

Boat and Stream Concepts

- 1) **Still water:** The water of a river or any other water body which is not flowing is known as still water.
- 2) **Stream:** It is the flowing water of a river which is moving at a certain speed.
- 3) **Upstream:** The boat or a swimmer moving against the stream is known as moving upstream i.e. against the flow of water.
- 4) **Downstream:** The boat or a swimmer moving along the stream is known as moving downstream i.e. along the flow of water.

Points to remember:

- 1) If the speed of the boat or swimmer is X km/hr and the speed of the stream is Y km/hr,
The speed of the boat or swimmer in the direction of the stream is known as speed downstream. It is given by;
Speed downstream = $(X+Y)$ km/hr
And, the speed of the boat or swimmer against the stream is known as speed upstream. It is given by;
Speed upstream = $(X-Y)$ km/hr

- 2) Speed of man or boat in still water is given by;

$$= \frac{1}{2} (\text{speed downstream} + \text{speed upstream})$$

- 3) Speed of the stream is given by;

$$= \frac{1}{2} (\text{speed downstream} - \text{speed upstream})$$

- 4) A man can row at a speed of X km/hr in still water. If the speed of the stream is Y km/hr and the man rows the same distance up and down the stream, his average speed for the entire journey is given by;

$$= \frac{\text{speed upstream} * \text{speed downstream}}{\text{speed of man in still water}} = \frac{(X-Y) * (X+Y)}{X} \text{ km/hr}$$

- 5) A man can row a boat in still water at X km/hr. If the stream is flowing at Y km/hr it takes him t hours more to row upstream than to row downstream to cover the same distance. The distance is given by;

$$\text{Distance} = \frac{(X^2 - Y^2)t}{2Y}$$

- 6) A man can swim in still water at X km/hr. If the stream is flowing at Y km/hr it takes him t hours to reach a place and return back to the starting point. The distance between the place and the starting point is given by;

$$\text{Distance} = \frac{(X^2 - Y^2)t}{2X}$$

- 7) A boat or swimmer covers a certain distance downstream in t_1 hours and returns the same distance upstream in t_2 hours. If the speed of the stream is Y km/hr, the speed of boat or man in still water is given by;

$$= Y \left(\frac{t_2 + t_1}{t_2 - t_1} \right) \text{ km/hr}$$

- 8) A boat or swimmer takes K times as long to move upstream as to move downstream to cover a certain distance. If the speed of the stream is Y km/hr, the speed of the boat or man in still water is given by;

$$= Y \left(\frac{K+1}{K-1} \right) \text{ km/hr}$$