

Average velocity

Average velocity is a vector quantity. Average velocity is defined as **the change in position or displacement (Δx) divided by the time intervals (Δt) in which the displacement occurs**. The average velocity can be positive or negative depending upon the sign of the displacement. Its SI unit is m/s.

$$\vec{V}_{av} = \frac{\Delta \vec{s}}{\Delta t} = \frac{s - s_o}{t - t_o}$$

Instantaneous velocity

Instantaneous velocity is the velocity at a specific instant in time (or over an infinitesimally small time interval). Its SI unit is m/s.

Example 1

It takes you 10 minutes to walk with an average velocity of 1.2 m/s to the North from the bus stop to the museum entrance. What is your displacement?

Solution:

You are given with $\Delta t = 10 \text{ minutes} = 600 \text{ s}$ and $v_{av} = 1.2 \text{ m/s}$, North.

You want to find Δs .

since

$$v_{av} = \frac{\Delta \vec{s}}{\Delta t}, \Delta \vec{s} = \vec{v}_{av} \times \Delta t = 1.2 \text{ m/s} \times 600 \text{ s} = 720 \text{ m, North}$$

This means the displacement has a magnitude of 720 m and a direction to the North.

Example 2

A passenger in a bus took 8 s to move 4 m to a seat on provided place forward. What is his average velocity?

Solution:

You are given $\Delta \vec{s} = 4 \text{ m}$ and $\Delta t = 8 \text{ s}$. What you want to find is \vec{v}_{av}

The average velocity is thus;

$$\vec{V}_{av} = \frac{\Delta \vec{s}}{\Delta t} = \frac{4 \text{ m}}{8 \text{ s}} = 0.5 \text{ m/s}.$$

speed

Speed is the measure of how fast an object is moving. It can be calculated by dividing the distance traveled by the time taken to travel that distance. Speed is typically measured in units such as meters per second (m/s), kilometers per hour (km/h), or miles per hour (mph).

$$v = \frac{s}{t}$$

Key Concept

Velocity is the physical quantity that describes how a moving object's displacement changes