

How Do You Solve a System of Equations by Substitution?

$$3x + 2y = 10$$

$$2x - y = 9$$

1st: Choose one equation and solve for x or y.

$$\begin{array}{l} \cancel{3x} + 2y = 10 \\ -\cancel{3x} \quad -3x \end{array} \quad \begin{array}{l} 2y = -\frac{3x}{2} + \frac{10}{2} \\ \cancel{2} \end{array} \quad y = -1.5x + 5$$

2nd: Substitute the expression from that equation into the other equation and solve.

$$2x - y = 9$$

$$2x - (-1.5x + 5) = 9$$

$$2x + 1.5x - \cancel{5} = 9 \\ +\cancel{5} + 5$$

$$\begin{array}{l} \cancel{3.5x} = 14 \\ \cancel{3.5} \quad \cancel{3.5} \end{array}$$

$$x = 4$$

3rd: Substitute the value found in step 2 back into the equation solved step one.

$$2x - y = 9$$

$$2(4) - y = 9$$

$$\begin{array}{l} \cancel{8} - y = 9 \\ -\cancel{8} \quad -8 \end{array}$$

$$\begin{array}{l} -y = 1 \\ -\cancel{1} \quad -1 \end{array}$$

$$y = -1$$

4th: Write the solution as an ordered pair.

$$(4, -1)$$

(2, -2)

Solve the following systems using substitution.

1. $y = 4x - 9$
 $y = x - 3$

$$4x - 9 = x - 3$$

$$4x - 9 + 9 = x - 3 + 9$$

$$4x = x + 6$$

$$-x \quad -x$$

$$3x = 6$$

$$\frac{3x}{3} = \frac{6}{3}$$

$$x = 2$$

$$y = 4(2) - 9$$

$$y = 8 - 9$$

$$y = -1$$

(2, -1)

2. $4x + 7y = -6$
 $x + 6y = -10$

$$-6y \quad -6y$$

$$X = -6y - 10$$

$$4(-6y - 10) + 7y = -6$$

$$-24y - 40 + 7y = -6$$

$$-17y - 40 = -6$$

$$+40 \quad +40$$

$$-17y = 34$$

$$-17 \quad -17$$

$$y = -2$$

$$X + 6(-2) = -10$$

$$X - 12 = -10$$

$$+12 \quad +12$$

$$X = 2$$

3. $4x + 2y = 10$
 $x - y = 13$

$$+y \quad +y$$

$$X = 13 + y$$

$$4(13 + y) + 2y = 10$$

$$52 + 4y + 2y = 10$$

$$52 + 6y = 10$$

$$-52 \quad -52$$

$$6y = -42$$

$$\frac{6y}{6} = \frac{-42}{6}$$

$$y = -7$$

$$X - (-7) = 13$$

$$X + 7 = 13$$

$$-7 \quad -7$$

$$X = 6$$

(6, -7)

4. $y = 4x - 11$
 $4x - y = 11$

$$4x - (4x - 11) = 11$$

$$4x - 4x + 11 = 11$$

$$11 = 11$$

Infinately many solutions

7 = 92 No Solution

5. Word problem

Mrs. Flips sold 300 cookies for her bake sale. She sold two types of cookies: large chocolate chip and small peanut butter cookies. She charged \$1 for the chocolate chip and 50-cents for the peanut butter cookies and collected \$270 total. How many of each type did she sell?

$X = \text{choco chip cookies}$
 $y = \text{peanut butter cookies}$

$$X + y = 300$$

$$1X + 0.50y = 270$$

$$-y \quad -y$$

$$X = 300 - y$$

$$1(300 - y) + 0.50y = 270$$

$$300 - y + 0.50y = 270$$

$$-300 \quad -300$$

$$-0.50y = -30$$

$$\frac{-0.50y}{-0.5} = \frac{-30}{-0.5}$$

$$y = 60 \text{ peanut butter cookies}$$

$$X = 240 \text{ choco chip cookies}$$

6. Word problem

Paco's Tacos sold 280 food items from its mobile unit. Only tacos (\$2 each) and burritos (\$3 each) were available. It took in \$660 in sales. How many tacos and how many burritos did it sell?

$X = \text{tacos}$
 $y = \text{burritos}$

$$X + y = 280$$

$$2X + 3y = 660$$

$$-y \quad -y$$

$$X = 280 - y$$

$$2(280 - y) + 3y = 660$$

$$560 - 2y + 3y = 660$$

$$560 + y = 660$$

$$-560 \quad -560$$

$$y = 100 \text{ burritos}$$

X = 180 tacos

Solve

$$\textcircled{1} \begin{aligned} y &= 2x - 3 \\ y &= -2x + 9 \end{aligned}$$

$$\textcircled{2} \begin{aligned} 3x - 4y &= 15 \\ 7x + y &= 4 \end{aligned}$$

$$\textcircled{3} \begin{aligned} 2x + 3y &= 16 \\ -7x - y &= 20 \end{aligned}$$