7.1 Solving Systems of Two Equations

$$2x - y = 10$$
$$3x + 2y = 1$$

A Solution is an ordered pair (x, y) that makes both equations true.

The two main methods for solving systems are substitution and elimination.

Solving by substitution:

Solving by substitution means we solve for one variable in one equation and then substitute that expression into the second equation to solve for the remaining variable.

$$2x - y = 10 \qquad y = 2x - 10$$

$$3x + 2y = 1$$

$$3x + 2(2x - 10) = 1$$

$$3x + 4x - 20 = 1$$

$$7x = 21$$

$$\boxed{x = 3}$$

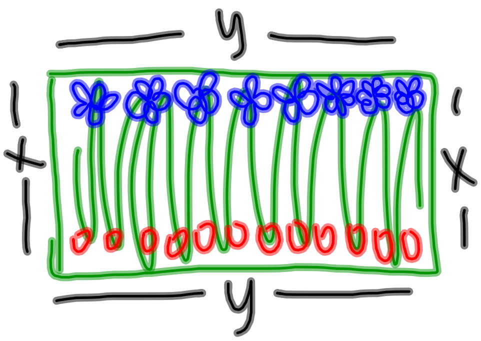
$$y = 2(3) - 10$$

$$y = 6 - 10$$

$$y = -4$$

$$\boxed{(3, -4)}$$

Find the dimensions of a rectangular garden that has perimeter 100ft and area of 300 ft.



$\boxed{7 \times 43}$

$2x + 2y = 100$

$yx = 300$

$2(x+y) = 100$

$x + y = 50$

$\boxed{x = 50 - y}$

$y(50-y) = 300$

$50y - y^2 = 300$

$0 = y^2 - 50y + 300$

$y = \frac{50 \pm \sqrt{50^2 - 4(300)}}{2}$

$y = 7, \boxed{43}$

$x = 50 - y \quad x = 7$

Solving by Elimination

Solving by elimination means using basic operations we eliminate one of the variables when adding the equations together, then solve for the remaining variable.

$$3(2x+3y=5)$$
$$2(-3x+5y=21)$$

$$\begin{array}{r} 6x+9y=15 \\ + \quad -6x+10y=42 \\ \hline 0+19y=57 \end{array}$$

$$\frac{19y}{19}=\frac{57}{19}$$

$$y=3$$

$$2x+3(3)=5$$
$$2x+9=5$$
$$2x=-4$$
$$x=-2$$

$$\boxed{(-2,3)}$$

Solve:

$$x - 3y = -2$$
$$2x - 6y = 4$$

$x = 3y - 2$

$2(3y-2) - 6y = 4$

$\cancel{6y} - 4 - \cancel{6y} = 4$

$-4 = 4$

$\boxed{\text{no solution}}$

Solve:

$$3(4x-5y=2)$$

$$-12x+15y=-6$$

$$+\ 12x-15y=6$$

$$0+0=0$$

$$0=0$$

$$\boxed{\text{Infinite}}$$

Possible Solutions:

One/two/three Solution(s): A unique ordered pair (x, y) that satisfies both equations. Number of solutions depends on the degree: Linear- one, Quadratic - two, cubic - three

No Solution: There is no ordered pair (x, y) that will make both equations true.

Infinitely many solutions: There are infinite ordered pairs (x, y) that make both equations true.