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:

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=1/2(a+b)km/hr
rate of stream=1/2(a-b)km/hr

SOLVED EXAMPLES

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

Sol. Rate in still water=1/2(10+7)km/hr=8.5 km/hr.
Rate of current=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 2hours30minutes to cover a distance of 5km upstream. find the speed of the river current in km/hr.

Sol. rate downstream=(15/3 ¾)km/hr=(15*4/15)km/hr=4km/hr.
Rate upstream=(5/2 ½)km/hr=(5*2/5)km/hr=2km/hr.
Speed of current=1/2(4-2)km/hr=1km/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=3xkmph.
So,2x=18 or x=9.
Rate upstream=9 km/hr,rate downstream=27 km/hr.
Hence,rate of stream=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 placeA first?

Sol. Clearly the cyclist moves both ways at a speed of 12 km/hr.
The boat sailor moves downstream @ (10+4)i.e.,14 km/hr and upstream @ (10-4)i.e., 6km/hr.
So,average speed of the boat sailor=(2*14*6/14+6)km/hr
=42/5 km/hr=8.4 km/hr.
since the average speed of the cyclist is greater ,he will return ta A first.

EX.5. A man can row 7 ½ kmph in still water.if in a river running at 1.5 km/hr an hour,it takes him 50 minutes to row to a place and back,how far off is the place?

Sol. Speed downstream =(7.5+1.5)km/hr=9 km/hr;
Speed upstream=(7.5-1.5)kmph=6kmph.
Let the required distance be x km.then,
x/9+x/6=50/60.
2x+3x=(5/6*18)
5x=15
x=3.
Hence,the required distance is 3km.

EX.6. In a stream running at 2kmph,a motar boat goes 6km upstream and back again to the starting point in 33 minutes.find the speed of the motarboat in still water.

Sol.let the speed of the motarboat in still water be x kmph.then,
6/x+2 +6/x-2=33/60
$11x^2$-240x-44=0
$11x^2$-242x+2x-44=0
(x-22)(11x+2)=0
x=22.

EX.7.A man can row 40km upstream and 55km downstream in 13 hours also, he can row 30km upstream and 44km 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,40/x +55/y =13…(i) and 30/x +44/y =10
Multiplying (ii) by 4 and (i) by 3 and subtracting ,we get:11/y=1 or y=11.
Substituting y=11 in (i),we get:x=5.
Rate in still water =1/2(11+5)kmph=8kmph.
Rate of current=1/2(11-5)kmph=3kmph