

Weekly Question (16 Jan)

Traffic signals at each cross junction on a main road all change on the same **2-minute cycle**. The speed limit of the road is 70 km/h.

Mr Hot Wheels knows that it is exactly 6 km from one cross junction to the next.

Without breaking the speed limit of the road, what is the **maximum speed, as a fraction of the speed limit** of the road, at which Mr Hot Wheels can travel to get to each intersection as it just changes to green light?

Solution:

Firstly, it is not possible to travel from a cross junction to the next in **2 min**.

$$2 \text{ min} \rightarrow 6 \text{ km}$$

$$1 \text{ min} \rightarrow 3 \text{ km}$$

$$(1 \text{ hour}) 60 \text{ min} \rightarrow 180 \text{ km} \quad (180 \text{ km/h is over speed limit})$$

or simply,

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{6 \text{ km}}{\left(\frac{2}{60} \text{ h}\right)} = 180 \text{ km/h}$$

Between 2 cross junctions, follow **two 2-minute cycles**, i.e. **4 min**.

$$4 \text{ min} \rightarrow 6 \text{ km}$$

$$60 \text{ min} \rightarrow 90 \text{ km} \quad (90 \text{ km/h is over speed limit})$$

Between 2 cross junctions, follow **three 2-minute cycles**, i.e. **6 min**.

$$6 \text{ min} \rightarrow 6 \text{ km}$$

$$60 \text{ min} \rightarrow 60 \text{ km} \quad (60 \text{ km/h} < 70 \text{ km/h})$$

$$\frac{60}{70} = \frac{6}{7}$$

ANS: The maximum speed Mr Hot Wheels can travel is $\frac{6}{7}$ of the speed limit.