

A **system of linear equations** is to or more linear equations (the x has an exponent of 1)
 A **solution** to a system of two equations is the point of intersection
 An **ordered pair** is the same as a coordinate or point (x, y)

OBJECTIVE 1: Using the Substitution Method
Substitution is more accurate than graphing.

STEPS:

1. Solve one of the equations for one of its variables.
2. Substitute the expression for the variable found in STEP 1 into the other equation.
3. Solve the equation from STEP 2 to find the value of one variable.
4. Substitute the value found in STEP 3 in any original equation containing both variables to find the value of the other variable.
5. Check the proposed solution in the original system. It must work in all original equations to be a solution.

$$2x + y = 10$$

$$x = y + 2$$

$$2(y+2) + y = 10$$

$$2y + 4 + y = 10$$

$$3y + 4 = 10$$

$$3y = 6$$

$$y = 2$$

$$x = (2) + 2$$

$$x = 4$$

$$(4, 2)$$

$$2(4) + 2 = 10 \checkmark$$

$$8 + 2 = 10 \checkmark$$

$$4 = 2 + 2 \checkmark$$

$$4 = 4 \checkmark$$

$$2x - y = 9$$

$$x = y + 1$$

$$2(y+1) - y = 9$$

$$2y + 2 - y = 9$$

$$y + 2 = 9$$

$$y = 7$$

$$x = 7 + 1$$

$$x = 8$$

$$(8, 7)$$

$$2(8) - (7) = 9$$

$$16 - 7 = 9 \checkmark$$

$$8 = 7 + 1 \checkmark$$

$$8 = 8 \checkmark$$

$$\begin{aligned}
 x + 3y &= 6 & 3y &= -x + 6 \\
 2x + 3y &= 10 & & \\
 2x + (-x + 6) &= 10 & & \\
 x + 6 &= 10 & & \\
 x &= 4 & & \\
 4 + 3y &= 6 & & \\
 3y &= 2 & & \\
 y &= \frac{2}{3} & & \\
 & & & \boxed{(4, \frac{2}{3})}
 \end{aligned}$$

$$\begin{aligned}
 x + 2y &= 7 & 2y &= -x + 7 \\
 2x + 2y &= 13 & & \\
 2x + (-x + 7) &= 13 & & \\
 x + 7 &= 13 & & \\
 x &= 6 & & \\
 & & & \boxed{(6, \frac{1}{2})} \\
 & & & 6 + 2(\frac{1}{2}) = 7 \checkmark \\
 & & & 2(6) + 2(\frac{1}{2}) = 13 \checkmark
 \end{aligned}$$

$$\begin{aligned}
 \frac{1}{2}x - y &= 3 \\
 x &= 6 + 2y \\
 \frac{1}{2}(6 + 2y) - y &= 3 \\
 3 + y - y &= 3 \\
 3 &= 3 \checkmark
 \end{aligned}$$

∞

$$\begin{aligned}
 7x - 3y &= -14 \\
 -3x + y &= 6 \\
 y &= 3x + 6 \\
 7x - 3(3x + 6) &= -14 \\
 7x - 9x - 18 &= -14 \\
 -2x - 18 &= -14 \\
 -2x &= 4 \\
 x &= -2 \\
 & & & \boxed{(-2, 0)} \\
 & & & -3(-2) + y = 6 \\
 & & & 6 + y = 6 \\
 & & & y = 0 \\
 & & & 7(-2) - 3(0) = -14 \checkmark \\
 & & & -14 + 0 = -14 \checkmark \\
 & & & -3(-2) + 0 = 6 \checkmark \\
 & & & 6 + 0 = 6 \checkmark
 \end{aligned}$$

$$\begin{aligned}
 \frac{1}{4}x - y &= 2 \\
 x &= 4y + 8 \\
 \frac{1}{4}(4y + 8) - y &= 2 \\
 y + 2 - y &= 2 \\
 2 &= 2 \checkmark
 \end{aligned}$$

∞

$$\begin{aligned}
 6x + 12y &= 5 \\
 -4x - 8y &= 0 \\
 -4x &= 8y \\
 x &= -2y \\
 6(-2y) + 12y &= 5 \\
 -12y + 12y &= 5 \\
 0 &\neq 5
 \end{aligned}$$

∅, { }, or no solution

Still need help with: