23 CHAPTER

BOAT AND STREAM

EXERCISE

YEAR : 2003

1. A man rows 750 m in 675 seconds against the stream and return in $7\frac{1}{2}$ minutes. Find his rowing speed in still water.
(a) 3 kmph (b) 4 kmph
(c) 5 kmph (d) 6 kmph

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:
(a) 4 (b) 5 (c) 3 (d) 2

YEAR : 2004

3. A boat goes 40 km up stream in 8 hours and 36 km downstream in 6 hours. The speed of the boat in still water is:
(a) 6.5 km/hour (b) 5.5km/hour
(c) 6 km/hour (d) 5 km/hour

YEAR : 2007

4. A man can row at a speed of $4\frac{1}{2}$ 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
(a) 1 (b) 1.5 (c) 2 (d) 2.5

5. The ratio of speed of a motorboat to that of the current of water is 36 : 5. The boat goes along with the current in 5 hours 10 minutes. It will come back in
(a) 5 hr 50 min (b) 6 hr
(c) 6 hr 50 min (d) 12 hr 10min

YEAR : 2008

6. A man goes downstream with a boat to some destination and returns upstream to his original place in 5 hours. If the speed of the boat in still water and the stream are 10 km/hr and 4 km/hr respe-ctively, the distance of the destination from the starting place is:
(a) 16 km (b) 18 km
(c) 21 km (d) 25 km

7. 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, they will meet after.
(a) 4.5 hours (b) 4 hours
(c) 5.4 hours (d) 6 hours

8. Speed of motorboat in still water is 45 kmph. If the motorboat travels 80 km along the stream in 1 hour 20 minutes, then the time taken by it to cover the same distance against the stream will be:
(a) 3 hrs (b) 1 hrs 20 min
(c) 2 hrs 40 min (d) 2 hrs 55 min

YEAR : 2009

9. A boat rows downstream 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
(a) 7 km/hr (b) 8 km/hr
(c) 9 km/hr (d) 10 km/hr

YEAR : 2010

10. A boat covers 24 km upstream and 36 km downstream in 6 hours, while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. The speed of the current is:
(a) 1 km/hr (b) 2 km/hr
(c) 1.5 km/hr (d) 2.5 km/hr

11. The speed of a boat in still water is 10 km/hr. It covers (upstream) a distance of 45 km in 6 hours. The speed (in km/hr) of the stream is:
(a) 2.5 km/h (b) 3 km/h
(c) 3.5 km/h (d) 4 km/h

12. A boat goes 12 km downstream and comes back to the starting point in 3 hours. If the speed of the current is 3 km/hr, then the speed (in km/hr) of the boat in still water is :
(a) 12 km/h (b) 9 km/h
(c) 8 km/h (d) 6 km/h

YEAR : 2011

13. A boat travels 24 km upstream in 6 hours and 20 km downstream in 4 hours. Then the speed of boat in still water and the speed of current are respectively.
(a) 4 kmph and 3 kmph
(b) 4.5 kmph and 0.5 kmph
(c) 4 kmph and 2 kmph
(d) 5 kmph and 2 kmph

14. If a boat goes 100 km downstream in 10 hours and 75 km upstream in 15 hours, then the speed of the stream is:
(a) 2 km/hr (b) 2.5 km/hr
(c) 3 km/hr (d) 3.5 km/hr

15. 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/hour) of the motorboat in still water is
(a) 20 (b) 26 (c) 25 (d) 28

16. The current of a stream runs at the rate of 4 km/hr. A boat goes 6 km and comes back to the starting point in 2 hsours. The speed of the boat in still water is
(a) 6 km/hr (b) 8 km/hr
(c) 7.5 km/hr (d) 6.8 km/hr

17. A man swims downstream distance of 15 km in 1 hour. If the speed of the current is 5 km/hr, the time taken by the man to swim the same distance upstream is:
(a) 1 hr 30 min (b) 45 min
(c) 2 hr 30 min (d) 3 hrs

18. A man can row 30 km downstream 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:
(a) 1 km/hr (b) 2 km/hr
(c) 4 km/hr (d) 3 km/hr

19. A person can row $7\frac{1}{2}$ km an hour in still water and he finds that it takes him twice as long to row up as to row down the river. The speed of the stream is:
(a) 2 km/hr (b) 3 km/hr
(c) $2\frac{1}{2}$ km/hr (d) $3\frac{1}{2}$ km/hr

20. A man can row 6 km/hr in still water. If the speed of the current is 2 km/hr, he takes 4 hours more in upstream than in the downstream.The distance is:
(a) 30 km (b) 24 km
(c) 20 km (d) 32 km

21. Speed of a boat is 5 km per hour in still water and the speed of the stream is 3 km per hour. If the boat takes 3 hours to go to a place and come back, the distance of the place is:
(a) 3.75 km (b) 4 km
(c) 4.8 km (d) 4.25 km

YEAR : 2012

22. A boat covers 12 km upstream and 18 km downstream in 3 hours, while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. What is the speed of the current?
(a) 1.5 km/hr (b) 1 km/hr
(c) 2 km/hr (d) 2.5 km/hr

23. A man can swim at the rate of 4 km/hr in still water. If the speed of the water is 2 km/hr, then the time taken by him to swim 10 km upstream is:
(a) $2\frac{1}{2}$ hrs (b) $3\frac{1}{2}$ hrs
(c) 5 hrs (d) 4 hrs

24. The speed of a stream is 3 km/hr. and the speed of a man in still water is 5 km/hr. The time taken by the man to swim 26 km downstream is:
(a) $8\frac{2}{3}$ hrs (b) $3\frac{1}{4}$ hrs
(c) 13 hrs (d) $5\frac{1}{5}$ hrs

25. 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:
(a) 2 hrs (b) 3 hrs
(c) 2.4 hrs (d) 1.2 hrs

YEAR : 2013

26. Speed of a boat along and against the current are 12 km/hr and 8 km/hr respectively. Then the speed of the current in km/hr is:
(a) 5 (b) 4 (c) 3 (d) 2

27. 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 :
(a) $9\frac{1}{3}$ hr (b) 10 hr
(c) 12 hr (d) $8\frac{1}{3}$ hr

28. A swimmer swims from a point A against a current for 5 minutes and then swims backwards in favour of the current for next 5 minutes and comes to the point B. If AB is 100 metres, the speed of the current (in km per hour) is:
(a) 0.4 (b) 0.2
(c) 1 (d) 0.6

29. A person can row a distance of one km upstream in ten minutes and downstream in four minutes. What is the speed of the stream?
(a) 4.5 km/hr (b) 4 km/hr
(c) 9 km/hr (d) 5.6 km/hr

30. A boat moves downstream at the rate of 1 km in $7\frac{1}{2}$ minutes and upstream at the rate of 5 km an hour. What is the speed of the boat in the still water?
(a) 8 km/hour (b) $6\frac{1}{2}$ km/hour
(c) 4 km/hour (d) $3\frac{1}{2}$ km/hour

(CGL Mains 25-10-2015)

31. A boat takes half time in moving a certain distance downstream than upstream. The ratio of the speed of the boat in still water and that of the current is
(a) 2 : 1 (b) 4 : 3
(c) 1 : 2 (d) 3 : 1

(CGL Mains 2014 / 12-4-2015)

32. A man rows upstream 36 km and downstream 48 km taking 6 hours each time. The speed of the current is:
(a) 0.5 km/hour
(b) 1 km/hour
(c) 2 km/hour
(d) 1.5 km/hour

(CGL Mains 2014 / 12-4-2015)

33. 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?
(a) 1 hour 27 $\frac{7}{13}$ minutes
(b) 1 hour 24 $\frac{7}{13}$ minutes
(c) 1 hour 25 $\frac{7}{13}$ minutes
(d) 1 hour 26 $\frac{7}{13}$ minutes

(LDC 1-11-2015 Morning)

34. A motor boat covers a certain distance downstream in a river in 3 hours. It covers the same distance upstream in 3 and half an hour . If the speed of the water is 1.5 km/h, then the speed of the boat in still water is:
(a) 17 km/h (b) 17.5 km/h
(c) 19.5 km/h (d) 19 km/h

(LDC 06-12-2015 Morning)

35. The speed of a boat down-stream is 15 km/hr and the speed of current is 3 km/hr. Find the total time taken by the boat to cover 15 km upstream and 15 km downstream.

(a) 2 hours 40 minutes

(b) 2 hours 42 minutes

(c) 3 hours 10 minutes

(d) 2 hours 30 minutes

(SSC CPO (Re) 06-06-2016, Evening)

36. A boat goes 75 km upstream in 3 hours and 60 km downs-tream in 1.5 hours. Then the speed of the boat in still water is:

(a) 32.5 kmph (b) 30 kmph

(c) 65 kmph (d) 60 kmph

(SSC CPO(Re) 07-06-2016, Evening)

37. The water in a river is flowing at the rate of 4 km/hr. If the width and depth of the river is 8m and 4m respectively, then how much water will enter the sea in 15 minutes.

(a) 60000 m^3 (b) 18000 m^3

(c) 28800 m^3 (d) 32000 m^3

(SSC CPO(Re) 08-06-2016, Evening)

38. A man rows to a place 35 km in distance and back in 10 hours 30 mintues. He found 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 flow of the stream.

(a) 1 km/hr (b) 0.75 km/hr

(c) 1.33 km/hr (d) 1.5 km/hr

(SSC CPO(Re) 08-06-2016, Evening)

39. Speed of a along and against the current are 14 kms/hr and 8 kms/hr respectively. The speed of the current is:

(a) 11 kms/hr (b) 6 kms/hr

(c) 5.5 kms/hr (d) 3 kms/hr

(SSC CGL Pre Exam 2016)

40. If the speed of a boat in still water is 20 km/hr and the speed of the current is 5 km/ hr, then the time taken by the boat to travel 100 km with the current is

(a) 2 hr (b) 3 hr

(c) 4 hr (d) 7 hr

(SSC CGL Pre Exam 2016)

41. A man can row upstream at 12 km/hr and dowstream at 18 km/hr. The man's rowing speed in still water is

(a) 15 km./hr (b) 5 km./hr

(c) 3 km./hr (d) 10km./hr

(SSC CGL Pre Exam 2016)

42. On a river, Q is the mid-point between two points P and R on the same bank of the river.A boat can go from P to Q and back in 12 hours, and from P to R in 16 hours 40 min . How long would it take to go from R to P ?

(a) $3\frac{3}{7}hr$ (b) $5hr$

(c) $6\frac{2}{3}hr$ (d) $7\frac{1}{3}hr$

(SSC CGL Mains Exam 2016)

ANSWER KEY

1.	(c)	6.	(c)	11.	(a)	16.	(b)	21.	(c)	26.	(d)	31.	(d)	36.	(a)	41.	(a)
2.	(c)	7.	(b)	12.	(b)	17.	(d)	22.	(c)	27.	(c)	32.	(b)	37.	(d)	42.	(d)
3.	(b)	8.	(c)	13.	(b)	18.	(b)	23.	(c)	28.	(d)	33.	(d)	38.	(b)		
4.	(b)	9.	(a)	14.	(b)	19.	(c)	24.	(b)	29.	(a)	34.	(c)	39.	(d)		
5.	(c)	10.	(b)	15.	(c)	20.	(d)	25.	(c)	30.	(b)	35.	(a)	40.	(c)		

EXPLANATION

1. (c) Speed of the Upstream, U

$\frac{750}{675} = \frac{10}{9}$ m/s

Time of downstream

$= 7\frac{1}{2}$ minutes = 450 seconds

($\because$ Boat will return in the downstream)

Speed of downstream, D

$= \frac{750}{450}$ m/s $= \frac{5}{3}$ m/s.

$\therefore$ Speed of man in still water

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

$= \frac{\frac{5}{3}+\frac{10}{9}}{2} = \frac{15+10}{2\times 9} = \frac{25}{18}$ m/s

$= \frac{25}{18}\times\frac{18}{5} = 5$ km/h.

2. (c) Speed of boat in still water, x = 6 km/h

Let speed of the stream = y km/h

Downstream speed = (6 + y) km/h

Upstream speed = 6 – y km/h

According to Question

$3\left(\frac{\text{Distance}}{6+y}\right) = \left(\frac{\text{Distance}}{6-y}\right)$

$\frac{3}{6+y} = \frac{1}{6-y}$

6 + y = 18 – 3y

4y = 12

y = 3

$\therefore$ Speed of stream = 3 km/h.

3. (b) Speed of upstream, U

$= \frac{40}{8} = 5$ km/h

Speed of Downstream, D

$= \frac{36}{6} = 6$ km/h

Speed of boat in still water, x

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

$= \frac{5+6}{2} = \frac{11}{2} = 5.5$ km/h.

4. (b) Speed of man in still water, x

$= \frac{9}{2}$ km/hr

Let speed of stream = y km/h.

Downstream speed = $\left(\frac{9}{2}+y\right)$

Upstream Speed = $\left(\frac{9}{2}-y\right)$

According to the question,

$2\times\left[\frac{\text{Distance}}{\left(\frac{9}{2}+y\right)}\right] = \frac{\text{Distance}}{\left(\frac{9}{2}-y\right)}$

$\frac{2}{\frac{9}{2}+y} = \frac{1}{\frac{9}{2}-y}$

$\frac{2\times 2}{9+2y} = \frac{2}{9-2y}$

$\frac{2}{9+2y} = \frac{1}{9-2y}$

18 – 4y = 9 + 2y

6y = 9

$y = \frac{9}{6} = \frac{3}{2} = 1.5$ km/h

5. (c) Since the ratio is given 36 : 5

Let the speed of boat in still water

= 36 km/h.

and the speed of the stream = 5 km/h

Downstream speed = 41 km/h

Upstream speed = 31 km/h

Distance = Downstream speed × Downstream time

$= \left(41\times\frac{31}{6}\right)$km.

Upstream time $= \frac{\text{Distance}}{\text{Upstream speed}}$

$= \frac{41\times\frac{31}{6}}{31} = \frac{41\times 31}{6\times 31}$

$= \frac{41}{6} = 6\frac{5}{6}$ h

= 6 hrs. 50 min.

Alternate

$V \propto \frac{1}{T}$

$\frac{V_1}{V_2} = \frac{T_2}{T_1}$

$\frac{36+5}{36-5} = \frac{x}{31/6}$

$x = \frac{41}{6}$ hours

= 6hrs. 50 min.

6. (c) Speed of the boat in still water,

= 10 km/h

Speed of the stream = 4 km/h

$\therefore$ Downstream speed = 14 km/h

Upstream speed = 6 km/h

Let Distance = M km.

$\frac{M}{14}+\frac{M}{6}$ = 5 hours

$\frac{3M+7M}{42} = 5$

10M = 42 × 5

$M = \frac{42\times 5}{10} = 21$ km.

Alternate

$T = \frac{2xD}{x^2-y^2}$

$D = \frac{(10^2-4^2)5}{2\times 10} = \frac{84\times 5}{20} = 21$ km.

7. (b) ⟵108 km⟶

A (12 + y) ⟶ ⟵ (15 – y) B

Let the speed of stream = y km/h

Since Boat A is moving downstream with 12 km/h

Speed of boat A

= (12 + y) km/h

Since Boat is moving upstream with 15 km/h

Speed of boat B = (15 – y) km/h

∵ Both the boats are moving in opposite direction,

Relative speed of A and B

= 12+y+15–y

= 27 km/h

$$\text{Time} = \frac{\text{Distance}}{\text{Relative speed}} = \frac{108}{27} = 4 \text{ hours}$$

8. (c) The speed of motorboat in still water, x = 45 km/h

Let the speed of current is y km/hr

Downstream speed

$$= \frac{80}{1+\frac{20}{60}} = \frac{80}{1+\frac{1}{3}}$$

$$= \frac{80 \times 3}{4} = 60 \text{ km/h}$$

x + y = 60

45 + y = 60

y = 15 km/h

Upstream speed,

= x – y = 45 – 15

= 30 km/h

$$\text{Time} = \frac{\text{Distance}}{\text{Upstream speed}}$$

$$= \frac{80}{30} = \frac{8}{3} \text{ h} = 2 \text{ hours } 40 \text{ min.}$$

9. (a) Downstream speed, D

$$= \frac{20km}{2hrs} = 10 \text{ km/h}$$

Upstream speed, U

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

Speed of boat in still water = $\frac{D+U}{2}$

$$= \frac{10+4}{2} = 7 \text{ km/hr}$$

10. (b) Let speed of boat in still water = x km/h

Speed of stream current = y km/h

ATQ

$$\frac{24}{x-y} + \frac{36}{x+y} = 6h \text{ .....(i)}$$

$$\frac{36}{x-y} + \frac{24}{x+y} = \frac{13}{2}h \text{ .....(ii)}$$

In these type of Quetions, make factor of 24 and 36 and choose the common values which satisfy the above equations.

24 = 2, 3, 4, 6, 8, (12)

36 = 3, 4, 9, (12)

Choose the common factor *i.e*

Put this value in equation (i)

$$\frac{24}{x-y} + \frac{36}{12} = 6$$

$$\frac{24}{x-y} + 3 = 6$$

x – y = 8

x + y = 12

∴ x + y = 12

∴ x = 10, y = 2

∴ Speed of current, y = 2 km/h.

11. (a) The speed of the boat in still water, x = 10 km/h

Let the speed of current is y km/hr

Upstream speed, U

$$= \frac{45}{6} \text{ km/h}$$

$$\therefore x - y = \frac{45}{6}$$

$$10 - y = \frac{45}{6}$$

$$y = 10 - \frac{45}{6}$$

$$= \frac{60-45}{6} = \frac{15}{6} = 2.5 \text{ km/h.}$$

∴ Speed of the stream, y

= 2.5 km/h

12. (b) $\frac{12}{x+y} + \frac{12}{x-y} = 3$

Speed of the current, y

= 3 km/h

$$\frac{12}{x+3} + \frac{12}{x-3} = 3$$

In such type of question take help from the options to save your valuable time.

Take option (b) x = 9

$$\frac{12}{9+3} + \frac{12}{9-3} = \frac{12}{12} + \frac{12}{6} = 1+2 = 3$$

∴ Option (b) is the answer

Alternate

$$T = \frac{2xD}{x^2 - y^2},$$

$$3 = \frac{2 \times x \times 12}{x^2 - 3^2}$$

$3(x^2 – 9) = 24x$

$x^2 – 9 = 8x$

$x^2 – 8x – 9 = 0$

$x = 9, –1$

$x = 9$ km/hr.

13. (b) Upstream speed, U

$$= \frac{24}{6} = \frac{12}{3}$$

= 4 km/h

Downstream speed, D

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

∴ Speed of boat in still water, x

$$= \frac{D+U}{2} = \frac{9}{2} = 4.5 \text{ km/h}$$

Speed of water current, y

$$= \frac{D-U}{2} = \frac{1}{2} = 0.5 \text{ km/h.}$$

14. (b) Downstream speed, D

$$= \frac{100}{10} = 10 \text{ km/h}$$

Upstream speed, U

$$= \frac{75}{15} = 5 \text{ km/h}$$

Speed of the stream, y

$$= \frac{D-U}{2} = \frac{10-5}{2} = \frac{5}{2} = 2.5 \text{ km/h.}$$

15. (c) Speed of the current, y

= 5 km/h

Let the speed of the motor boat in still water = x km/h

ATQ

$$\frac{10}{x+5} + \frac{10}{x-5} = \frac{5}{6}$$

Take option (c)

$$\frac{10}{25+5} + \frac{10}{25-5} = \frac{10}{30} + \frac{10}{20}$$

$$= \frac{1}{3} + \frac{1}{2} = \frac{5}{6}$$

∴ Option c is the answer.

Alternate

$$T = \frac{2xD}{x^2 - y^2}$$

$$\frac{50}{60} = \frac{2 \times x \times 10}{x^2 - 5^2}$$

$$\frac{5}{6} = \frac{20x}{x^2 - 25}$$

$$x^2 - 25 = 24x$$

$$x^2 - 24x - 25 = 0$$

$$x = 25, -1$$

$x = 25$ km/h.

16. (b) Speed of the stream, y
= 4 km/h

Let the speed of the boat in still water = x km/h

Downstream speed = $(x + 4)$ km/h

Upstream speed = $(x - 4)$ km/h

ATQ

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

Take option (b)

$$\frac{6}{8+4} + \frac{6}{8-4} = \frac{6}{12} + \frac{6}{4}$$

$$= \frac{1}{2} + \frac{3}{2} = \frac{4}{2} = 2$$

$\therefore$ Option (b) is the answer.

Alternate:

$$T = \frac{2xD}{x^2 - y^2}$$

$$2 = \frac{2 \times x \times 6}{x^2 - 4^2}$$

$$2(x^2 - 16) = 12x$$

$$x^2 - 6x - 16 = 0$$

$x = 8, -2$

$x = 8$ km/h

17. (d) Let the speed of boat in still water = x km/h.

The speed of current, y = 5 km/h

Downstream speed = 15 km/h.

$x + 5 = 15$

$x = 10$ km/h.

Upstream speed, U

$= x - y = 10 - 5$

= 5 km/h.

$$\text{Upstream time} = \frac{\text{Distance}}{\text{Upstream speed}}$$

$$= \frac{15}{5} = 3 \text{ hours.}$$

18. (b) Let the speed of stream/ current = y km/h
and the speed of boat in still water
= x km/h

$x = 4y$

$$\frac{30}{x+y} + \frac{30}{x-y} = 8$$

$$\frac{30}{5y} + \frac{30}{3y} = 8$$

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

$y = 2$ km/h

Alternate

$$T = \frac{2xD}{x^2 - y^2}$$

Given, $x = 4y$

$$8 = \frac{2 \times 4y \times 30}{(4y)^2 - (y)^2}$$

$$8(16y^2 - y^2) = 240y$$

$$120y^2 = 240y$$

$y = 2$ km/hr.

19. (c) Speed of person in still water

$$= \frac{15}{2} \text{ km/h}$$

Let the speed of current/stream = y km/h

ATQ

Upstream time
= 2×(Downstream time)

$$\frac{\text{Distance}}{\text{upstream speed}}$$

$$= 2 \times \frac{\text{Distance}}{\text{Downstream speed}}$$

$$\frac{2}{15 - 2y} = 2 \times \frac{2}{15 + 2y}$$

On solving $y = 2\frac{1}{2}$ km/h.

Alternate

$\because T_U = 2 \times T_D$

	up stream (U)	downstream (D)
Time →	2	1
speed →	1	2
	$\Leftrightarrow x-y$	$\Leftrightarrow x+y$

$$\frac{x+y}{x-y} = \frac{2}{1}$$

$$\frac{x}{y} = \frac{3}{1}$$

$x : y = 3 : 1$

$$3 \text{ unit} \rightarrow 7\frac{1}{2} = \frac{15}{2}$$

$$1 \text{ unit} \rightarrow \frac{15}{2 \times 3} = 2.5 \text{ km/hr}$$

20. (d) Speed of man in still water, x = 6 km/h

Speed of current, y
= 2 km/h

Let Distance = M

ATQ

Upstream time = Downstream time + 4

$$\frac{M}{4} = \frac{M}{8} + 4$$

$$\frac{M}{4} = \frac{M + 32}{8}$$

$$\frac{M}{1} = \frac{M + 32}{2}$$

$M = 32$

$\therefore$ Distance = 32 km.

Alternate

$x = 6$ km/hr.

$y = 2$ km/hr.

D : U = (6 + 2) : (6 – 2) = 2 : 1

$T_D : T_U = \underbrace{1 : 2}_{1 \text{unit}}$

1 unit = 4 hours

$T_D = 1 \times 4 = 4$ hours

$T_U = 2 \times 4 = 8$ hours

Distance = D × T_D

$= (6+2) \times 4 = 32$ km.

21. (c) Speed of boat in still water, x = 5 km/h

Speed of stream, y = 3 km/h

ATQ

$$\frac{\text{Distance}}{8} + \frac{\text{Distance}}{2}$$

= 3 hours.

On solving,

Distance = 4.8 km.

Alternate

$$T = \frac{2xD}{x^2 - y^2}$$

$$3 = \frac{2 \times 5 \times D}{5^2 - 3^2}$$

$3 \times 16 = 10 \times D$

D = 4.8 km.

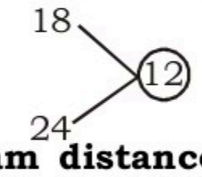
22. (c) **ATQ**

$$\frac{18}{x+y}+\frac{12}{x-y}=3 \quad .....(i)$$

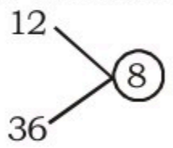
$$\frac{24}{x+y}+\frac{36}{x-y}=\frac{13}{2} \quad .....(ii)$$

NOTE: In such type of Question, take common values of same types of distances and satisfy the given equation.

Downstream distance:-



Upstream distance:-



On

Putting $x + y = 12$

and $x - y = 8$,

both the equation are satisfied.

Therefore, $y = \frac{12-8}{2} = \frac{4}{2} = 2$ km/hr.

23. (c) Speed of man in still water, x = 4 km/h

Speed of water, y = 2 km/h

Upstream speed, U = 4 – 2 = 2 km/h

Upstream time,

$$= \frac{\text{Distance}}{\text{Upstream speed}}$$

$$= \frac{10}{2} = 5 \text{ hours.}$$

24. (b) Speed of stream, y = 3 km/h

Speed of man in still water, x = 5 km/h

Downstream speed, D = 5 + 3 = 8 km/h

Downstream time

$$= \frac{\text{Distance}}{\text{Downstream speed}} = \frac{26}{8}$$

$$= \frac{13}{4} = 3\frac{1}{4} \text{ hours.}$$

25. (c) Speed of Downstream, D = 12 km/h

Speed of Upstream, U = 8 km/h

Speed of boat in still water

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

$$= \frac{20}{2} = 10 \text{ km/h.}$$

Time taken by the boat in still water $= \frac{24 \text{ km}}{10 \text{ km/hr}} = 2.4$ hours

26. (d) Downstream speed, D = 12 km/hr.

Upstream speed, U = 8 km/hr.

Speed of the current, $y = \frac{D-U}{2}$

$$= \frac{12-8}{2} = \frac{4}{2} = 2 \text{ km/hr.}$$

27. (c) Speed of man in still water, x = 3 km/hr.

Speed of the stream, y = 2 km/hr.

Upstream speed = $x - y$ = 1 km/hr.

Upstream time

$$= \frac{\text{Distance}}{\text{Upstream speed}}$$

$$= \frac{10 \text{km}}{1 \text{km / hr}} = 10 \text{ hr.}$$

Downstream speed = $x + y$ = 5 km/h

Downstream time

$$= \frac{\text{Distance}}{\text{Downstream speed}}$$

$$= \frac{10 \text{km}}{5 \text{km/h}} = 2 \text{ hours}$$

Total time = U.T + D.T

= 10 hr + 2 hr

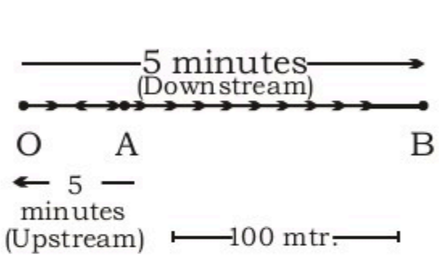
= 12 hrs.

Alternate:

$$T = \frac{2xD}{x^2 - y^2}$$

$$T = \frac{2 \times 3 \times 10}{3^2 - 2^2} = \frac{60}{5} = 12 \text{ hrs.}$$

28. (d)



See the figure,

OA = distance covered by upstream speed in 5 minutes

$$= \frac{5}{60}(x-y)$$

OB = distance covered by downstream speed in 5 minutes

$$= \frac{5}{60}(x+y)$$

ATQ

OB – OA = AB

$$\frac{5}{60}(x+y) - \frac{5}{60}(x-y) = \frac{100}{1000} \text{ km.}$$

$$\frac{5}{60}[x+y-x+y] = \frac{100}{1000} \text{ km.}$$

On solving

y = 0.6 km/hr.

∴ Speed of the current = 0.6 km/hr.

29. (a) Upstream speed, U

$$= \frac{1\text{km}}{\frac{10}{60}\text{hr}} = 6 \text{ km/hr}$$

Downstream speed, D

$$= \frac{1\text{km}}{\frac{4}{60}\text{hr}} = 15 \text{ km/hr}$$

Speed of the stream, $y = \frac{D-U}{2}$

$$= \frac{15-6}{2} = \frac{9}{2} = 4.5 \text{ km/hr.}$$

30. (b)

	(Distance)	(Time)
Down stream =	1 km	$7\frac{1}{2}$ min
	×8 ↓	↓ ×8
	8 km	60 min (1hour)
Upstream = 5 km		1hour

Speed of boat in still water = $\frac{\text{(Downstream + upstream)}}{2}$ of speed

$$= \frac{8+5}{2} = \frac{13}{2} = 6\frac{1}{2} \text{ km/h}$$

31. (d) **ATQ**

Downstream speed = $x + y$

Upstream speed = $x - y$

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

$$\therefore \quad x + y = \frac{D}{T} \quad ..... \text{(i)}$$

$$x - y = \frac{D}{2T} \quad .....\text{(ii)}$$

Solve equation (i) and (ii)

$$x = \frac{3D}{4T}, \; y = \frac{D}{4T}$$

$$\therefore \quad \frac{x}{y} = \frac{3D}{4T} \times \frac{4T}{D} = \frac{3}{1} = 3 : 1$$

Alternate:

	Downstream (D)		Upstream(U)
T →	1	:	2
S →	2	:	1

$S_B = \frac{S_D + S_U}{2} = \frac{2+1}{2} = \frac{3}{2}$

$S_C = \frac{S_D - S_U}{2} = \frac{2-1}{2} = \frac{1}{2}$

$S_B : S_C$

$= \frac{3}{2} : \frac{1}{2}$

$= 3 : 1$

32. (b) **ATQ**

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

Downstream speed

$= x + y = \frac{48}{6} = 8$ km/h

Upstream speed

$= x - y = \frac{36}{6} = 6$ km/h

$x + y = 8$ km/h.....(i)

$x - y = 6$ km/h. .....(ii)

Solve equation (i) and (ii)

$x = 7$ km/h.

$y = 1$ km/h.

∴ Speed of the current is = 1 *km/hr.*

33. (d) **ATQ**

Speed of current 'y'

= 4km/h

Distance = 12 km.

Speed in upstream = $(x - y)$ km/hr.

Here 'x' is speed of boat in still water

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

$x - 4 = \frac{12}{5}$

$5x - 20 = 12$

$5x = 32$

$x = 6.4$ km/hr.

Speed in dowstream = $(x + y)$

$= 6.4 + 4 = 10.4$ km/h

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

$\text{Time} = \frac{15}{10.4} = \frac{150}{104}$

$= 1$ hour $26\ \frac{7}{13}$ minutes

34. (c) **ATQ**

Downstream speed

$x + y = \frac{d}{3}$ or $d = 3(x + y)$ ....(i)

Upstream speed

$= x - y = \frac{d \times 2}{7}$

or $d = \frac{7}{2}(x - y)$ .....(ii)

Compare both the distance

$3(x + y) = \frac{7}{2}(x - y)$

$6x + 6y = 7x - 7y$

$x = 13y$

Hence, y = Speed of current

= 1.5 km/h

$x = 13 \times 1.5$

$x = 19.5$ km/h

(speed of boat in still water)

35. (a) Given

Speed of boat in down stream

= 15 km/h

Speed of current = 3 km/h

Speed of boat in still water

= 12 km/h

time taken at upstream

$= \frac{15}{12-3}$

$= \frac{15}{9}$ h = 1 h 40 min

time taken at downstream

$= \frac{15}{12+3} = 1$h

total time = 2h 40 min

36. (a) Let speed of boat = x

speed of stream = y

According to question,

$\frac{75}{x-y} = 3 \Rightarrow x - y = 25$ .....(i)

$\frac{60}{x+y} = 1.5 \Rightarrow x + y = 40$.....(ii)

From (i) & (ii)

$x = 32.5$ km/hr

37. (d) If water flows at 4km/h.

So in 15 minutes it travels → 1 km.

So vol. of water entering the sea in 15 minutes

$= 8 \times 4 \times 1000$

$= 32000\ m^3$

38. (b) Let speed of man and stream is 'V', 'U'

Then $\frac{5}{V+U} = \frac{4}{V-U}$

[Travelling distance in same time]

$5V - 5U = 4V + 4U$

$V = 9U \Rightarrow \frac{V}{U} = \frac{9}{1}$

Let $U = x$, $V = 9x$

$\frac{35}{2x}\left(\frac{1}{5} + \frac{1}{4}\right) = \frac{21}{2}$

$\Rightarrow \frac{5}{x} \times \frac{9}{20} = 3$

$x = \frac{3}{4} = 0.75$

Speed of stream

$= 1 \times 0.75$

= 0.75 km/hr.

39. (d) $S + W = 14$. . . (i)

$S - W = 8$. . . .(ii)

from eq (i) & (ii)

S = 11 km/h, w= 3 km/h

speed of current = 3 km/h

40. (c) Relative speed = 20 + 5

= 25 km/hr

$\text{time} = \frac{100}{25} = 4$ hours.

41. (a) Speed of boat in still water

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

where x = downstream speed and y = upstream speed.

Boat's speed $= \frac{18+12}{2} = \frac{30}{2}$

= 15 km/hr

42. (d) P ——— Q ——— R

←16.40→

∵ time required travelling from P to R = 16 H 40 M

= 16 H 40 M

∵ PQ = QR (∵ Q is midpoint)

Required time to travell PQ

$= \frac{1}{2}$ (16H,40M)= 8 H,20 min

total required time from P to Q + Q to P = 12H

= 8H20M + Q to P = 12H

∴ time Q to P = 12H-8H 20M

= 3H 40 M

∵ $\overrightarrow{QP} = \frac{1}{2}\overrightarrow{RP}$ (distance)

∴ Required time to $\overrightarrow{RP}$

$= 2 \times [\overrightarrow{QP}]$

= 2[3H40M]

= 7H 20Minute

$= 7\frac{1}{3}$ Hr.