Stacy Santizo
Period 4

Solving Three- Variable Systems

Step 1) Rewrite the system in three variables as a system with two variables either by substitution or elimination
Step 2) Solve the new system for both its variables
Step 3) Substitute the values found in step 2 into one of the original equations and solve for the remaining variable
0=1 means there is no solution
0=0 means there is infinitely many solutions

Example: ***Solve the system***

$$4x + 2y + 3z = 12$$
$$2x - 3y + 5z = -7$$
$$6x - y + 4z = -3$$

Step 1: Rewrite the system

$$4x + 2y + 3z = 12$$
$$\underline{12x - 2y + 8z = -6}$$
$$16x + 11z = 6$$

$$2x - 3y + 5z = -7$$
$$\underline{-18x + 3y - 12z = 9}$$
$$-16x - 7z = 2$$

Step 2: Solve the new system

$$16x + 11z = 6$$
$$\underline{-16x - 7z = 2}$$
$$4z = 8$$
$$z = 2$$
$$x = -1$$

Step 3: Substitute x= -1 and z=2 into an original equation and solve for y

$$6x - y + 4z = -3$$
$$6(-1) - y + 4(2) = -3$$
$$y = 5$$

Solution: x = -1, y = 5, and z = 2

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1) Solve the system:

$x - y + z = -3$
$x - y - z = -3$
$5x - 5y + z = -15$

2) Solve the system:

$4r - 4s + 4t = -4$
$4r + s - 2t = 5$
$-3r - 3s - 4t = -16$

3) Solve the system

$x + y + z = 2$
$5x + 5y + 5z = 3$
$4x + y - 3z = -6$

Solving Real- Life Problems

Example:
An amphitheater charges $75 for each seat in Section A, $55 for each seat in Section B, and $30 for each lawn seat. There are three times as many seats in Section B as in Section A. The revenue

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from selling all 23,000 seats is $870,000. How many seats are in each section of the amphitheater?

Step 1: Write a verbal model

# of seats in B, y = 3 x # of seats in A, x
# of seats in A, x + # of seats in B, y + # of lawn seats, z = Total # of seats
75 • # of seats in A, x + 55 • # of seats in B, y + 30 • # of lawn seats, z = total revenue

Step 2: Write a system

$$y = 3x$$
$$x + y + z = 23{,}000$$
$$75x + 55y + 30z = 87{,}000$$

Step 3: Rewrite as a system in two variables

$$x + \quad + z = 23{,}000$$
$$x + \quad + z = 23{,}000$$
$$4x + z = 23{,}000$$
$$75x + 55 \quad + 30z = 870{,}000$$
$$75x + 55(\quad) + 30z = 870{,}000$$
$$240x + 30z = 870{,}000$$

Step 4: Solve

$$-120x - 30z = -690{,}000$$
$$\underline{240x + 30z = 870{,}000}$$
$$120x = 180{,}000$$
$$x = 1500$$
$$y = 4500$$
$$z = 17{,}000$$

Solution

1) An ultimate Frisbee team has to order jerseys, shorts, and hats. They have a budget of $1350 to spend on $50 jerseys, $20 shorts, and $15 hats. They want to buy 40 items in preparation for the oncoming season and must order as many jerseys as shorts and hats combined

- How many of each item should they order? Write a system of equations to help you solve this problem.

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2)Mike is doing a math quiz and he has 2 hours. It takes him 5 minutes to complete a multiple-choice question, 5 minutes to complete a calculation question and 10 minutes to complete a word problem. He must complete 20 questions and as many as multiple-choice questions as calculation questions and word problems combined.

- How many of each kind of question should he complete? Write a system of equations to help you solve this problem.

3) Tracy wants to buy some pies for her sisters and she has a budget of $82 to spend on $5 apple pies, $4.5 banana pies, and $5.5 chocolate pies. She wants to buy 16 pies for her sisters and must buy as many chocolate pies as apple pies and banana pies combined.

- How many of each item should she buy? Write a system of equations to help you solve this problem.