

Section 2 – Topic 7
Solving Linear Systems Using Elimination

Consider the following system of linear equations:

$$\begin{aligned} &\left(\frac{1}{3}x + y = \frac{4}{3}\right) 3 \\ &\left(-\frac{1}{4}x - \frac{1}{2}y = -\frac{1}{4}\right) 4 \end{aligned}$$

What property/properties can be used to write an equivalent system?

multiplication (-5, 3)

Write an equivalent system, and use the elimination method to solve for x and y.

$$\begin{array}{r} x + 3y = 4 \\ -x - 2y = -1 \\ \hline y = 3 \end{array} \qquad \begin{array}{r} x + 3(3) = 4 \\ x + 9 = 4 \\ -9 \quad -9 \\ \hline x = -5 \end{array}$$

Try It!

$$\left(\frac{1}{2}, \frac{1}{3}\right)$$

1. Use the elimination method to solve the following system.

$$2\left(\frac{1}{2}\right) + 3y = 2$$

$$1 + 3y = 2$$

$$3y = 1 \quad y = \frac{1}{3}$$

$$\left(\frac{x}{3} + \frac{y}{2} = \frac{1}{3}\right) 6 \quad 2x + 3y = 2$$

$$\left(\frac{1}{6} = \frac{5}{6}x - \frac{3}{4}y\right) 12 \quad 2 = 10x - 9y$$

$$\begin{array}{r} (2x + 3y = 2) \cdot 3 \\ 10x - 9y = 2 \end{array}$$

$$\begin{array}{r} 6x + 9y = 6 \\ (+) 10x - 9y = 2 \\ \hline 16x = 8 \\ \frac{16x}{16} = \frac{8}{16} \end{array} \quad x = \frac{1}{2}$$

2. Each morning Darnell does a combination of aerobics and stretching exercises. The exercises burn different amounts of calories per minute. The following system represents the time Darnell exercises and the amount of calories burned. In the system, x represents the number of minutes Darnell spends doing aerobics and y represents the number of minutes he spends stretching.

$$\begin{aligned} x + y &= 60 \\ 15x + 5y &= 500 \end{aligned}$$

Use the system to answer the following questions.

- a. How many minutes does Darnell spend exercising? *60 minutes*
- b. How many calories per minute does Darnell burn while doing aerobics? *15 calories per min*
- c. How many calories per minute does Darnell burn while stretching? *5 calories per min*
- d. How many total calories does Darnell burn while exercising? *500 calories*

$$\begin{aligned} (x + y = 60) \cdot 5 \\ 15x + 5y = 500 \end{aligned}$$

- e. Use the elimination method to solve the system and determine the number of minutes Darnell spends doing each exercise.

$$\begin{array}{r} -5x - 5y = -300 \\ 15x + 5y = 500 \\ \hline \end{array}$$

$$10x = 200$$

$$x = 20 \text{ minutes for aerobics}$$

$$y = 40 \text{ minutes for stretching}$$

3. All 28 members of Miami High School's Surf Club went on a one-day surf trip. Members rented either short boards for \$16.00 per day or longboards for \$19.00 per day. The club paid a total of \$478 for rental equipment.

$x = \text{short}$
 $y = \text{long}$

- a. Write a system of equations to represent the number of students who went on the trip and the amount of money the club spent.

$$\begin{aligned} (x + y = 28) \cdot 16 \\ 16x + 19y = 478 \end{aligned}$$

$$\begin{aligned} -16x - 16y &= -448 \\ 16x + 19y &= 478 \\ \hline 3y &= 30 \\ y &= 10 \end{aligned}$$

- b. How many students rented a longboard?

10 students

- c. How many students rented a short board?

18 students

BEAT THE TEST!

1. Solve the following system of equations.

$$\begin{array}{l}
 2x - 3(3) = -5 \\
 2x - 9 = -5 \\
 2x = 4 \\
 x = 2
 \end{array}
 \quad
 \begin{array}{l}
 \left(\frac{x}{3} - \frac{y}{2} = -\frac{5}{6}\right) 6 \\
 \left(\frac{x}{5} - \frac{y}{3} = -\frac{3}{5}\right) 15
 \end{array}
 \quad
 \begin{array}{l}
 x = \boxed{2} \\
 y = \boxed{3}
 \end{array}$$

$$\begin{array}{l}
 (2x - 3y = -5) 3 \\
 (3x - 5y = -9) 2 \\
 \hline
 6x - 9y = -15 \\
 -6x + 10y = 18 \\
 \hline
 y = 3
 \end{array}$$

