Problem of the Week
Problem C and Solution
In the Dark

Problem

A train that is 400 metres long approaches a tunnel that is 1200 metres long. The entire train is completely in the tunnel for 30 seconds. That is, from the time that the last car on the train has completely entered the tunnel until the time when the front of the train emerges from the other end of the tunnel, 30 seconds pass. If the train is travelling at a constant speed, determine this speed in kilometres per hour.

Solution

When the last car of the train has completely entered the tunnel, the front of the train is $1200 - 400 = 800$ metres from the other end of the tunnel. Thus, the train will travel 800 metres in 30 seconds. We can calculate the speed of the train by dividing the distance travelled by the time required to travel the distance.

The speed of the train is $800 \div 30 = \frac{80}{3}$ m/s.

Now we must convert from m/s to km/h. We will do this in two steps: first convert metres to kilometres, and then convert seconds to hours.

1. Metres to kilometres: $\dfrac{80 \text{ m}}{3 \text{ s}} = \dfrac{80 \text{ m}}{3 \text{ s}} \times \dfrac{1 \text{ km}}{1000 \text{ m}} = \dfrac{2 \text{ km}}{75 \text{ s}}$

2. Seconds to hours: $\dfrac{2 \text{ km}}{75 \text{ s}} = \dfrac{2 \text{ km}}{75 \text{ s}} \times \dfrac{60 \text{ s}}{1 \text{ min}} \times \dfrac{60 \text{ min}}{1 \text{ hr}} = \dfrac{96 \text{ km}}{1 \text{ hr}}$

Therefore, the train is travelling at a speed of 96 km/hr.