

TIME, SPEED AND DISTANCE



DEFINITIONS AND CONCEPTS

Speed: The distance travelled by a person or object in unit time is called the speed of that person or object.

$$\text{i.e., Speed} = \frac{\text{Distance}}{\text{Time}}$$

Note:

- The unit of speed is m/second or km/hour.
- $1 \text{ m/second} = \frac{18}{5} \text{ km/hour}$
- $1 \text{ km/hour} = \frac{5}{18} \text{ m/second}$

Time: The time taken to cover a fixed distance at a fixed speed is called time.

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Distance: The distance covered by a moving person or object at a uniform speed in each time is called distance.

$$\text{Distance} = \text{Time} \times \text{Speed}$$

Average speed: If a moving object covers a certain distance in two or more parts at different speeds, then,

$$\text{Average Speed} = \frac{\text{Total Distance Covered}}{\text{Total Time Taken}}$$

Facts related to trains

- If a train of length l m passes a person or a pole in t seconds, then the distance covered by the train = Length of the train
- If a train of length l m passes a bridge or a platform of length p m in t seconds, then the distance covered by the train = $(l + p)$ m.
- When a train passes another train or a moving object, then the distance covered is equal to the sum of their lengths and the speed is equal to the relative speed.
- Relative speed = $a + b$ (when both objects are moving in opposite direction)
Relative speed = $a - b$ (when both objects are moving in the same direction)
(Here a and b are the speeds of both objects respectively)

Example: A train covers 63 km in 3 hours. Calculate its speed. How much distance does the train cover in 30 minutes?

Solution: According to the question,

Time = 3 hours, Distance = 63 km

$$\therefore \text{speed} = \frac{\text{Distance}}{\text{Time}} = \frac{63 \text{ km}}{3 \text{ hours}} = 21 \text{ km/hr}$$

$$\text{Given time} = 30 \text{ minutes} = \frac{30}{60} \text{ hours} = \frac{1}{2} \text{ hours}$$

$$\text{Therefore, distance travelled in 30 minutes} = 21 \text{ km/hr} \times \frac{1}{2} \text{ hours} = 10.5 \text{ km.}$$

Example: Kiran travels the first 110 km in 2 hours and the next 130 km in 4 hours. What is his average speed in km/hr for the whole journey?

Solution: Total distance travelled = 110 + 130 = 240 km

Total time taken = 2 + 4 = 6 hours

$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}} = \frac{240}{6} = 40 \text{ km/hr}$$

Example: A train travelling at 60 kmph passes a man in 6 seconds. What is the length of the train?

$$\text{Solution: Speed in } \frac{m}{\text{sec}} = 60 \times \frac{5}{18} = \frac{50}{3} \frac{m}{\text{sec}}$$

Time taken to pass the man = 6 seconds.

$$\text{So, distance covered} = \frac{50}{3} \times 6 = 100 \text{ m} = \text{length of the train}$$