

Course: MFM2P Gr. 10 AppliedLesson: 5 - 3Unit: Linear SystemsTopic: Solving Linear Systems by Substitution

✚ *homework check:* Lesson 5 - 2✚ *note:* Solving Linear Systems by Substitution

Another method used when solving linear systems is substitution. Literally, we substitute one expression into another equation to collect and solve. It helps when one equation is rearranged so that one variable is isolated. For example, solve the following systems.

a)

$$3x - y = 4$$

$$x + y = 8$$

In equation two, rearrange to isolate y

$$y = 8 - x$$

Substitute the new expression for y into the first equation

$$3x - (8 - x) = 4$$

$$3x - 8 + x = 4$$

$$4x - 8 = 4$$

$$4x = 4 + 8$$

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

and substitute back into second equation to solve for y

$$y = 8 - x$$

$$y = 8 - 3$$

$$y = 5$$

Therefore, the point of intersection would be (3,5)

- b) Minden Karate Club has a competition for the students. If you win a grappling match you are awarded 5 points. If you tie, you are awarded 2 points. Rebecca grappled 15 times with 3 losses and her score was 42 points. How many grapples did Rebecca win?

Rebecca either won or tied 15 matches – 3 losses = 12 times

Let x represent the number of times Rebecca wins a match.

Let y represent the number of times Rebecca ties a match.

$$5x + 2y = 42$$

$$x + y = 12$$

Rearrange equation two for y

$$y = 12 - x$$

Substitute this new expression into equation one

$$5x + 2(12 - x) = 42$$

$$5x + 24 - 2x = 42$$

$$3x + 24 = 42$$

$$3x = 42 - 24$$

$$3x = 18$$

$$\frac{3x}{3} = \frac{18}{3}$$

$$x = 6$$

Therefore, Rebecca wins 6 of the 12 matches.

✚ *homework assignment:* Lesson 5 - 3

Lesson 5 – 3: Solving Systems by Substitution**1. Use substitution to solve each system. Show your work in an organized manner.**

a)
$$\begin{aligned}y &= -6x + 11 \\ 8x - 6y &= 22\end{aligned}$$

b)
$$\begin{aligned}y &= -6x + 16 \\ -2x + 6y &= -18\end{aligned}$$

c)
$$\begin{aligned}y &= -6x - 3 \\ 8x - 4y &= -20\end{aligned}$$

d)
$$\begin{aligned}y &= -3x + 20 \\ 2x + 2y &= 20\end{aligned}$$

e)
$$\begin{aligned}y &= 3x + 4 \\ 7x + y &= -6\end{aligned}$$

f)
$$\begin{aligned}2x + 3y &= 22 \\ y &= -6x + 2\end{aligned}$$

2. Malcolm is twice as old as Sam. The sum of their ages is 39.

- a) Write an equation to represent the information in the first sentence.

- b) Write an equation to represent the information in the second sentence.

- c) Use substitution to find the age of each boy.

3. Carly rents a theatre for a concert. The theatre charges \$825 plus \$2 per person. Carly plans to charge \$7 per person.

- a) Write an equation to represent the information in the first sentence.

- b) Write an equation to represent the information in the second sentence.

- c) Use substitution to find the price per ticket.

4. Two numbers have a sum of 148. These same numbers also have a difference of 54.

- a) Write a system of two equations.

- b) Solve the system to find these two numbers.