Lesson 7-2

Example 1 Solve Using Substitution

Use substitution to solve the system of equations.

$2x - y = -3$

$x = 2y$

Since $x = 2y$, substitute $2y$ for x in the first equation.

$2x - y = -3$	First equation
$2(2y) - y = -3$	$x = 2y$
$4y - y = -3$	Simplify.
$3y = -3$	Combine like terms.
$\frac{3y}{3} = \frac{-3}{3}$	Divide each side by 3.
$y = -1$	Simplify.

Use $x = 2y$ to find the value of x.

$x = 2y$	Second equation
$x = 2(-1)$	$y = -1$
$x = -2$	Simplify.

Check In each equation, replace x with –2 and y with –1.

$2x - y = -3$ $\quad$ $x = 2y$

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

$-4 + 1 \stackrel{?}{=} -3$ $\quad$ $-2 = -2$ ✓

$-3 = -3$ ✓

The solution is (-2, -1).

Example 2 Solve for One Variable, Then Substitute

Use substitution to solve the system of equations.

$y - x = -4$

$6x + y = 3$

Solve the first equation for y since the coefficient of y is 1.

$y - x = -4$	First equation
$y - x + x = -4 + x$	Add x to each side.
$y = -4 + x$	Simplify.

Find the value of x by substituting $-4 + x$ for y in the second equation.

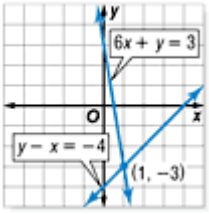
$6x + y = 3$	Second equation
$6x + (-4 + x) = 3$	$y = -4 + x$
$7x - 4 = 3$	Combine like terms.
$7x - 4 + 4 = 3 + 4$	Add 4 to each side.
$7x = 7$	Simplify.
$\frac{7x}{7} = \frac{7}{7}$	Divide each side by 7.
$x = 1$	Simplify.

Substitute 1 for x in either equation to find the value of y.

Choose the equation that is easier to solve.

$y - x = -4$	First equation
$y - 1 = -4$	$x = 1$
$y - 1 + 1 = -4 + 1$	Add 1 to each side.
$y = -3$	Simplify.

The solution is (1, -3). The graph at the right verifies the solution.



Example 3 Dependent System

Use substitution to solve the system of equations.

$y = -x + 3$

$2x + 2y = 6$

Since $y = -x + 3$, substitute $-x + 3$ for y in the second equation.

$2x + 2y = 6$	Second equation
$2x + 2(-x + 3) = 6$	$y = -x + 3$
$2x + -2x + 6 = 6$	Distributive Property
$6 = 6$	Simplify.

The statement $6 = 6$ is true. This means that there are infinitely many solutions of the system of equations. This is true because the slope-intercept form of both equations is $y = -x + 3$. That is, the equations are equivalent, and they have the same graph.

Example 4 Write and Solve a System of Equations

One type of punch served in the cafeteria contains 10% fruit juice. Another punch contains 20% fruit juice. How much of each punch should be used to make 10 gallons of a punch that is 16% fruit juice?

Let a = the number of gallons of the 10% fruit juice and b = the number of gallons of the 20% fruit juice. Use a table to organize the information.

	10% Fruit Juice	20% Fruit Juice	16% Fruit Juice
Total Gallons	a	b	10
Gallons of Fruit Juice	$0.10a$	$0.20b$	$0.16(10)$

The system of equations is $a + b = 10$ and $0.10a + 0.20b = 0.16(10)$. Use substitution to solve this system.

$a + b = 10$	First equation
$a + b - b = 10 - b$	Subtract b from each side.
$a = 10 - b$	Simplify.

$0.10a + 0.20b = 0.16(10)$	Second equation
$0.10(10 - b) + 0.20b = 0.16(10)$	$a = 10 - b$
$1 - 0.10b + 0.20b = 1.6$	Distributive Property
$1 + 0.10b = 1.6$	Combine like terms.
$1 + 0.10b - 1 = 1.6 - 1$	Subtract 1 from each side.
$0.10b = 0.6$	Simplify.
$\frac{0.10b}{0.10} = \frac{0.6}{0.10}$	Divide each side by 0.10.
$b = 6$	Simplify.

$a + b = 10$	First equation
$a + 6 = 10$	$b = 6$
$a + 6 - 6 = 10 - 6$	Subtract 6 from each side.
$a = 4$	Simplify.

6 gallons of the 20% fruit juice punch and 4 gallons of the 10% fruit juice punch should be used.