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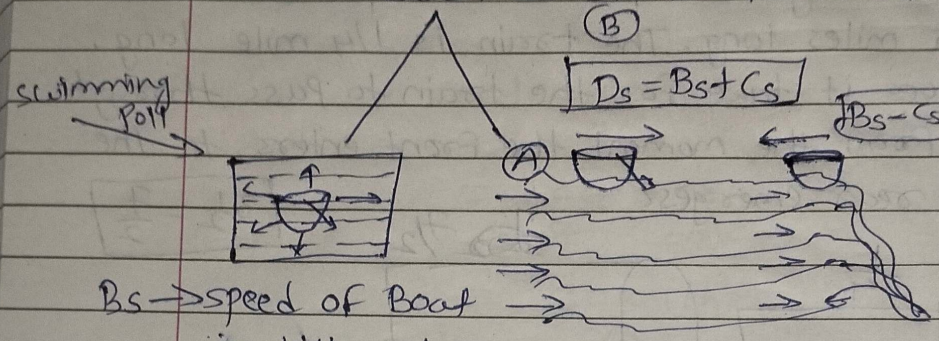
15. Boat and stream – 01

Boat & stream / current



Bs → speed of Boat in still water

① Down stream →

② Up stream ←

$D_s = B + C$

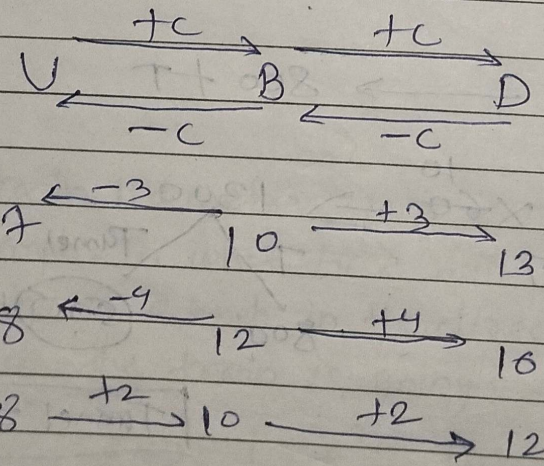
$U_s = B - C$

$B = \frac{D+U}{2}$

$C = \frac{D-U}{2}$

D_s → Down stream
B → Boat original speed
C → current speed
U → Up stream

Imp



Diff upstream and downstream = 2 current

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1) A boat goes 20 km downstream in one hour and the same distance upstream in two hours. The speed of the boat in still water is:

⇒

$D = 20 \text{ km/hr}$

$U = \frac{20}{2} = 10 \text{ km/hr}$

$B = \frac{D+U}{2} = \frac{20+10}{2} = \frac{30}{2} = \boxed{15 \text{ km/hr}}$

2) A boat goes 6 km an hour in still water, it takes thrice as much time in going the same distance against the current comparison to direction of current. The speed of the current (in km/hour) is:

⇒ $B = 6 \text{ km/hr}$

	D	U
T ⇒	1	3
S ⇒	3	1

	B ⊕	C ⊖
S ⇒	4	2
	2	1

$6 \xleftarrow{\times 3} 2 : 1 \xrightarrow{\times 3} 3 \text{ km/hr}$ (current speed)

3) A man can row boat at 5 kmph. In still water. if the velocity of current is 1 kmph. And he takes 1 hour to row to a place and come back, how far is the place?

⇒

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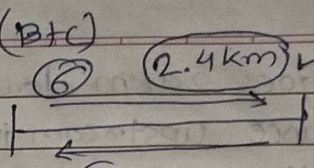
B = 5 kmph
C = 1 kmph



Total Time = 1 hr

Total speed = Avg speed = $\frac{2S_1S_2}{S_1+S_2} = \frac{2\times6\times4}{10} \times 1$ hour

$= 4.8$ km → Full distance

Place distance is Half i.e. 2.4km

4) A man can row at a speed of 4.5 km/hr in still water. if he takes 2 times as long to row a distance upstream as to row the same distance downstream, then the speed of stream (in km/hr) is:

⇒ B = 4.5 km/hr

	U		D
T →	2	:	1
S →	1	:	2
	B⊕		C⊖
S →	3	:	1

4.5 − 1.5 = 3 ; ×1.5 → 1.5 km/hr

1.5 km/hr → Speed of Stream

5) In a fixed time, a boy swims double the distance along the current that he swims against the current. if the speed of the current is

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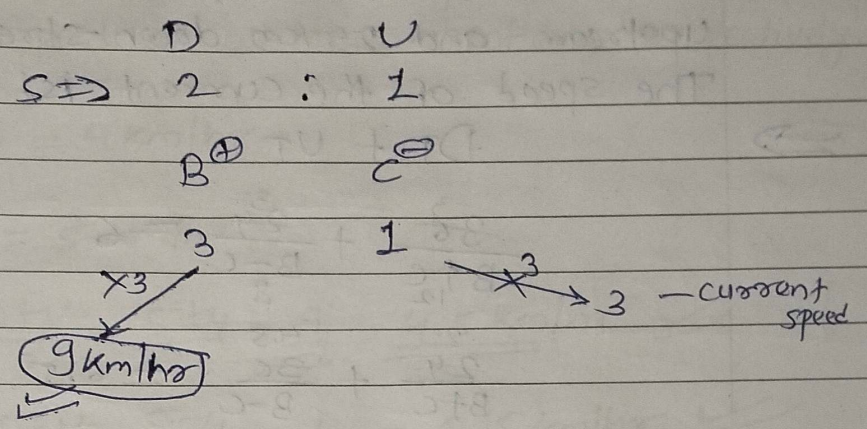
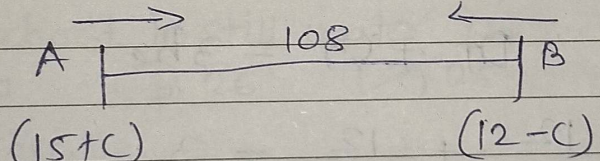
8 km/hr, the speed of the boys in still water is:

⇒ C = 3 km/hr



6) Two boats A and B start towards each other from two places, 108 km apart. speed of the boat A and B in still water are 12 km/hr and 15 km/hr respectively. if A proceeds down and B up the stream, the will meet after.

⇒



$15+C+12-C = 27$

$\Rightarrow \frac{108}{27} = 4$ hr

7) A boat running rows down stream covers a distance of 20 km in 2 hrs while it covers the same distance upstream in 5 hrs. then speed of the boat in still water is:

⇒ $D = \frac{20}{2} = 10$ km/hr

$U = \frac{20}{5} = 4$ km/hr

$B \Rightarrow \frac{D+U}{2} = \frac{10+4}{2} = \frac{14}{2} \Rightarrow$ 7 km/hr ← Speed Boat

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8) A boat covers 24 km upstream and 36 km downstream in 6 hours, while it covers 36 km upstream and 24 km down-stream in 6.5 hours. The speed of the current is:

⇒ DT + UT

$$\frac{36}{B+C} + \frac{24}{B-C} = 6 \qquad B+C \Rightarrow 12, \quad B-C \Rightarrow 8$$

$$\frac{24}{B+C} + \frac{36}{B-C} = 6.5$$

$$C = \frac{4}{2} = 2 \text{ km/hr}$$

9) A boat goes 12 km downstream and comes back to the starting point in 3 hours. if the speed of the current is 3km/hr, then the speed (km/hr) of the boat in still water is:

⇒ By option solve

$$\frac{12}{B+3} + \frac{12}{B-3} = 3 \text{ hr}$$

$$1 + 2 \longrightarrow 3$$

B = 9

10) A sailor goes 12 km down stream in 48 minutes and returns in 1 hour 20 minutes. The speed of the sailor in still water is:

⇒ 48 min —D→ 12 km

4 min → 1 km (×15)

60 min —D→ 15 km

$$B = \frac{15+9}{2}$$

80 min —U→ 12 km

20 min → 3 km (×3)

60 min —U→ 9 km

$$B = \frac{24}{2}$$

B = 12 km/hr

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11) A boat travels 24 km upstream in 6 hours and 20 km down-stream in 4 hours. Then the speed of boat in still water and the speed of water current are respectively.

⇒

$$U = \frac{24}{6} = 4 \text{ km/hr}$$

$$D = \frac{20}{4} = 5 \text{ km/hr}$$

$$B = \frac{D+U}{2} = \frac{5+4}{2} = \frac{9}{2} = \underline{4.5 \text{ km/hr}} \checkmark$$

$$C = \frac{D-U}{2} = \frac{5-4}{2} = \frac{1}{2} = \underline{0.5 \text{ km/hr}} \checkmark$$

12) The speed of the current is 5 km/hour. A motorboat goes 10 km upstream and back again to the starting point in 50 minutes. The speed (in km/hr) of the motorboat in still water is:

⇒ a) 20 b) 26 c) 25 d) 28

By option

$$\frac{10}{B-5} + \frac{10}{B+5} \Rightarrow \frac{50}{60} = \frac{5}{6}$$

→ hour convert

$$\boxed{\frac{1}{2} + \frac{1}{3} = \frac{5}{6}} \rightarrow \underline{25}$$

13) The current of a stream runs at the rate of 4 km an hour. A boat goes 6 km and comes back to the starting point in 2 hours. The speed of the boat in still water is:

⇒ a) 6 b) 8 c) 7.5 d) 6.8

By option:-

Put options in B and check:-

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

$$\boxed{0.5 + 1.5 = 2} \leftarrow \boxed{8}$$

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14) A man can row 30 km down-stream and return in a total of 8 hours. if the speed of the boat in still water is four times the speed of the current, then the speed of the current is:

⇒

B	C
4	1
4x	1x

$$\frac{30}{B+C} + \frac{30}{B-C} = 8$$

$$\frac{30}{5x} + \frac{30}{3x} = 8 \text{ hr}$$

$$\frac{6}{x} + \frac{10}{x} = 8$$

$$\frac{16}{x} = 8$$

$$x = 2$$

15) A man can row 6 km/hr in still water. if the speed of the current is 2 km/hr, it takes 4 hours more in upstream than in the downstream than in the downstream for the same distance. the distance is:

⇒

	B		C
S →	6		2
S →	3	:	1
	(B-C)		(B+C)
	U		D
S →	2		4

$D = 8 \text{ km/hr}$

$8 \times 4 = 32 \text{ km}$

4 hour → 32 km goes

T → 4 — 2 (×2) → 4 hr

2 → 4 hr

PM

$D = \text{Time DIFF} \times \frac{S_1 S_2}{S_1 - S_2}$

$D = \frac{4 \times 8 \times 4}{4}$

⇒ 32 km

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[16] A boat covers 12 km upstream and 18 km downstream in 3 hours, while it covers 36 km upstream and 24 km downstream in 6.5 hours. what is the speed of current?

⇒ Trial method

$$\frac{12}{B-C} + \frac{18}{B+C} = 3$$

$B+C = 12$

$B-C = 8$

$C \rightarrow \frac{4}{2} = \boxed{2 \text{ km/hr}}$

$$\frac{36}{B-C} + \frac{24}{B+C} = 6.5$$

8 12

[17] A boy can swim in still water at a speed of 10 km/hr. if the speed of the current would have been 5 km/hr, then the boy could swim 60 km. Downstream

$B = 10$

$C = 5$

$$\frac{60}{B+C} = \frac{60}{15} = \boxed{4 \text{ hr}}$$

[18] The speed of a stream is 3 km/hr and the speed of a man in still water is 5 km/hr the time take by the man to 26 km down stream is.

$D = B+C = 3+5 = 8 \text{ km/hr}$

$$\frac{26}{8} = 3\text{hr } \frac{2}{8}\frac{1}{4} \times 60$$

$= \boxed{3\text{hr } 15 \text{ min}}$

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19) The speed of a boat along the stream is 12 km/hr and against the stream is 8 km/hr the time taken by the boat to sail 24 km in still water is:

$D = 12$
$U = 8$ } +

$B = \frac{12+8}{2} = \frac{20}{2} = 10$ km/hr

$\Rightarrow \frac{24}{10} =$ (2.4 hr)

20) A man can swim 3 km/hr in still water. If the velocity of the stream is 2 km/hr, the time taken by him to swim to a place 10 km upstream and back is:

$\Rightarrow$

U → , ← D

$\frac{10}{1} + \frac{10}{5}$

(B−C) (B+C)

10 hr + 2 hr = (12 hr)

21) A person can row a distance of one km upstream in ten minutes and downstream in four minutes. What in the speed of the stream?

$\Rightarrow$

10 min —U→ 1 km

60 min —U→ (6 km)

4 min —D→ 1 km

60 min —D→ (15 km)

$C \Rightarrow \frac{U-D}{2} = \frac{15-6}{2} = \frac{9}{2} =$ (4.5 km/hr)

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22) A boat moves downstream at the rate of 1 km in 7.5 minutes and upstream at the rate of 5 km an hour. what is the speed of the boat in the still water?

⇒ 7.5 min $\xrightarrow{D}$ 1 km

15 min $\longrightarrow$ 2 km

60 min $\xrightarrow{D}$ (8 km)

$U = 5$ km/hr

$B = \frac{U+D}{2} = \frac{5+8}{2} = \frac{13}{2} =$ (6.5 km/hr)

23) A man rows upstream 36 km and downstream 48 km taking 6 hours each time. The speed of the current is:

⇒ $D = \frac{48}{6} = 8$ km/hr

$U = \frac{36}{6} = 6$ km/hr

$C = \frac{D-U}{2} = \frac{8-6}{2} = \frac{2}{2} =$ (1 km/hr)

24) A man rows 12 km in 5 hours against the stream and the speed of current being 4 kmph. what time will be taken by him to row 15 km with the stream?

⇒ $C = 4$ km/hr

$U = \frac{12}{5} = 2.4$ km/hr

$D \Rightarrow 2.4 + 2(4)$

$D \Rightarrow 10.4$ km/hr

$\Rightarrow \frac{15}{10.4} = \frac{150}{104} = \boxed{\frac{75}{52}}$ hr

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25) A man rows to a place 60km distance and back in 13 hours 30 minutes. He finds that he can row 5 km with the stream in the same time as he can row 4 km against the stream. Find the rate of the stream.

$\Rightarrow$

$C = \frac{D-U}{2}$

	D		U
S →	5	:	4
T →	4	:	5

$C = \frac{2}{2} = 1$ km/hr ✓

×1.5 ↓ 6hr $\frac{60}{6} = 10$

×1.5 ↓ 7.5hr $\frac{60}{7.5} = 8$

g → $\overset{1.5}{x}$ → 13.5

26) Speed of motorboat in still water is 45km/hr. if the motorboat travels 80km along the stream in 1h 20 min, then the time taken by it to cover the same distance against the stream will be:

$\Rightarrow$

B = 45

80 min — D → 80 km

60 min — D → 60 km

diff = C

$U = B - C$

$U = 45 - 15$

$U = 30$

$C = 15$ km

$U = 30$ km

$\frac{80}{30} = 2\text{hr}\ \frac{2}{3} \times 6$

$= 2\text{hr}\ 4\text{min}$

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27) speed of boat in still water is 5 km/hr. while river is flowing with a speed of 2 km/hr and time taken to cover a certain distance upstream is 2 hr more than time taken to cover the same distance downstream. Find the distance?

⇒

	B	C
speed →	5	2

	D	U
S →	7 km/hr	3 km/hr
	7 :	3
T →	3 :	7

4

1.5 hr

$\frac{1}{2}$

2 hr

D = 10.5 km in 1.5 hr

↑ Total distance.

28) A man can row at 10 km/hr in still water. if he takes total 5 hr to go to a place 24 km away and return, then the speed of the water current is :-

⇒ a) 2 km/h b) 3 km/h c) 12 km/h d) 1 km/h

24 →

← 24

By option solve ~~b)~~ 2)

$D_T + U_T = 5$

$\frac{24}{10+C} + \frac{24}{10-C} = 5$

$2 + 3 = 5$

C = 2 km/hr

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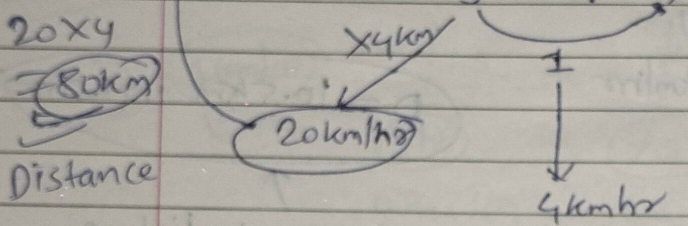
29) A steamer goes downstream from one port to another in 4 hr. it covers the same distance upstream in 5 hr. if the speed of the stream is 2 km/hr. then find the distance between the two ports.

⇒

	D		U
T →	4hr		5hr
T →	4	:	5
S →	5	:	4



Diff betn D and U speed is double of current
i.e. 2km × 2
= 4km/hr

30) A boatman takes twice as long to row a distance against the stream as to row the same distance with the stream. Find the ratio of speeds of the boat in still water and the stream?

⇒

	U		D
T →	2	:	1
S →	1	:	2

	B ⊕		C ⊖
S →	3	:	1

31) A river is flowing with a steady speed of 4km/hr. one rows his boat downstream in the river and then returns by rowing upstream in the same river. when he returns to the starting point, the total distance covered by him is 42 km. If the return journey takes 2 hr more than his outward journey, then the speed of his rowing in still water must be:

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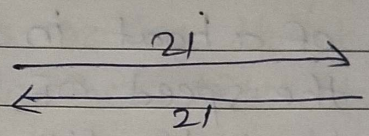
a] 12 km/h b] 10 km/h c] 9 km/hr d] 8 km/hr e] None of these.

⇒ By option solve



$U_T - D_T = 2$

B = 10 km/hr

$$\frac{21}{B-4} - \frac{21}{B+4} = 2$$

$$\frac{21}{6} - \frac{21}{14} = 2$$

$$\frac{7}{2} - \frac{3}{2} = 2$$

$$\frac{4}{2} = 2$$

$2 = 2$ ✓

32] The ratio of speeds of a motorboat to that of the current of water is 36 : 5. The motorboat goes along with the current in 5h 10 min. Find the time to come back of motorboat.

⇒

	B		C
S →	36	:	5
	D		U
S →	41	:	31
T →	31	:	41

↓ ↓

310 410 ⇒ 6hr 50 min ✓

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(33) In a river the ratio of the speed of stream and speed of a boat in still water is 2:5. Aga ratio of the speed of stream and speed of an another boat in still water is 3:4. what is the ratio of the speed of the First boat to the second boat in still water?

⇒

	C	B	
B_1	2×3 :	5×3	$= 15$
B_2	3×2	4×2	$= 8$

make diff same

15 : 8 ratio

(34) A motorboat travelling at some speed, can cover 25 km upstream and 39 km downstream in 8 hr. At the same speed, it can travel 35 km upstream and 52 km downstream in 11 hr. The speed of the stream is:

⇒ trial Error

$$\frac{25}{B-C} + \frac{39}{B+C} = 8$$

$B+C = 5$

$B+C = 13$

Subtraction

$$\frac{35}{B-C} + \frac{52}{B+C} = 11$$

$C = \frac{8}{2}$

$C = 4 \text{ km/hr}$

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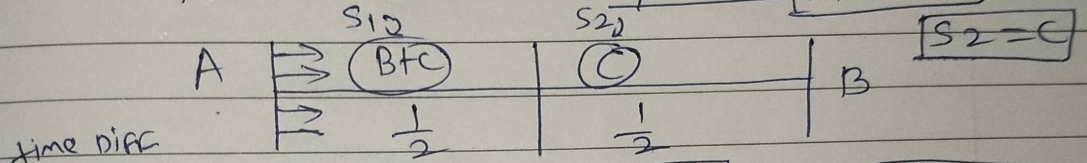
35] A man can row a boat at a speed of 8 kmph in still water. He was rowing the boat downstream from one point to another. After travelling half of the distance the motor of the boat failed and stopped working. He travelled on the boat along the stream and reached his destination taking six hours more than usual time. The speed of the stream is 2 kmph. what is the distance betn the two points? B = 8 kmph C = 2 kmph S_1 = B+C

⇒



Time Diff

$$D = TD \times \frac{S_1 S_2}{S_1 - S_2}$$

15 15 ⟹ 30 km (Total Distance)

$$D = 6 \times \frac{10 \times 2}{8} = \frac{120}{8} = 15 \text{ km}$$