Name:_____

Date:_____

Solving 3 Variable equations

How to:

Pick any two pairs of equations in the system. Then use addition and subtraction to eliminate the same variable from both pairs of equations. This leaves two equations with two variables--one equation from each pair. Solve *this* system using the Addition/Subtraction method. Then plug the solution back in to one of the original three equations to solve for the remaining variable.

Step-by-Step Ex:

$4x - 3y + z = -10$

$2x + y + 3z = 0$

$-x + 2y - 5z = 17$

Pick two pairs:

$4x-3y+z= -10$

$2x+z+3z=0$

$2x+y+3z=0$

$-x+2z-5z=17$

Eliminate the same variable from each system:

$4x - 3y + z = -10$

$2(2x + y + 3z = 0)$

$4x - 3y + z = -10$

$-4x - 2y - 6z = 0$

$-5y - 5z = -10$

$2x + y + 3z = 0$

$(-x + 2y - 5z = 17)2$

$2x + y + 3z = 0$

$-2x + 4y - 10z = 34$

$5y - 7z = 34$

Solve the system of the two new equations:

$-5y - 5z = -10$

$5y - 7z = 34$

$-12z = 24$

Thus, $z = -2$

$-5y - 5(-2) = -10$

$-5y + 10 = -10$

$-10y + 20 = -20$ $\quad -10y = -40$

$-20 \quad -20$

Thus, $y = 4$

Substitute into one of the original equations:

$-x + 2y - 5z = 17$

$-x + 2(4) - 5(-2) = 17$

$-x + 18 = 17$

$-x = -1$

$x = 1$

Therefore, $(x, y, z) = (1, 4, -2)$.

Check: Does $2(1) + 4 + 3(-2) = 0$? Yes.

Practice:

1. $x-2y+z=16$

   $3x+y-z=-15$

   $3x-2y-3z=12$

2. $-2x-2y+2z=-18$

   $-x-2y-z=-10$

   $2x+y-3z=14$