



Problem of the Week

Problem D and Solution

Lengthy Layover

**Problem**

Including takeoff and landing, a plane has an average speed of 500 km/h while in flight. The plane travels from Toronto to Thunder Bay in 1 hour 40 minutes, has a brief layover, then returns to Toronto. The return flight is by the same route and in the same amount of time. If the wait in Thunder Bay reduces the average speed to 425 km/h for the entire two-way trip, how long was the layover?

Solution

Let t be the length of the layover, in hours.

The plane travels from Toronto to Thunder Bay in 1 hour 40 minutes at a speed of 500 km/h. Using the formula distance = speed \times time, the distance from Toronto to Thunder Bay must be $500 \frac{\text{km}}{\text{h}} \times 1\frac{2}{3} \text{ h} = 500 \times \frac{5}{3} = \frac{2500}{3}$ km.

Therefore, for the two-way trip, the plane travels $2 \times \frac{2500}{3} = \frac{5000}{3}$ km.

The length of time of the entire two-way trip is the time of the two flights plus the layover time. Therefore, the total length of time of the trip is

$$\frac{5}{3} + \frac{5}{3} + t = \frac{10}{3} + t \text{ hours.}$$

Since the average speed of the entire two-way trip is 425 km/h, using the formula distance = speed \times time, we have

$$\begin{aligned} \frac{5000}{3} &= 425 \times \left(\frac{10}{3} + t \right) \\ \frac{10}{3} + t &= \frac{5000}{3 \times 425} \\ t &= \frac{200}{51} - \frac{10}{3} \\ &= \frac{200}{51} - \frac{170}{51} \\ &= \frac{10}{17} \end{aligned}$$

Therefore, the layover was $\frac{10}{17}$ hours, or approximately 35 minutes.

