

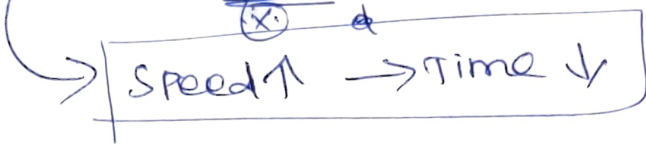
Boats & streams

①

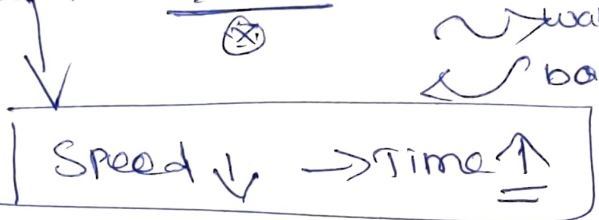
- 1) Still water - "boat speed"
- 2) Running water - with flow of the river → "Stream speed".

4 Basic concepts

① Downstream = along the river (water direction)



② Upstream = against the river (opposite direction of water)



Speed (as) Velocity of stream (as) velocity of the current.

Down stream = Boat speed + stream speed

Upstream = Boat speed - Stream speed

⊗ Always boat speed must be greater than stream.

$$\text{Boat speed of boat} = \frac{D_S + U_S}{2}$$

$$\text{Speed of Stream} = \frac{D_S - U_S}{2}$$

$$\frac{P}{S/T}$$

$$D = S \times T$$

$$D_{DS} = (B.S + S.S) \times T$$

$$D_{US} = (B.S - S.S) \times T$$

- ① Aman can row downstream at 11 km/hr and upstream at 7 km/hr . Find the speed of man at still water and stream.

$$\text{Speed of Boat} = \frac{D.S + U.S}{2} = \frac{11 + 7}{2} = \frac{18}{2} = 9 \text{ km/hr}$$

$$\text{Stream speed} = \frac{D.S - U.S}{2} = \frac{11 - 7}{2} = \frac{4}{2} = 2 \text{ km/hr}$$

- ② A boat covers a distance of 40 km downstream in 2 hrs while it takes 4 hrs to cover the same distance upstream. What is the speed of the boat in still water in km/hr .



$$D.S = \frac{40}{2} = 20 \text{ km/hr (D.S. speed)}$$

$$U.S = \frac{40}{4} = 10 \text{ km/hr (U.S. speed)}$$

$$\text{Speed of boat} = \frac{D.S + U.S}{2} = \frac{20 + 10}{2} = \frac{30}{2} = 15 \text{ km/hr}$$

- ③ The rate of stream is 12 km/hr and the ratio between the speeds of boat in downstream & the speed of the boat in upstream is $8:5$. What is the speed of the boat in still water?

Ans: D.S : U.S

$$8 : 5$$

$$8x : 5x$$

$$\text{boat speed} = \frac{D.S + U.S}{2}$$

we know stream speed = 12 km/hr

$$S.S = \frac{D.S - U.S}{2} = \frac{8x - 5x}{2}$$

$$12 = \frac{3x}{2}$$

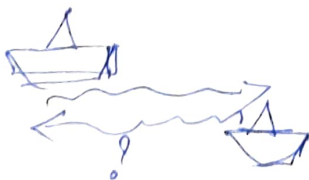
$$24 = 3x$$

$$\boxed{x = 8}$$

$$\boxed{D.S = 64 \text{ km/hr}}$$

$$\text{Speed of boat} = \frac{D.S + U.S}{2} = \frac{64 + 40}{2} = \frac{104}{2} = 52 \text{ km/hr}$$

- (A) The speed of boat is 15 km/hr & speed of stream is 11 km/hr less than the speed of the boat. Find the time to travel 1045 km upstream and return back to starting point-



$$\text{Boat speed} = 15 \text{ km/hr}$$

$$\text{Stream speed} = 4 \text{ km/hr}$$

$$\frac{D}{S} = T$$

$$T = \frac{D}{S}$$

$$\text{Total time} = \frac{D}{S_{u.s}} + \frac{D}{S_{D.S}}$$

$$= \frac{1045}{15-4} + \frac{1045}{15+4} = \frac{1045}{11} + \frac{1045}{19}$$

$$= \frac{1045}{11} + \frac{1045}{19} = 95 + 55 = \underline{150 \text{ hrs.}}$$

(4)