

Substitution

1. Solve for one of the variables.
2. Substitute this value into the other equation and solve.
3. Substitute value back into the first equation.

Example: Solve: $\begin{cases} x + 3y = 12 \\ -2x + 4y = 9 \end{cases}$

* x in the first equation is the easiest variable to solve for

$$x + 3y = 12$$

$$x = 12 - 3y$$

$$x = 12 - 3(3.3)$$

$$x = 12 - 9.9$$

$$x = 2.1$$

$$-2x + 4y = 9$$

$$-2(12 - 3y) + 4y = 9$$

$$-24 + 6y + 4y = 9$$

$$-24 + 10y = 9$$

$$10y = 33$$

$$y = 3.3$$

(2.1, 3.3) is the solution point

Application: *At Renaldi's Pizza, a soda and two slices of pizza cost \$10.25. A soda and four slices of pizza cost \$18.75. Find the cost of each item.*

s = number of sodas

p = number of pizza slices

$$\begin{cases} s + 2p = 10.25 \\ s + 4p = 18.75 \end{cases}$$

$$s + 2p = 10.25$$

$$s = 10.25 - 2p$$

$$s = 10.25 - 2(4.25)$$

$$s = 10.25 - 8.50$$

$$s = \$1.75$$

$$s + 4p = 18.75$$

$$(10.25 - 2p) + 4p = 18.75$$

$$2p + 10.25 = 18.75$$

$$2p = 8.50$$

$$p = \$4.25$$

Elimination

Example: Solve: $\begin{cases} 3x + y = -9 \\ -3x - 2y = 12 \end{cases}$

$$3x + y = -9$$

$$3x + (-3) = -9$$

$$3x = -6$$

$$x = -2$$

$$3x + y = -9$$

$$\underline{-3x - 2y = 12}$$

$$-1y = 3$$

$$y = -3$$

Solution Point = $(-2, -3)$

Example: Solve: $\begin{cases} 2m + 4n = -4 \\ 3m + 5n = -3 \end{cases}$

$$2m + 4n = -4$$

$$2m + 4(-3) = -4$$

$$2m = 8$$

$$m = 4$$

$$-6m - 12n = 12$$

$$\underline{6m + 10n = -6}$$

$$-2n = 6$$

$$n = -3$$

Solution Point = $(m, n) \rightarrow (4, -3)$