Answer on Question #47280, Physics, Relativity

A boat takes 2 hours to travel 8km up and 8km down the river when the water was still. How much time does the boat take to make the same trip when the river starts flowing at 4kmph ?

Solution:

Downstream motion of a boat is its motion in the same direction as the flow of the Stream. Upstream motion is exactly the opposite.

There are two parameters in these problem.

1. Speed of the Stream (S): This is the speed with which the river flows.
$$S = 4 \text{ km/h}.$$

2. Speed of the boat in still water (B): If the river is still, this is the speed at which the boat would be moving.
$$B = \frac{16 \text{ km}}{2 \text{ hours}} = 8 \text{ km/h}$$

The effective speed of a boat in upstream $u = B - S = 8 - 4 = 4 \text{ km/h}$

The effective speed of a boat in downstream $d = B + S = 8 + 4 = 12 \text{ km/h}$

Thus, the time of travel is
$$t = \frac{8 \text{ km}}{u} + \frac{8 \text{ km}}{d} = \frac{8}{4} + \frac{8}{12} = 2 + \frac{2}{3} = \frac{8}{3} = 2.67 \text{ hours} = 2 \text{ hours } 40 \text{ min}$$

Answer: $\frac{8}{3}$ hours $= 2.67$ hours $= 2$ hours 40 min