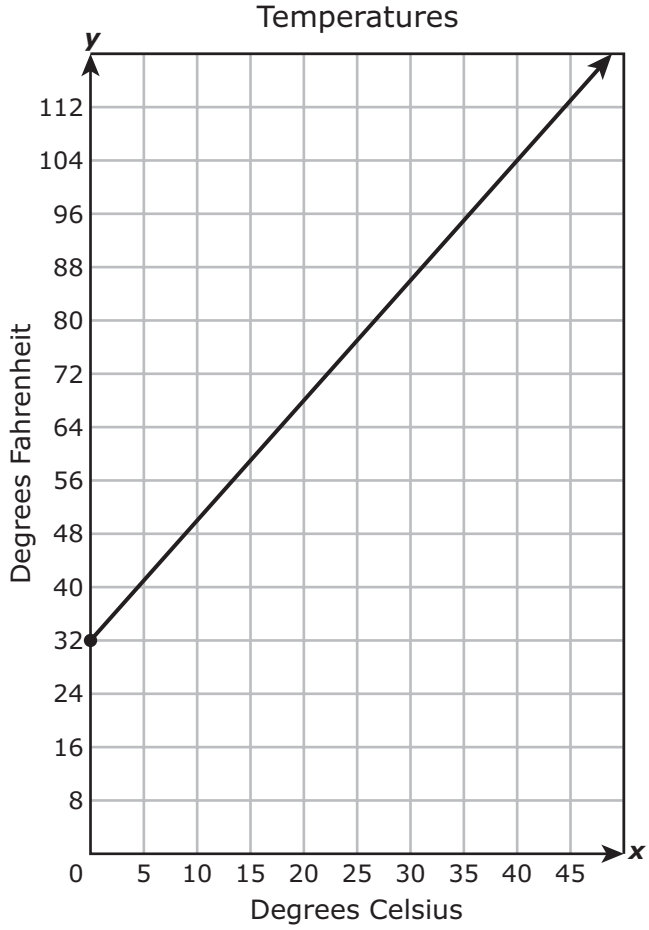
A (−8, 8)

B (6, −5)

C (4, −6)

D (−2, −7)

38 The conversion of degrees Celsius to degrees Fahrenheit can be represented by a linear relationship. The graph shows the linear relationship between y, the temperature in degrees Fahrenheit, and x, the temperature in degrees Celsius from the freezing point of water.



Which equation best represents this situation?

F $y = \frac{5}{9}x$

G $y = \frac{9}{5}x$

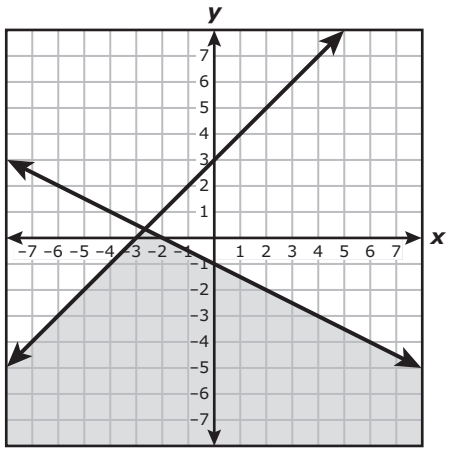
H $y = \frac{5}{9}x + 32$

J $y = \frac{9}{5}x + 32$

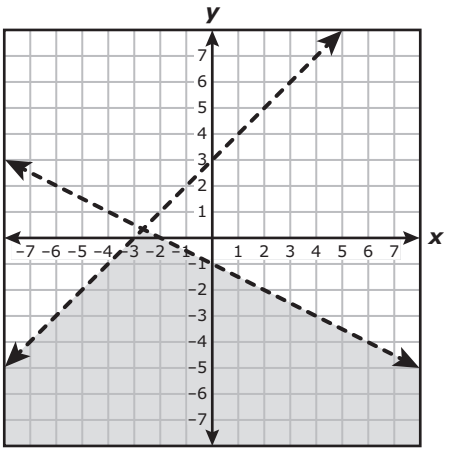
39 Which graph best represents the solution set for this system of inequalities?

$$x + 2y < -2$$
$$y - x < 3$$

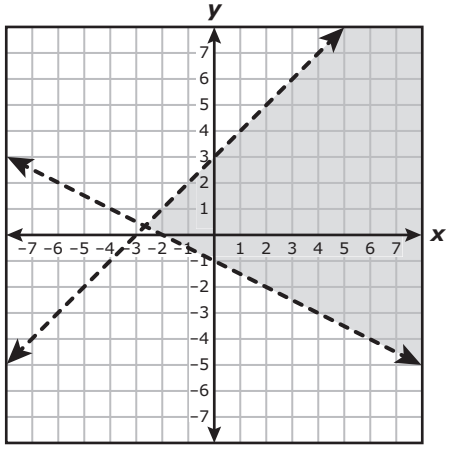
A



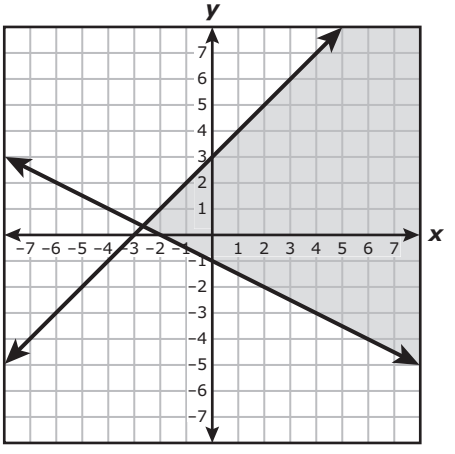
C



B



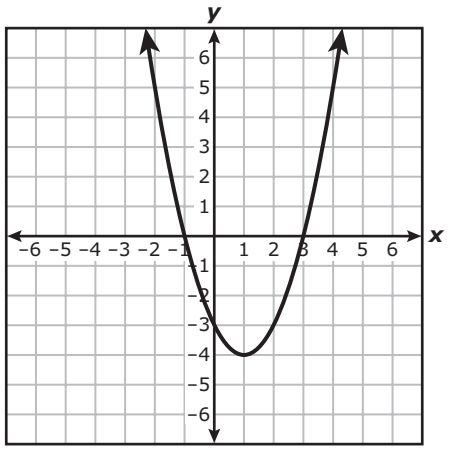
D



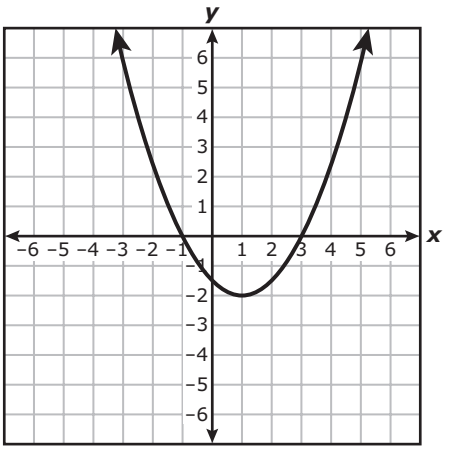
GO ON

40 Which graph best represents $h(x) = (x + 1)(x - 3)$?

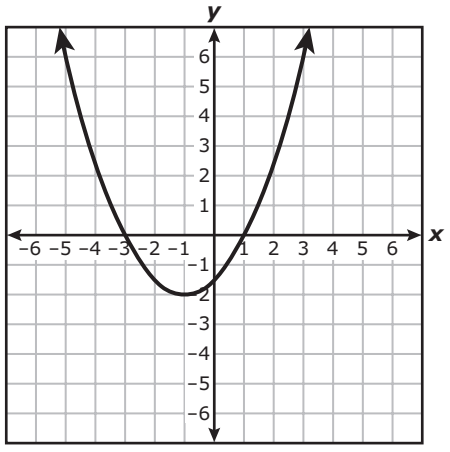
F



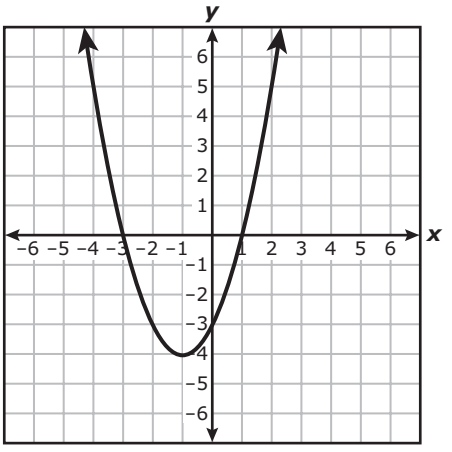
H



G



J



GO ON

41 The first six terms in a geometric sequence are shown, where $a_1 = -4$.

$$-4 \quad -16 \quad -64 \quad -256 \quad -1{,}024 \quad -4{,}096 \ldots$$

Based on this information, which equation can be used to find the n^{th} term in the sequence, a_n?

A $a_n = -4n$

B $a_n = -(4)^n$

C $a_n = -n^2$

D $a_n = (-4)^n$

---

42 What is the solution to $4(q + 56.5) = 30q - 112$?

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

---

43 Which expression is equivalent to $36m^2 - 100$?

A $(9m - 20)(4m + 5)$

B $4(3m - 5)(3m + 5)$

C $2(2m - 5)(9m + 10)$

D $4(3m - 5)^2$

44 The table shows the net revenue in millions of dollars of a company every three months for two years. An exponential function can be used to model the data.

Company

Time, x (months)	Net Revenue, $r(x)$ (millions of dollars)
3	274
6	389
9	467
12	560
15	960
18	1,100
21	1,320
24	1,584

Which function best models the data?

F $r(x) = 223.06(1.09)^x$

G $r(x) = 1.09(223.06)^x$

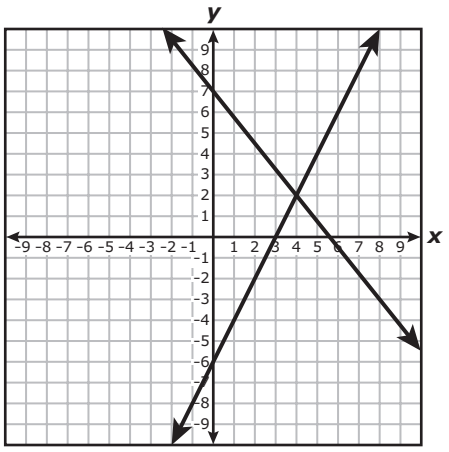
H $r(x) = 2{,}232.91(0.92)^x$

J $r(x) = 0.92(2{,}232.91)^x$

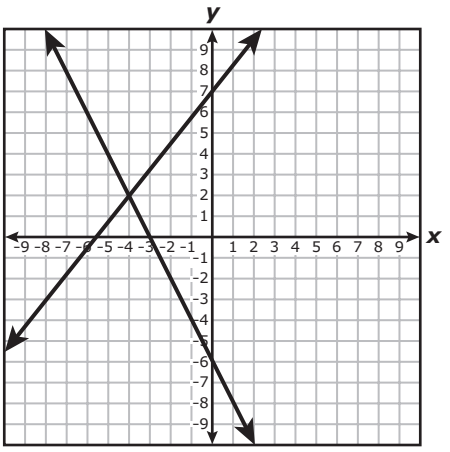
45 Which graph best represents this system of equations and its solution?

$$2x = 6 - y$$
$$5x - 4y = 28$$

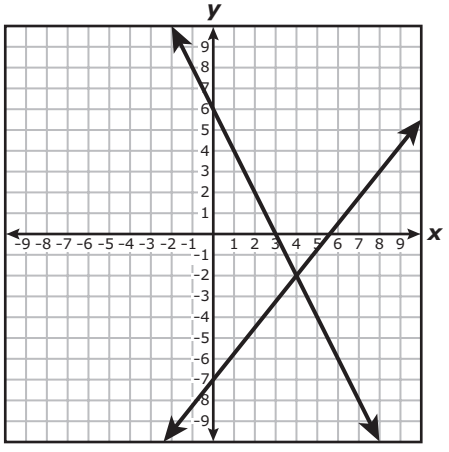
A



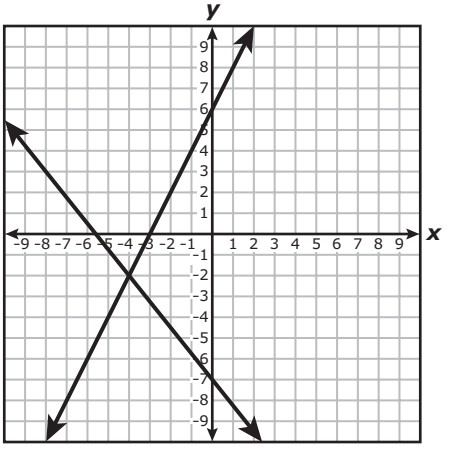
C



B



D



46 Which function is equivalent to $k(x) = x^2 + 2x - 15$?

F $k(x) = (x + 15)(x - 1)$

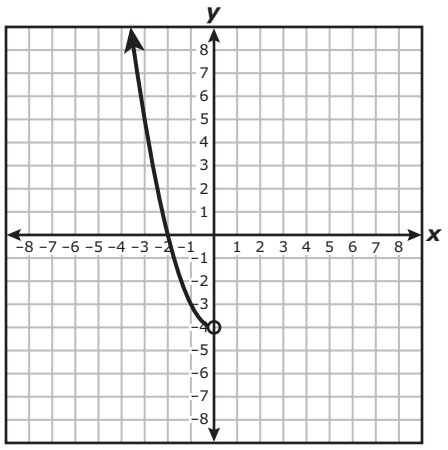
G $k(x) = (x + 1)(x - 15)$

H $k(x) = (x + 5)(x - 3)$

J $k(x) = (x + 3)(x - 5)$

47 Which graph best represents part of a quadratic function with a domain of all real numbers less than −4?

A



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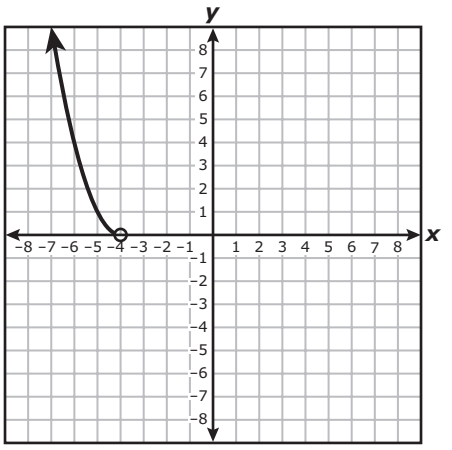
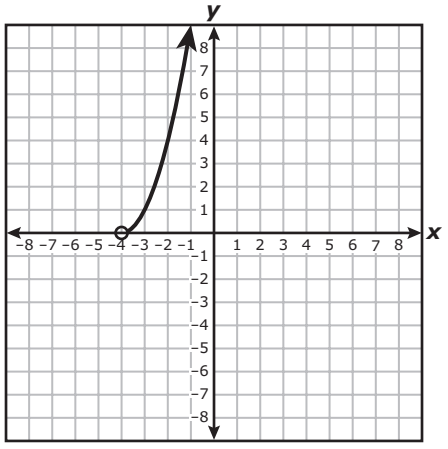
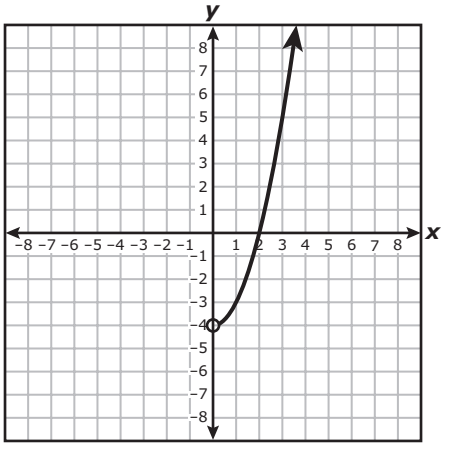


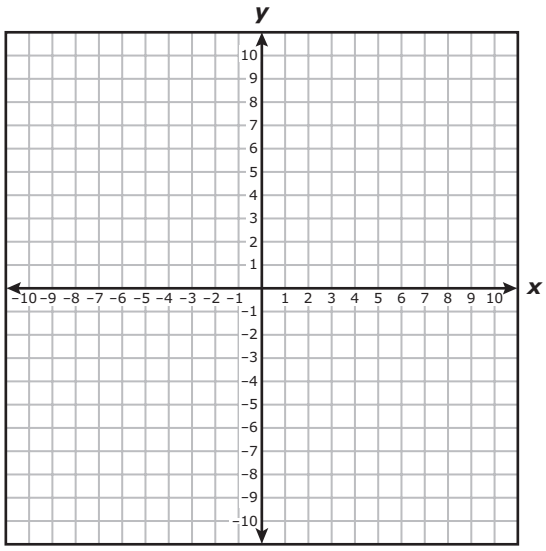
B



D



48 The graph of a line passes through the points (−3, 1) and (5, 8).



What is the slope of the line?

F $\frac{9}{2}$

G $\frac{7}{8}$

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

J $-\frac{7}{8}$

49 A mail carrier delivers mail on one of two different routes: a morning route or an afternoon route. Each workday the mail carrier is assigned one of these two routes.

- Last month the mail carrier delivered mail on the morning route 16 times and on the afternoon route 12 times, for a total distance traveled of 141 miles.
- This month the mail carrier delivered mail on the morning route 10 times and on the afternoon route 15 times, for a total distance traveled of 123.75 miles.

What is the distance of the morning route in miles?

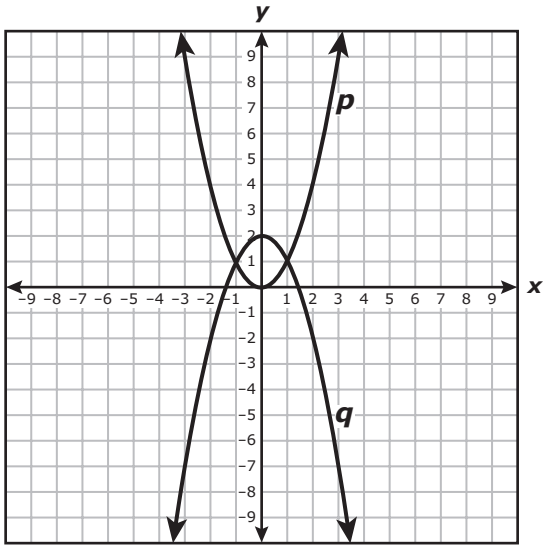
A 5.25 mi

B 6.00 mi

C 4.75 mi

D 5.00 mi

50 Quadratic functions p and q are graphed on the grid. The graph of p was transformed to create the graph of q.



Which function best represents the graph of q?

F $q(x) = -(x - 2)^2$

G $q(x) = -(x + 2)^2$

H $q(x) = -x^2 - 2$

J $q(x) = -x^2 + 2$

---

51 What is the solution to this equation?

$$2(40 - 5y) = 10y + 5(1 - y)$$

A 7.5

B 15

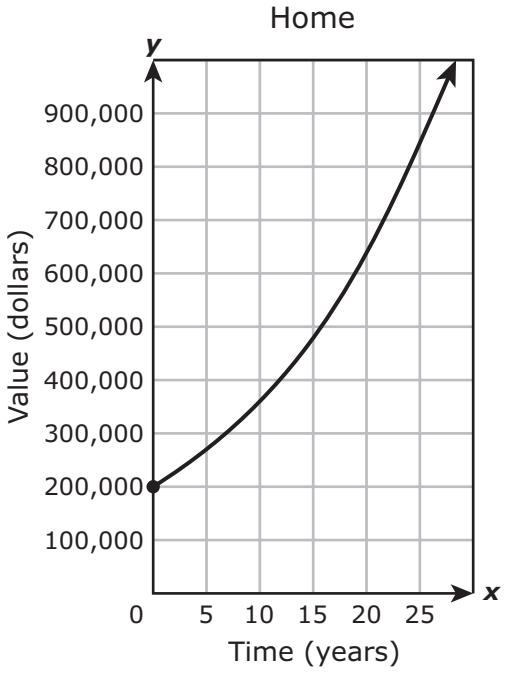
C 5

D Not here

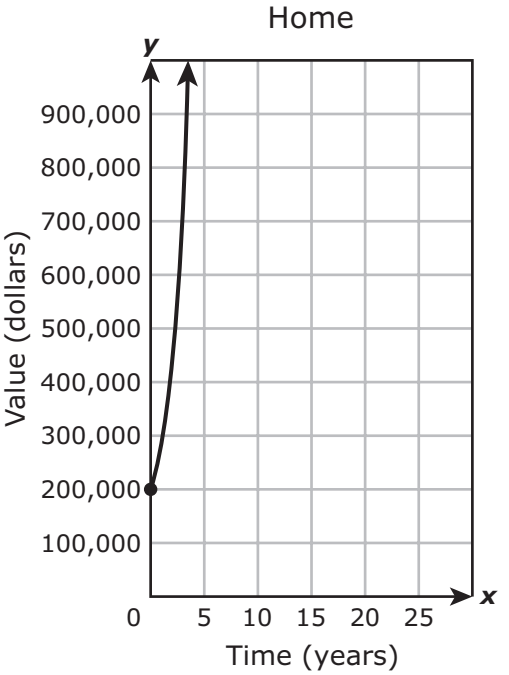
52 The initial value of a home is $200,000. The value of the home will increase at a rate of 6% each year.

Which graph best models this situation?

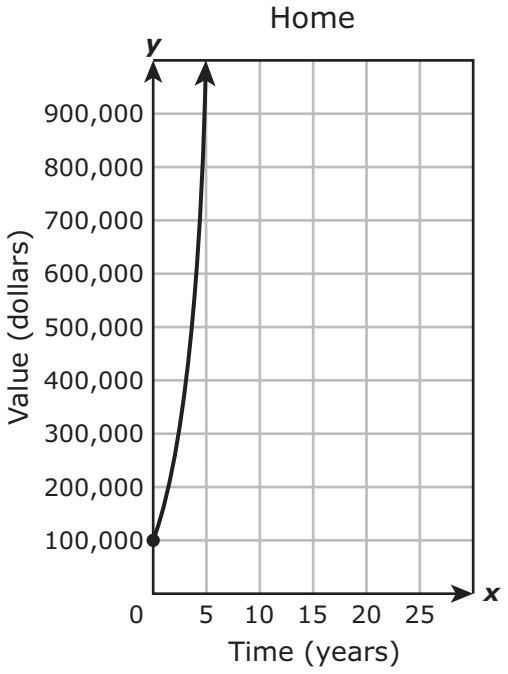
F



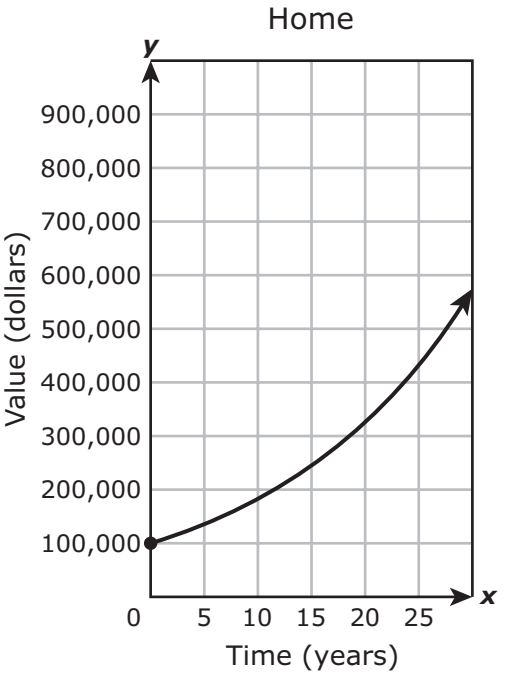
H



G

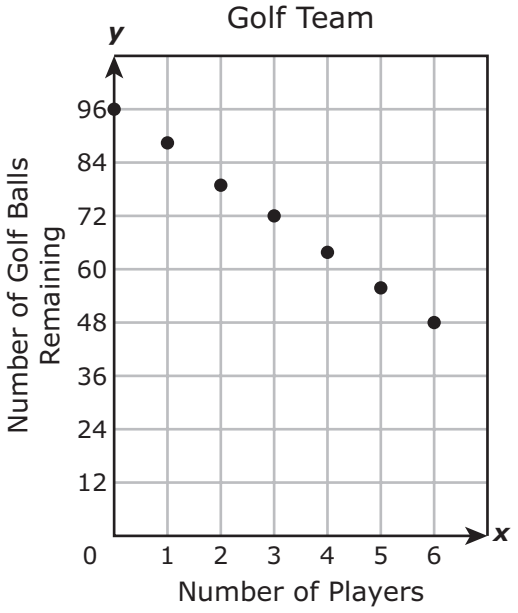


J



GO ON

53 A coach has 96 golf balls for the school's golf team. The coach will give each player on the team 8 golf balls. The graph shows the linear relationship between y, the number of golf balls remaining for the team, and x, the number of players on the team.



The coach will use no more than 6 players on the school's golf team. Which set best represents the range of the function for this situation?

A {96, 84, 72, 60, 48, 36, 24}

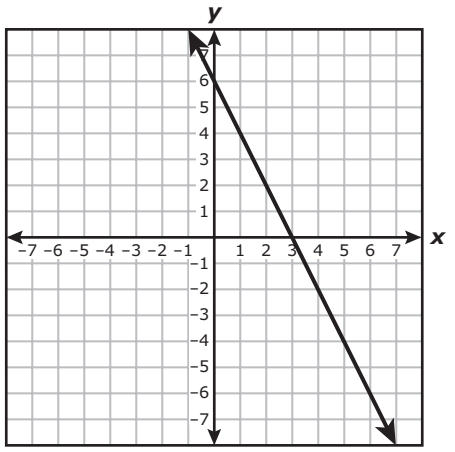
B {8, 9, 10, 11, 12, 13, 14}

C {96, 88, 80, 72, 64, 56, 48}

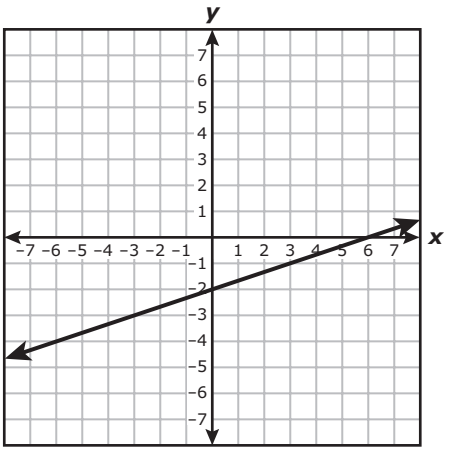
D {0, 1, 2, 3, 4, 5, 6}

54 Linear function k has a zero of -2 and a y-intercept of 6. Which graph best represents k?

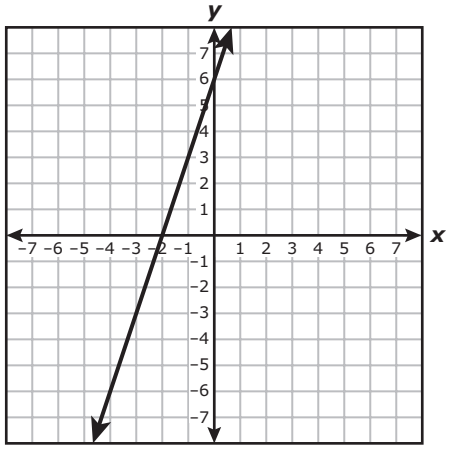
F



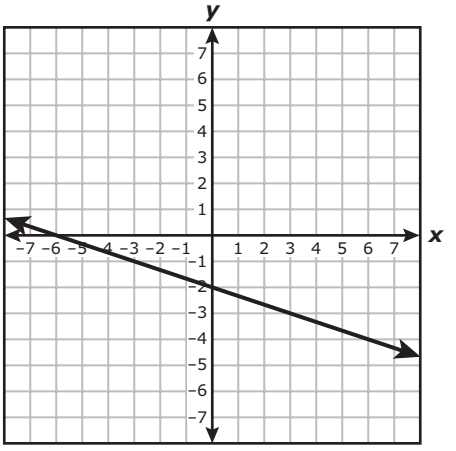
H



G



J



BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS ON THE ANSWER DOCUMENT.

STOP

STAAR
Algebra I
May 2022