Problem of the Week
Problem A and Solution
Swimming Practice

Problem

Kunik takes swimming lessons at the community pool. A lap is the length of the pool, which is 25 m. During the lessons Kunik swims laps, from one end of the pool to the other end and back to the starting point. Kunik can swim 10 laps of the pool in 5 minutes if she is doing the front crawl, and she can swim 6 laps of the pool in 4 minutes if she is doing the backstroke.

A) How many metres can Kunik swim in 10 minutes, using the front crawl?

B) Approximately how long will it take Kunik to swim 60 laps of the pool if she uses the front crawl for half the laps and the backstroke for half the laps?

C) If Kunik wants to swim faster when she is in the pool, should she do the front crawl or the backstroke? Justify your answer.

Solution

A) Notice that 10 minutes is twice as much as 5 minutes. Since Kunik can swim 10 laps in 5 minutes using the front crawl, if we double the amount of time in the pool, we expect her to swim double the number of laps. Since double the time is $2 \times 5 = 10$ minutes, then we expect her to swim $2 \times 10 = 20$ laps in that time. Since each lap is 25 m, Kunik can swim $25 \times 20 = 500$ m in 10 minutes.

B) Half of 60 is 30 since $30 + 30 = 60$, so Kunik will be swimming 30 laps using the front crawl and 30 laps using the backstroke. For each stroke, we can use a table to determine how long it takes Kunik to swim 30 laps.

Table for front crawl

Minutes	Laps
5	10
10	20
15	30

Table for backstroke

Minutes	Laps
4	6
8	12
12	18
16	24
20	30

From the tables, we expect it will take Kunik $15 + 20 = 35$ minutes to swim 60 laps if she uses each stroke half of the time.

C) From the tables we notice that it takes Kunik 15 minutes to swim 30 laps using the front crawl, and it takes her 20 minutes to swim the 30 laps using the backstroke. Since it takes longer for her to swim the same number of laps using the backstroke, she should do the front crawl if she wants to swim faster.

Teacher's Notes

This problem could be solved using the rates of speed. The formula for calculating speed is:

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

Since Kunik swims 10 laps of the pool in 5 minutes, then her front crawl speed is:

$$\frac{250}{5} = 50 \text{ metres/min}$$

Since she swims 6 laps of the pool in 4 minutes, then her backstroke speed is:

$$\frac{150}{4} = 37.5 \text{ metres/min}$$

Based on these calculations, we can see that Kunik's rate of speed is faster doing the front crawl.

If we want to find out the time of an activity given the speed and distance, we can rearrange the formula this way:

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

To calculate her time in part B) of the question we can substitute the distances and speeds into our formula for finding the time. The distance she swims using each stroke is 750 m.

$$\text{time} = \frac{750 \text{ metres}}{50 \ \frac{\text{meters}}{\text{min}}} + \frac{750 \text{ metres}}{37.5 \ \frac{\text{meters}}{\text{min}}} = 15 \text{ minutes} + 20 \text{ minutes} = 35 \text{ minutes}$$

Notice the units in the calculation of the time. The distance unit (metres) appears in the numerator and denominator of the fraction. These units cancel each other. The time unit (min) appears in the denominator of the unit of speed in the denominator of the fraction. This means that the units we are calculating in the end are minutes. Keeping track of the units in your calculations that involve speed, time, and distance is a good way to check that you are working with the proper formula.