

JUNE 1, 2017

**UNIT 4: SYSTEMS OF LINEAR
EQUATIONS**

**7.4: USING A SUBSTITUTION
STRATEGY TO SOLVE A SYSTEM
OF LINEAR EQUATIONS**

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NUMBERS, RELATIONS AND FUNCTIONS 10



WHAT'S THE POINT OF TODAY'S LESSON?

We will continue working on the NRF 10 Specific Curriculum Outcome (SCO) "Relations and Functions 10" OR "RF10" which states:

RF10: "Solve problems that involve systems of equations in two variables graphically and algebraically."



What does THAT mean???

SCO RF10 means that we will:

- * **model a situation using a system of linear equations**
- * **relate a system of linear equations to the context of a problem**
- * **determine and verify the solution of a system of linear equations graphically**
- * **explain the meaning of the point of intersection of a system of linear equations**
- * **determine and verify the solution of a system of linear equations algebraically**
- * **explain, using examples, why a system of equations may have no solution, one solution or an infinite number of solutions**
- * **explain a strategy to solve a system of linear equations**
- * **solve a problem that involves a system of linear equations**



HOMEWORK QUESTIONS???
(page 425, #4 and #5)

When no equation in a linear system has a variable with coefficient 1, it is helpful if there are two like terms where one term is a multiple of the other term.

EXAMPLE:

Solve this linear system:

$$\begin{aligned} 15x - 2y &= 9 & \textcircled{1} \\ 5x + 4y &= 17 & \textcircled{2} \end{aligned}$$

In equation 2, the term 4y can be written as 2(2y):
 $5x + 2(2y) = 17$ $\textcircled{3}$

Rearrange equation 1 for 2y:

$$\begin{aligned} 15x - 2y &= 9 \\ -2y &= -15x + 9 \\ 2y &= 15x - 9 \end{aligned}$$

Substitute 15x - 9 in equation 3:

$$\begin{aligned} 5x + 2(2y) &= 17 \\ 5x + 2(15x - 9) &= 17 \\ 5x + 30x - 18 &= 17 \\ 35x &= 35 \\ x &= 1 \end{aligned}$$

Substitute x = 1 into equation 1:

$$\begin{aligned} 15x - 2y &= 9 \\ 15(1) - 2y &= 9 \\ -2y &= -6 \\ y &= 3 \end{aligned}$$

$$x = 1 \text{ and } y = 3$$

VERIFICATION: $x = 1$ and $y = 3$

$$\begin{aligned}15x - 2y &= 9 \\15(1) - 2(3) &= 9 \\15 - 6 &= 9 \\9 &= 9\end{aligned}$$

$$\begin{aligned}5x + 4y &= 17 \\5(1) + 4(3) &= 17 \\5 + 12 &= 17 \\17 &= 17\end{aligned}$$

YOU TRY!

Solve this linear system.

$$5x - 3y = 18 \quad (1)$$

$$4x - 6y = 18 \quad (2)$$

$$4x - 2(3y) = 18 \quad (3)$$

$$5x - 3y = 18 \quad (1)$$

$$-3y = -5x + 18$$

$$\underline{3y = 5x - 18}$$

$$4x - 2(\cancel{3y}) = 18 \quad (3)$$

$$4x - 2(5x - 18) = 18$$

$$4x - 10x + 36 = 18$$

$$-6x = -18$$

$$\underline{x = 3}$$

$$4x - 6y = 18 \quad (2)$$

$$4(\underline{3}) - 6y = 18$$

$$-6y = 6$$

$$\underline{y = -1}$$

Verification: $5x - 3y = 18$ $4x - 6y = 18$

$$5(3) - 3(-1) = 18$$

$$15 + 3 = 18$$

$$18 = 18$$

$$4(3) - 6(-1) = 18$$

$$12 + 6 = 18$$

$$18 = 18$$

$$x = 3 ; y = -1$$

EXAMPLE:

a) Create a linear system to model this situation:

Nuri invested \$2000, part at an annual interest rate of 8% and the rest at an annual interest rate of 10%. After one year, the total interest was \$190.

b) Solve this problem: How much money did Nuri invest at each rate?

a) Let x represent the amount of money Nuri invests at 8%.

Let y represent the amount of money Nuri invests at 10%.

$$0.08x + 0.10y = 190 \quad (1)$$

$$x + y = 2000 \quad (2)$$

b) $8x + 10y = 19000 \quad (3)$

$$x + y = 2000 \quad (2)$$

$$y = 2000 - x$$

$$8x + 10y = 19000 \quad (3)$$

$$8x + 10(2000 - x) = 19000$$

$$8x + 20000 - 10x = 19000$$

$$-2x = -1000$$

$$x = 500$$

$$x + y = 2000 \quad (2)$$

$$500 + y = 2000$$

$$y = 1500$$

Verification: $0.08x + 0.10y = 190$ $x + y = 2000$
 $0.08(500) + 0.10(1500) = 190$ $500 + 1500 = 2000$
 $40 + 150 = 190$ $2000 = 2000$
 $190 = 190$

$$x = \$500 ; y = \$1500$$

YOU TRY!

- a) Create a linear system to model this situation: Alexia invested \$1800, part at an annual interest rate of 3.5% and the rest at an annual interest rate of 4.5%. After one year, the total interest was \$73.
- b) Solve this problem: How much money did Alexia invest at each rate?

Let x ...

Let y ...

$$x + y = 1800 \quad (1)$$

$$0.035x + 0.045y = 73 \quad (2)$$

$$35x + 45y = 73000 \quad (3)$$

$$x + y = 1800 \quad (1)$$

$$y = 1800 - x$$

$$35x + 45y = 73000 \quad (3)$$

$$35x + 45(1800 - x) = 73000$$

$$35x + 81000 - 45x = 73000$$

$$-10x = -8000$$

$$x = 800$$

$$x + y = 1800 \quad (1)$$

$$800 + y = 1800$$

$$y = 1000$$

$$x = \$800 ; y = \$1000$$

CONCEPT REINFORCEMENT:

FPCM:

PAGE 425: #6, #10, #11 & #12

PAGE 426: #14 & #16

Attachments

Worksheet - Review of Coordinate Geometry (Math 10).doc

area of a triangle.doc

coord geom review.doc

Puzzle Worksheet - Graphing #2 (Coffee).pdf

Puzzle Worksheet - Graphing #1 (Cow).pdf

Puzzle Worksheet - Slope Point (given both).pdf

Puzzle Worksheet - Slope Point (given two points).pdf

Worksheet - Equation of a Line.pdf

Worksheet Solutions - Equation of a Line.pdf

Worksheet - Distance_Midpoint(2).pdf

Review - Coordinate Geometry.pdf