SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

19GET276 – VQAR II

II YEAR/ IV SEMESTER

UNIT 1 – QUANTITATIVE ABILITY III

TOPIC – BOATS AND STREAMS

BOATS AND STREAMS

1. **Downstream/Upstream:**

   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:

   Speed downstream = $(u + v)$ km/hr.

   Speed upstream = $(u - v)$ km/hr.

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

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

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

BOATS AND STREAMS

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.

A. 2 hours

B. 3 hours

C. 4 hours

D. 5 hours

Answer: Option **C**

Explanation:

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

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

BOATS AND STREAMS

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:

A. 8.5 km/hr

B. 9 km/hr

C. 10 km/hr

D. 12.5 km/hr

Answer: Option **C**

Explanation:

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.

BOATS AND STREAMS

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:

A. 3 km/hr

B. 5 km/hr

C. 8 km/hr

D. 9 km/hr

Answer: Option **C**

Explanation:

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

BOATS AND STREAMS

A motorboat, whose speed in 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

Answer: Option **B**

Explanation:

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

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

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

$$\therefore \frac{30}{(15 + x)} + \frac{30}{(15 - x)} = 4\frac{1}{2}$$

$$\Rightarrow \frac{900}{225 - x^2} = \frac{9}{2}$$

$$\Rightarrow 9x^2 = 225$$

$$\Rightarrow x^2 = 25$$

$$\Rightarrow x = 5 \text{ km/hr.}$$

BOATS AND STREAMS

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?

A. 4 km/hr

B. 6 km/hr

C. 8 km/hr

D. Data inadequate

Answer: Option **B**

Explanation:

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.

BOATS AND STREAMS

The speed of a boat in still water in 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

Answer: Option **D**

Explanation:

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

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

BOATS AND STREAMS

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

Answer: Option **A**

Explanation:

Speed downstream = (5 + 1) kmph = 6 kmph.

Speed upstream = (5 - 1) kmph = 4 kmph.

Let the required distance be x km.

Then, $\frac{x}{6} + \frac{x}{4} = 1$

$\Rightarrow 2x + 3x = 12$

$\Rightarrow 5x = 12$

$\Rightarrow x = 2.4$ km.

BOATS AND STREAMS

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:

A. 2 mph

B. 2.5 mph

C. 3 mph

D. 4 mph

Answer: Option **A**

Explanation:

Let the speed of the stream x mph. Then,

Speed downstream = $(10 + x)$ mph,

Speed upstream = $(10 - x)$ mph.

$$\therefore \quad \frac{36}{(10 - x)} - \frac{36}{(10 + x)} = \frac{90}{60}$$

$$\Rightarrow 72x \times 60 = 90\,(100 - x^2)$$

$$\Rightarrow x^2 + 48x - 100 = 0$$

$$\Rightarrow (x + 50)(x - 2) = 0$$

$$\Rightarrow x = 2 \text{ mph.}$$

BOATS AND STREAMS

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

Answer: Option **C**

Explanation:

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.

BOATS AND STREAMS

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

Answer: Option **D**

Explanation:

Speed upstream = 7.5 kmph.

Speed downstream = 10.5 kmph.

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

BOATS AND STREAMS

A man rows to a place 48 km distant and come 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. 2 km/hr

D. 2.5 km/hr

Answer: Option **A**

Explanation:

Suppose he move 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.

BOATS AND STREAMS

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:

A. 2 : 1

B. 3 : 1

C. 3 : 2

D. 4 : 3

Answer: Option **B**

Explanation:

Let man's rate upstream be x kmph.

Then, his rate downstream = $2x$ kmph.

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

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

$= 3 : 1.$

THANK YOU