Type 3: Mixture Problems

Ex1 A chemical supply company received an order for 1500L of 38% salt solution. To fill the order it was necessary to mix 40% salt solution with 30% salt solution. How many litres of each should be mixed?

Amount	x	+	y	=	1500
Salt	40% of x		30% of y		38%

① $x + y = 1500$

② $0.40x + 0.30y = 0.38(1500)$

Action 1 ① $x + y = 1500$

$x = 1500 - y$

Act 2 ② $0.40x + 0.30y = 570$

$0.40(1500 - y) + 0.30y = 570$

$600 - 0.4y + 0.3y = 570$ (−600 −600)

$-0.1y = -30$

$\frac{-0.1y}{-0.1} = \frac{-30}{-0.1}$

$y = 300$

Act 3 (300) $x = 1500 - y$

$x = 1500 - 300$

$x = 1200$

∴ 1200L of 40% and 300L of 30% should be mixed.

Type 4: Distance, Speed, Time Problems

Ex2 Batman drove 230km to Catwoman's house and it took him 4 hours. Part of the time, he was on the highway in Arkham City where the speed limit is 110km/h. The rest of the time he had to drive on the smaller roads where the speed limit is 40km/h so that Joker's spies would not notice him. Suppose that Batman drove exactly at the speed limit the whole trip, how much time did Batman spend on each type of the road?

Let "h" be the amount of time travelled on highway

" "s" " " " " " " " " sideroads

Batman —HIGHWAY— SIDEROADS → Catwoman

	HIGHWAY	SIDEROADS
distance = speed × time	speed × time	
$= 110 \times h$	$= 40 \times s$	
$= 110h$	$= 40s$	

Total time travelled ⇒ $h + s = 4$

Total distance travelled ⇒ $110h + 40s = 230$

our system

SUBSTITUTION

$s = 4 - h$

$110h + 40s = 230$

$110h + 40(4 - h) = 230$

$110h + 160 - 40h = 230$

$70h = 230 - 160$

$\frac{70h}{70} = \frac{70}{70}$

$h = 1$

$s = 4 - h$

$= 4 - 1$

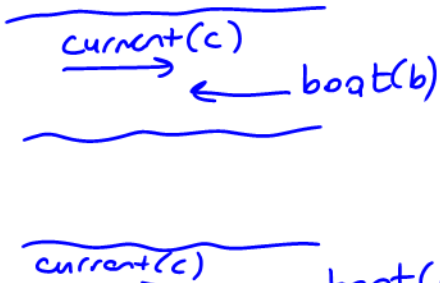
$s = 3$

∴ The time spent on highway is 1h and sideroads is 3hours.

Ex3 It took a patrol boat 5 hours to travel 60km up a river against the current and 3 hours for the return trip with the current. Find the speed of the boat in still water and the speed of the current.

let "b" be the speed of the boat in still water
" "c" " " " " " " current

	distance	speed	time
①	60	b−c	5
②	60	b+c	3



① $60 = 5(b-c)$ → divide each side by 5 → $\frac{\cancel{60}^{12}}{\cancel{5}} = \frac{\cancel{5}^{1}(b-c)}{\cancel{5}}$

② $60 = 3(b+c)$ → divide each side by 3 → $\frac{\cancel{60}^{20}}{\cancel{3}} = \frac{\cancel{3}^{1}(b+c)}{\cancel{3}}$

$\Rightarrow \boxed{\begin{array}{l} 12 = b-c \\ 20 = b+c \end{array}}$ → our system

① $12 = b - c$

② $20 = b + c$

$+$

$12+20 = b+b-c+c$

$\frac{32}{2} = \frac{2b}{2}$

$\boxed{b = 16}$

$12 = b - c$

$12 = 16 - c$

$12-16 = -c$

$\frac{-4}{-1} = \frac{-c}{-1}$

$\boxed{c = 4}$

The boat's speed in still water is 16 km/h and current's speed is 4 km/h.