Aptitude-Boats-And-Streams

For more notes visit

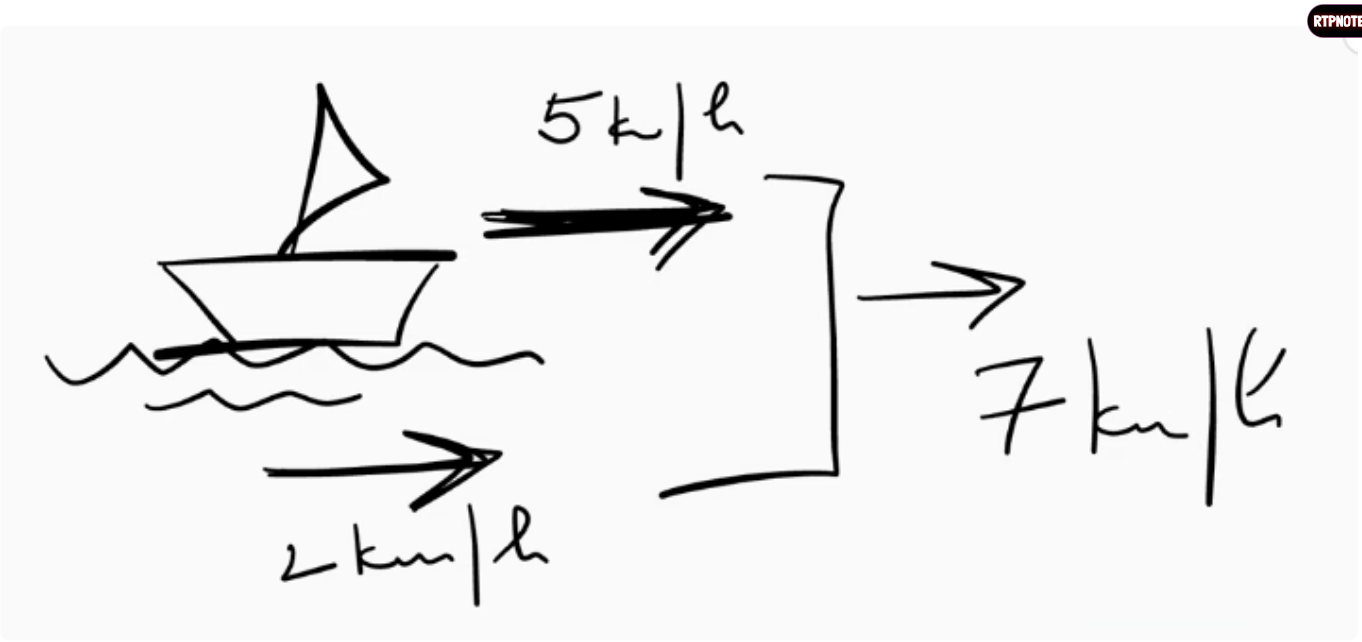
https://rtpnotes.vercel.app

Reference Playlist

https://youtube.com/playlist?list=PL8p2I9GklV454LdGfDOw0KkNazKuA-6B2&feature=shared

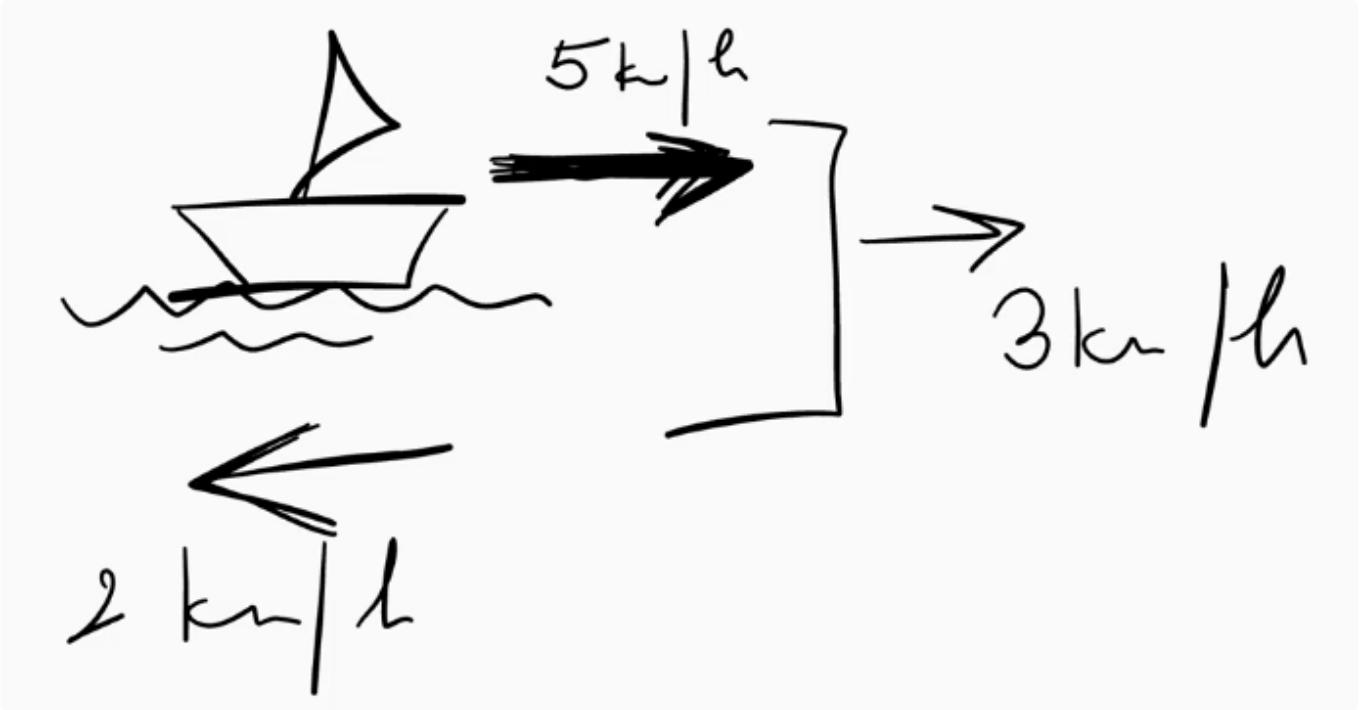
Basic Concept

Downstream



- Let speed of boat = u = 5km/h
- Let speed of water = v = 2km/h
- Resultant speed = u + v = 5+2 = 7km/h

Upstream



- Let speed of boat = u = 5
- Let speed of water = v = 2
- Resultant speed = u-v = 5-2 = 3km/h

Questions

Question 1

A man can row upstream at 4km/h and downstream at 8km/h. Find mans rate in still water and the rate of current

- Upstream speed =4km/hr
- Downstream speed = 8km/hr
- Solving u and v
  - u+v = 8km/hr
  - u-v = 4km/hr
  - 2u = 12km/hr
  - u = 6km/hr = Mans rate in still water
  - 6 + v = 8 => v = 8-6 => v = 2km/hr
- **Man = 6km/hr**
- **Current = 2km/hr**

Question 2

A man rows 24km downstream and 16km upstream, taking 4 hours each time. Find the velocity of the current.

- Speed = distance / time
- Downstream
  - Speed = 24/4 = 6km/hr
- Upstream
  - Speed = 16/4 = 4km/hr
- Solving u and v
  - u+v = 6
  - u-v = 4
  - 2u = 10
  - u = 5km/hr

    - v = 1km/hr
- **Velocity of the current = 1km/hr**

Question 3

A man can row 4.5km/hr in still water and he finds that it takes him twice as long to row up as to row down the river. Find the rate of the stream.

- Given
    - Man can row 4.5km/hr in still water
        - u = 4.5km/hr
    - Time taken for upstream = 2x time taken for downstream
    - Rate of stream = v = ?
- Speed = distance/time
- Distance = Speed x time
- Distance of upstream = distance of downstream
- Let t be time taken for downstream, and 2 t be time taken for upstream
- (u+v) x 2t = (u-v) x t
- 2u + 2v = u-v
- u + 3v = 0
- 4.5 + 3v = 0 (Subbing value of u)
- v = - 4.5/3 = - 1.5km/hr
- **Rate of stream = 1.5km/hr**

Question 4

A man can row 8km/hr in still water. When the river is running at 2km/hr, it takes him 3 hours 12 mins to row to a place and back. How far is the place?

- Given
    - u = 8km/hr
    - v = 2km/hr

- Upstream speed
  - u -v = 6km/hr
- Downstream speed
  - u + v = 10km/hr
- Total time taken = 3 hours 12 minutes
- Distance = speed x time
  - 10t1 = 6t2 => 5t1 = 3t2
  - t1 + t2 = 3hours + 12 minutes = 3 + 1/5
- Solving t1 and t2
  - t2 = 2 hrs
- Distance = 6t2 => Distance = 6x2 = 12km
- **Distance = 12km**

Question 5

A man can row 30km upstream and 44 km downstream in 10 hours, while he can row 40km upstream and 55km downstream in 13 hours. Find the rate of the current and speed of man in still water

Case 1

- Upstream = 30km
- Down = 44km
- Time taken = 10hrs

Case 2

- Upstream = 40km
- Down = 55km
- Time taken = 13 hours

Find u and v? (Speed of man and rate of current)

- From Case 1
  - Distance = speed x time

    - 30km = (u-v) x t1
    - 44km = (u+v) x t2
    - t1 = 30/(u-v)
    - t2 = 44/(u+v)
    - t1+t2 = 10hrs
- From case 2
    - 40 = (u-v) x t1
    - 55 = (u+v) x t2
    - t1 = 40/(u-v)
    - t2 = 55/(u+v)
    - t1 + t2 = 13
- Let p = 1/(u-v)
- Let q = 1/(u+v)
- We get the following equations
    - 30p + 44q = 10
    - 40p + 55q = 13
    - Solving for p and q we get
    - p = 1/5, q = 1/11
- p = 1/5 = 1/ (u-v)
- q = 1/11 = 1/(u+v)
- We get the following equations
    - u-v = 5
    - u+v = 11
    - Solving we get
    - **u = 8km/hr**
    - **v = 3km/hr**

Question 6

A man rows downstream at 15 km/hr and against the stream at 9 km/hr. His speed in still water is ?

- Given

    - u+v = 15km/hr
    - u-v = 9km/hr
    - Solving for u we will get
    - 2u = 24km/hr
    - u = 12km/hr
- **Speed in still water = 12km/hr**

Question 7

A boat covers 12 km against the stream and 22 km along the stream. It takes 5 hours in each case. The speed of the boat in still water is ? (HINT: against the stream = upstream , along the stream = downstream)

- Given
    - 12 = (u-v) x 5
    - 22 = (u+v) x 5
    - Solving for u and v, we will get
- **u = 3.4km/hr**

Question 8

A boat goes 6 km in an hour in still water. It takes thrice as much time in covering the same distance against the current, as it takes along the current. Speed of the current is ?

- u = 6km/hr
- Time taken upstream = 3 x (Time taken downstream)
- v = ?
- Speed= distance / time
- time= distance / speed
- 6/(u-v) = 3 x 6/(u+v)
- 6/(u-v) = 18/(u+v) => 1/(u-v) = 3/(u+v)
- u = 6

- 1/(6-v) = 3 / (6+v) => (6+v) = 3 x (6-v)
  - => 6+v = 18 - 3v
  - => 6 + 4v = 18
  - =>4v = 12
  - => v = 3
- **Speed of current is 3km/hr**

Question 9

A boatman goes 2 km against the current of the stream in 1 hour and goes 1 km along the current in 10 minutes. How long will it take to go 5 km in still water?

- Upstream
  - Speed = distance / time
  - Speed = 2 / 1 = 2km/hr
- Downstream
  - Speed = 1/10/60 = 6km/hr
- Solving for u
  - u+v = 6km/hr
  - u-v = 2km/hr
  - 2u = 8km/hr
  - u = 4km/hr
- Speed = distance / time
  - 4 = 5/t
  - t = 5/4
  - t = 1.25 hours
- **Time taken = 1.25hr = 1 hour 15 minutes**

Question 10

A swimmer can swim at 5 km/hr in still water. When the river flows at 1 km/hr, then he takes 75 minutes to go to a certain point and then coming back to the starting point. How far is this

place?

- Given
  - u = 5km/hr
  - v = 1km/hr
- Upstream time + downstream time = 1 hour 15 minutes = 1.25 hours
- Upstream time = Distance / speed = d/4
- Downstream time = d / 6
- d/4 + d/6 = 1.25
- 3d/12 + 2d/12 = 1.25
- 5d = 1.25 x 12
- d = (1.25 x 12) / 5
- **Distance = 3km**