No. 71

(i) Ritu can row downstream 20 km in 2 hours, and upstream 4km in 2 hours.

Find her speed of rowing in still water and the speed of the current.

Soln.

Let Ritu's speed in still water be x km/hr and the spee… in

Speed of the Boat in upstream = (x – y)

Speed of the boat in downstream = …m

Distance covered in downstream = 20 km

Time taken in down stream = 2 hrs

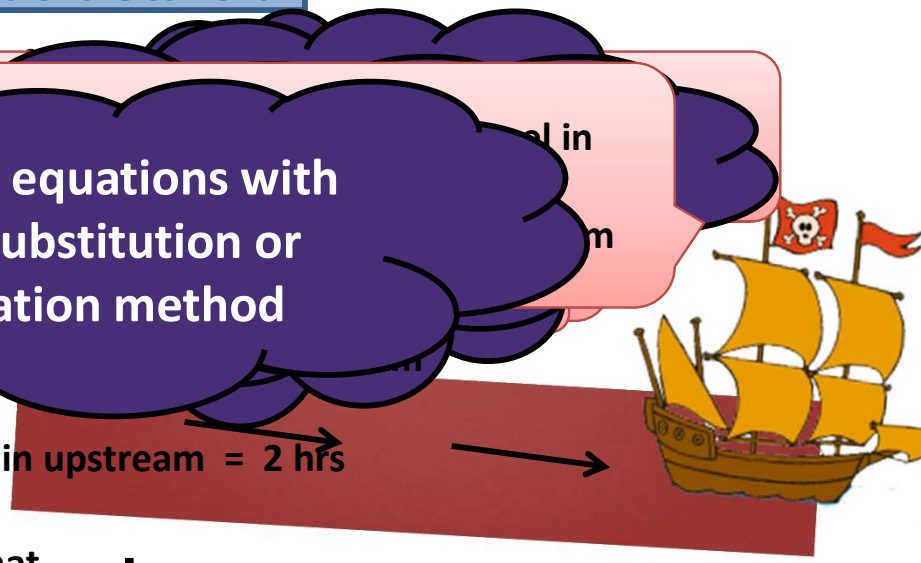
We Know that,

Speed = $\frac{\text{Distance}}{\text{Time}}$

$\therefore x + y = \frac{20}{2}$

$\therefore x + y = 10$ ....(i)

Solve the equations with either substitution or elimination method



Time Taken in upstream = 2 hrs

We Know that,

Speed = $\frac{\text{Distance}}{\text{Time}}$

$\therefore x - y = \frac{4}{2}$

$\therefore x - y = 2$ ....(ii)

$x = 6$

Substituting x = 6 in (i)

$y = 4$

Downstream

$\therefore$ Speed of rowing in still water is 6 km/hr and speed of current is 4 km/hr

No. 72

(ii) **Roohi travels 300 km to her home partly by train and partly by bus.**
She takes 4 hours if she travels 60 km by train by remaining by bus
If she travels 100 km by train and remaining by bus, she takes 10 minutes longer.
Find the speed of train and bus separately.

Soln. Let the speed of the train be x km/hr and the speed

	Train	Bus
Distance	60 km	240 km
Speed	x km / hr	y km / hr
Time	$\frac{60}{x}$ hr	$\frac{240}{y}$ hr

	Train	
Dist		

New time = $4 + \frac{1}{6} = \frac{25}{6}$ hrs

According to the first condition

$$\frac{60}{x} + \frac{240}{y} = 4$$

Dividing throughout by 4

$$\frac{15}{x} + \frac{60}{y} = 1 \quad \text{... (i)}$$

Accordi

$$\frac{100}{x} + \frac{200}{y} = \frac{25}{6}$$

Dividing throughout by 25

$$\frac{4}{x} + \frac{8}{y} = \frac{1}{6} \quad \text{... (ii)}$$

No. 73

Lets understand the meaning of boat travelling upstream and downstream.

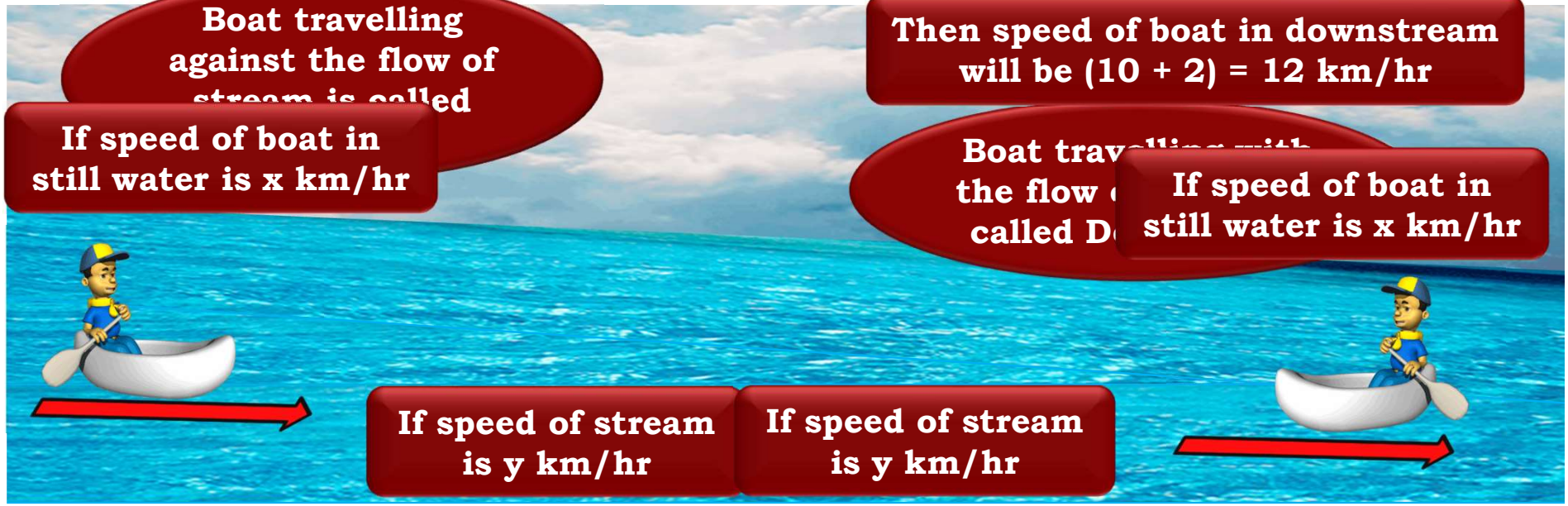
Then speed of boat in upstream will be (x – y) km/hr

am =
eed of stream

Then speed of boat in downstream will be (x + y) km/hr

Then speed of boat in upstream will be (10 – 2) = 8 km/hr

Speed of boat in downstream =
Speed of boat in still water + Speed of stream



No. 74

(Q) A boat takes 6 hours to travel 8 km upstream and 32 km downstream, and it takes 7 hours to travel 20 km upstream and 16 km downstream.
Find the speed of the boat in still water and the speed of the stream.

Sol. Let the speed of the boat in still water be x km/hr and the speed [illegible] km/hr.

Let us assume that

Total time is 6 hours

Total time is 7 hours

Speed of boat in downstream will be (x + y) km/hr

	Upstream	Downstream
Distance	8 km	32 km
Speed	(x – y) km/hr	(x + y) km/hr
Time = $\frac{\text{Distance}}{\text{Speed}}$	$\left(\frac{8}{x-y}\right)$ hrs	$\left(\frac{32}{x+y}\right)$ hrs

We know that

As per the first given condition,

$$\left(\frac{8}{x-y}\right) + \left(\frac{32}{x+y}\right) = 6 \quad \text{.....(i)}$$

As per the second given condition,

$$\left(\frac{20}{x-y}\right) + \left(\frac{16}{x+y}\right) = 7 \quad \text{.....(ii)}$$

(Q) A boat takes 6 hours to travel 8 km upstream and 32 km downstream, and it takes 7 hours to travel 20 km upstream and 16 km downstream.
Find the speed of the boat in still water and the speed of the stream.

Sol. Substituting $\frac{1}{x-y} = m$ and $\frac{1}{x+y} = n$ in (i) and (ii) we get

$$\left(\frac{8}{x-y}\right)\frac{1}{+}\left(\frac{32}{x+y}\right)\frac{1}{8} = \frac{1}{6} \quad \text{.....(i)}$$

$$\left(\frac{20}{x-y}\right) + \left(\frac{16}{x+y}\right) = 7 \quad \text{.....(ii)}$$

$8m + 32n = 6$ .... (iii)

$20m + 16n = 7$ .... (iv)

Multiplying (iv) by 2, we get

$40m + 32n = 14$ .... (v)

Subtracting (iii) from (v)

$$\begin{array}{rrrr} 40m & + 32n & = & 14 \\ 8m & + 32n & = & 6 \\ (-) & (-) & (-) & \\ \hline 32m & & = & 8 \end{array}$$

$$\therefore \quad m = \frac{8}{32}$$

$$\therefore \quad m = \frac{1}{4}$$

Substituting $m = \frac{1}{4}$ in (iii),

$$8\left(\frac{1}{4}\right) + 32n = 6$$

$$\therefore \quad 2 + 32n = 6$$

$$\therefore \quad 32n = 6 - 2$$

$$\therefore \quad 32n = 4$$

$$\therefore \quad n = \frac{4}{32}$$

$$\therefore \quad n = \frac{1}{8}$$

Resubstituting the values of m and n we get,

$x - y = 4$ ....(vi)

$x + y = 8$ ....(vii)

Adding (vi) and (vii),

$$\begin{array}{rrr} x & - y & = 4 \\ x & + y & = 8 \\ \hline 2x & & = 12 \end{array}$$

$$\therefore \quad x = \frac{12}{2}$$

$$\therefore \quad x = 6$$

Substituting $x = 6$ in (vii)

$$6 + y = 8$$

$$\therefore \quad y = 8 - 6$$

$$\therefore \quad y = 2$$

∴ The speed of boat in still water is 6km/hr and speed of stream is 2km/hr

No. 75

(ii) Yash scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer.
Had 4 marks been awarded for each right answer and 2 marks deducted for each wrong answer, then Yash would have scored 50 marks.
How many question were there in the test?

Soln. Let number of right answers be x and wrong answer be y

What we need to find?

According to first condition,

$3x - 1y = 40$ ....(i)

According to second condition,

$4x - 2y = 50$ ....(ii)

...wer were right
... were wrong

	Marks awarded for Right answer	Marks deducted for Wrong answer	Total
Condition I	3x	1y	40
Condition II	4x	2y	50

No. 76

Distance covered by wheel in 1 revolution = No. of revolutions × Circumference

$= 2 \times$

$=$

No. of revolutions = $\frac{\text{Distance covered}}{\text{Circumference}}$

We know t

Circumference = $\pi \times$ Diameter

Since π is a constant value, means circumference changes as the diameter changes

If
then it

If diameter
then circ
increases by half

If a wheel makes 1 revolution

If diameter increase by 1/4, then circumference also increases by 1/4

Distance covered by wheel in 1 revolution is

If circumference is x m and it increases by 1/4, then new circumference will be

Original circumference + increase in circumference

$\therefore$ New circumference = $x + \frac{1}{4}(x)$

$= \frac{4x + x}{4}$

$= \frac{5x}{4}$

Q. The fore wheel of a carriage makes 6 revolutions more than the rear wheel in going 120m. If the diameter of the fore wheel be increased by ¼ its present diameter and the diameter of the rear wheel be increased by one-fifth of its present diameter, then the fore wheel makes 4 revolutions more than the rear wheel in going the same distance. Find the circumference of each wheel of the carriage.

Sol. Let the circumference of fore wheel be x m & rear wheel be y m.

Circumference of fore

No. of revolutions = $\frac{\text{Distance covered}}{\text{Circumference}}$

	Fore wheel	Rear wheel
Circumference	x m	y m
Distance	120 m	120 m
No. of Revolutions = $\frac{\text{Distance covered}}{\text{Circumference}}$	$\frac{120}{x}$	$\frac{120}{y}$

120 m

Fore wheel covers more revolutions than rear wheel

As per the first condition,

$$\frac{120}{x} = \frac{120}{y} + 6$$

$$\frac{120}{x} - \frac{120}{y} = 6 \quad \text{...(i)}$$

Q. The fore wheel of a carriage makes 6 revolutions more than the rear wheel in going 120m. If the diameter of the fore wheel be increased by ¼ its present diameter and the diameter of the rear wheel be increased by one-fifth of its present diameter, then the fore wheel makes 4 revolutions more than the rear wheel in the same distance. Find the circumference of each wheel of the carriage.

Sol. Let the circumference of fore wheel be x m & rear wheel be y m.

If diameter increases by ¼, then circumference also increases by ¼

If diameter increases by 1/5, then circumference also increases by 1/5

No. of Revolutions = Distance covered / Circumference

	Fore wheel	Rear wheel
Circumference	$\frac{5x}{4}$	$\frac{6y}{5}$
Distance	120	120
No. of Revolutions = Distance covered / Circumference	$\frac{120}{(\frac{5x}{4})} = \frac{96}{x}$	$\frac{120}{(\frac{6y}{5})} = \frac{100}{y}$

$$\frac{120}{(\frac{5x}{4})} = \frac{96}{x} \qquad \frac{120}{(\frac{6y}{5})} = \frac{100}{y}$$

Lets solve these 2 equations

$$\frac{24}{x} - \frac{20}{y} = 6 \quad \ldots(i)$$

No. of Revolutions = Distance covered / Circumference

New circumference $= x + \frac{1}{4}(x)$

$$= \frac{4x + x}{4}$$

$$= \frac{5x}{4}$$

As per the second condition,

$$\frac{96}{x} = \frac{100}{y} + 4$$

$$\frac{96}{x} - \frac{100}{y} = 4 \quad \ldots(ii)$$

$$\frac{120}{x} - \frac{120}{y} = 6 \quad \text{...(i)}$$

$$\frac{96}{x} - \frac{100}{y} = 4 \quad \text{...(ii)}$$

Lets make coefficient of b equal or lets remove it by substitution

Substituting $\frac{1}{x} = a$ and $\frac{1}{y} = b$ in (i) and (ii)

$$20a - 20b = 1 \quad \text{...(iii)}$$

$$96a - 100b = 4 \quad \text{...(iv)}$$

Multiplying (i) by 5 we get,

$$100a - 100b = 5 \quad \text{...(v)}$$

Subtracting (v) from (iv)

$$96a - \cancel{100b} = 4$$

$$100a - \cancel{100b} = 5$$

(–) (+) (–)

$$-4a = -1$$

$$\therefore \quad a = \frac{1}{4}$$

Substituting $a = \frac{1}{4}$ in (iii),

$$20\left(\frac{1}{4}\right) - 20b = 1$$

$$\therefore \quad 5 - 20b = 1$$

$$\therefore \quad -20b = -4$$

$$\therefore \quad b = \frac{1}{5}$$

Resubstituting the values of a and b

$$a = \frac{1}{x} \qquad b = \frac{1}{y}$$

$$\therefore \quad \frac{1}{4} = \frac{1}{x} \qquad \therefore \quad \frac{1}{5} = \frac{1}{y}$$

$$\therefore \quad x = 4 \qquad \therefore \quad y = 5$$

$\therefore$ Circumference of fore wheel is 4m and circumference of rear wheel is 5m

Thank You