

Core Concept

Solving a System of Linear Equations by Graphing

- Step 1 Graph each equation in the same coordinate plane.
- Step 2 Estimate the point of intersection.
- Step 3 Check the point from Step 2 by substituting for x and y in each equation of the original system.

Work with a partner.

Your family opens a bed-and-breakfast. They spend \$600 preparing a bedroom to rent. The cost to your family for food and utilities is \$15 per night. They charge \$75 per night to rent the bedroom.

a. Write an equation that represents the costs.

$$\begin{array}{l} \text{Cost, } C \\ \text{(in dollars)} \end{array} = \begin{array}{l} \$15 \text{ per} \\ \text{night} \end{array} \cdot \begin{array}{l} \text{Number of} \\ \text{nights, } x \end{array} + \$600$$

b. Write an equation that represents the revenue (income).

$$\begin{array}{l} \text{Revenue, } R \\ \text{(in dollars)} \end{array} = \begin{array}{l} \$75 \text{ per} \\ \text{night} \end{array} \cdot \begin{array}{l} \text{Number of} \\ \text{nights, } x \end{array}$$

c. A set of two (or more) linear equations is called a **system of linear equations**. Write the system of linear equations for this problem.

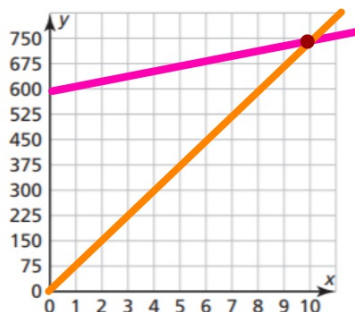
Graph both equations to prove where the lines would intersect when the family would break even.

2 EXPLORATION: Using a Table or Graph to Solve a System (continued)

- b. How many nights does your family need to rent the bedroom before breaking even?

$$\begin{array}{r} 15x + 600 = 75x \\ -15x \quad \quad -15x \\ \hline \end{array} \qquad \frac{600}{60} = \frac{60x}{60} \qquad 10 = x$$

- c. In the same coordinate plane, graph the cost equation and the revenue equation from Exploration 1.



$$\begin{array}{l} 15(10) + 600 = 750 \\ 75(10) = 750 \end{array}$$

10, 750

- d. Find the point of intersection of the two graphs. What does this point represent? How does this compare to the break-even point in part (b)? Explain.

After 10 nights they will break even at \$750

Click the example to show th

Tell whether the ordered pair is a solution of the system of linear equations.

a. $(2, 5)$; $x + y = 7$ Equation 1
 $2x - 3y = -11$ Equation 2

b. $(-2, 0)$; $y = -2x - 4$ Equation 1
 $y = x + 4$ Equation 2

SOLUTION

a. Substitute 2 for x and 5 for y in each equation.

Equation 1

$$x + y = 7$$

$$2 + 5 \stackrel{?}{=} 7$$

$$7 = 7 \quad \checkmark$$

Equation 2

$$2x - 3y = -11$$

$$2(2) - 3(5) \stackrel{?}{=} -11$$

$$-11 = -11 \quad \checkmark$$

► Because the ordered pair $(2, 5)$ is a solution of each equation, it is a solution of the linear system.

b. Substitute -2 for x and 0 for y in each equation.

Equation 1

$$y = -2x - 4$$

$$0 \stackrel{?}{=} -2(-2) - 4$$

$$0 = 0 \quad \checkmark$$

Equation 2

$$y = x + 4$$

$$0 \stackrel{?}{=} -2 + 4$$

$$0 \neq 2 \quad \times$$

► The ordered pair $(-2, 0)$ is a solution of the first equation, but it is not a solution of the second equation. So, $(-2, 0)$ is *not* a solution of the linear system.

Click the problem to show th

Tell whether the ordered pair is a solution of the system of linear equations.

1. $(1, -2)$; $\begin{cases} 2x + y = 0 \\ -x + 2y = 5 \end{cases}$ no

2. $(1, 4)$; $\begin{cases} y = 3x + 1 \\ y = -x + 5 \end{cases}$ yes

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***Graph #2 as well to prove point of intersection of both graphs.**

Click the example to show th

Solve the system of linear equations by graphing.

$$y = -2x + 5 \quad \text{Equation 1}$$

$$y = 4x - 1 \quad \text{Equation 2}$$

SOLUTION

Step 1 Graph each equation.

Step 2 Estimate the point of intersection.

The graphs appear to intersect at $(1, 3)$.

Step 3 Check your point from Step 2.

Equation 1

$$y = -2x + 5$$

$$3 \stackrel{?}{=} -2(1) + 5$$

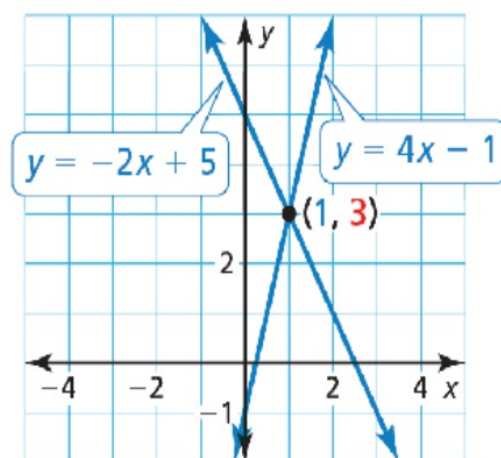
$$3 = 3 \quad \checkmark$$

Equation 2

$$y = 4x - 1$$

$$3 \stackrel{?}{=} 4(1) - 1$$

$$3 = 3 \quad \checkmark$$



► The solution is $(1, 3)$.

Click the problem to show th

Solve the system of linear equations by graphing.

3. $y = x - 2$

$$y = -x + 4$$

(3, 1)

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

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

(-4, 1)

5. $2x + y = 5$

$$3x - 2y = 4$$

(2, 1)

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***graph all three to prove!**

Click the problem to show tr

6. You have a total of 18 math and science exercises for homework. You have six more math exercises than science exercises. How many exercises do you have in each subject? [12 math problems, 6 science problems](#)

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***Warm UP for Wednesday 12/5**