KINEMATICS: QUANTITIES AND UNITS

Objective

- Understand and use fundamental quantities and units in the SI system.

Key Facts

Base Units:

QUANTITY	BASE UNIT	ABBREVIATION
time		
length		
mass		

Prefixes:

NAME	SYMBOL	MAGNITUDE
kilo	k	10^3
centi	c	0.01
milli	m	0.001
micro	μ	10^{-6}

Derived units:

QUANTITY	UNIT	ABBREVIATION
velocity	metres per second	m/s or ms^{-1}
acceleration	metres per second squared	m/s² or ms^{-2}
force	newton	N
moment	newton metre	Nm

1 tonne = 1000 kg

DISTANCE VS DISPLACEMENT

- **Total distance** measures how far an object has **travelled in total.**
  - It does not take into account the direction of travel.

- **Displacement** is the distance of an object from is **from its initial position**.
  - It takes into account direction of travel.

VELOCITY VS SPEED

- **Velocity** is the **rate of change** of **displacement**.
  - It takes into account direction of travel.

- **Speed** is the **magnitude** of **velocity**.
  - It does **not** take into account the direction of travel.

ACCELERATION

- **Acceleration** is the **rate of change** of **velocity.**
  - It takes into account the direction of travel.

VECTORS AND SCALARS

- **Vectors** quantities have **magnitude** and **direction**.
- **Scalar** quantities have **magnitude** only.

▷ Examples

2.4e. Use your calculator to convert the following:

(a) $27 \, \text{kmh}^{-1}$ into ms^{-1},

(b) $42 \, \text{cm}^3$ into litres.

2.4p. Use your calculator to convert the following:

(a) $32500 \, \text{cm}^3$ into m^3,

(b) $500 \, \text{kmh}^{-1}$ into ms^{-1}.

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f(x) AVERAGE VELOCITY / AVERAGE SPEED

$$\text{Av velocity} = \frac{\text{change in displacement}}{\text{time taken}} \qquad \text{Av speed} = \frac{\text{total distance}}{\text{time taken}}$$

2.5e. Points A, B and C lie on a straight line as shown in the diagram.

A particle travels from A to C in 28 seconds.

(a) (i) Find the **displacement** of the particle from A.

(ii) Find the **total distance** travelled by the particle.

(b)(i) Find the **average speed** of the particle.

(ii) Find the **average veolcity** of the particle.