BOATS AND STREAMS

Q1. A boatman can row a certain distance down the stream in 2 hours and can row the same distance up the stream in 3 hours. If the velocity of the stream is 4km/hr, what is the speed of the boat in still water?

Answer:

Let the speed of the boat in still water be 'b' km/hr,
And let the distance travelled be ’d’ km.
When rowing downstream (i.e., with the stream),
The effective speed of the boat is the sum of its speed in still water and the velocity of the stream. So, the speed downstream is (b + 4) km/hr.
Similarly, when moving upstream (i.e., against the stream), the effective speed of the boat is the difference between its speed in still water and the velocity of the stream. So, the speed upstream is (b - 4) km/hr.

Using the formula:
Time = Distance / Speed
We have:
Downstream time = 2 hours, D / (b + 4) = 2, D = 2(b + 4)
Upstream time = 3 hours, D / (b - 4) = 3, D = 3(b - 4)
Equating the expressions for 'd', we get:
2(b + 4) = 3(b - 4) => 2b + 8 = 3b - 12
B = 20
Therefore, the speed of the boat in still water is 20 km/hr.

Q2. A man can row 9(1/3) km/hr in still water. He finds that it takes thrice as much time to row upstream as to row downstream (same distance). Find the speed of the current.

Answer:

Let the speed of the current be 'c' km/hr, and the speed of the boat in still water be 'b' km/hr.
We know that the man can row at a speed of 9(1/3) km/hr in still water, so we have:
b = 9(1/3) km/hr
Let the distance travelled be 'd' km.
When rowing downstream (i.e., with the stream), the effective speed of the boat is the sum of its speed in still water and the velocity of the stream. So, the speed downstream is (b + c) km/hr.
Similarly, when rowing upstream (i.e., against the stream), the effective speed of the boat is the difference between its speed in still water and the velocity of the stream. So, the speed upstream is (b - c) km/hr.
Let the time taken to row downstream be 't' hours. Then, the time taken to row upstream is 3t hours.

Using the formula:
Time = Distance / Speed
We have:
Downstream time = t hours
d / (b + c) = t
d = t(b + c)
Upstream time = 3t hours
d / (b - c) = 3t
d = 3t(b - c)

Equating the expressions for 'd', we get:
t(b + c) = 3t(b - c)
b + c = 3b - 3c
4c = 2b
c = b/2
Substituting the value of 'b' we got earlier, we get:
c = 9(1/3) / 2 = 4(2/3) km/hr
Therefore, the speed of the current is 4(2/3) km/hr.

Q3. A boat travels from A to B along the stream and from B to A against the stream in 3 hours. If the velocity of the boat in still water is 4 km/hr, what is the distance between A and B?

Answer:

Using the information given, we can set up the following equations:
Let d be the distance between A and B, and let c be the speed of the stream.
Downstream journey (A to B): Speed of boat = 4 + c km/hr Time = d/(4 + c) hr
Upstream journey (B to A): Speed of boat = 4 - c km/hr Time = d/(4 - c) hr
Total time for both journeys is given as 3 hours: d/(4 + c) + d/(4 - c) = 3
Solving for c, we get: c = 2/3 km/hr (since we cannot have a negative speed)
Substituting c = 2/3 km/hr into 8d = 48 - 5c^2, we get: d = 10 km
Therefore, the distance between A and B is 10 km.
Answer: 10 km.

Q4. A motorboat travels 16 km in 2 hours against the flow of river and travels next 8 km along the flow of the river in 20 minutes. How long will it take motorboat to travel 48 km in still water?

Answer:

Speed = distance/time
Speed upstream = 16/2 = 8 km/hr
Speed downstream =8/(20/60) = 480/20 = 24 km/hr
∴ **Speed in still water =** 1/2 **(speed downstream +speed upstream)**
= 1/2 (24+8)=16 km/hr
Required time = distance/speed
= 48/16
=3 hour

Q5. A boat running upstream takes 9 hours 48 minutes to cover a certain distance, while it takes 7 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?

Answer:

c) 6:1

Q6. 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:

Answer:

Speed upstream =9−1.5=7.5kmph
Speed downstream =9+1.5=10.5kmph
Total distance covered upstream=105km
Total distance covered downstream=105km
Time upstream=7.5105=14hrs
Time downstream=10.5105=10hrs

Total Time=14+10=24hrs
Hence the correct option is (D). => 24 hours

Q7.In one hour, a boat goes 11 km/hr along the stream and 5 km/hr against the stream. The speed of the boat in still water (in km/hr) is:

Answer:

Speed in still water = 12 (11 +5) kmph = 8 kmph.

Q8. 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

Answer:

Formula used:
Speed of the boat in still water = (Downstream speed + Upstream speed)/2
Speed of stream = (Downstream speed – Upstream speed)/2

Calculation:
Ratio, downstream time: upstream time = 1: 2
⇒ Ratio, downstream speed: upstream speed = 2: 1 (∵ when the distance is the same, the ratio of speed is inversely proportional to the ratio of time taken)
Suppose, Downstream speed = 2x and Upstream speed = x Speed of the boat in still water = (2x + x)/2 = 3x/2 Speed of stream = (2x – x)/2 = x/2

∴ required ratio = 3x/2: x/2 = 3: 1

Q8. 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

Answer:

Speed of current = 5 - 3.5 = 1.5 km/hr
Man's speed along the current = Man speed in still water + speed of current.
⇒ Man's speed along the current = 5 + 1.5 = 6.5 km/hr

Q9. The time taken by a man to row his boat upstream is twice the time taken by him to row the same distance downstream. If the speed of the boat in still water is 42 kmph, find the speed of the stream?

Answer:

Let's assume that the speed of the stream is "s" km/h, and the speed of the boat in still water is "b" km/h.
When rowing upstream (against the stream), the effective speed of the boat is reduced by the speed of the stream, so the speed of the boat relative to the water is:
b - s km/h

When rowing downstream (with the stream), the effective speed of the boat is increased by the speed of the stream, so the speed of the boat relative to the water is:
b + s km/h
Let's assume that the distance travelled both upstream and downstream is "d" km. According to the problem, the time taken to row upstream is twice the time taken to row downstream. We can express this as an equation:
Time taken upstream = 2 x Time taken downstream
We know that time = distance / speed, so we can write this equation as:
d / (b - s) = 2 x d / (b + s)
Simplifying this equation, we get:
b - s = 2 (b + s)
b - s = 2b + 2s
s = b / 3
We are also given that the speed of the boat in still water is 42 km/h, so we can substitute this value for "b" to get:
s = 42 / 3 = 14 km/h
Therefore, the speed of the stream is 14 km/h.

Q10. A man can row 30 km downstream and 20 km upstream in 4 hours. He can row 45 km downstream and 40 km upstream in 7 hours. Find the speed of man in still water?

Answer:

A man can row 30 km downstream and 20 km upstream in 4 hours. He can row 45 km downstream and 40 km upstream in 7 hours.
We have to find the speed of man in still water.
Let the speed of man is x km/h and stream is y km/h.

Case 1: the man can row 30 km downstream and 20 km upstream in 4 hrs.
$\frac{30}{(x+y)} + \frac{20}{(x-y)} = 4$
Let 1/(x + y) = P and 1/(x - y) = Q
⇒30P + 20Q = 4
⇒15P + 10Q = 2 ... (1)

Case 2: he can row 45 km downstream and 40 km upstream in 7 hrs.
$\frac{45}{(x+y)} + \frac{40}{(x-y)} = 7$
⇒45P + 40Q = 7 ... (2)
From equations (1) and (2) we get,
⇒4 (15P + 10Q) - (45P + 40Q) = 2 × 4 - 7
⇒60P - 45P = 1
⇒P = 1/15 = 1/(x + y)
⇒x + y = 15 km/h ... (3)
And Q = 1/10 = 1/(x - y)
⇒x - y = 10 ... (4)
From equations (3) and (4) we get,
x = 12.5 km/h and y = 2.5 km/h
Therefore the speed of man in still water is 12.5 km/h.