

EXAMPLE 16

Rani cycles for $\frac{3}{4}$ of an hour from her home to the Cultural Festival held in the city with a speed change of 18 km/h. Traveling to the Cultural Festival takes 40% more time compared to the time for the return trip at the same speed change. Calculate the difference in acceleration between the trips to and from the Cultural Festival.

Solution:

$$\begin{aligned}\text{Acceleration when going} &= \frac{18 \text{ km/hour}}{\frac{3}{4} \text{ hour}} \\ &= 24 \text{ km/hour}^2\end{aligned}$$

$$\begin{aligned}\text{Time reduced} &= \left(\frac{40}{100}\right) \times \frac{3}{4} \text{ hour} \\ &= 0.3 \text{ hour}\end{aligned}$$

$$\begin{aligned}\text{Time taken for return trip} &= 0.75 \text{ hour} - 0.3 \text{ hour} \\ &= 0.45 \text{ hour}\end{aligned}$$

$$\begin{aligned}\text{Acceleration during return trip} &= \frac{18 \text{ km/hour}}{0.45 \text{ hour}} \\ &= 40 \text{ km/hour}^2\end{aligned}$$

$$\begin{aligned}\text{Difference in acceleration} &= 40 \text{ km/hour}^2 - 24 \text{ km/hour}^2 \\ &= 16 \text{ km/hour}^2\end{aligned}$$

TIPS

Unit km/hour^2 can be written as kmh^{-2} or km/h^2 .

EXAMPLE 17

Samy drove at a speed of 70 km/h. He increased his speed to 100 km/h in 30 minutes. Calculate the acceleration in

(a) km/h per hour

(b) km/h per second

Solution:

$$\begin{aligned}\text{(a) Change of speed} &= 100 \text{ km/h} - 70 \text{ km/h} \\ &= 30 \text{ km/h}\end{aligned}$$

$$\begin{aligned}\text{(b) Time} &= 30 \text{ minutes} \leftarrow 30 \times 1 \text{ min} \\ &= 30 \times 60 \text{ s} \\ &= 1800 \text{ seconds}\end{aligned}$$

$$\begin{aligned}\text{Acceleration} &= \frac{30 \text{ km/h}}{30 \text{ min}} \\ &= \frac{30 \text{ km/h}}{\left(\frac{1}{2}\right) \text{ h}} \leftarrow 30 \text{ minutes} = \frac{1}{2} \text{ hour} \\ &= 60 \text{ km/h per hour}\end{aligned}$$

$$\begin{aligned}\text{Acceleration} &= \frac{30 \text{ km/h}}{1800 \text{ s}} \\ &= 0.0167 \text{ km/h per second}\end{aligned}$$