Lesson 6-5

Example 1

Find the solution to the system of equations: $2x - y = 6$, $2x + y = 14$.

Solution

$2x - y = 6$
    $y = 2x - 6$ Solve the first equation for y in terms of x.

       $2x + y = 14$ Write the second equation.
$2x + (2x - 6) = 14$ Substitute $(2x - 6)$ for y.
  $2x + 2x - 6 = 14$ Solve for x.
          $4x = 20$
           $x = 5$

Choose one of the original equations.

    $2x - y = 6$
$2(5) - y = 6$ Substitute 5 for x.
  $10 - y = 6$ Solve for y.
      $y = 4$

Check $x = 5$, $y = 4$ in $2x - y = 6$ $2x + y = 14$
each original equation. $2(5) - 4 = 6$ $2(5) + 4 = 14$
                          $10 - 4 = 6$ $10 + 4 = 14$
The solution is (5, 4). $6 = 6$ ✓ $14 = 14$ ✓

Example 2

Find the solution to the system of equations: $2x - 3y = 9$, $6y - 4x = 12$.

Solution

$6y - 4x = 12$ $2x - 3y = 9$
    $6y = 4x + 12$ Solve for y. $2x - 31\frac{2}{3}x + 22 = 9$ Substitute for y.
      $y = \frac{2}{3}x + 2$ $2x - 2x - 6 = 9$
                                                         $-6 = 9$

There is no solution. The lines are parallel.

Example 3

Solve the system of equations: $9x - 6y = 18$, $6x - 4y = 12$.

Solution

$$9x - 6y = 18$$
$$y = \frac{3}{2}x - 3 \qquad \text{Solve for } y.$$

$$6x - 4y = 12$$
$$6x - 41\frac{3}{2}x - 32 = 12 \qquad \text{Substitute for } y.$$
$$6x - 6x + 12 = 12$$
$$12 = 12$$

The lines are the same. There is an infinite number of solutions that satisfy the equation $9x - 6y = 18$ and $6x - 4y = 12$.

Example 4

SHIPPING An appliance store delivers large appliances using vans and trucks. When loaded, each van holds 5 appliances and each truck holds 8. If 54 appliances are delivered and 9 vehicles are full, how many vans and trucks are used?

Solution

Define each of the variables.

Write and solve a system of equations relating to the variables.

Let t = number of trucks
   v = number of vans

There are 9 vehicles.

$$v + t = 9$$
$$t = 9 - v \qquad \text{Solve for } t.$$

54 appliances are delivered; 8 in each truck and 5 in each van.

$$5v + 8t = 54$$
$$5v + 8(9 - v) = 54 \qquad \text{Substitute } 9 - v \text{ for } t.$$
$$5v + 72 - 8v = 54$$
$$-3v = -18 \qquad \text{Solve for } v.$$
$$v = 6$$

$$v + t = 9$$
$$6 + t = 9 \qquad \text{Substitute for } v.$$
$$t = 3 \qquad \text{Solve for } t.$$

There are 6 vans and 3 trucks delivering appliances.