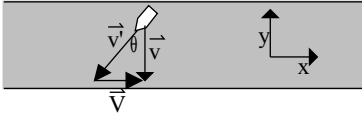


Chapter 3 Problem 27 †



Given

$V = 0.57 \text{ m/s}$ (speed of river)

$v' = 1.3 \text{ m/s}$ (speed of boat relative to the water)

$v = ?$ (speed of the boat relative to the shore)

$d = 63 \text{ m}$ (width of the river)

Solution

a) In what direction should you head your boat?

Since you want to travel straight across the river, you want the x-component of your boats velocity to cancel the velocity of the current. Since the desired direction of travel is perpendicular to the current, the vectors form a right triangle. The angle for the direction of travel is then

$$\sin \theta = \frac{V}{v'} = \frac{0.57 \text{ m/s}}{1.3 \text{ m/s}}$$

$$\theta = 26^\circ \text{ upstream}$$

b) How long will it take to get across the river?

The velocity of the boat with respect to the shore is found using the right triangle in the diagram.

$$\cos \theta = \frac{v}{v'}$$

$$v = v' \cos \theta = (1.3 \text{ m/s}) \cos(26.0^\circ)$$

$$v = 1.17 \text{ m/s}$$

Since the velocity is constant, the time is calculated from the formula $d = v \cdot t$

$$t = \frac{d}{v} = \frac{63 \text{ m}}{1.17 \text{ m/s}} = 54 \text{ s}$$

†Problem from Essential University Physics, Wolfson