19. BOATS AND STREAMS

IMPORTANT FACTS AND FORMULAE

1. In water, the direction along the stream is called ***downstream***. And, the direction against the stream is called ***upstream***.
2. If the speed of a boat in still water is u km/hr and the speed of the stream is v km/hr, then :

$$\textit{Speed downstream} = (u + v) \text{ km/hr}$$

$$\textit{Speed upstream} = (u - v) \text{ km/hr}.$$

3. If the speed downstream is a km/hr and the speed upstream is b km/hr, then :

$$\textit{Speed in still water} = \frac{1}{2}(a + b) \text{ km/hr}$$

$$\textit{Rate of stream} = \frac{1}{2}(a - b) \text{ km/hr}$$

SOLVED EXAMPLES

Ex. 1. ***A man can row upstream at 7 kmph and downstream at 10 kmph. Find man's rate in still water and the rate of current.***

Sol. Rate in still water $= \frac{1}{2}(10 + 7)$ km/hr $= 8.5$ km/hr.

Rate of current $= \frac{1}{2}(10 - 7)$ km/hr $= 1.5$ km/hr.

Ex. 2. ***A man takes 3 hours 45 minutes to row a boat 15 km downstream of a river and 2 hours 30 minutes to cover a distance of 5 km upstream. Find the speed of the river current in km/hr.***

Sol. Rate downstream $= \left(\frac{15}{3\frac{3}{4}}\right)$ km/hr $= \left(15 \times \frac{4}{15}\right)$ km/hr $= 4$ km/hr.

Rate upstream $= \left(\frac{5}{2\frac{1}{2}}\right)$ km/hr $= \left(5 \times \frac{2}{5}\right)$ km/hr $= 2$ km/hr.

$\therefore$ Speed of current $= \frac{1}{2}(4 - 2)$ km/hr $= 1$ km/hr.

Ex. 3. ***A man can row 18 kmph in still water. It takes him thrice as long to row up as to row down the river. Find the rate of stream.***

Sol. Let man's rate upstream be x kmph. Then, his rate downstream $= 3x$ kmph.

$\therefore$ Rate in still water $= \frac{1}{2}(3x + x)$ kmph $= 2x$ kmph.

So, $2x = 18$ or $x = 9$.

$\therefore$ Rate upstream $= 9$ km/hr, Rate downstream $= 27$ km/hr.

Hence, rate of stream $= \frac{1}{2}(27 - 9)$ km/hr $= 9$ km/hr.

Ex. 4. ***There is a road beside a river. Two friends started from a place A, moved to a temple situated at another place B and then returned to A again. One of them moves on a cycle at a speed of 12 km/hr, while the other sails on a boat at a speed of 10 km/hr. If the river flows at the speed of 4 km/hr, which of the two friends will return to place A first ?*** (R.R.B. 2001)

Sol. Clearly, the cyclist moves both ways at a speed of 12 km/hr.

So, average speed of the cyclist = 12 km/hr.

The boat sailor moves downstream @ (10 + 4) *i.e.*, 14 km/hr and upstream @ (10 − 4) *i.e.*, 6 km/hr.

So, average speed of the boat sailor $= \left(\frac{2 \times 14 \times 6}{14 + 6}\right)$ km/hr

$= \frac{42}{5}$ km/hr = 8.4 km/hr.

Since the average speed of the cyclist is greater, he will return to A first.

Ex. 5. ***A man can row $7\frac{1}{2}$ kmph in still water. If in a river running at 1.5 km an hour, it takes him 50 minutes to row to a place and back, how far off is the place ?*** (R.R.B. 2002)

Sol. Speed downstream = (7.5 + 1.5) kmph = 9 kmph;

Speed upstream = (7.5 − 1.5) kmph = 6 kmph.

Let the required distance be x km. Then,

$\frac{x}{9} + \frac{x}{6} = \frac{50}{60} \Leftrightarrow 2x + 3x = \left(\frac{5}{6} \times 18\right) \Leftrightarrow 5x = 15 \Leftrightarrow x = 3.$

Hence, the required distance is 3 km.

Ex. 6. ***In a stream running at 2 kmph, a motorboat goes 6 km upstream and back again to the starting point in 33 minutes. Find the speed of the motorboat in still water.***

Sol. Let the speed of the motorboat in still water be x kmph. Then,

Speed downstream = $(x + 2)$ kmph; Speed upstream = $(x - 2)$ kmph.

$\therefore \quad \frac{6}{x+2} + \frac{6}{x-2} = \frac{33}{60} \Leftrightarrow 11x^2 - 240x - 44 = 0 \Leftrightarrow 11x^2 - 242x + 2x - 44 = 0$

$\Leftrightarrow (x - 22)(11x + 2) = 0 \Leftrightarrow x = 22.$

Hence, speed of motorboat in still water = 22 kmph.

Ex. 7. ***A man can row 40 km upstream and 55 km downstream in 13 hours. Also, he can row 30 km upstream and 44 km downstream in 10 hours. Find the speed of the man in still water and the speed of the current.***

Sol. Let rate upstream = x km/hr and rate downstream = y km/hr.

Then, $\frac{40}{x} + \frac{55}{y} = 13$ ...(*i*) and $\frac{30}{x} + \frac{44}{y} = 10$ ...(*ii*)

Multiplying (*ii*) by 4 and (*i*) by 3 and subtracting, we get : $\frac{11}{y} = 1$ or $y = 11$.

Substituting $y = 11$ in (*i*), we get : $x = 5$.

$\therefore$ Rate in still water $= \frac{1}{2}(11 + 5)$ kmph = 8 kmph.

Rate of current $= \frac{1}{2}(11 - 5)$ kmph = 3 kmph.

EXERCISE 19A

(OBJECTIVE TYPE QUESTIONS)

Directions : ***Mark (✓) against the correct answer :***

1. In one hour, a boat goes 11 km along the stream and 5 km against the stream. The speed of the boat in still water (in km / hr) is : **(S.S.C. 2000)**
   (*a*) 3 (*b*) 5 (*c*) 8 (*d*) 9

2. A man can row upstream at 8 kmph and downstream at 13 kmph. The speed of the stream is :
   (*a*) 2.5 km / hr (*b*) 4.2 km / hr (*c*) 5 km / hr (*d*) 10.5 km / hr

3. A man rows downstream 32 km and 14 km upstream. If he takes 6 hours to cover each distance, then the velocity (in kmph) of the current is :
   (*a*) $\frac{1}{2}$ (*b*) 1 (*c*) $1\frac{1}{2}$ (*d*) 2

4. A boat running downstream covers a distance of 16 km in 2 hours while for covering the same distance upstream, it takes 4 hours. What is the speed of the boat in still water ? **(S.B.I.P.O. 2002)**
   (*a*) 4 km / hr (*b*) 6 km / hr (*c*) 8 km / hr (*d*) Data inadequate

5. A boatman goes 2 km against the current of the stream in 1 hour and goes 1 km along the current in 10 minutes. How long will it take to go 5 km in stationary water ?
   (*a*) 40 minutes (*b*) 1 hour (*c*) 1 hr 15 min (*d*) 1 hr 30 min **(R.R.B. 2002)**

6. A man can row three-quarters of a kilometre against the stream in $11\frac{1}{4}$ minutes. The speed (in km / hr) of the man in still water is : **(L.I.C.A.A.O. 2003)**
   (*a*) 2 (*b*) 3 (*c*) 4 (*d*) 5

7. A man takes twice as long to row a distance against the stream as to row the same distance in favour of the stream. The ratio of the speed of the boat (in still water) and the stream is : **(S.S.C. 1998)**
   (*a*) 2 : 1 (*b*) 3 : 1 (*c*) 3 : 2 (*d*) 4 : 3

8. A boat running upstream takes 8 hours 48 minutes to cover a certain distance, while it takes 4 hours to cover the same distance running downstream. What is the ratio between the speed of the boat and speed of the water current respectively ?
   (*a*) 2 : 1 (*b*) 3 : 2 (*c*) 8 : 3
   (*d*) Cannot be determined (*e*) None of these **(Bank P.O. 2003)**

9. If a boat goes 7 km upstream in 42 minutes and the speed of the stream is 3 kmph, then the speed of the boat in still water is :
   (*a*) 4.2 km / hr (*b*) 9 km / hr (*c*) 13 km / hr (*d*) 21 km / hr

10. A man's speed with the current is 15 km / hr and the speed of the current is 2.5 km / hr. The man's speed against the current is : **(M.A.T. 1997)**
    (*a*) 8.5 km / hr (*b*) 9 km / hr (*c*) 10 km / hr (*d*) 12.5 km / hr

11. If a man rows at the rate of 5 kmph in still water and his rate against the current is 3.5 kmph, then the man's rate along the current is :
    (*a*) 4.25 kmph (*b*) 6 kmph (*c*) 6.5 kmph (*d*) 8.5 kmph

12. A boat can travel with a speed of 13 km / hr in still water. If the speed of the stream is 4 km / hr, find the time taken by the boat to go 68 km downstream. **(R.R.B. 2003)**
    (*a*) 2 hours (*b*) 3 hours (*c*) 4 hours (*d*) 5 hours

13. Speed of a boat in standing water is 9 kmph and the speed of the stream is 1.5 kmph. A man rows to a place at a distance of 105 km and comes back to the starting point. The total time taken by him is :

(a) 16 hours (b) 18 hours (c) 20 hours (d) 24 hours

14. The speed of a boat in still water is 15 km/hr and the rate of current is 3 km/hr. The distance travelled downstream in 12 minutes is :

(a) 1.2 km (b) 1.8 km (c) 2.4 km (d) 3.6 km

15. A man can row at 5 kmph in still water. If the velocity of current is 1 kmph and it takes him 1 hour to row to a place and come back, how far is the place ?

(a) 2.4 km (b) 2.5 km (c) 3 km (d) 3.6 km

(S.S.C. 2004)

16. A boat takes 19 hours for travelling downstream from point A to point B and coming back to a point C midway between A and B. If the velocity of the stream is 4 kmph and the speed of the boat in still water is 14 kmph, what is the distance between A and B ?

(a) 160 km (b) 180 km (c) 200 km (d) 220 km

17. A man can row $9\frac{1}{3}$ kmph in still water and finds that it takes him thrice as much time to row up than as to row down the same distance in the river. The speed of the current is :

(a) $3\frac{1}{3}$ km/hr (b) $3\frac{1}{9}$ km/hr (c) $4\frac{2}{3}$ km/hr (d) $4\frac{1}{2}$ km/hr

18. A boat covers a certain distance downstream in 1 hour, while it comes back in $1\frac{1}{2}$ hours. If the speed of the stream be 3 kmph, what is the speed of the boat in still water ?

(Bank P.O. 2003)

(a) 12 kmph (b) 13 kmph (c) 14 kmph
(d) 15 kmph (e) None of these

19. A motorboat, whose speed is 15 km/hr in still water goes 30 km downstream and comes back in a total of 4 hours 30 minutes. The speed of the stream (in km/hr) is :

(a) 4 (b) 5 (c) 6 (d) 10

(R.R.B. 2002)

20. The speed of a boat in still water is 10 km/hr. If it can travel 26 km downstream and 14 km upstream in the same time, the speed of the stream is :

(a) 2 km/hr (b) 2.5 km/hr (c) 3 km/hr (d) 4 km/hr

21. A boat takes 90 minutes less to travel 36 miles downstream than to travel the same distance upstream. If the speed of the boat in still water is 10 mph, the speed of the stream is :

(M.A.T. 1997)

(a) 2 mph (b) 2.5 mph (c) 3 mph (d) 4 mph

22. A man rows to a place 48 km distant and back in 14 hours. He finds that he can row 4 km with the stream in the same time as 3 km against the stream. The rate of the stream is :

(a) 1 km/hr (b) 1.5 km/hr (c) 1.8 km/hr (d) 3.5 km/hr

23. 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 velocity of the current is :

(a) 1 km/hr (b) 1.5 km/hr (c) 2 km/hr (d) 2.5 km/hr

24. At his usual rowing rate, Rahul can travel 12 miles downstream in a certain river in 6 hours less than it takes him to travel the same distance upstream. But if he could double his usual rowing rate for his 24-mile round trip, the downstream 12 miles would then take only one hour less than the upstream 12 miles. What is the speed of the current in miles per hour? **(M.A.T. 2001)**

(a) $1\frac{1}{3}$ (b) $1\frac{2}{3}$ (c) $2\frac{1}{3}$ (d) $2\frac{2}{3}$

ANSWERS

1. (c)	2. (a)	3. (c)	4. (b)	5. (c)	6. (d)	7. (b)	8. (c)
9. (c)	10. (c)	11. (c)	12. (c)	13. (d)	14. (d)	15. (a)	16. (b)
17. (c)	18. (d)	19. (b)	20. (c)	21. (a)	22. (a)	23. (c)	24. (d)

SOLUTIONS

1. Speed in still water $= \frac{1}{2}(11+5)$ kmph $= 8$ kmph.

2. Speed of stream $= \frac{1}{2}(13-8)$ kmph $= 2.5$ kmph.

3. Rate downstream $= \left(\frac{32}{6}\right)$ kmph; Rate upstream $= \left(\frac{14}{6}\right)$ kmph.

   $\therefore$ Velocity of current $= \frac{1}{2}\left(\frac{32}{6}-\frac{14}{6}\right)$ kmph $= \frac{3}{2}$ kmph $= 1.5$ kmph.

4. Rate downstream $= \left(\frac{16}{2}\right)$ kmph $= 8$ kmph; Rate upstream $= \left(\frac{16}{4}\right)$ kmph $= 4$ kmph.

   $\therefore$ Speed in still water $= \frac{1}{2}(8+4)$ kmph $= 6$ kmph.

5. Rate downstream $= \left(\frac{1}{10}\times 60\right)$ km/hr $= 6$ km/hr; Rate upstream $= 2$ km/hr.

   Speed in still water $= \frac{1}{2}(6+2)$ km/hr $= 4$ km/hr.

   $\therefore$ Required time $= \left(\frac{5}{4}\right)$ hrs $= 1\frac{1}{4}$ hrs $= 1$ hr 15 min.

6. Rate upstream $= \left(\frac{750}{675}\right)$ m/sec $= \frac{10}{9}$ m/sec;

   Rate downstream $= \left(\frac{750}{450}\right)$ m/sec $= \frac{5}{3}$ m/sec.

   $\therefore$ Rate in still water $= \frac{1}{2}\left(\frac{10}{9}+\frac{5}{3}\right)$ m/sec $= \frac{25}{18}$ m/sec $= \left(\frac{25}{18}\times\frac{18}{5}\right)$ km/hr

   $= 5$ km/hr.

7. Let man's rate upstream be x kmph. Then, his rate downstream $= 2x$ kmph.

   $\therefore$ (Speed in still water) : (Speed of stream) $= \left(\frac{2x+x}{2}\right) : \left(\frac{2x-x}{2}\right) = \frac{3x}{2} : \frac{x}{2} = 3 : 1.$

8. Let the man' rate upstream be x kmph and that downstream be y kmph. Then,
Distance covered upstream in 8 hrs 48 min. = Distance covered downstream in 4 hrs.

$$\Rightarrow \left(x \times 8\frac{4}{5}\right) = (y \times 4) \Rightarrow \frac{44}{5}x = 4y \Rightarrow y = \frac{11}{5}x.$$

$$\therefore \text{ Required ratio } = \left(\frac{y+x}{2}\right) : \left(\frac{y-x}{2}\right) = \left(\frac{16x}{5} \times \frac{1}{2}\right) : \left(\frac{6x}{5} \times \frac{1}{2}\right) = \frac{8}{5} : \frac{3}{5} = 8 : 3.$$

9. Rate upstream $= \left(\frac{7}{42} \times 60\right)$ kmph $= 10$ kmph.

Speed of stream $= 3$ kmph.
Let speed in still water be x km/hr. Then, speed upstream $= (x - 3)$ km/hr.
$\therefore \quad x - 3 = 10 \quad$ or $\quad x = 13$ km/hr.

10. Man's rate in still water $= (15 - 2.5)$ km/hr $= 12.5$ km/hr.
Man's rate against the current $= (12.5 - 2.5)$ km/hr $= 10$ km/hr.

11. Let the rate along the current be x kmph. Then, $\frac{1}{2}(x + 3.5) = 5$ or $x = 6.5$ kmph.

12. Speed downstream $= (13 + 4)$ km/hr $= 17$ km/hr.

Time taken to travel 68 km downstream $= \left(\frac{68}{17}\right)$ hrs $= 4$ hrs.

13. Speed upstream $= 7.5$ kmph; Speed downstream $= 10.5$ kmph.

$$\therefore \text{ Total time taken } = \left(\frac{105}{7.5} + \frac{105}{10.5}\right) \text{ hours } = 24 \text{ hours.}$$

14. Speed downstream $= (15 + 3)$ kmph $= 18$ kmph.

Distance travelled $= \left(18 \times \frac{12}{60}\right)$ km $= 3.6$ km.

15. Speed downstream $= (5 + 1)$ kmph $= 6$ kmph; Speed upstream $= (5 - 1)$ kmph $= 4$ kmph.
Let the required distance be x km.

Then, $\frac{x}{6} + \frac{x}{4} = 1 \Leftrightarrow 2x + 3x = 12 \Leftrightarrow 5x = 12 \Leftrightarrow x = 2.4$ km.

16. Speed downstream $= (14 + 4)$ km/hr $= 18$ km/hr;
Speed upstream $= (14 - 4)$ km/hr $= 10$ km/hr.
Let the distance between A and B be x km. Then,

$$\frac{x}{18} + \frac{(x/2)}{10} = 19 \Leftrightarrow \frac{x}{18} + \frac{x}{20} = 19 \Leftrightarrow \frac{19x}{180} = 19 \Leftrightarrow x = 180 \text{ km.}$$

17. Let speed upstream be x kmph. Then, speed downstream $= 3x$ kmph.

Speed in still water $= \frac{1}{2}(3x + x)$ kmph $= 2x$ kmph.

$$\therefore \quad 2x = \frac{28}{3} \Rightarrow x = \frac{14}{3}.$$

So, Speed upstream $= \frac{14}{3}$ km/hr; Speed downstream $= 14$ km/hr.

Hence, speed of the current $= \frac{1}{2}\left(14 - \frac{14}{3}\right)$ km/hr $= \frac{14}{3}$ km/hr $= 4\frac{2}{3}$ km/hr.

18. Let the speed of the boat in still water be x kmph. Then,
Speed downstream $= (x + 3)$ kmph, Speed upstream $= (x - 3)$ kmph.

$$\therefore \quad (x + 3) \times 1 = (x - 3) \times \frac{3}{2} \Leftrightarrow 2x + 6 = 3x - 9 \Leftrightarrow x = 15 \text{ kmph.}$$

19. Let the speed of the stream be x km / hr. Then,

Speed downstream = $(15 + x)$ km / hr, Speed upstream = $(15 - x)$ km / hr.

$$\therefore \quad \frac{30}{(15+x)} + \frac{30}{(15-x)} = 4\frac{1}{2} \quad \Leftrightarrow \quad \frac{900}{225-x^2} = \frac{9}{2} \quad \Leftrightarrow \quad 9x^2 = 225$$

$$\Leftrightarrow \quad x^2 = 25 \quad \Leftrightarrow \quad x = 5 \text{ km / hr.}$$

20. Let the speed of the stream be x km / hr. Then,

Speed downstream = $(10 + x)$ km / hr, Speed upstream = $(10 - x)$ km / hr.

$$\therefore \quad \frac{26}{(10+x)} = \frac{14}{(10-x)} \quad \Leftrightarrow \quad 260 - 26x = 140 + 14x \quad \Leftrightarrow \quad 40x = 120 \quad \Leftrightarrow \quad x = 3 \text{ km / hr.}$$

21. Let the speed of the stream be x mph. Then,

Speed downstream = $(10 + x)$ mph, Speed upstream = $(10 - x)$ mph.

$$\therefore \quad \frac{36}{(10-x)} - \frac{36}{(10+x)} = \frac{90}{60} \quad \Leftrightarrow \quad 72x \times 60 = 90\,(100 - x^2) \quad \Leftrightarrow \quad x^2 + 48x + 100 = 0$$

$$\Leftrightarrow \quad (x + 50)\,(x - 2) = 0 \quad \Leftrightarrow \quad x = 2 \text{ mph.}$$

22. Suppose he moves 4 km downstream in x hours. Then,

Speed downstream = $\left(\frac{4}{x}\right)$ km / hr, Speed upstream = $\left(\frac{3}{x}\right)$ km / hr.

$$\therefore \quad \frac{48}{(4/x)} + \frac{48}{(3/x)} = 14 \text{ or } x = \frac{1}{2}.$$

So, Speed downstream = 8 km / hr, Speed upstream = 6 km / hr.

Rate of the stream = $\frac{1}{2}(8 - 6)$ km / hr = 1 km / hr.

23. Let rate upstream = x kmph and rate downstream = y kmph.

Then, $\frac{24}{x} + \frac{36}{y} = 36$ ...(*i*) and $\frac{36}{x} + \frac{24}{y} = \frac{13}{2}$ ...(*ii*)

Adding (*i*) and (*ii*), we get : $60\left(\frac{1}{x} + \frac{1}{y}\right) = \frac{25}{2}$ or $\frac{1}{x} + \frac{1}{y} = \frac{5}{24}$ ...(*iii*)

Subtracting (*i*) from (*ii*), we get : $12\left(\frac{1}{x} - \frac{1}{y}\right) = \frac{1}{2}$ or $\frac{1}{x} - \frac{1}{y} = \frac{1}{24}$ ...(*iv*)

Adding (*iii*) and (*iv*), we get : $\frac{2}{x} = \frac{6}{24}$ or $x = 8$.

So, $\frac{1}{8} + \frac{1}{y} = \frac{5}{24} \quad \Leftrightarrow \quad \frac{1}{y} = \left(\frac{5}{24} - \frac{1}{8}\right) = \frac{1}{12} \quad \Leftrightarrow \quad y = 12.$

$\therefore$ Speed upstream = 8 kmph, Speed downstream = 12 kmph.

Hence, rate of current = $\frac{1}{2}(12 - 8)$ kmph = 2 kmph.

24. Let the speed in still water be x mph and the speed of the current be y mph. Then,

Speed upstream = $(x - y)$; Speed downstream = $(x + y)$

$$\therefore \quad \frac{12}{(x-y)} - \frac{12}{(x+y)} = 6 \quad \Leftrightarrow \quad 6\,(x^2 - y^2) = 24y \quad \Leftrightarrow \quad x^2 - y^2 = 4y$$

$$\Leftrightarrow \quad x^2 = (4y + y^2) \qquad \ldots(i)$$

And, $\frac{12}{(2x-y)} - \frac{12}{(2x+y)} = 1 \quad \Leftrightarrow \quad 4x^2 - y^2 = 24y \quad \Leftrightarrow \quad x^2 = \frac{24y + y^2}{4}$ ...(*ii*)

From (*i*) and (*ii*), we have :

$$4y + y^2 = \frac{24y + y^2}{4} \Leftrightarrow 16y + 4y^2 = 24y + y^2 \Leftrightarrow 3y^2 = 8y \Leftrightarrow y = \frac{8}{3}.$$

$\therefore$ Speed of the current $= \frac{8}{3}$ mph $= 2\frac{2}{3}$ mph.

EXERCISE 19B

(DATA SUFFICIENCY TYPE QUESTIONS)

Directions (*Questions 1 to 6*) : ***Each of the questions given below consists of a statement and/or a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statement(s) is/are sufficient to answer the question. Read both the statements and***

Give answer (*a*) ***if the data in Statement I alone are sufficient to answer the question, while the data in Statement II alone are not sufficient to answer the question;***

Give answer (*b*) ***if the data in Statement II alone are sufficient to answer the question while the data in statement I alone are not sufficient to answer the question;***

Give answer (*c*) ***if the data either in Statement I or in Statement II alone are sufficient to answer the question;***

Give answer (*d*) ***if the data even in both Statements I and II together are not sufficient to answer the question;***

Give answer (*e*) ***if the data in both Statements I and II together are necessary to answer the question.***

1. What is the speed of the boat in still water ? **(Bank P.O. 2003)**
   I. It takes 2 hours to cover the distance between A and B downstream.
   II. It takes 4 hours to cover the distance between A and B upstream.
2. What is the speed of the stream ?
   I. The ratio of the speed upstream to the speed downstream of a boat is 2 : 3.
   II. The distance travelled upstream in 2 hours by the boat is more than the distance travelled by it downstream in 1 hour by 4 km.
3. What is the speed of the boat in still water ? **(Bank P.O. 2003)**
   I. The boat covers a distance of 48 kms in 6 hours while running upstream.
   II. The boat covers the same distance in 4 hours while running downstream.
4. What is the man's speed in still water ?
   I. The speed of the stream is one-third of the man's speed in still water.
   II. In a given time, the man can swim twice as far with the stream as he can against it.
5. A boat takes a total time of three hours to travel downstream from P to Q and upstream back from Q to P. What is the speed of the boat in still water ?
   I. The speed of the river current is 1 km per hour.
   II. The distance between P and Q is 4 km. **(S.B.I.P.O. 1997)**
6. What is the speed of the boat in still water ?
   I. The speed downstream of the boat is thrice the speed upstream.
   II. The sum of the speeds of the boat, upstream and downstream is 12 kmph.

Directions (*Questions 7-8*) : ***Each of the questions given below consists of a question followed by three statements. You have to study the question and the statements and decide which of the statement(s) is/are necessary to answer the questions.***

7. What is the speed of the boat in still water ?
   I. The speed downstream is 12 kmph.
   II. The speed upstream is 4 kmph.
   III. In a to and fro journey between two points, the average speed of the boat was 6 kmph.
   (*a*) I and II only (*b*) All I, II and III (*c*) III, and either I or II
   (*d*) Any two of the three (*e*) None of these

8. What is the speed of stream ? **(Bank P.O. 2004)**
   I. The boat covers 24 km in 6 hours moving upstream.
   II. The boat covers 24 km in 3 hours moving downstream.
   III. The ratio between the speed of boat and stream is 3 : 1 respectively.
   (*a*) Any two of the three (*b*) I and II only (*c*) II and III only
   (*d*) I and III only (*e*) All I, II and III

ANSWERS

1. (*d*) 2. (*e*) 3. (*e*) 4. (*d*) 5. (*e*) 6. (*b*) 7. (*d*) 8. (*a*)

SOLUTIONS

1. Let AB = x km.

   I. Speed downstream = $\frac{x}{2}$ km/hr. II. Speed upstream = $\frac{x}{4}$ km/hr.

   Speed of boat in still water = $\frac{1}{2}\left(\frac{x}{2}+\frac{x}{4}\right)$ km/hr.

   Thus, I and II both even do not give the answer.

   ∴ Correct answer is (*d*).

2. I. Let speed upstream = $2x$ km/hr and speed downstream = $3x$ km/hr.

   II. $(2 \times 3x) - (1 \times 2x) = 4 \Leftrightarrow 4x = 4 \Leftrightarrow x = 1$.

   ∴ Speed upstream = 2 km/hr, speed downstream = 3 km/hr.

   Speed of the stream = $\frac{1}{2}(3-2)$ km/hr = $\frac{1}{2}$ km/hr.

   Thus, I and II together give the answer.

   ∴ Correct answer is (*e*).

3. I. Speed upstream = $\frac{48}{6}$ km/hr = 8 km/hr.

   II. Speed downstream = $\frac{48}{4}$ km/hr = 12 km/hr.

   Speed of the boat = $\frac{1}{2}(8+12)$ km/hr = 10 km/hr.

   Thus, I and II together give the answer.

   ∴ Correct answer is (*e*).

4. Let man's speed in still water be x km/hr.

   I. Speed of the stream = $\frac{x}{3}$ km/hr.

   Speed downstream = $\left(x+\frac{x}{3}\right)$ km/hr = $\frac{4x}{3}$ km/hr.

   Speed upstream = $\left(x-\frac{x}{3}\right)$ km/hr = $\frac{2x}{3}$ km/hr.