Boats and Streams

The water of a stream, usually, keeps flowing at a certain speed, in a particular direction. This speed is called the current of the stream. A boat develops speed because of its engine power. The speed with which it travels when there is no current is called speed of boat in still water. When the boat moves in the direction of the current is said to be with the stream/ current or downstream. When the boat moves in the direction opposite to that of the current, it is said to be against the stream is called upstream.

Eg:-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

If the speed downstream is u km/hr and the speed upstream is v km/hr, then:

* Speed of boat in still water = ½(u+v)km/hr

* Speed (Rate) of stream = ½ (u-v)km/hr

Examples

a) A man can row a boat 12 km/h with the stream and 8km/h against the stream.

Find his speed in still water.

a) 2km/hr
b) 4km/hr
c) 8km/hr
d) 10km/hr

Solution: Speed of boat in still water = ½(u+v) km/hr = ½ (12+8)=10km/hr

b) A man can row a boat 27km/h with the stream and 11km/h against the stream.

Find speed of stream

a) 2km/hr
b) 4km/hr
c) 8km/hr
d) 10km/hr

Solution: Speed (Rate) of stream = ½ (u-v) km/hr = ½ (27-11)=8km/hr

c) A boat running downstream covers a distance of 16km 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)4km/hr
b)6km/hr
c)8km/hr
d) None of these

Rate of downstream=(16/2) kmph=8kmph
Rate of upstream =(16/4) kmph=4kmph
Therefore Speed in still water=1/2(8+4) kmph=6kmph

Note: If ratio of downstream and upstream speeds of a boat is 'a:b.'

Then ratio of time taken= b:a

Speed of stream=a-b/a+b *Speed in still water

Speed in still water =a+b/a-b *Speed of stream

Exercise Questions

1. A man rows downstream 32 km and 14km upstream. If he takes 6 hours to cover each distance, then the velocity (in kmph) of the current is:

a)1/2
b)1
c)1and ½
d)2

Solution: Rate downstream=(32/6)kmph; Rate upstream=(14/6)kmph
Velocity of current=1/2(32/6-14/6)kmph=3/2kmph=1.5kmph

2. In one hour, a boat goes 11km along the stream and 5km against the stream.

The speed of the boat in still water (in km/hr)is:

a)3
b)5
c)8
d)9

Solution: Speed in still water=1/2(11+5)kmph=8kmph

3. Speed of a boat in still water is 16km/h. If it can travel 20km downstream in the same time as it can travel 12 km upstream, the rate of stream is.

a)1km/h
b)2km/h
c)4km/h
d)5km/h

Solution: Speed downstream: Speed upstream=20:12=5:3

Speed of current=5-3/5+3*16=4km/h

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Exercise Questions

1. A person can row 750 metres against the stream in 11 ¼ minutes and returns in 7 ½ minutes. The speed of the person in in still water is :

   a) 2 km/hr b)3 km/hr c)4km/hr d) 5 km/hr

2. If a man rows at the rate of 6 kmph in still water and his rate aginst the current is 4.5 kmph, then the man's rate along the current is

   a) 6 kmph b)7.5 kmph c) 6.5kmph d) 8 kmph

3. A boat moves upstream at the rate of 1 km in 20 minutes and down stream 1 km in 12 minutes. The speed of the current is :

   a) 1 kmph b)2 kmph c)3 kmph d)2.5 kmph

4. A man can row a boat at 10 kmph in still water and the speed of the stream is 8 kmph. What is the time taken to row a distance of 90 km down the stream ?

   a) 8hrs b)5 hrs c) 15 hrs d) 20 hrs

5. If athul rows 16 km upstream and 24 km down steam taking 4 hours each, then the speed of the stream

   a) 1 kmph b)2 kmph c)1.5 kmph d)2.5 kmph

Answer & Explanations

1. The speed in upstream = .75 * (4/45)*60 = 4 kmph

The speed in downstream = .75 *(2/15) *60 = 6 kmph

Speed in still water = ½(4+6) = 5 kmph

2. Let the rate along the current be x kmph

Then, ½ (x+ 4.5) = 6 :. x = 7.5

3. Rate upstream = (1/20 *60) = 3 kmph

Rate dowm stream = 1/12 * 60 = 5 kmph

Rate of the current = ½ (5-3) = 1 kmph

4. Speed in down stream = 10 +8 = 18

Time taken to cover 90 km down stream = 90/18 = 5 hrs.

5. Speed upstream = 16/4 = 4 kmph

Speed down stream = 24/4 = 6 kmph

Speed of stream = ½ (6-4) = 1 kmph