BOATS AND STREAMS

INTRODUCTION

Like the previous chapter 'trains', this chapter is also based on time, speed, and distance. In this chapter we will deal with the problems related speed of boat in still water and running water, upstream, downstream etc. Normally by speed of the boat or swimmer we mean the speed of the boat in still water.

SOME IMPORTANT POINTS

1. If the speed of water in any river or stream is zero, then it is called still water.

2. If the water in the river is moving in any direction, then it is called running water or stream water.

3. If the water is moving along the direction of stream, then it is called downstream.

4. If the water is moving against the direction of stream, then it is called upstream.

5. Let the speed of boat (swimmer) in still water be x km/hr and the speed of stream is y km/hr, then the boat's (swimmer's)

6. If the speed of boat (swimmer) in downstream is 'a' km/hr and speed of boat (swimmer) in upstream is 'b' km/hr then, the boat's (swimmer's)

   Speed in still water = $\frac{a+b}{2} km/hr$

   Speed of stream water = $\frac{a-b}{2} km/hr$

7. When the downstream distance is equal to the upstream distance then average speed for the total journey is given by

$$\frac{Speed\ in\ downstream\ \times speed\ in\ upstream}{speed\ of\ boat\ (swimmer) in\ still\ water}$$

8. When the downstream distance is equal to the upstream distance then the time taken by the boat (swimmer) to cover the whole journey is given by

$$\frac{boat's\ (swimmer) speed\ in\ still\ water \times total\ distance}{speed\ in\ downstream \times speed\ in\ upstream}$$

EXAMPLES

Q. 1. A person can row down a stream at 6 km per hour and up the same stream at 3 km per hour. Find his rate in still water.

a) 2.7 km/hr b) 3.5 km/hr
c) 4.5 km/hr d) 5 km/hr

Q. 2. A man can row at the rate of 9 km per hr in still water. At what rate can he row against a stream flowing 7 km per hr?

a) 2 km/hr b) 6 km/hr
c) 4 km/hr d) 3.8 km/hr

Q. 3. A man rows 15 km downstream in 3 hours 45 minutes and 5 km upstream in 2 hours 30 minutes. Find his speed in still water and also the speed of the current.

a) 9km/hr b) 6 km/hr
c) 1 km/hr d) 4 km/hr

Q. 4. A man row at a speed of 9 km/hr in still water and back to the place in the river which flows at 3 km/hr. Find his average speed of the total journey?

a) 3 km/hr **b) 8 km/hr**
c) 12 km/hr d) 20 km/hr

Q. 5. A man can row 30 km upstream and 44 km downstream in 10 hours. Also he can row 40 km upstream and 55 km downstream in 13 hours. Determine his speed in still water and speed of the stream.

a) 2 km/hr b) 5 km/hr
c) 3 km/hr d) 8 km/hr

Q. 6. A man can row 6 km/hr in still water and he finds that it takes twice as long in rowing up as in rowing down the river. Find the rate of the current.

a) 2 km/hr b) 3 km/hr
c) 5 km/hr d) 12 km/hr

Q. 7. If the downstream rate of a boat is 12 km/hr and upstream rate is 9 km/hr. Also, it takes 4 hours 12 minutes in going from P to Q and from Q to P back. Find the distance between P and Q.

a) 11.5 km b) 15 7 km
c) 31.3 km **d) 21.6 km**

MODERATE LEVEL PRACTICE EXERCISE

1. A person can row down a stream at 6 km/hr and up the same stream at 3 km per hour. The rate of flow of stream is

a) 1.5 km/hr b) 2.5 km/hr
c) 4.5 km/hr d) 9 km/hr

2. A person can row at the rate of x km/hr upstream and at the rate of y km/hr downstream. The rate in still water is

a) x + y b) x – y
c) $\frac{x-y}{2}$ **d)** $\frac{x+y}{2}$

3. A person rows 1 km downstream in 10 minutes and upstream in 30 minutes. The velocity of current is

a) 1 km/hr **b) 2 km/hr**
c) 4 km/hr d) 1.5 km/hr

4. A boat goes downstream at 6 km/hr and upstream at 2 km/hr. The speed of boat in still water is

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

5. A boat takes thrice as much time to sail in the upstream of a river as it would have taken to sail in the downstream. If the speed of the water is 5 km/hr, then the speed of boat in still water is

a) 4 km/hr b) 6 km/hr
c) 10 km/hr d) 12 km/hr

6. A boat is rowed down a river at the speed of 1 km in 6 minutes and up the river at the speed of 6 km per hour. The speed of current of water is

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

7. If Anirudh rows 15 km upstream and 21 km downstream taking 3 hour each time, then the speed of current is

a) 1 km/hr b) 1.5 km/hr
c) 2 km/hr d) 12 km/hr

8. A steamer is going at a speed of 4.5 km/hr in still water to a certain upstream point and back to the starting point in a river which flows at 1.5 km/hr. The average speed of the steamer for the total journey is

a) 12 km/hr b) 9 km/hr
c) 6 km/hr **d) 4 km/hr**

9. A man rows 750 m in 675 seconds against the stream and returns in 450 seconds. His rowing speed in still water is

a) 3 km/hr b) 4 km/hr
c) 5 km/hr d) 6 km/hr

10. A person can swim in still water at 4 km/hr. If the speed of water is 2 km/hr, how many hours will the man take to swim back against the current for 6 km?

a) 2 hrs **b) 3 hrs**
c) 4 hrs d) 5 hrs

11. A man can row $9\frac{1}{3}$ km/hr in still water and finds that it takes time 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) 14 km/hr

12. 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) 3.6 km b) 2.4 km
c) 1.2 km d) 1.8 km

13. A boat is rowed down a river at 16 km per hour and up the river at 8 km per hour then the velocity of the river is

a) 4 km/hr b) 8 km/hr
c) 12 km/hr d) 16 km/hr

14. A boat goes 40 km upstream in 8 hours and a distance of 36 km downstream in 6 hours. The speed of boat in standing water is

a) 5 km/hr **b) 5.5 km/hr**
c) 6 km/hr d) 6.5 km/hr

15. Speed of a boat in still water is 9 km/hr and the speed of the stream is 1.5 km/hr. 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**

16. A man can row a boat at 10 km/hr in standing water. If the speed of the stream is 6 km/hr, the time taken to row a distance of 80 km down the stream is

a) 8 hours **b) 5 hours**
c) 10 hours d) 20 hours

17. A boat takes 4 hours for travelling downstream from point A to point B and coming back to point A upstream. If the velocity of the stream is 2 km/hr and the speed of the boat in still water is 4 km/hr. The distance between A and B is

a) 4 km **b) 6 km**

c) 8 km d) 9 km