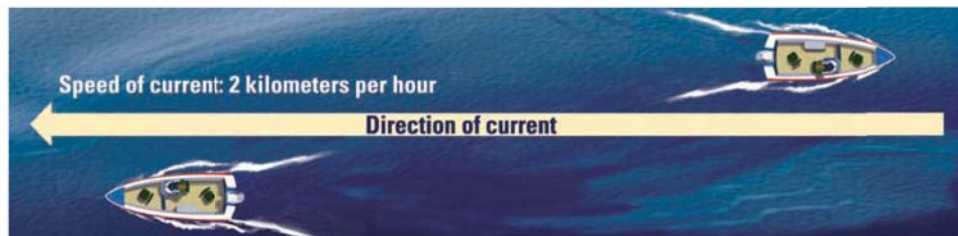




EXAMPLE 6 TAKS REASONING: Multi-Step Problem

BOAT TRAVEL A boat travels 24 kilometers upstream (against the current) and 24 kilometers downstream (with the current) as shown in the diagram. Write an equation that gives the total travel time t (in hours) as a function of the boat's average speed r (in kilometers per hour) in still water. Find the total travel time if the boat's average speed in still water is 10 kilometers per hour.



Solution

STEP 1 Write a verbal model. Then write an equation.

$$\begin{array}{c}
 \text{Total travel time (hours)} \\
 \downarrow \\
 t
 \end{array}
 =
 \frac{\text{Distance upstream (kilometers)}}{\text{Speed of boat going upstream (kilometers/hour)}}
 +
 \frac{\text{Distance downstream (kilometers)}}{\text{Speed of boat going downstream (kilometers/hour)}}$$

$$t = \frac{24}{r-2} + \frac{24}{r+2}$$

COMBINE SPEEDS

When you go upstream, you subtract the speed of the current from the speed at which you travel in still water. When you go downstream, you add the speeds.

STEP 2 Find the sum of the expressions on the right side of the equation.

$$\begin{aligned}
 t &= \frac{24}{r-2} + \frac{24}{r+2} && \text{Write equation.} \\
 &= \frac{24(r+2)}{(r-2)(r+2)} + \frac{24(r-2)}{(r+2)(r-2)} && \text{Rewrite fractions using LCD, } (r-2)(r+2). \\
 &= \frac{24(r+2) + 24(r-2)}{(r-2)(r+2)} && \text{Add fractions.} \\
 &= \frac{48r}{(r-2)(r+2)} && \text{Simplify.}
 \end{aligned}$$

STEP 3 Calculate the value of t when $r = 10$.

$$t = \frac{48(10)}{(10-2)(10+2)} = \frac{480}{(8)(12)} = \frac{480}{96} = 5$$

► The total travel time is 5 hours.



GUIDED PRACTICE for Example 6

9. **WHAT IF?** In Example 6, suppose the speed of the current is 3 kilometers per hour. Find the total travel time.