Solving Systems with Algebra

Example 1 Use the substitution method

Use substitution when one of the variables has a leading coefficient of 1.

$$\begin{aligned} x + y &= -2 \\ 3x + 4y &= 6 \end{aligned}$$

Step 1: Solve an equation for one variable.

Step 2: Substitute into other equation and solve.

Step 3: Substitute answer into another equation and solve.

Example 2 Use the elimination method by multiplying one equation

Use elimination when none of the variables has a leading coefficient of 1.

$$\begin{aligned} 2x + 5y &= 14 \\ 4x + 2y &= -4 \end{aligned}$$

Step 1: Multiply one equation by a value that will eliminate a variable when adding the equations together.

Step 2: Add the equations and solve.

Step 3: Substitute answer into another equation and solve.

Example 3 Use the elimination method by multiplying BOTH equations

Use elimination when none of the variables has a leading coefficient of 1.

$$\begin{aligned} 3x - 4y &= -37 \\ -5x + 3y &= 14 \end{aligned}$$

Step 1: Multiply one equation by a value that will eliminate a variable when adding the equations together.

Step 2: Add the equations and solve.

Step 3: Substitute answer into another equation and solve.

Example 4

Solve linear systems with many or no solutions

a. $x - 3y = 7$

$2x - 6y = 12$

b. $2x - 6y = 12$

$-5x + 15y = -30$