

# Systems of Equations Walkthrough

## Substitution Method

$$\begin{cases} 6x - 3y = 5 \\ y - 2x = 8 \end{cases}$$

→ To isolate the variable:

$$\begin{array}{r} y - 2x = 8 \\ + 2x \quad + 2x \\ \hline \end{array}$$

$$y = 8 + 2x$$

$$\begin{cases} 6x - 3y = 5 \\ y = 2x + 8 \end{cases}$$

$$6x - 3y = 5$$

$$y = 2x + 8$$

$$6x - 3(2x + 8) = 5$$

$$6x - 6x - 24 = 5$$

$$0 - 24 = 5$$

$$-24 \neq 5$$

$\emptyset = \text{no solutions}$

In this example, we will be using substitution to solve a system of equations. By solving a system of equations, we discover where two lines would intersect on a graph.

For the substitution method, we find the equation that has the easiest variable to isolate (get by itself). In this example, that equation is  $y - 2x = 8$  with  $y$  being the variable that is isolated.

After we isolate the variable, we plug in the equation that has been rearrange into the other equation and solve for the one variable.

To solve, the first step we must do is distribute the  $-3$ .

Now, we combine like terms on the same side of the equation.

Since the variables cancelled out and  $-24$  does not equal  $5$ , our system of equations has NO SOLUTIONS which means the lines never intersect on the graph.