



Ex: A rectangle's length is 3 feet shorter than its width. The rectangle's entire perimeter is 59 feet. Find dimensions of rectangle.

①

Soln:  perimeter = total length of all sides

 $59 = p = w + l + w + l = 2w + 2l$

↑ given ↑ from picture

length = width - 3
↑
"is"

$l = w - 3$

We have a system:

$$\begin{cases} 2w + 2l = 59 & (i) \\ -w + l = w - 3 & (ii) \end{cases}$$

Plug (ii) into (i):

$$2w + 2(w - 3) = 59$$

$$2w + 2w - 6 = 59$$

$$4w = 65$$

$w = \frac{65}{4} \text{ ft}$

plug into (ii)

$$l = \frac{65}{4} - 3 = \frac{65}{4} - \frac{12}{4} = \frac{53}{4} \text{ ft}$$

$$3 = \frac{12}{4}$$

(2)

EX: \$5,000 is invested into two accounts
One account pays 2% interest annually

and other pays 4% " "

A total of \$120 in interest was made.

How much money was put into each account?

Soln: Account 1 ~ 2% ~ a_1 ~ total \$ amount invested in account 1

Account 2 ~ 4% ~ a_2 ~ " "

$$2\% = \frac{2}{100} = 0.02$$

$$\begin{cases} a_1 + a_2 = 5000 & (i) \\ 0.02a_1 + 0.04a_2 = 120 & (ii) \end{cases}$$

Solve (i) for a_2 :

$$a_2 = 5000 - a_1$$

Plug into (ii):

$$0.02(a_1) + 0.04(5000 - a_1) = 120$$

$$0.02a_1 + 0.04(5000) - 0.04a_1 = 120$$

$$(0.02 - 0.04)a_1 = 120 - 200$$

$$-0.02a_1 = -80$$

$$a_1 = \frac{-80}{-0.02} = 4000$$

$$a_2 = 5000 - 4000 = 1000$$

\$4000 was invested in 2% acct
\$1000 ————— 4% acct

Ex: Sum of two numbers is 12.

One is 3 less than the other.
↓
of the numbers

3

Soln: number one $\sim n_1$
number two $\sim n_2$

$$\begin{cases} n_1 + n_2 = 12 & (i) \\ n_1 = n_2 - 3 & (ii) \end{cases}$$

Plug (ii) into (i):

$$(n_2 - 3) + n_2 = 12$$

$$2n_2 = 15$$

$$n_2 = \frac{15}{2} = 7.5$$

$$n_1 = 7.5 - 3$$

$$= 4.5$$

$$n_1 + n_2 = 4.5 + 7.5 = 12 \checkmark$$

EX: You poured some 3% alcohol soln and some 8% alcohol soln into a container.

You now have 320 grams of 5% alcohol soln. How many grams of each did you use?

Soln: a_1 ~ grams of 3% soln
 a_2 ~ grams of 8% soln

$$\begin{cases} a_1 + a_2 = 320 & \text{(i) (row grams counted)} \\ 0.03a_1 + 0.08a_2 = 0.05(320) & \text{(ii)} \end{cases}$$

$$(i) \quad a_1 = 320 - a_2$$

$$(ii) \quad 0.03(320 - a_2) + 0.08a_2 = 16$$
$$9.6 - 0.03a_2 + 0.08a_2 = 16$$

$$0.05a_2 = 6.4$$

$$a_2 = \frac{6.4}{0.05} = 128$$

$$a_1 = 320 - 128 = 192$$

\Rightarrow 192g of 3% soln
128g of 8% soln

3% alc soln means 3% of total grams is alcohol particles

\Downarrow

$0.03a_1$ ~ total number of GRAMS of alcohol in a_1

in end

~~total grams~~
0.05 of total grams of mixture is alcohol particles

\uparrow
 $0.05(320)$