

**Section 2 – Topic 7**  
**Solving Linear Systems Using Elimination**

Consider the following system of linear equations:

$$\left( \frac{1}{3}x + y = \frac{4}{3} \right) \cdot 3 \quad x + 3y = 4$$

$$\left( -\frac{1}{4}x - \frac{1}{2}y = -\frac{1}{4} \right) \cdot 4 \quad -x - 2y = -1$$

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

Multiplication + Addition

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

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

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


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Try It!

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

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

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

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

$$\begin{array}{r} \cancel{6x + 9y} = 6 \\ \cancel{10x - 9y} = 2 \\ \hline 16x = 8 \end{array}$$

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

$$x = \frac{1}{2}$$

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

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

$$\begin{array}{r} (x + y = 60) \cdot 5 \\ 15x + 5y = 500 \end{array} \quad \begin{array}{r} -5x - 5y = -300 \\ \hline 15x + 5y = 500 \\ \hline 10x = 200 \end{array} \quad x = 20$$

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

20 minutes doing aerobics

40 minutes doing 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.

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

- 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.

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

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

$$x = 18$$

- 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.

$$\begin{aligned} 2x - 3y &= -5 \quad -3 \\ 3x - 5y &= -9 \quad 2 \end{aligned}$$

$$\left( \frac{x}{3} - \frac{y}{2} = -\frac{5}{6} \right) 6$$

$$x = \boxed{2}$$

$$\begin{aligned} -6x + 9y &= 15 \\ 6x - 10y &= -18 \\ \hline -y &= -3 \\ -1 & \quad -1 \\ y &= 3 \end{aligned}$$

$$\left( \frac{x}{5} - \frac{y}{3} = -\frac{3}{5} \right) 15$$

$$y = \boxed{3}$$

$$\begin{aligned} 2x - 3(+3) &= -5 \\ 2x - 9 &= -5 \\ +9 \quad +9 & \end{aligned}$$

$$\begin{aligned} 2x &= 4 \\ \frac{2x}{2} &= \frac{4}{2} \\ x &= 2 \end{aligned}$$

2. Amanda rented a bicycle and inline skates at a park. The following system represents the hours she spent bicycling and skating and the total amount spent for the rentals. In the system,  $x$  represents the number of hours she rented the bicycle and  $y$  represents the number of hours she rented the inline skates.

$$\begin{array}{r} (x + y = 5) \cdot 4 \\ 4x + 3y = 17 \end{array}$$

$$\begin{array}{r} -4x - 4y = -20 \\ 4x + 3y = 17 \\ \hline -1y = -3 \\ y = 3 \end{array}$$

Which of the following statements are true? Select all that apply.

- Amanda rented the bicycle and inline skates for a total of 5 hours.
- The charge to rent a bicycle is \$3 per hour.
- The charge to rent inline skates is \$4 per hour.
- Amanda spent \$17 at the park on bicycle and inline skate rental.
- Amanda rented the bicycle for 5 hours.
- Amanda rented the inline skates for 3 hours.