Graphing Linear Equations

MATH CONTENT TOPICS: A.1.b, A.5.a, A.5.d
MATH PRACTICES: MP.1.a, MP.1.b, MP.1.e, MP.2.c, MP.3.a, MP.4.b, MP.4.c

1 Learn the Skill

Some equations have two variables. In this case, the value of one variable depends on the other. You can show the possible solutions for an equation with two variables on a graph. A **linear equation** is one that forms a straight line when graphed. All of the solutions of the equation lie on a line. To draw a line, you must find at least two points on the line and connect them.

2 Practice the Skill

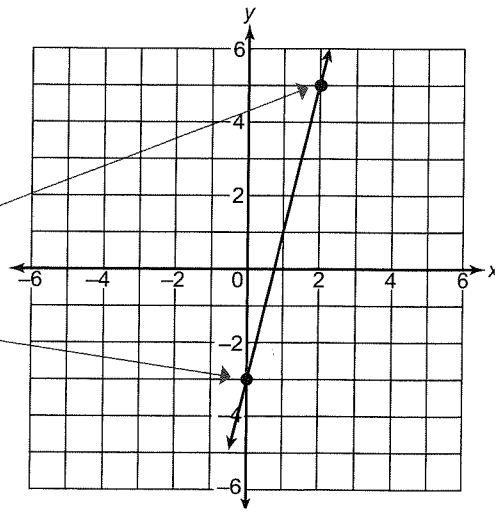
By practicing the skill of graphing linear equations, you will improve your study and test-taking abilities, especially as they relate to the GED® Mathematical Reasoning Test. Study the graph and information below. Then answer the question that follows.

a Choose a value for x. Zero is an easy number with which to begin. Substitute the number for x and solve for y. This pair of values forms an ordered pair that lies on the graph of the line. Choose another value for x and solve for y to find another ordered pair. Plot and connect the two points to graph the line.

Graph $y = 4x - 3$

Let $x = 0$.
$y = 4(0) - 3$
$y = 0 - 3$
$y = -3$
Plot (0,−3).

Let $x = 2$.
$y = 4(2) - 3$
$y = 8 - 3$
$y = 5$
Plot (2, 5).



b Use this formula to find the distance between two points:

$$\text{distance between points} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

To find the distance to the nearest tenth between points (0, −3) and (2, 5), substitute the coordinates into the formula. Solve.

$$d = \sqrt{(2-0)^2 + (5-(-3))^2}$$
$$= \sqrt{2^2 + 8^2}$$
$$= \sqrt{4 + 64}$$
$$= \sqrt{68}$$
$$\approx 8.2$$

1. Which ordered pair is a solution to $2x + y = 5$?

A. (−1, 3)
B. (3, −1)
C. (0, −5)
D. (−2, 6)

INSIDE THE ITEMS

If you think an ordered pair may be a solution to a linear equation, then the equation should be true for those values of x and y. Substitute the values of x and y from the ordered pair into the equation and simplify.

3 Apply the Skill

DIRECTIONS: Read each question, and choose the **best** answer.

2. Which of the following ordered pairs is a point on the line of the equation $x + 2y = 4$?

   A. (−2, 0)
   B. (1, 3)
   C. (0, 2)
   D. (2, −4)

3. Which ordered pair is a solution to $2x - y = 0$?

   A. (0, 0)
   B. (1, −2)
   C. (−1, 2)
   D. (2, −2)

4. What is the missing x-value if $(x, 3)$ is a solution to $y = 2x + 2$?

   A. −1

   B. $-\frac{1}{2}$

   C. $\frac{1}{2}$

   D. 1

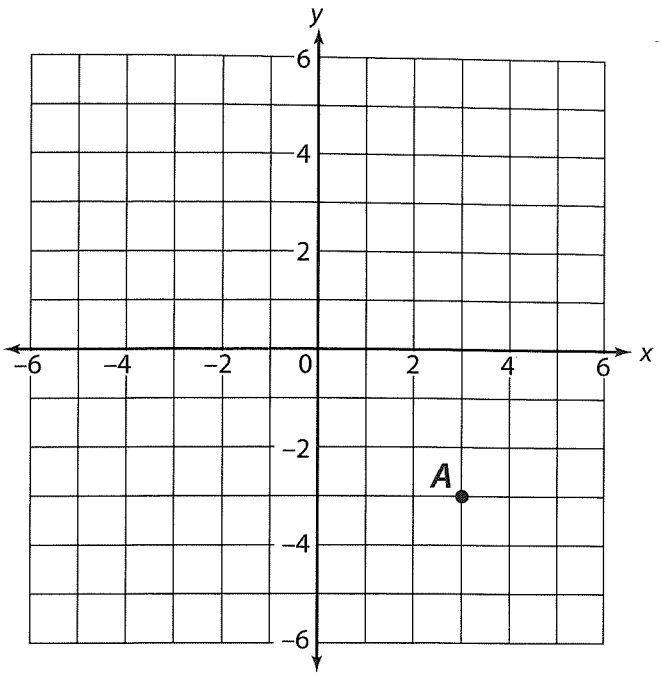
5. A segment is drawn from the origin to (−4, 3). What is the length of the segment?

   A. 1.0
   B. 5.0
   C. 7.0
   D. 12.0

6. Two points are located at (2, 5) and (4, 3). What is the distance between the points to the nearest hundredth?

   A. 1.41
   B. 2.45
   C. 2.65
   D. 2.83

DIRECTIONS: Read the information, and study the grid. Then choose the **best** answer to each question.



7. Point A lies on a line of the equation $x + 2y = -3$. Which of the following are other points on this line?

   A. (0, −3)
   B. (−1, 2)
   C. (0, −2)
   D. (−5, 1)

8. Marvin walks a straight line from (−5, 2) to (−3, 1) and stops. Then he walks a straight line from (−3, 1) to (−1, −4). What is the approximate distance Marvin traveled?

   A. 14.94
   B. 9.04
   C. 7.62
   D. 5.83

9. Point A lies on a circle that is centered at the origin. Given that all points on the circle are the same distance from the origin, which of the following represents the point on the circle on the positive y-axis?

   A. $(3\sqrt{2}, 0)$
   B. $(0, 3\sqrt{2})$
   C. (3, 0)
   D. (0, 3)

LESSON 12

Graphing Linear Equations

Use with *Student Book* pp. 72–73

MATH CONTENT TOPICS: Q.2.a, Q.2.e, Q.6.c, A.1.b, A.2.d, A.5.a, A.5.d
MATH PRACTICES: MP.1.a, MP.1.b, MP.1.d, MP.1.e, MP.2.c, MP.3.a, MP.4.a, MP.4.b, MP.4.c

1 Review the Skill

You can graph an equation that has two variables. For each *x*-value, there is a unique *y*-value. These values can be written as ordered pairs and plotted on a grid. A **linear equation** forms a straight line on a graph. A line can be drawn for the equation when two points have been identified.

A **system of linear equations** is a set of two or more linear equations. The **solution of a set of linear equations** is the ordered pair (*x*, *y*) that satisfies, or is a solution of, all of the equations. On a graph, the solution of a set of linear equations is the point at which the lines intersect.

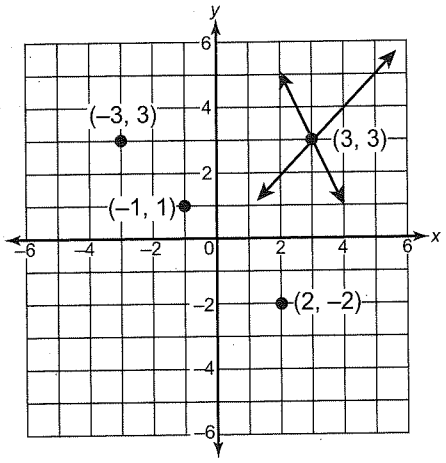
You can count spaces to determine the distance between two points on a vertical or horizontal line. However, for any other kind of line, please use the distance formula.

2 Refine the Skill

By refining the skill of graphing linear equations, you will improve your study and test-taking abilities, especially as they relate to the GED® Mathematical Reasoning Test. Study the graph below. Then answer the questions that follow.

a To answer Question 1, determine the equation that is graphed. Then substitute each answer choice into the equation to find one that makes the equation true.

b To answer Question 2, use the following distance formula:
distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, where one point is (x_1, y_1) and the other is (x_2, y_2).



c These two lines intersect at the point (3, 3). So, the solution of the system of the two equations shown by the lines is (3, 3).

TEST-TAKING TIPS

Try to work backward from the answer choices. For Question 1, substitute the x- and y-values of one point into each equation. If the equation is not true, eliminate the answer choice.

a 1. The points graphed on the grid above satisfy which of the following equations?

A. $x - y = 0$
B. $x + y = 0$
C. $x - y = -1$
D. $x + y = 1$

b 2. A line is drawn from point (−3, 3) to point (2, −2). What is the length of the line to the nearest tenth?

A. 1.4
B. 6.0
C. 7.1
D. 10.0

UNIT 3

3 Master the Skill

DIRECTIONS: Read each question, and choose the **best** answer.

3. Which ordered pair is a solution of $y = \frac{1}{2}x$?

   A. (4, 8)
   B. (1, 3)
   C. (4, 2)
   D. (1, 2)

4. What is the missing y-value if $(2, y)$ is a solution of $-x = y + 1$?

   A. −3
   B. −2
   C. −1
   D. 1

5. What is the missing x-value if $(x, -3)$ is a solution of $2x + 2y = -8$?

   A. −7
   B. −2
   C. −1
   D. 3

6. The graph of the equation $y = 4 - 3x$ would pass through which point on the coordinate grid?

   A. (1, −1)
   B. (4, 8)
   C. (3, 1)
   D. (2, −2)

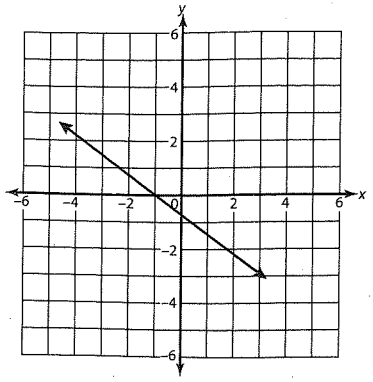
7. What is the missing x-value if $(x, 1)$ is a solution of $2x - y = 5$?

   A. −3
   B. 2
   C. 3
   D. 6

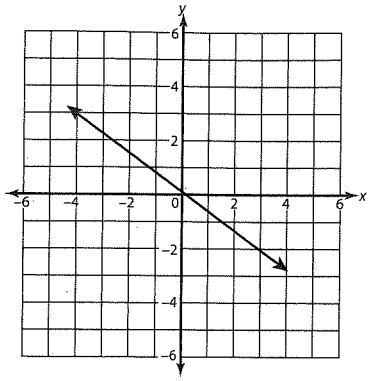
DIRECTIONS: Read each question, and choose the **best** answer.

8. Which of the following shows the graph of the equation $x + 2y = 2$?

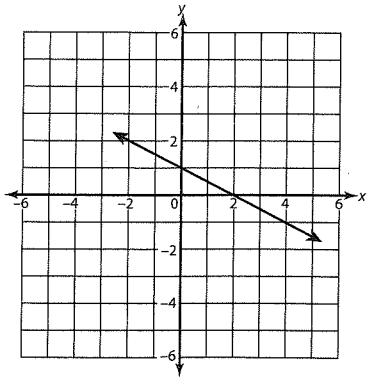
   A.



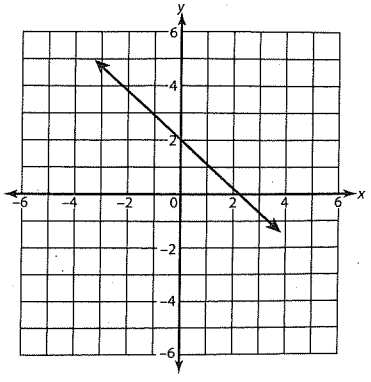
   B.



   C.



   D.

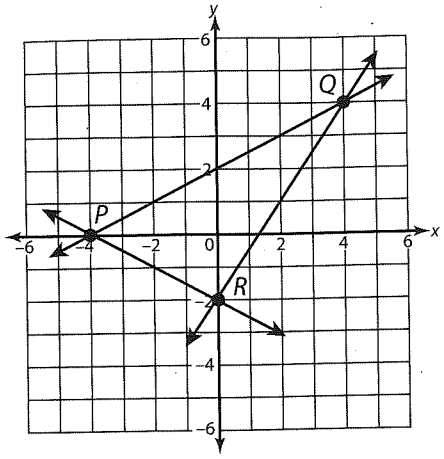


UNIT 3

3 Master the Skill

Spotlighted Item: DRAG-AND-DROP

DIRECTIONS: Study the grid. Then use the drag-and-drop options to place each ordered pair or equation in the appropriate box.



9. What is the equation of each line that makes up a side of the triangle?

Side *PR*	Side *QR*	Side *PQ*

$y = \frac{1}{2}x + 2$ | $y = \frac{3}{2}x - 2$ | $y = -\frac{1}{2}x - 2$

10. Which point is the solution of each pair of equations?

$y = \frac{1}{2}x + 2$ and $y = \frac{3}{2}x - 2$	$y = \frac{3}{2}x - 2$ and $y = -\frac{1}{2}x - 2$	$y = -\frac{1}{2}x - 2$ and $y = \frac{1}{2}x + 2$

(−4, 0) | (4, 4) | (0, −2)

11. Which points are located on each line?

$y = \frac{1}{2}x + 2$	$y = \frac{3}{2}x - 2$	$y = -\frac{1}{2}x - 2$

(2, −3) | (0, 2) | (2, 1)

(−6, −1) | (8, −6) | (6, 7)

DIRECTIONS: Read each question, and choose the **best** answer.

12. Point *B* is located at (4, 7) on a coordinate grid. If a line were drawn directly from the point to the origin, what would be the length of the line to the nearest tenth?

A. 3.0
B. 3.3
C. 5.3
D. 8.1

13. Two points are located at (−2, −5) and (−3, −8). What is the distance between these two points?

A. 3.2
B. 4.2
C. 5.8
D. 13.9

DIRECTIONS: Read each question, and choose the **best** answer.

14. The graph of the equation $y = -2x - 1$ passes through which point?

A. (1, −3)
B. (1, −2)
C. (0, 1)
D. (−1, 2)

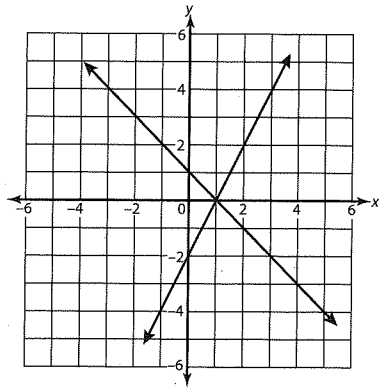
15. Two points are located at (−3, −2) and (−4, 5). What is the distance between these two points?

A. 3.2
B. 7.1
C. 8.2
D. 9.1

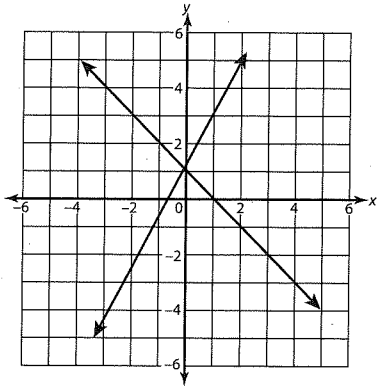
DIRECTIONS: Read the question, and choose the **best** answer.

16. Which graph shows the solution of the equations $2x - y = 2$ and $y = -x + 1$?

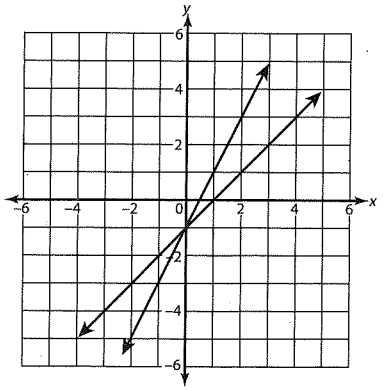
A.



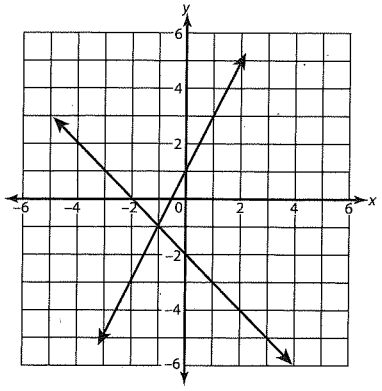
B.



C.

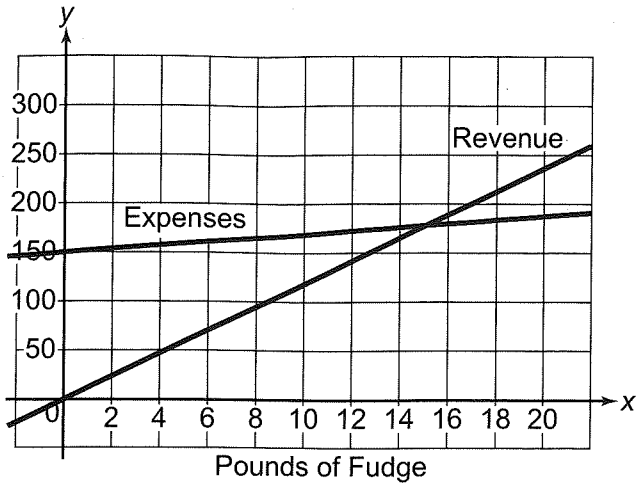


D.



DIRECTIONS: Study the information and graph, read each question, and choose the **best** answer.

Rachel runs a small business. She produces and sells homemade fudge. The following graph shows Rachel's total revenue and total expenses based on the number of pounds of fudge sold.



17. If the *Revenue* line passes through the point (4, 48), what is the equation of the *Revenue* line?

A. $12x + y = 0$
B. $4x - 5y = 0$
C. $12x - y = 0$
D. $4x + 5y = 0$

18. Rachel's start-up expenses total $150. What is the equation of the *Expenses* line?

A. $x - 2y = 150$
B. $x + 2y = 150$
C. $2x - y = -150$
D. $2x - y = 150$

19. The solution set of a revenue equation and an expense equation is called the break-even point. How many pounds of fudge must Rachel sell to reach the break-even point?

A. 18
B. 15
C. 10
D. 8

UNIT 3