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# **5.2** Solving Systems of Linear Equations by Substitution For use with Exploration 5.2

**Essential Question** How can you use substitution to solve a system of linear equations?

# **EXPLORATION:** Using Substitution to Solve Systems

Work with a partner. Solve each system of linear equations using two methods.

#### Method 1 Solve for x first.

Solve for x in one of the equations. Substitute the expression for x into the other equation to find y. Then substitute the value of y into one of the original equations to find x.

#### Method 2 Solve for *y* first.

Solve for y in one of the equations. Substitute the expression for y into the other equation to find x. Then substitute the value of x into one of the original equations to find y.

Is the solution the same using both methods? Explain which method you would prefer to use for each system.

<b>a.</b> $x + y = -7$	<b>b.</b> $x - 6y = -11$	<b>c.</b> $4x + y = -1$
-5x + y = 5	3x + 2y = 7	3x - 5y = -18

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# 5.2 Solving Systems of Linear Equations by Substitution (continued)

#### **EXPLORATION:** Writing and Solving a System of Equations

#### Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

#### Work with a partner.

- **a.** Write a random ordered pair with integer coordinates. One way to do this is to use a graphing calculator. The ordered pair generated at the right is (-2, -3).
- **b.** Write a system of linear equations that has your ordered pair as its solution.



**c.** Exchange systems with your partner and use one of the methods from Exploration 1 to solve the system. Explain your choice of method.

# **Communicate Your Answer**

- 3. How can you use substitution to solve a system of linear equations?
- **4.** Use one of the methods from Exploration 1 to solve each system of linear equations. Explain your choice of method. Check your solutions.

a.	x + 2y = -7	b.	x - 2y = -6	c.	-3x + 2y = -10
	2x - y = -9		2x + y = -2		-2x + y = -6
d	2	•	2n - 2n = 0	£	2
a.	3x + 2y = 13	e.	$3x - 2y \equiv 9$	1.	3x - y = -6
	x - 3y = -3		-x - 3y = 8		4x + 5y = 11

# 5.2 Notetaking with Vocabulary For use after Lesson 5.2

In your own words, write the meaning of each vocabulary term.

system of linear equations

solution of a system of linear equations

# Core Concepts

## Solving a System of Linear Equations by Substitution

- **Step 1** Solve one of the equations for one of the variables.
- **Step 2** Substitute the expression from Step 1 into the other equation and solve for the other variable.
- **Step 3** Substitute the value from Step 2 into one of the original equations and solve.

Notes:

5.2 Notetaking with Vocabulary (continued)

# **Extra Practice**

In Exercises 1–18, solve the system of linear equations by substitution. Check your solution.

1.	2x + 2y = 10	2.	2x - y = 3	3.	x - 3y = -1
	y = 5 + x		x = -2y - 1		x = y

**4.** 
$$x - 2y = -3$$
**5.**  $2x + y = 3$ **6.**  $3x + y = -5$  $y = x + 1$  $x = 3y + 5$  $y = 2x + 5$ 

7. 
$$y = 2x + 8$$
  
 $y = -2x$   
 $y = \frac{1}{4}x + 3$   
8.  $y = \frac{3}{4}x + 1$   
 $y = 4$   
9.  $2x - 3y = 0$   
 $y = 4$ 

## 5.2 Notetaking with Vocabulary (continued)

**10.** 
$$x + y = 3$$
  
 $2x + 4y = 8$   
**11.**  $y = \frac{1}{2}x + 1$   
 $y = -\frac{1}{2}x + 9$   
**12.**  $3x - 2y = 3$   
 $4x - y = 4$ 

**13.** 
$$7x - 4y = 8$$
**14.**  $y = \frac{3}{5}x - 12$ 
**15.**  $3x - 4y = -1$ 
 $5x - y = 2$ 
 $y = \frac{1}{3}x - 8$ 
 $5x + 2y = 7$ 

**16.** 
$$y = -x + 3$$
**17.**  $y - 5x = -2$ 
**18.**  $4x - 8y = 3$ 
 $x + 2y = 0$ 
 $-4x + y = 2$ 
 $8x + 4y = 1$ 

**19.** An adult ticket to a museum costs \$3 more than a children's ticket. When 200 adult tickets and 100 children's tickets are sold, the total revenue is \$2100. What is the cost of a children's ticket?