U3D1

Solving Linear Systems

in 3-Variables

Solve by elimination:

1. $2x + 3y = 7$ → $2x + 3y = 7$ $2x + 2 = 3$
     $2x + y = 3$ $×(-1)$ $-2x - y = -3$ $2x = 1$
                                $2y = 4$ $x = \frac{1}{2}$
                                $y = 2$ $\left(\frac{1}{2}, 2\right)$

2. $5x - 2y = 4$ $\longrightarrow$ $5x - 2y = 4$

$-2x + y = 2$ $\xrightarrow{\times 2}$ $-4x + 2y = 4$

$\overline{}$

$x = 8$

$(8, 18)$

$5(8) - 2y = 4$

$40 - 2y = 4$

$-2y = -36$

$y = 18$

3. A scientist wants to create 120 ml of a solution that is 30% acidic. To create this solution, she has access to a 20% solution and a 45% solution. How many millimeters of each solution should she combine to create the 30% solution?

Let $x =$ amt. of 20% solution $\underline{72\ ml}$
$y =$ amt. of 45% solution $\underline{48\ ml}$

$$x + y = 120 \longrightarrow x = 120 - y$$

$$.20x + .45y = \overset{36}{\cancel{.30(120)}}$$

$$.20(120 - y) + .45y = 36$$

$$24 - .20y + .45y = 36$$

$$\frac{.25y}{.25} = \frac{12}{.25}$$

$$y = 48$$

$$x + 48 = 120$$
$$x = 72$$

What if you want to solve for 3 variables?

Need 3 equations!

* Try to get down to 2 variables first

How would you solve the following?

① $2x + 3y - z = 5$

② $4x - y - z = -1$

③ $x + 4y + z = 12$

①+③ $2x + 3y - z = 5$
     $x + 4y + z = 12$
     ④ $3x + 7y = 17$

②+③ $4x - y - z = -1$
     $x + 4y + z = 12$
     ⑤ $5x + 3y = 11$

④ $3x + 7y = 17$ $\xrightarrow{\times 5}$ $15x + 35y = 85$
⑤ $5x + 3y = 11$ $\xrightarrow{\times(-3)}$ $-15x - 9y = -33$
                                    $26y = 52$
                                    $y = 2$

④ $3x + 7(2) = 17$
   $3x + 14 = 17$
   $3x = 3$
   $x = 1$

① $2(1) + 3(2) - z = 5$
   $2 + 6 - z = 5$
   $8 - z = 5$
   $3 = z$

$(1, 2, 3)$

Solve:

① $x + 2y - z = 8$
② $y + z = 4$
③ $x - y - z = 2$

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

① $6 + 2y - z = 8$
       $2y - z = 2$
② $\underline{\quad y + z = 4}$
       $3y = 6$
       $y = 2$

② $2 + z = 4$
       $z = 2$

$(6, 2, 2)$