Speed

Understanding Speed

Speed is the measure of how fast or slow an object moves.

It is determined by the distance traveled by an object in a given amount of time.

Example: A teacher rolls two toy cars at different speeds. The faster car covers more distance in the same time.

Everyday Examples of Speed

- A fast-moving fan circulates more air compared to a slow-moving one.
- An aeroplane is preferred over a train for long-distance travel due to higher speed.
- Slow-moving air (breeze) feels pleasant, whereas fast-moving air causes storms and tornadoes.

Measuring Speed

To measure speed accurately, we need to know:

- i. Distance traveled
- ii. Time taken to cover that distance

Formula for Speed

Speed (v) = $\frac{Distance traveled(s)}{Time taken(t)}$

Example: A car travels 100 km in 4 hours.

Speed = 100 km / 4 hours = 25 km/h

Average Speed

Speed is usually not constant in real-life situations.

• Average speed is calculated using: Average Speed = $\frac{Total \ Distance}{Total \ Time}$

Example: A vehicle moving on a straight road may have an average speed of 25 km/h, but it may be higher on open roads and lower in crowded areas.

Rearranging the Speed Formula

Using the formula for speed, we can also calculate:

i. Distance traveled = Speed × Time

ii. Time taken = $\frac{Distance}{Speed}$

Units of Speed

SI Unit: Metres per second (m/s)

Other common units: Metres per minute (m/min), Kilometres per hour (km/h)

Speed Measuring Instruments

i. Speedometer

An instrument on a vehicle's dashboard that indicates its speed.

Measured in km/h.

Can be analog (needle type) or digital.

ii. Odometer

An instrument that measures the total distance traveled by a vehicle.

Recorded in kilometres.

Commonly found in scooters, motorcycles, and cars.

Numerical Example

Problem: Roma walks 270 meters to a park in 3 minutes. Find her speed.

- Distance = 270 m
- Time = 3 min = 3 × 60 = 180 s

• Speed =
$$\frac{Distance}{Time} = \frac{270 \text{ m}}{180 \text{ s}} = 1.5 \text{ m/s}$$

Uniform and Non-Uniform Motion

i. Uniform Motion

When an object moves at a constant speed along a straight line.

Example: A car moving at a constant speed of 60 km/h on an empty highway.

ii. Non-Uniform Motion

When an object's speed varies over time.

Example: A train moving through a city, where it speeds up and slows down at different points.

In non-uniform motion, the object covers unequal distances in equal intervals of time or equal distances in unequal intervals of time.