

## 3-2

## Reteaching

## Solving Systems Algebraically

Follow these steps when solving by substitution.

- Step 1** Solve one equation for one of the variables.
- Step 2** Substitute the expression for this first variable into the other equation. Solve for the second variable.
- Step 3** Substitute the second variable's value into either equation. Solve for the first variable.
- Step 4** Check the solution in the other original equation.

**Problem**

What is the solution of the system of equations?  $\begin{cases} 4x + 3y = 10 \\ x + 2y = 10 \end{cases}$

- Step 1**  $x = -2y + 10$  Solve one equation for  $x$ .
- Step 2**  $4(-2y + 10) + 3y = 10$  Substitute the expression for  $x$  into the other equation.  
 $-8y + 40 + 3y = 10$  Distribute.  
 $-5y = -30$  Combine like terms.  
 $y = 6$  Solve for  $y$ .
- Step 3**  $x + 2(6) = 10$  Substitute the  $y$  value into either equation.  
 $x + 12 = 10$  Simplify.  
 $x = -2$  Solve for  $x$ .
- Step 4**  $4(-2) + 3(6) \stackrel{?}{=} 10$  Check the solution in the other equation.  
 $-8 + 18 \stackrel{?}{=} 10$  Simplify.  
 $10 = 10 \checkmark$

The solution is  $(-2, 6)$ .

**Exercises**

Solve each system by substitution.

1.  $\begin{cases} x - 3y = 2 \\ -x + 2y = 5 \end{cases}$

$x = -19, y = -7$

2.  $\begin{cases} a + 3b = 4 \\ a = -2 \end{cases}$

$a = -2, b = 2$

3.  $\begin{cases} -2m + n = 6 \\ -7m + 6n = 1 \end{cases}$

$m = -7, n = -8$

4.  $\begin{cases} 7x - 3y = -1 \\ x + 2y = 12 \end{cases}$

$x = 2, y = 5$

# 3-2 Reteaching (continued)

## Solving Systems Algebraically

Follow these steps when solving by elimination.

- Step 1** Arrange the equations with like terms in columns. Circle the like terms for which you want to obtain coefficients that are opposites.
- Step 2** Multiply each term of one or both equations by an appropriate number.
- Step 3** Add the equations.
- Step 4** Solve for the remaining variable.
- Step 5** Substitute the value obtained in step 4 into either of the original equations, and solve for the other variable.
- Step 6** Check the solution in the other original equation.

### Problem

What is the solution of the system of equations?  $\begin{cases} 2x + 5y = 11 \\ 3x - 2y = -12 \end{cases}$

**Step 1**  $\begin{array}{r} \textcircled{2x} + 5y = 11 \\ \textcircled{3x} - 2y = -12 \end{array}$  Circle the terms that you want to make opposite.

**Step 2**  $\begin{array}{r} 6x + 15y = 33 \\ -6x + 4y = 24 \end{array}$  Multiply each term of the first equation by 3.  
Multiply each term of the second equation by  $-2$ .

**Step 3**  $19y = 57$  Add the equations.

**Step 4**  $y = 3$  Solve for the remaining variable.

**Step 5**  $\begin{array}{r} 3x - 2(3) = -12 \\ x = -2 \end{array}$  Substitute 3 for  $y$  to solve for  $x$ .

**Step 6**  $\begin{array}{r} 2(-2) + 5(3) \stackrel{?}{=} 11 \\ -4 + 15 \stackrel{?}{=} 11 \\ 11 = 11 \checkmark \end{array}$  Check using the other equation.

The solution is  $(-2, 3)$ . You can also check the solution by using a graphing calculator.

### Exercises

Solve each system by elimination.

5.  $\begin{cases} 3x + 2y = -17 \\ x - 3y = 9 \end{cases}$   $x = -3, y = -4$

6.  $\begin{cases} 5f + 4m = 6 \\ -2f - 3m = -1 \end{cases}$   $f = 2, m = -1$

7.  $\begin{cases} 3x - 2y = 5 \\ -6x + 4y = 7 \end{cases}$  no solution

8.  $\begin{cases} -2x - 4y = 2 \\ 10x + 20y = -10 \end{cases}$   $y = -\frac{1}{2}x - \frac{1}{2}$ , where  $x$  is any real number

9. **Reasoning** Why does a system with no solution represent parallel lines?

If there is no solution, then there are no values of the variables that will make both equations true. This means there is no point that lies on both lines, so the lines never meet and are therefore parallel.