

# Solving Systems of Equations



There are a number of different ways in which to solve systems of equations. The second method we are going to look at is called substitution.



When we refer to solving a system of equations, we want to solve for a numerical value for one variable.



**Rules for Substitution as a method for solving a system of equations.**

- **There must be the same number of equations as variables.**

- If there are two variables, there must be two equations; three variables, three equations, etc.

- **One of the equations can easily be substituted into the other equation to solve for one variable.**

Steps when solving systems of equations using substitution

$$\begin{array}{l} \textcircled{1} \\ \textcircled{2} \end{array} \begin{array}{l} -8x + y = 0 \\ x + 2y + 17 = 0 \end{array}$$

Step 1: Isolate one of the variables with the coefficient 1.

$$y = 8x$$

Step 2: Substitute into the other equation.

$$x + 2(8x) + 17 = 0$$

Step 3: Solve for the variable

$$\begin{array}{l} 1x + 16x + 17 = 0 \\ 17x = -17 \end{array}$$

$$\begin{array}{r} \cancel{17}x = -17 \\ \hline 17 \quad 17 \\ \hline x = -1 \end{array}$$

Step 4: Substitute your value from Step 3 into the other equation and solve for the other variable.

$$\begin{array}{l} -8x + y = 0 \\ -8(-1) + y = 0 \\ 8 + y = 0 \\ \hline y = -8 \end{array}$$