

Answer on Question #48971, Physics, Mechanics | Kinematics | Dynamics

A boatman sails his boat at a speed of 3 km per hour straight to cross a 0.5 km wide river at an angle of 30 degree with the direction of flow whose velocity is 2 km per hour. But the boatman to save his time sails his boat for 5 minutes in this condition. After that he changes the angle to 60 degree and also changes the speed of the boat to 4 km per hour and quickly cross the river. How much time he needed to cross the river totally????

Solution:

The y-component of first velocity is

$$v_{1y} = v_1 \sin \theta_1 = 3 * \sin 30^\circ = 1.5 \text{ km/h}$$

The distance on first part is

$$y_1 = v_{1y} t_1 = 1.5 * \frac{5}{60} = 0.125 \text{ km}$$

The distance on second part is

$$y_2 = d - y_1 = 0.5 - 0.125 = 0.375 \text{ km}$$

The y-component of second velocity is

$$v_{2y} = v_2 \sin \theta_2 = 4 * \sin 60^\circ = 3.464 \text{ km/h}$$

Thus,

$$t_2 = \frac{y_2}{v_{2y}} = \frac{0.375}{3.464} = 0.108 \text{ hour} = 0.108 * 60 \approx 6.5 \text{ min}$$

The total time is

$$t = t_1 + t_2 = 5 + 6.5 = 11.5 \text{ min}$$

Answer: $t = 11.5 \text{ min}$