

Algebra I

Lesson 6.2 – Solving Systems by Substitution

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OK, so we can solve a system of equations by graphing. Sometimes that may be a little difficult especially if the y-intercept is a fraction or the solution is not an integer ordered pair. There is an algebraic method called **substitution**.

Vocabulary

Substitution – a method by which one equation is solved for a variable. The resulting expression is then substituted into the remaining equation.

Solve by substitution

$$\begin{cases} x + 4y = 6 \\ x + y = 3 \end{cases}$$
$$x + 4y - 4y = 6 - 4y$$
$$x = 6 - 4y$$

$$\begin{aligned} x + y &= 3 \\ 6 - 4y + y &= 3 \\ 6 - 3y - 6 &= 3 - 6 \\ \left(-\frac{1}{3}\right) - 3y &= -3 \left(-\frac{1}{3}\right) \\ y &= 1 \end{aligned}$$

$$\begin{aligned} x + 4y &= 6 \\ x + 4(1) &= 6 \\ x + 4 - 4 &= 6 - 4 \\ x &= 2 \end{aligned}$$

Answer: (2,1)

1. Solve for one variable in one equation (it may not be needed if an equation is already solved for one variable).
2. Substitute the resulting expression into the other equation.
3. Solve the equation to get the value of the first variable.
4. Substitute That value into one of the original equation and solve.
5. Write the values from Steps 3 and 4 as an ordered pair (x, y) and check.

Solve by substitution

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

$$\begin{cases} 2x + y = -4 \\ x + y = -7 \end{cases}$$

$$\begin{cases} x = 2y - 4 \\ x + 8y = 16 \end{cases}$$

$$\begin{cases} -2x + y = 8 \\ 3x + 2y = 9 \end{cases}$$