



LESSON 6

ALGEBRA I

Learning Standards

- AI 2.0** *Students understand and use such operations as taking the opposite, finding the reciprocal, and taking a root, and raising to a fractional power. They understand and use the rules of exponents.*
- AI 3.0** *Students solve equations and inequalities involving absolute values.*
- AI 4.0** *Students simplify expressions before solving linear equations and inequalities in one variable, such as $3(2x - 5) + 4(x - 2) = 12$.*
- AI 5.0** *Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.*
- AI 6.0** *Students graph a linear equation and compute the x- and y-intercepts (e.g., graph $2x + 6y = 4$). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by $2x + 6y < 4$).*
- AI 7.0** *Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations by using the point-slope formula.*
- AI 8.0** *Students understand the concepts of parallel lines and how their slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.*
- AI 9.0** *Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.*
- AI 10.0** *Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.*
- AI 15.0** *Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.*



What These Standards Mean

Approximately twelve of the 80 CAHSEE math questions are based on the Algebra I standards. To correctly answer these questions, you should be able to do and understand the following:

- Recognize equivalent forms of polynomials and other algebraic expressions.
- Understand the meaning of opposite, reciprocal, root, and absolute value.
- Identify the graph that matches a particular linear function and find its slope and intercepts.
- Know that lines on a graph are parallel if and only if they have the same slope.
- Solve linear inequalities.
- Solve problems involving rate, average speed, distance, and time.
- Identify the solution to a system of two equations in two unknowns.
- Solve rate, work, and percent mixture problems.

Algebra I Vocabulary

absolute value

root

exponent

parallel

y-intercept

slope of a line

equation, inequality

**STEP ONE TEN-MINUTE LESSON****Sample Problem 1**

Solve for x .

$$|x + 3| = 12$$

A $\{-15, 15\}$

B $\{-9, 9\}$

C $\{-9, 15\}$

D $\{9, -15\}$

(A) (B) (C) (D)

To solve this problem, you need to figure out how many places on the number line you have to move + 3 to get to 15. You also have to figure out which negative number makes this equation correct.

Answer choice A: The negative number is correct. $|-15 + 3| = |-12| = 12$. However, the positive number is not correct. $|15 + 3| = 18$. This is not the correct answer choice.

Answer choice B: The number with the negative sign should be greater than the positive number. This is not the correct answer choice.

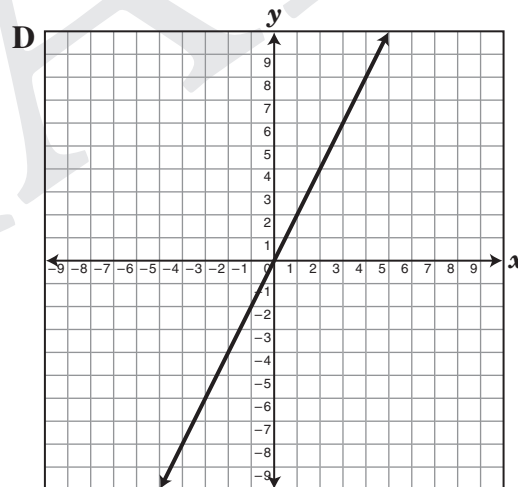
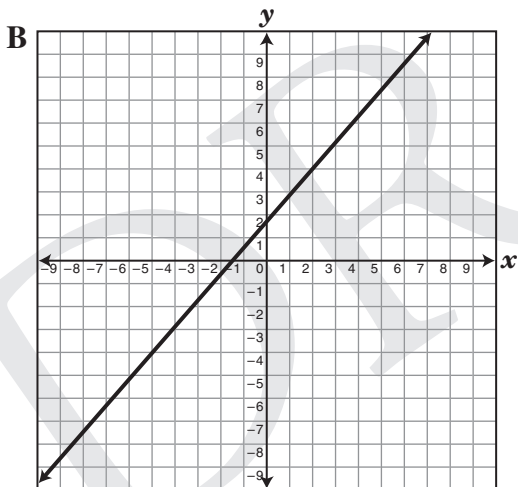
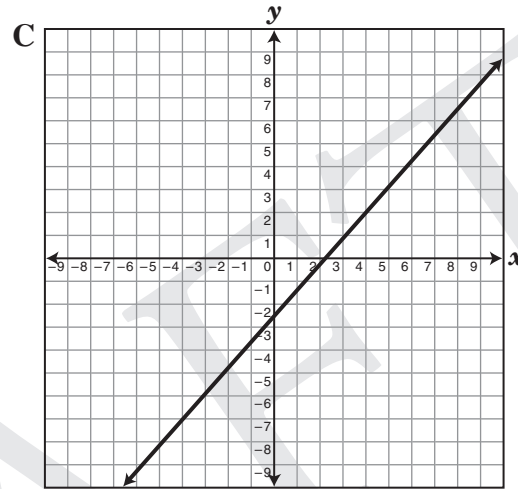
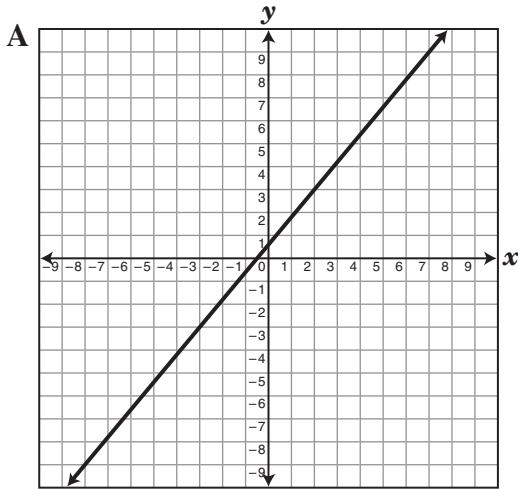
Answer choice C: This is not the correct answer choice, since the number after the negative sign is not greater than the positive numeral.

Answer choice D: This is the correct answer choice. $|-15 + 3| = |-12| = 12$ and $|9 + 3| = 12$.



Sample Problem 2

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



(A) (B) (C) (D)

To solve this problem, you need to substitute values for x and y into the equations. For example, if $x = 2$, then $y = 2 \times 2$ or 4. Substitute several values for x and y and then determine which graph is correct.

Answer choice A: None of the points on this graph equal $y = 2x$, so this answer choice is not correct.

Answer choice B: This answer choice is also incorrect. This point $(2, 4)$ is on this graph. However, when you plot other points for $y = 2x$ on this graph, it does not look like this. This is not the correct answer choice.

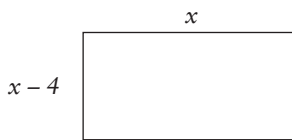


Answer choice C: This line doesn't include the points from $y = 2x$, so this answer choice is also incorrect.

Answer choice D: If you plot the points from this equation, they will be on this line. For example, the points (2, 4), (3, 6), and (4, 8) are on this line. This is the correct answer choice.

Sample Problem 3

The width of the rectangle below is 4 units shorter than the length. Which expression could be used to represent the area of the rectangle?



- A $x^2 + 4$
 - B $x^2 - 4$
 - C $x^2 - 4x$
 - D $x^2 + 8x - 4$
- (A) (B) (C) (D)

To solve this problem, you need to know the formula to find the area of a rectangle:

$$A = l \times w.$$

Answer choice A: The x portion of this answer is correct, but you would not add 4 since the width is shorter than the length. This is not the correct answer choice.

Answer choice B: While this might seem like the correct answer, you need to multiply 4 by x . This answer choice is also incorrect.

Answer choice C: Let $x =$ length and $x - 4 =$ width. The area is then found by multiplying $x - 4$ by x . Simplify the expression. $x(x - 4)$ yields $x^2 - 4x$. This is the correct answer choice.

Answer choice D: The term $8x$ does not belong in the expression. This answer choice is incorrect. Answer choice C is correct.

**STEP TWO SIDEBAR INSTRUCTION**

Complete the following problems. Use the Sidebar Instruction to help you choose the correct answer.

1. If $x = 5$, then $-x =$

A -5

B $-\frac{1}{5}$

C $\frac{1}{5}$

D 5

A B C D

2. What is the y-intercept of the line $2y = -4x - 10$?

A $(0, -5)$

B $(0, -10)$

C $(2.5, 0)$

D $(10, 0)$

A B C D

3. What is the slope of a line parallel to the line $y = \frac{1}{4}x + 3$?

A -4

B $-\frac{1}{4}$

C $\frac{1}{4}$

D 3

A B C D

**SIDEBAR INSTRUCTION**

$\frac{1}{4}x$ is the opposite of x . If $x = 5$, then the opposite of 5 is what number?

**SIDEBAR INSTRUCTION**

A graph intersects an axis when the value of the variable representing the other axis = 0. Therefore, the y-intercept can be found by setting $x = 0$ and solving for y .

**SIDEBAR INSTRUCTION**

In the linear equation $y = mx + b$, which part of the equation gives the slope? What common trait do parallel lines share?



4. If x is an integer, what is the solution to $|x + 2| < 1$

- A {3}
- B $\{-2, -1, 0\}$
- C $\{-2\}$
- D $\{-3, -2, -1, 0\}$

(A) (B) (C) (D)



SIDEBAR INSTRUCTION

How many places toward zero on a number line can x move and still be less than 1?

5. Which of the following points lies on the line $y = 6x + 3$?

- A $(-1, -3)$
- B $(0, 9)$
- C $(1, -2)$
- D $(9, 1)$

(A) (B) (C) (D)



SIDEBAR INSTRUCTION

Substitute the points into the equation. Then choose the correct answer.

6. Simplify.

$$3x^2 + 9x + \frac{6x^3}{3x}$$

- A $x + 3 + 2x^2$
- B $x^2 + 3x + 2x^3$
- C $9x^2 + 27x + 18x^3$
- D $9x^3 + 27x^2 + 18x^4$

(A) (B) (C) (D)



SIDEBAR INSTRUCTION

Divide each term of the numerator by $3x$.



7. Terry has been on her school's cross-country team for 3 years. When she first joined, she was able to run 5 miles an hour. Now Terry can run 12 miles an hour. About what percentage has her running speed increased?

- A 42%
- B 53%
- C 140%
- D 240%

- A B C D

**SIDEBAR INSTRUCTION**

Keep in mind that 12 is more than twice 5.



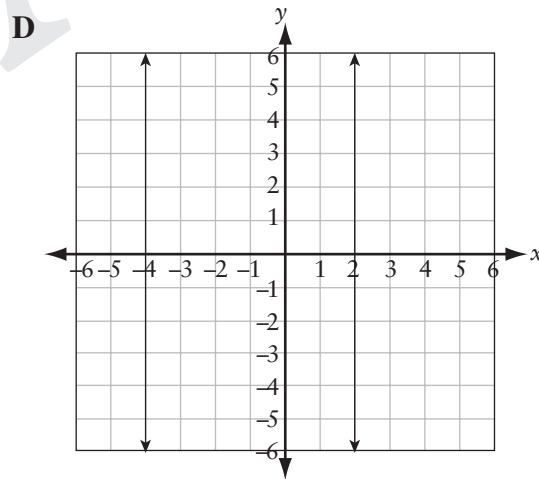
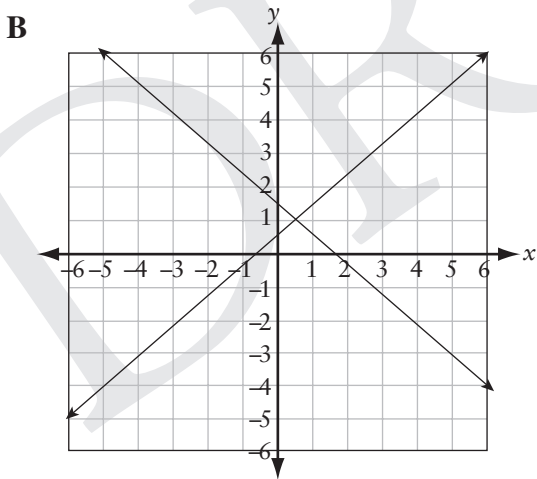
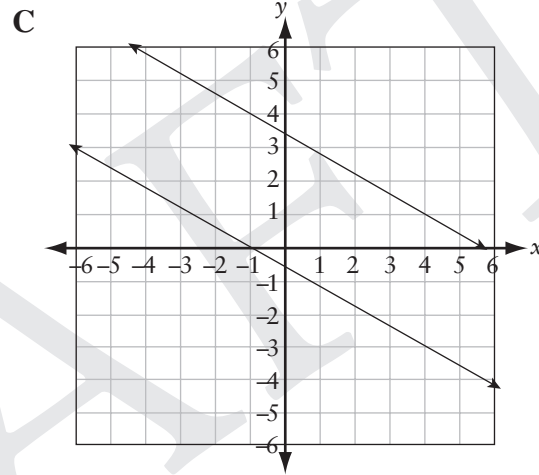
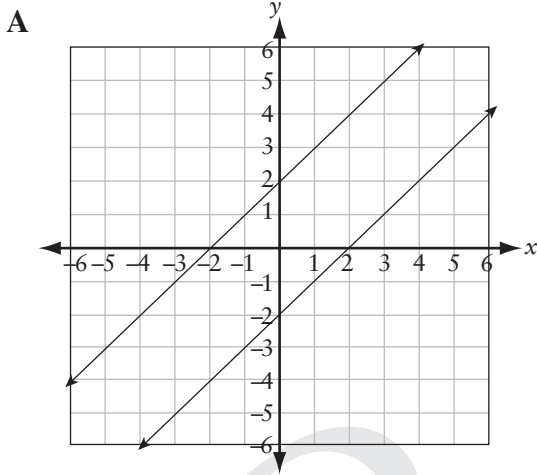
8. Which graph represents the system of equations shown below?

$$\begin{cases} y = x + 2 \\ y = x - 2 \end{cases}$$



SIDEBAR INSTRUCTION

Find the x - and y - intercepts of both equations. Then choose the correct graph.



- (A) (B) (C) (D)



9. Which of the following points lies on the line

$$2x + 3y = 18?$$

- A (2, 4)
B (6, 2)
C (-4, 8)
D (-10, -4)

A B C D

**SIDEBAR INSTRUCTION**

Substitute each of the points in the answer choices, and choose the correct answer choice.

10. Which of the following is equivalent to

$$2(x + 3) - 4(2x + 1) = -14?$$

- A $2x + 3 - 8x + 1 = -14$
B $2x + 3 - 8x + 4 = -14$
C $2x + 6 - 8x + 1 = -14$
D $2x + 6 - 8x - 4 = -14$

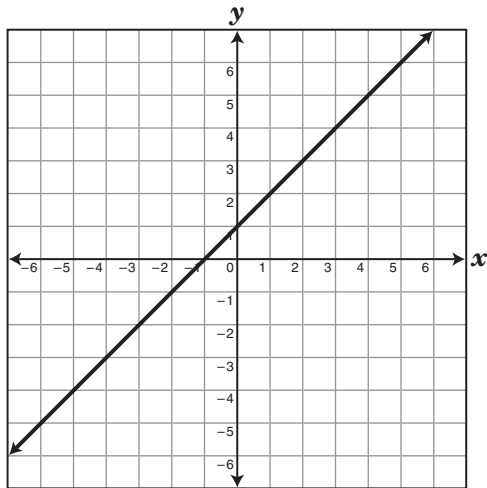
A B C D

**SIDEBAR INSTRUCTION**

Use the Distributive property to simplify the expression.



11. Which coordinate pairs represent the x - and y -intercepts of the graph, respectively, shown below.



- A $(0, 1)$ and $(0, -1)$
B $(-1, 0)$ and $(0, 1)$
C $(0, 1)$ and $(-3, -3)$
D $(-2, -2)$ and $(0, 1)$

A B C D

**SIDEBAR INSTRUCTION**

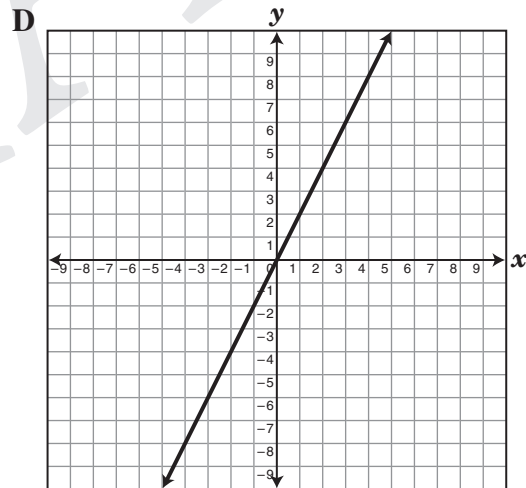
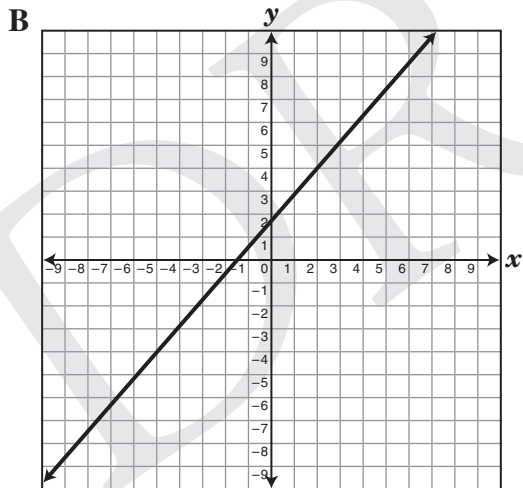
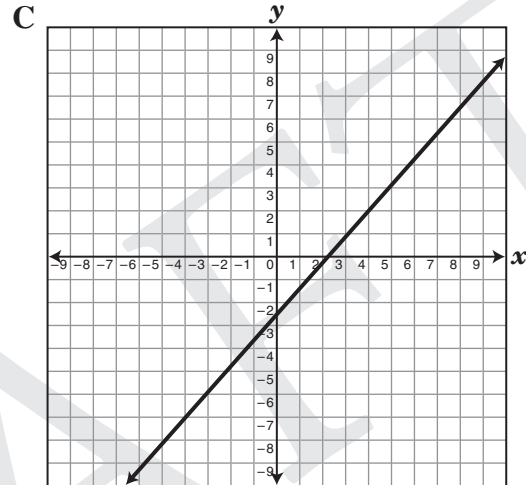
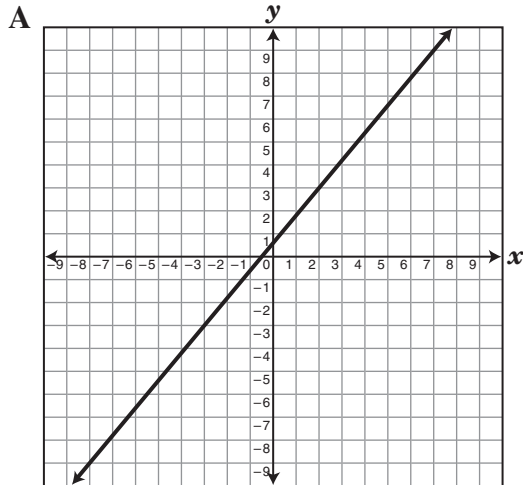
The x -intercept is the point where the line crosses the x -axis. Similarly, the y -intercept is the point where the line crosses the y -axis. Look at each answer choice. Remember that the x -coordinate appears first.



12. Which of the following is the graph of $y = 2x$?

**SIDEBAR INSTRUCTION**

Plot x - and y -values into the equation. Then choose the correct graph.



(A) (B) (C) (D)



13. Assume y is an integer and solve for y .

$$|y - 3| = 10$$

A $\{13, -7\}$

B $\{-13, -7\}$

C $\{13, 7\}$

D $\{13, -7\}$

Ⓐ Ⓑ Ⓒ Ⓓ

**STEP THREE ON YOUR OWN**

Complete each of the following problems on your own.

14. What is the reciprocal of $\frac{xy^3}{z}$?

A $\frac{-xy^3}{z}$

B $\frac{-z}{xy^3}$

C $\frac{xy^3}{z}$

D $\frac{z}{xy^3}$

(A) (B) (C) (D)

15. Which of the following points lies on the line $12y - 6x = 24$?

A (0, 2)

B (-4, 0)

C (2, 0)

D (0, -4)

(A) (B) (C) (D)

16. A low carbohydrate diet, some dieters say, allows them to lose weight very quickly. A 240-pound dieter needs to lose 30% of his weight. If he can lose weight at the rate of 2 pounds per week, how long will it take him to reach his desired weight?

A 30 weeks

B 36 weeks

C 52 weeks

D 84 weeks

(A) (B) (C) (D)

17. What is the x-intercept of the line $2x + 18 = -6y$?

A (-9, 0)

B (-3, 2)

C (0, -9)

D (0, 0)

(A) (B) (C) (D)

18. Which of the following could be the equation of a line parallel to the line $y = x$?

A $-y = x$

B $y = x - 2$

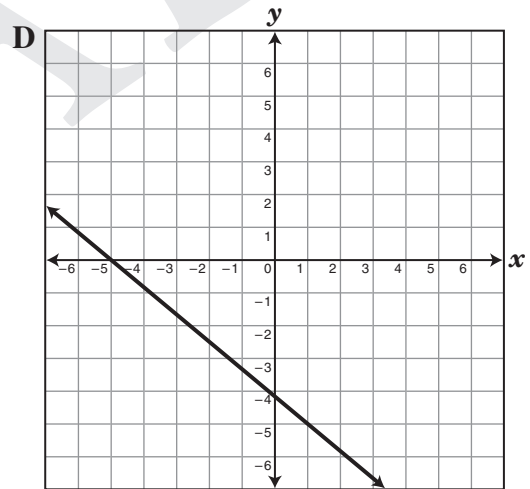
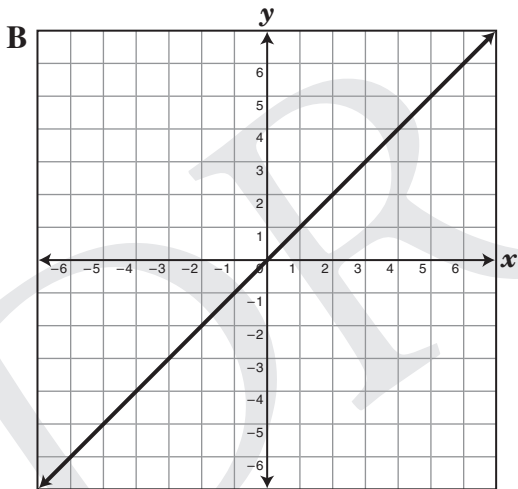
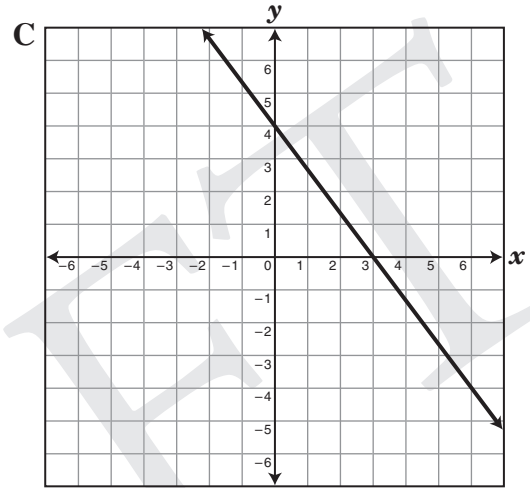
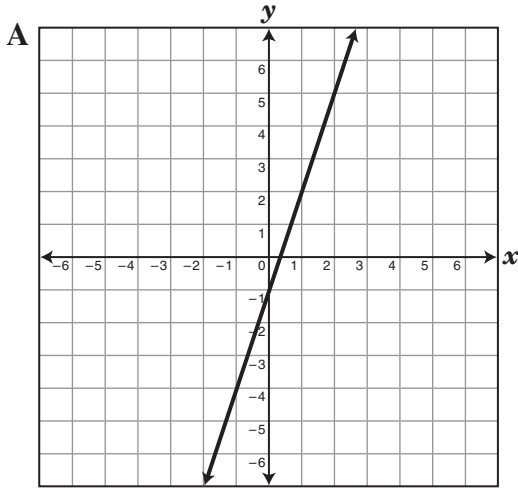
C $y = -x$

D $x = -y$

(A) (B) (C) (D)



19. Which of the following is the graph of $3x - y = 1$?



- (A) (B) (C) (D)



20. Simplify.

$$(x^3 - 2x + 9) - (2x^3 + x + 1)$$

- A $-x^3 + 3x + 8$
- B $-x^3 - 3x + 8$
- C $3x^3 - x + 8$
- D $3x^3 + 3x + 8$

A B C D

21. In the city, Sarah and her mother travel 25 miles per hour. They travel twice this speed when driving on the highway. How far do Sarah and her mother travel in 45 minutes on the highway?

- A 28.4 miles
- B 37.5 miles
- C 45 miles
- D 50 miles

A B C D

22. What is the solution of the system of equations shown below?

$$\begin{cases} y = 2x + 2 \\ y = 3x \end{cases}$$

- A $(-2, -8)$
- B $(2, 6)$
- C $(1, 3)$
- D $(1, 4)$

A B C D

23. If $x = -\frac{1}{2}$, then $-x =$

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

A B C D



24. What is the y-intercept of the line $3y = 3x - 1$?

- A $(0, \frac{1}{3})$
- B $(0, -\frac{1}{3})$
- C $(3, 0)$
- D $(-3, 0)$

A B C D

25. What is the reciprocal of $\frac{ab^2}{c^3}$?

- A $\frac{c^3}{ab^2}$
- B $\frac{-c^3}{ab^2}$
- C ab^2c^3
- D $\frac{-ab^2}{c^3}$

A B C D

26. What is the slope of a line parallel to the line $y = \frac{1}{2}x - 3$?

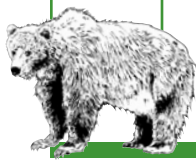
- A -3
- B -2
- C $-\frac{1}{2}$
- D $\frac{1}{2}$

A B C D

27.
$$\begin{cases} 2x + 4y = 14 \\ -3x + 7y = 5 \end{cases}$$

What is the solution to the system of equations shown above?

- A $(-3, -2)$
- B $(-3, 2)$
- C $(3, 2)$
- D $(3, -2)$



REVIEW 3

Complete the following problems.

1. To attend a brunch for a teacher's retirement, a student must pay \$25.00. For each family member a student takes to the brunch, the student pays an additional \$10.00. Students are also asked to leave a 10% tip, based on the amount they pay to attend. Which expression represents the number of family members m , that the student brings?

- A $0.10(25.00 + 10m) + 25.00 + 10m$
B $25.00 + 10m \times 0.10$
C $25.00 + 10m + 0.10$
D $0.10m + (25.00 \times 0.10) + 10$

(A) (B) (C) (D)

2. If $z = -2$, then $-z =$

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

(A) (B) (C) (D)

3. Which of the following statements describes parallel lines?

- A The slopes are negative reciprocals of each other.
B They have the same slope.
C The slopes are inversely proportional.
D They have opposite slopes.

(A) (B) (C) (D)

4. What does x^2 equal when $x = -3$?

- A $-\frac{1}{9}$
B $\frac{1}{9}$
C -9
D 9

(A) (B) (C) (D)

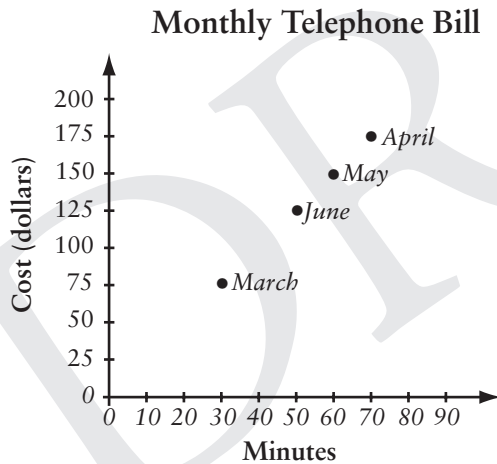
5. Solve for x .

$$3x - 5 = 10$$

- A -15
- B -5
- C 3
- D 5

A B C D

6. The graph below shows Latisha's long-distance telephone bill for four different months. What is the price per minute for a long-distance call?



- A \$0.50
- B \$1.00
- C \$2.50
- D \$25.00

A B C D

7. When driving their car, Kiera and her family average 54 miles per hour on the highway. If they go on a $6\frac{1}{2}$ -hour trip on a highway, how far will they travel?

- A 257 miles
- B 351 miles
- C 540 miles
- D 724 miles

A B C D

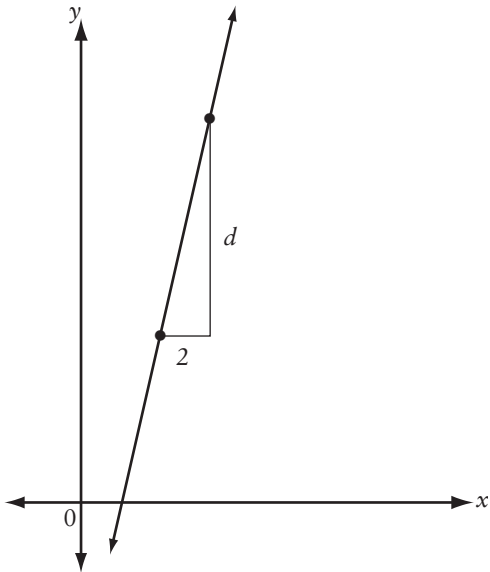
8. Simplify the expression shown below.

$$(3xy^2z^2)(-4x^2yz)$$

- A $-12x^3y^3z^3$
- B $-12xyz$
- C $-1x^3y^3z^2$
- D $12xyz$

A B C D

9. The slope of the line shown below is $\frac{9}{2}$.



What is the value of d ?

- A 3
- B 5
- C 9
- D 18

A B C D

10. In the year 2005, an animal shelter took in 10,326 cats and 6,236 dogs. If by the year 2010, the number of cats taken in would have doubled in size and the number of dogs remained the same, what would be the difference between the two groups?

- A 2,126
- B 4,090
- C 8,180
- D 14,416

A B C D

11. What is the solution of the system of the equations shown below?

$$\begin{cases} y = 4x - 3 \\ y = 5x - 2 \end{cases}$$

- A (2, 5)
- B (2, 8)
- C (-1, -7)
- D (1, 7)

A B C D

12. Solve for x .

$$3x + 6 = 48$$

- A -8
- B 12
- C 14
- D 16

(A) (B) (C) (D)

13. Assume y is an integer and solve for y .

$$|y + 4| = 8$$

- A $\{-4, 4\}$
- B $\{-12, 12\}$
- C $\{-4, 12\}$
- D $\{4, -12\}$

(A) (B) (C) (D)

14. PICK UP TAKS SAMPLE PROBLEM
PAGE 52.

7AF 3.1

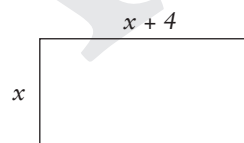
(A) (B) (C) (D)

15. A medium-sized dog's heart rate is about 100 beats per minute. How many times will its heart beat in 2 days?

- A 600
- B 14,400
- C 28,800
- D 36,000

(A) (B) (C) (D)

16. The length of the rectangle below is 4 units longer than the width. Which expression could be used to represent the area of the rectangle?



- A $x^2 - 16$
- B $x^2 + 4x + 4$
- C $x^2 + 4x$
- D $x^2 + 8x + 16$

(A) (B) (C) (D)

17. $\sqrt{16y^4} =$

- A 4
- B $4y$
- C $4y^2$
- D $4y^4$

(A) (B) (C) (D)

18. What is the solution to the system of equations shown below?

$$\begin{cases} 5x + 7y = 20 \\ 6x - 2y = 10 \end{cases}$$

- A $(-4, -7)$
B $(4, -7)$
C $(-4, 7)$
D $(4, 7)$

A B C D

19. Which of the following is equivalent to

$$\frac{2}{5}(20b - 5c) - (8c - 12b)?$$

- A $-4b - 10c$
B $-4b + 6c$
C $-14c$
D $20b - 10c$

A B C D

