

SYSTEMS OF EQUATIONS

SUBSTITUTION

$$2x + 3y = 13$$

$$5x - 2y = -34$$

$$\frac{5x + 34}{2} = \frac{2y}{2}$$

$$\frac{5}{2}x + 17 = y$$

$$2x + 3\left(\frac{5}{2}x + 17\right) = 13$$

$$2\left[2x + \frac{15}{2}x + 51\right] = 26$$

$$4x + 15x + 102 = 26$$

$$\frac{19x}{19} = \frac{-76}{19}$$

$$x = -4$$

$$\frac{5}{2}(-4) + 17 = y$$

$$-10 + 17 = y$$

$$7 = y$$

- 1) Isolate a variable in one of the equations
- 2) Substitute into the opposite eq. & solve

$$(-4, 7)$$

ELIMINATION

$$\begin{array}{l} 4[3x + 8y = -1] \\ -3[4x - 5y = 30] \end{array}$$

$$\begin{array}{r} 12x + 32y = -4 \\ + \quad -12x + 15y = -90 \\ \hline 47y = -94 \\ \frac{47y}{47} = \frac{-94}{47} \\ y = -2 \end{array}$$

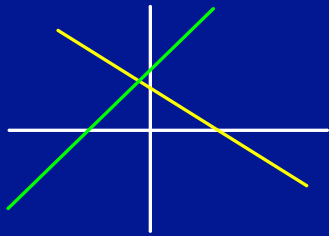
$$4x - 5(-2) = 30$$

$$4x + 10 = 30$$

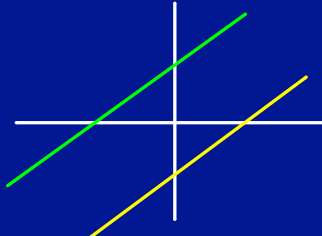
$$4x = 20$$

$$x = 5$$

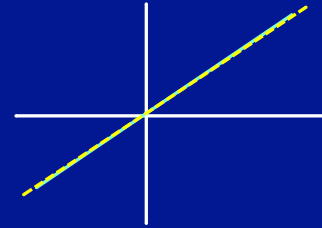
$$(5, -2)$$



One solution
- different slopes



No solution
- same slope
- different intercepts
 $0 = 7$



Infinitely many
Solution: $y = mx + b$
- same slopes
- same intercepts
 $0 = 0$ $6 = 6$

$$\begin{aligned} 3[4x - 2y &= 8] \\ 2[-6x + 3y &= 12] \end{aligned}$$

$$\begin{aligned} 3y &= 6x + 12 \\ y &= 2x + 4 \end{aligned}$$

$$4x - 8 = 2y$$

$$2x - 4 = y$$

same slope
diff. int
No solution

$$\begin{aligned} 12x - 6y &= 24 \\ -12x + 6y &= 24 \\ \hline 0 &= 48 \end{aligned}$$

A dietician needs to mix 10 gallons of milk that is 2 1/2% milk fat for the day's rounds. He has some milk that is 4% milkfat and some that is 1 1/2% milkfat. How much of each should be used?

$$x + y = 10$$

$$0.04x + 0.015y = 0.025(10)$$

$$\boxed{0.04x + 0.015y = 0.25} \times 1000$$

$$\begin{cases} 40x + 15y = 250 \\ x + y = 10 \end{cases}$$

$$y = 10 - x$$

$$y = 10 - (4) = 6$$

$x = \text{gal of 4\% milk}$

$y = \text{gal of 1.5\% milk}$

$$\left. \begin{array}{l} 5\% \text{ of } 32 \\ 0.05 \times 32 = 1.60 \end{array} \right\}$$

$$40x + 15(10 - x) = 250$$

$$40x + 150 - 15x = 250$$

$$25x = 100$$

$$x = 4$$

4 gal of 4%
6 gal of 1.5%

On a recent camping trip, it took Molly and Sam 2 hr to row 4 mi upstream from the drop in point to the campsite. After a leisurely weekend of camping, fishing and relaxation, they rowed back downstream to the drop in point in just 30 minutes. Find (a) the speed of the current and (b) the speed of Molly and Sam would be rowing in still water.

$$D = R \cdot T$$

$$\left. \begin{aligned} (y-x) \cdot 2 &= 4 \\ 2y - 2x &= 4 \end{aligned} \right\} \left. \begin{aligned} (y+x) \cdot \frac{1}{2} &= 4 \\ 2 \left[\frac{1}{2}y + \frac{1}{2}x = 4 \right] \\ y + x &= 8 \end{aligned} \right\}$$

$$\begin{aligned} 2y - 2x &= 4 \\ 2[y + x] &= 8 \end{aligned}$$

$$\begin{array}{r} 2y - 2x = 4 \\ 2y + 2x = 16 \\ \hline 4y = 20 \\ y = 5 \end{array}$$

$$\begin{aligned} 5 + x &= 8 \\ x &= 3 \end{aligned}$$

x = speed of current
 y = rowing speed in still water

speed of current: $3 \frac{\text{mi}}{\text{h}}$
 speed of rowing: $5 \frac{\text{mi}}{\text{h}}$

FIXED COSTS / VARIABLE COSTS

↑
Costs you have to
pay regardless
of the amount
produced
(Rent, Insurance)
\$1200

↑
Costs per item

\$0.20 plastic
\$0.06 String
\$0.11 packaging

0.37

Revenue
Amount of money
received from
sales

yo-yo's \$3.50 each

$$C = 1200 + 0.37x$$

$$R = 3.50x$$

Break Even Point = Find where lines intersect

