**Chapter-16s**

**Boats and Streams**

**Important Facts and Formula**

1. The speed of water or stream that denoted by v km/hr.
2. Speed of boat or boatman in calm water which we denoted by u km/hr.
3. **Speed downstream =** (u + v) km / hr
4. **Speed upstream =** (u – v) km / hr.
5. In water, the direction along with stream   is called Downstream.
6. The direction of boat against the stream is called Upstream.

If the **speed downstream is x km / hr** and the **speed upstream is y km / hr,**then

* **Speed in still water =**1 / 2 ( x + y ) km / hr
* **Rate of Stream =** 1 / 2 ( x – y ) km / hr .

**Example:**   
A boy can row upstream at 6 km/hr and downstream at 12 km/hr. Find boy’s rate in still water and the rate of current?

**Answer:**  
We Know the formula of  
Rate in still water that is = 1 / 2 ( x + y )km /hr  
So we applied formula 1 / 2 ( 12 + 6 ) = 1 / 2 X 18 = 9 km/ hr. and  
we also know the formula of  
Rate of current that is = 1 / 2 ( x – y )km /hr

So we applied formula of 1 / 2 (12 – 6) = 3 km / hr.\

**Example:** A boy can row downstream at 24 km and upstream 16 km . If he has 8 hours to cover each distance, then what is the velocity of the current?

**Answer:**  
The rate of downstream = 24 / 8 km/hr ,

The rate of  upstream = 16 / 8 km /hr .  
So, the velocity of the current is  1 / 2 ( 24 / 8 – 16 / 8 ) km /hr = 8 / 8 = 1 km /hr

**Example:**  
A man can go 40 km/hr upstream  36 km/hr downstream . Find the speed of current & speed of man in still water?  
**Answer:**  
So , Speed of current Y is  
= U – V / 2  
= 40 – 36 / 2 =  4 / 2  
= 2 km/hr .

So, Speed of man in still water x is  
= U + V / 2  
= 40 + 36 / 2  
= 38 km/hr

**Example:**  
A small ship covers a certain distance downstream in 1 hour ,when it comes back in 3 /2 hours . If the speed of the stream be 4 km/hr,  
what is the speed of the boat in still water ?  
**Answer:**  
Suppose the speed of the ship in still water be x km/hr , Then  
speed of downstream = ( x + 4 ) km /hr .  
Speed of upstream =  ( x – 4 ) km /hr .  
So , ( x + 4 ) x 1 =  ( x – 4 ) x 3 / 2  
2x + 8 = 3x – 12  
= 3x – 2x = -12 – 8  
= x = 20 km /hr .

**Example:**  
If a boat goes 7km upstream in 21km and the stream is 5 kmph, then the speed of the boat?  
**Answer:**  
Rate of stream = d / t = 7 x 60 / 21 = 20 kmph.  
Let speed in still water be x km / hr.  
Then, speed upstream = (x – 5) km /hr.  
So, (x – 5) = (20 – 5) = 15 km /hr.

**Example:**  
A boat can travel with a speed of 14 km / hr in still water. If the speed of the stream is 4 km/ hr, find the time taken to go 72 km downstream.  
**Answer:**  
Speed of downstream (14 + 4 ) = 18 km/ hr  
Time taken to travel 72 km downstream  
= 72 / 18 = 4 hrs  
So time taken to go downstream is 4 hrs.

**Example:**  
A man can row upstream at 10 km /hr And downstream at 18 kmph. what is the speed of the stream ?  
**Answer:**  
Speed of stream = 1 / 2(a – b )

1 / 2 (18 – 10) kmph = 4 kmph

**Example:**  
Kapil can row a certain distance downstream in 8 hours and upstream the distance in 10 hours , If the stream flows rate at of 4 km / hour then , Find the speed of Kapil in still water .  
**Answer:**  
Speed of Kapil in still water be z km /hr  
downstream speed = ( u – v)  
upstream speed = ( u + v)

**Shortcut trick:**  
Speed of Kapil in still water is =  
rate ( upstream speed + downstream speed /  upstream speed – downstream speed )  
4 ( 10 + 8 ) / 10 – 8 = 36 km / hr .