

Lesson 8-4

Example 1

Solve the system of equations. Check the solution.

$$\begin{aligned} 3x + 4y &= 7 \\ -3x + y &= -2 \end{aligned}$$

Solution

$$\begin{array}{r} 3 + 4y = 7 \\ \underline{-3x + y = -2} \\ 0 + 5y = 5 \\ 5y = 5 \\ y = 1 \end{array}$$

The x -coefficients are opposites.
Add the equations.
Solve for y .

$$\begin{array}{r} 3x + 4y = 7 \\ 3x + 4(1) = 7 \\ 3x + 4 = 7 \\ 3x = 3 \\ x = 1 \end{array}$$

Choose one of the original equations.
Substitute 1 for y .
Solve for x .

Check

$$\begin{array}{r} 3x + 4y = 7 \\ 3(1) + 4(1) \stackrel{?}{=} 7 \\ 3 + 4 \stackrel{?}{=} 7 \\ 7 = 7 \checkmark \end{array}$$

$$\begin{array}{r} -3x + y = -2 \\ -3(1) + 1 \stackrel{?}{=} -2 \\ -3 + 1 \stackrel{?}{=} -2 \\ -2 = -2 \checkmark \end{array}$$

The solution is (1, 1).

Example 2

Solve the system of equations. Check the solution.

$$2x + 5y = 16$$

$$x + 5y = 13$$

Solution

$$\begin{array}{r} 2x + 5y = 16 \\ -(x + 5y = 13) \end{array}$$

□

$$\begin{array}{r} 2x + 5y = 16 \\ -x \end{array}$$

The y coefficients are the same.

Example 3

Solve the system of equations.

$$\begin{aligned}3x + 4y &= 16 \\ x + y &= 2\end{aligned}$$

Solution

$$\begin{array}{rcl}3x + 4y = 16 & \square & 3x + 4y = 16 \\ \underline{-3(x + y = 2)} & & \underline{-3x - 3y = -6} \\ & & 0 + y = 10 \\ & & y = 10\end{array}$$

Multiply the second equation by -3.
Add.

Choose one of the original equations.

$$\begin{aligned}x + y &= 2 \\ x + 10 &= 2 && \text{Substitute 10 for } y. \\ x &= -8 && \text{Solve for } x.\end{aligned}$$

Be sure to check the solution.

The solution is $(-8, 10)$.

Example 4

Thomas has dimes and quarters in his pocket. There are 14 coins. The value of the coins is \$2.15. How many of each kind of coin does Thomas have?

Solution

Let d = the number of dimes and q = the number of quarters. The total number of coins is 14, so $d + q = 14$. The value of the coins is \$2.15, so $0.1d + 0.25q = 2.15$.

$$\begin{array}{rcl}
 -0.1(d + q = 14) & -0.1d - 0.1q = -1.4 & \text{Multiply the first equation by } -0.1. \\
 \underline{0.1d + 0.25q = 2.15} & \underline{0.1d + 0.25q = 2.15} & \text{Add.} \\
 & 0 + 0.15q = 0.75 & \text{Solve for } q. \\
 & 0.15q = 0.75 & \\
 & q = 5 &
 \end{array}$$

Choose one of the original equations.

$$\begin{array}{rcl}
 d + q = 14 & & \\
 d + 5 = 14 & \text{Substitute } 5 \text{ for } q. & \\
 d = 9 & \text{Solve for } d. &
 \end{array}$$

Thomas has 5 quarters and 9 dimes.