

## 7.3 - Solving Systems by Elimination

Vocabulary:Eliminate: add or subtract to eliminate a variable

$$\boxed{(2, 7)}$$

x    y

$$\begin{array}{r} 5x - 6y = -32 \\ + 3x + 6y = 48 \\ \hline \end{array}$$

$$\frac{8x}{8} = \frac{16}{8}$$

$$x = 2$$

$$\begin{array}{r} 5(2) - 6y = -32 \\ -10 - 6y = -32 \\ \phantom{-10} - 6y = -22 \\ y = 7 \frac{1}{3} \end{array}$$

**1 EXAMPLE** Solve by elimination.

$$2x + 3(1) = 11$$

$$\begin{array}{r} 2x + 3 = 11 \\ -3 \quad -3 \\ \hline \end{array}$$

$$\begin{array}{r} 2x = 8 \\ \hline 2 \quad 2 \end{array}$$

$$\boxed{x = 4}$$

$$\boxed{(4, 1)}$$

$$\begin{array}{r} \cancel{2x} + 3y = 11 \\ + \cancel{-2x} + 9y = 1 \\ \hline \end{array}$$

$$\begin{array}{r} 12y = 12 \\ \hline 12 \quad 12 \end{array}$$

$$\boxed{y = 1}$$

1. Solve the system of equations.

$$2x + 5y = 17$$

$$\textcircled{+} \quad 6x - 5y = -9$$


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$$\begin{array}{r} 8x = 8 \\ \hline 8 \end{array} \quad \begin{array}{r} 8 \\ \hline 8 \end{array}$$

$$\textcircled{x = 1}$$

$$\boxed{(1, 3)}$$

$$2(1) + 5y = 17$$

$$\begin{array}{r} 2 + 5y = 17 \\ -2 \quad \quad \quad -2 \end{array}$$

$$5y = 15$$

$$\boxed{y = 3}$$

**3 EXAMPLE**Solve by elimination. →  $3x + 6y = -6$ 

$$3(-5x - 2y = -14)$$

$$\begin{array}{r} 3x + 6y = -6 \\ + -5x - 6y = -42 \\ \hline \end{array}$$

$$\begin{array}{r} -12x = -48 \\ \hline -12 \quad -12 \end{array}$$

$$x = 4$$

$$(4, -3)$$

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

$$\begin{array}{r} 12 + 6y = -6 \\ -12 \quad -12 \end{array}$$

$$6y = -18$$

$$y = -3$$

9. Solve the system of equations.

$$4(3x - 10y = -25)$$

$$\begin{array}{r} 4x + 40y = 20 \\ + 12x - 40y = -100 \\ \hline \end{array}$$

$$\frac{16x}{16} = \frac{-80}{16}$$

$$x = -5$$

$$(-5, 1)$$

$$4(-5) + 40y = 20$$

$$\begin{array}{r} -20 + 40y = 20 \\ +20 \quad \quad +20 \end{array}$$

$$40y = 40$$

$$y = 1$$

**2 EXAMPLE** On a special day, tickets for a minor league baseball game were \$5 for adults and \$1 for students. The attendance that day was 1139, and \$3067 was collected. Write and solve a system of equations to find the number of adults and the number of students that attended the game.

$$x = \text{adults} \quad y = \text{students}$$

$$\begin{array}{r} 1x + y = 1139 \\ + \quad -5x + y = -3067 \\ \hline \end{array}$$

$$\begin{array}{r} -4x = -1928 \\ \hline -4 \quad \quad \quad +4 \\ \hline \end{array}$$

$$x = 482 \text{ adults}$$

$$\begin{array}{r} 482 + y = 1139 \\ -482 \quad \quad \quad -482 \\ \hline \end{array}$$

$$y = 657 \text{ Students}$$

- 4 **EXAMPLE** Suppose the band sells cans of popcorn for \$5 per can and cans of mixed nuts for \$8 per can. The band sells a total of 240 cans and receives a total of \$1614. Find the number of cans of popcorn and the number of cans of mixed nuts sold.

$$\begin{array}{r}
 5x + 8y = 1614 \\
 -8(x + y = 240) \\
 \hline
 -8x + -8y = -1920 \\
 5x + 8y = 1614 \\
 \hline
 -3x = -306 \\
 \hline
 -3 \phantom{x} = \phantom{-306} \\
 \hline
 \phantom{-3}x = \phantom{-306}
 \end{array}$$

$$\begin{array}{r}
 240 \\
 -102 \\
 \hline
 138
 \end{array}$$

138 cans of mixed nuts

$x = 102$  cans of popcorn

16. Two groups of students order burritos and tacos at a local restaurant. One order of 3 burritos and 4 tacos costs \$11.33. The other order of 9 burritos and 5 tacos costs \$23.56. Find the cost of a burrito and the cost of a taco.

$$-3(3x + 4y = 11.33)$$

$$\begin{array}{r}
 9x + 5y = 23.56 \\
 + \quad -9x - 12y = -33.99 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 -7y = -10.43 \\
 \hline
 -7 \phantom{y} \\
 \hline
 \end{array}$$

$$y = \$1.49 \text{ taco}$$

$$3x + 4(1.49) = 11.33$$

$$\begin{array}{r}
 3x + 5.96 = 11.33 \\
 \hline
 -5.96 \phantom{x} \\
 \hline
 \end{array}$$

$$3x = 5.37$$

$$x = \$1.79 \text{ burrito}$$



**5 EXAMPLE**

Solve by elimination.

$$\left. \begin{array}{l} 5(3x + 5y = 10) \\ -3(5x + 7y = 10) \end{array} \right\}$$

$$3x + 5(5) = 10$$

$$\begin{array}{r} 3x + 25 = 10 \\ -25 \end{array}$$

$$3x = -15$$

$$x = -5$$

$$\begin{array}{r} 15x + 25y = 50 \\ -15x + 21y = -30 \\ \hline \end{array}$$

$$4y = 20$$

$$y = 5$$

17. Solve the system of equations.

$$\begin{array}{l} 10 (3x + 2y = -9) \\ 3(-10x + 5y = -5) \end{array} \quad \begin{array}{l} 30x + 20y = -90 \\ -30x + 15y = -15 \end{array}$$

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

$$\begin{array}{r} 3x + -6 = -9 \\ +6 \quad +6 \end{array}$$

$$3x = -3$$

$$x = -1$$

$$(-1, 3)$$

$$35y = -105$$

$$y = -3$$



