BOAT AND STREAM

There are a variety of subconcepts that are related to answering questions based on boat and streams concept. Given below are the four terms which are important for a candidate to know to understand the concept of streams.

- **Stream –** The moving water in a river is called a stream.
- **Upstream –** If the boat is flowing in the opposite direction to the stream, it is called upstream. In this case, the net speed of the boat is called the upstream speed
- **Downstream –** If the boat is flowing along the direction of the stream, it is called downstream. In this case, the net speed of the boat is called downstream speed
- **Still Water –** Under this circumstance the water is considered to be stationary and the speed of the water is zero

The questions from this topic may seem to be confusing until a candidate is aware of the above-mentioned terms and how they may be used for answering the questions.

This topic basically deals with calculating the speed of anything in the water when it flows along with the flow of water or in the opposite direction.

Upstream and Downstream – Formula

Given below are a few important formulas with the help of which you can solve the questions based on boat and streams.

Candidates must learn these formulas by heart to ensure they are able to answer the simple formula based questions correctly and do not end up losing marks for direct questions.

- **Upstream = (u−v) km/hr**, where “u” is the speed of the boat in still water and “v” is the speed of the stream
- **Downstream = (u+v)Km/hr**, where “u” is the speed of the boat in still water and “v” is the speed of the stream
- **Speed of Boat in Still Water = ½ (Downstream Speed + Upstream Speed)**
- **Speed of Stream = ½ (Downstream Speed – Upstream Speed)**
- **Average Speed of Boat = {(Upstream Speed × Downstream Speed) / Boat’s Speed in Stii Water}**
- If it takes “t” hours for a boat to reach a point in still water and comes back to the same point then, the distance between the two points can be calculated by **Distance = {(u^2-v^2) × t} / 2u**, where “u” is the speed of the boat in still water and “v” is the speed of the stream
- If it takes “t” hours more to go to a point upstream than downstream for the same distance, the formula for distance will be: **Distance = {(u^2-v^2) × t} / 2v**, where “u” is the speed of the boat in still water and “v” is the speed of the stream

- If a boat travels a distance downstream in “t1” hours and returns the same distance upstream in “t2” hours, then the speed of the man in still water will be: **Speed of Man in Still Water = [v × {(t2+t1) / (t2-t1)}] km/hr**, where“v” is the speed of the stream

Q 1. A person can swim in water with a speed of 13 km/hr in still water. If the speed of the stream is 4 km/hr, what will be the time taken by the person to go 68 km downstream?

1. 2.5 hours
2. 3 hours
3. 4 hours
4. 3.5 hours
5. 4.5 hours

Answer: (3) 4 hours

Solution:

Downstream Speed = (13+4) km/hr = 17 km/hr

To travel 68 km downstream.

Time taken = 68/17 = 4 hours

Q 2. In one hour, a boat goes 13 km/hr in the direction of the stream and 7 km/hr against the direction of the stream. What will be the speed of the boat in still water?

1. 8 km/hr
2. 10 km/hr
3. 14 km/hr
4. 6 km/hr
5. Cannot Be Determined

Answer: (2) 10 km/hr

Solution:

According to the formula,

Speed of a boat in still water = ½ (DownstreamSpeed + UpstreamSpeed)

Speed of boat in still water = ½ (13+7) = ½ × 20 = 10 km/hr

Q 3. A woman can row upstream at 16 km/hr and downstream at 26 km/hr. What is the speed of the stream?

1. 5 km/hr
2. 2 km/hr
3. 4.5 km/hr
4. 21 km/hr
5. 12 km/hr

Answer: (1) 5km/hr

Solution:

According to the formula,

Speed of the stream = ½ (Downstream Speed – Upstream Speed)

Speed of the stream = ½ (26-16) = ½ × 10 = 5 km/hr

Q 4. A speedboat, whose speed in 15 km/hr in still water goes 30 km downstream and comes back in a total of 4 hours 30 minutes. What is the speed of the stream in km/hr?

1. 2.5 km/hr
2. 3.5 km/hr
3. 4 km/hr
4. 5 km/hr
5. 3.25 km/hr

Answer: (4) 5 km/hr

Solution:

Let the speed of the stream be x km/hr

Upstream Speed = 15 + x

Downstream Speed = 15 – x

So, {30 / (15+x)} + {30 / (15-x)} = 4 ½ (4 hours 30 minutes)

⇒ {900 / (225-x2)} = 9/2

⇒ $9x^2 = 225$

⇒$x^2 = 25$

⇒x = 5

Q 5. A boat is moving 2 km against the current of the stream in 1 hour and moves 1 km in the direction of the current in 10 minutes. How long will it take the boat to go 5 km in stationary water?

1. 1 hr 20 minutes
2. 1 hr 30 minutes
3. 1 hr 15 minutes
4. 30 minutes
5. 45 minutes

Answer: (3) 1 hr 15 minutes

Solution:

Downstream = (1/10 × 60) = 6 km/hr

Upstream = 2 km/hr

Speed in still water = ½ (6+2) = 4 km/hr

So, the time is taken by the boat to go 5km in stationary water = 5/4 hrs = 1 ¼ hrs = 1 hr 15 minutes