

# Study Guide

## Substitution

One method of solving systems of equations is by algebraic **substitution**.

**Example:** Solve  $x + 3y = 7$  and  $2x - 4y = 6$ .

Solve the first equation for  $x$ .

$$\begin{aligned} x + 3y &= 7 \\ x &= 7 - 3y \end{aligned}$$

Substitute  $7 - 3y$  for  $x$  in the second equation. Solve for  $y$ .

$$\begin{aligned} 2(7 - 3y) - 4y &= -6 \\ 14 - 6y - 4y &= -6 \\ -10y &= -20 \\ y &= 2 \end{aligned}$$

Substitute 2 for  $y$  in either one of the two original equations to find the value of  $x$ .

$$\begin{aligned} x + 3(2) &= 7 \\ x + 6 &= 7 \\ x &= 1 \end{aligned}$$

The solution of this system is  $(1, 2)$ .

**Use substitution to solve each system of equations. If the system does not have exactly one solution, state whether it has no solution or infinitely many solutions.**

1.  $x = 3$   
 $2y + x = 3$

2.  $y = 2$   
 $2x - 4y = 1$

3.  $y = 3x - 7$   
 $3x - y = 7$

4.  $y = -x + 3$   
 $2y + 2x = 4$

5.  $x + y = 16$   
 $2y = -2x + 2$

6.  $x = 2y$   
 $0.25x + 0.5y = 10$

**Use a system of equations and substitution to solve each problem.**

7. How much of a 10% saline solution should be mixed with a 20% saline solution to obtain 1000 milliliters of a 12% saline solution?

8. The tens digit of a two-digit number is 3 greater than the units digit. Eight times the sum of the digits is 1 less than the number. Find the number.