CLASS 12

# BOAT & STREAM

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→ Boat (B)

⇝ water (W)

Relative Speed = B+W

→ Boat

water ←

Relative Speed = B−W

Downstream = (B+W)

Upstream = (B−W)

① A boat road down a river at 21 Km/Hr and road up the river at 9 Km/Hr. What is the velocity of the stream.

$$B + W = 21$$
$$B - W = 9$$
$$2B = 30$$
$$B = 15 \text{ Km/Hr}$$

water = 21−15 = 6 Km/Hr. Ans:


2. A swimmer can swim downstream at 14 Km/Hr and upstream (US) at 6 Km/Hr. Find the speed of swimmer in still water?

$$S + W = 14$$
$$S - W = 6$$
$$2S = 20$$
$$S = 10 \text{ Km/Hr}$$ Ans

[3] The speed of a boatman in the direction of stream is 15 Km/Hr. while the speed of steam is 1.5 Km/Hr. What is the speed of boatmen against the stream.

$$B + W = 15$$
$$\downarrow$$
$$1.5$$

$$B = 13.5 \text{ Km/Hr}.$$

Upstream $\Rightarrow$ $B - W$

$\Rightarrow$ $13.5 - 1.5 = 12$ Km/Hr.

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[4] A swimmer swims a distance of 36 Km in 6 Hrs downstream. and a distance of 40 Km upstream in 8 Hrs. find the speed of swimmer in still water ?

$$B + W = 6$$
$$B - W = 5$$

$$B = 5.5 \text{ Km/Hr} \quad \underline{\text{Ans}}$$
$$W = 0.5 \text{ Km/Hr}$$

$S = \frac{36}{6} = 6$

$S = \frac{40}{8} = 5$

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[5] In 3 Hrs a swimmer can bow 21 Km down stream and 15 Km against the stream in same time. find the speed of stream ?

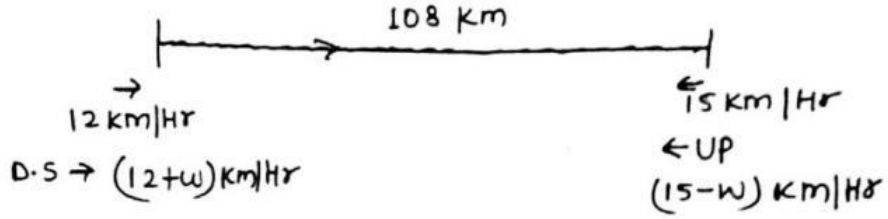
$$B + W = 7$$
$$B - W = 5$$

$$B = 6 \text{ Km/Hr}$$
$$W = 1 \text{ Km/Hr} \quad \underline{\text{Ans.}}$$

$\frac{21}{3} = 7$

$\frac{15}{3} = 5$

6 Two places are 108 Km apart. Two boats starts from both places at same time towards each other. If one boat is going downstream then other one is going to upstream. After how much time will they meet each other if their speeds are 12 Km/Hr & 15 Km/Hr.




$$\text{meeting time} = \frac{\text{distance}}{\text{Relative speed}}$$

$$\text{Relative speed} = 12+w+15-w = 27$$

$$\text{meet time} = \frac{108}{27} = 4 \text{ Hrs.}$$

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7 A boat takes double of time taken by it to go downstream while coming in upstream. If speed of water is 3 Km/Hr. find the speed of boat.

$$\frac{D}{B+3} \times 2 = \frac{D}{B-3} \qquad T = \frac{D}{S.}$$

$$2B-6 = B+3$$

$$B = 9 \text{ Km/Hr} \quad \underline{\text{Ans.}}$$

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8 A man can bow $9\frac{1}{3}$ Km/hin still water & he finds that it takes him thrice as much time to row upstream as to row downstream. find speed of water/current.

$$\frac{D}{\left(\frac{28}{3}+w\right)} \times 3 = \frac{D}{\left(\frac{28}{3}-w\right)}$$

D·S Relative speed $= \frac{28}{3}+w$

U·P Relative speed $= \frac{28}{3}-w$

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

$$w = \frac{14}{3} \text{ km/Hr}.$$

**OR**

D·S = 1 Hr

U·P = 3 Hr.

$$\left(\frac{28}{3}+w\right) \times 1 = \left(\frac{28}{3}-w\right) \times 3$$

$$w = \frac{14}{3} \text{ km/Hr}.$$

$D = ST$

यहाँ distance को equate किया है।

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**9** A boatman can bow certain distance D·S in 2 Hrs and U·P the same distance in 3 Hrs. If the stream flows at the rate of 4 km/Hr. find the speed of boat in still water?

D·S = 2 Hr.

U·P = 3 Hr.

D·S speed = B+4

U·P speed = B−4

$$(B+4) \times 2 = (B-4) \times 3$$

$$2B+8 = 3B-12$$

$$B = 20 \text{ km/Hr}.$$

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**10** A boatman goes 6 km upstream and back again to the starting point in 2 Hrs. If the speed of water is 4 km/Hr. find the speed of boat?

A) 6.5 km/Hr

B) 7.5 km/Hr

~~C) 8 km/Hr~~

D) 8.5 km/Hr.

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

$$\frac{6}{B+4} + \frac{6}{B-4} = 2$$

either solve or pick from options.

option c statisfies. $B = 8$ km/Hr Ans.

11. A boat travels ~~B km~~ u s Q to P and downstream P to Q in 3 Hrs. The distance b/w P to Q is 4 km, the speed of water is 1 km/Hr. find the speed of boat in still water ?

$$\frac{4}{B+1} + \frac{4}{B-1} = 3 \text{ Hr}$$

A) 4.5 km/H
B) 5.2 km/H
C) 2.5 km/H
D) 3 km/H

Option D satisfies.

B = 3 km/Hr.

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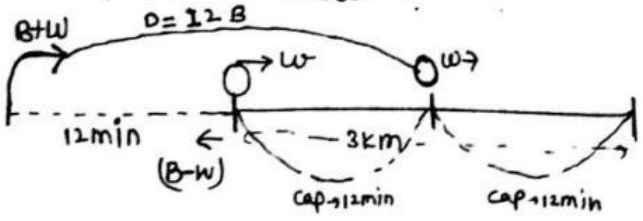
12. Priyanka was travelling in her boat. Suddenly a wind blows her hat off & started floating back downstream. The boat continued to travel upstream for 12 more minutes before priyanka realised her hat had fallen off. She turned back downstream and she caught up the hat as soon as it reached the starting point. If her hat flew off exactly 3 km from where she started find the speed of water ?




Relative speed of Boat & cap = $B - W + W = B$.

$\frac{B \times 12}{60} = B$. $D = ST \Rightarrow B \times 12 = 12B$.

R.S in same dirn $= B + W - W = B$.

Time of catch = $\frac{D}{S} = \frac{12B}{B} = 12$ min.

Total time taken by cap to flow back = 12+12 = 24 min

$D = 3$ km

$T = \frac{24}{60} = \frac{2}{5}$

$S = \frac{D}{T} = \frac{3}{2/5} = 7\frac{1}{2}$ Km/Hr. Ans

OR

Boat की speed नहीं निकलेगी।

$D = 3$ km

Time = double ले लो = $2 \times 12 = 24$ min = $\frac{2}{5}$ Hr.

$S = \frac{3}{2/5} = 7\frac{1}{2}$ km/Hr. Ans:

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13] A boatman goes 39 km D.S and 25 km U.S & takes 8 Hr. While it takes 10 Hrs to go 52 km D.S and 30 km U.S. find the speed of boat ?

$\frac{39}{B+W} + \frac{25}{B-W} = 8$ — (i)

$\frac{52}{B+W} + \frac{30}{B-W} = 10$ — (ii)

multiply (i) by 6 and (ii) by 5

$\frac{234}{B+W} + \frac{150}{B-W} = 48$

$\frac{260}{B+W} + \frac{150}{B-W} = 50$

$\frac{26}{B+W} = 2$

$B+W = 13$

put $B+W=13$ in (i)

$3 + \frac{25}{B-W} = 8$

$\frac{25}{B-W} = 5$

$B-W = 5$

$B+W = 13$

$B-W = 5$

$B = 9$ km/Hr

$W = 4$ km/Hr

OR you can pick value from options or assume yourself to satisfy the eqn.

14 A boatman goes 24 km D·S and 36 km U·S in 9 Hrs. While it takes $8\frac{1}{2}$ Hrs to go 36 km D·S and 24 km U·S. find the speed of boat ?

$$\frac{24}{B+W}\times 3 + \frac{36}{B-W}\times 3 = 9\times 3 \Rightarrow \frac{72}{B+W} + \frac{108}{B-W} = 27$$

$$\frac{36}{B+W}\times 2 + \frac{24}{B-W}\times 2 = \frac{17}{2}\times 2 \Rightarrow \frac{72}{B+W} + \frac{48}{B-W} = 17$$

$$\frac{60}{B-W} = 10$$

$$B-W = 6$$

Put $(B-W) = 6$ in eq(1)

$$\frac{24}{B+W} + 6 = 9$$

$$\frac{24}{B+W} = 3$$

$$B+W = 8$$

$$B+W = 8$$

$$B-W = 6$$

$$B = 7 \text{ km/Hr}$$

$$W = 1 \text{ km/Hr}.$$

OR Assume values to satisfy the eqn.

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15 A ship is 77 Km from the shore, springs a leak which admits $2\frac{1}{4}$ ton of water in every $5\frac{1}{2}$ min. An outlet tank can through out 12 tons of water per hour. find at what speed it should move such that when it begins to sink a rescue ship moves with 6 km/Hr escapes the passengers of the ship if 69 ton of water is enough to sink ?

$\frac{11}{2}$ min ——— $\frac{9}{4}$ ton

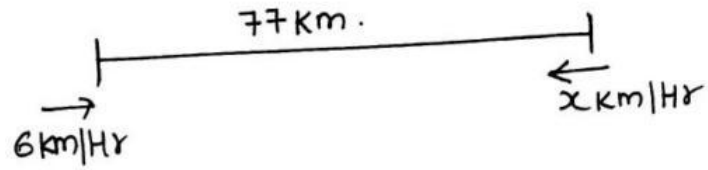
1 min ——— $\frac{\frac{9}{4}}{11/2} = \frac{9}{22}$ ton

60 min ——— $\frac{9}{22} \times \frac{30}{60} = \frac{270}{11}$ ton/hr enters into ship

$\Rightarrow$ $\frac{270}{11}$ — (12) → outlet pipe.

$\frac{270-132}{11} = \frac{138}{11}$ ton/hr filling in ship per hour.

Now $\frac{69}{138/11} = \frac{69 \times 11}{138_2} = \frac{11}{2}$ Hr → ship will sink in $\frac{11}{2}$ Hr.




$(6+x) \times \frac{11}{2} = 77$

$6+x = 14$

$x = 8$ km/Hr. Ans.

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