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Speed, Velocity and Acceleration | Revision Booklet

Types of Motion

- Left to right
- In a circle
- Up and down
- Floating and sinking
- Twisting

Examiner Tip

Units are VERY important in this chapter!

Every type of motion is linked to several variables,

Time, length/distance, speed, velocity, and acceleration

Time

How do we accurately measure time?

- Stopwatch

What is the S.I. unit of time?

- Second (s)

Length/Distance

How do we accurately measure length?

- Metre stick / ruler
- Trundle wheel

What is the S.I. unit of length?

- Metre (m)

Speed

What is speed?

The distance an object travels per unit of time

What are examples of speed?

- A car travels at a speed of 30 m/s
- A person walks at a speed of 2 m/s

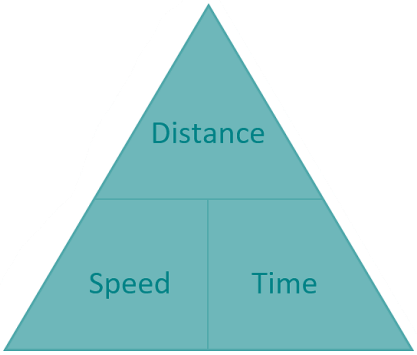
How do we calculate speed?

- Formula: speed = distance/time

What is the S.I. unit of density?

- Metres per second (m/s)

Formula



Example 1

Conor ran a 100m race in 20s. 4hrs. What was his average speed in m/s?

Solution

Speed = $\frac{Distance\ travelled\ (m)}{Time\ taken\ (s)}$

Distance = 100m , Time = 20s

Speed = $\frac{100m}{20s}$

Speed = 5m/s

Example 2

Tara rides her bike 56.8km in What is her average speed in km/hr?

Solution

Speed = $\frac{Distance\ travelled\ (km)}{Time\ taken\ (hr)}$

Distance = 56.8km , Time = 4.2hrs

Speed = $\frac{56.8km}{4.2hrs}$

Speed = 14.2km/hrs

Velocity

What is velocity?

An object's speed in a direction

What are examples of velocity?

- A bus travels at a speed of 60 km/hr north
- A person walks at a speed of 1.5 m/s west

How do we calculate velocity?

- Formula: velocity = $\frac{change\ in\ displacement\ (m)}{time\ taken\ (s)}$

What is the S.I. unit of velocity?

- Metres per second (m/s)

Example 1

Kelly drives her car 600m in 50s north. What is her average speed in m/s?

Solution

Velocity = $\frac{change\ in\ displacement\ (m)}{time\ taken\ (s)}$

Distance = 60m , Time = 50s = $\frac{11}{12}$hrs

Velocity = $\frac{600m}{50s}$ north

Velocity = 12m/s north

Example 2

George drives his car 66km in 55mins south. What is his velocity in km/hr?

Solution

Velocity = $\frac{change\ in\ displacement\ (m)}{time\ taken\ (s)}$

Distance = 60km,Time=55 mins= $\frac{55}{60}$

Velocity = $\frac{60km}{\frac{11}{12}hrs}$ south

Velocity = 72km/hrs south

Acceleration

What is acceleration?

Change in velocity per second

What is acceleration?

- Change in velocity per second

Examples:

- A motorcycle accelerates at a rate of 10 m/s^2
- A person increases their running speed at a rate of 0.2 m/s^2

How do we calculate velocity?

- Formula: acceleration = $\frac{change\ in\ velocity\ (m/s)}{time\ taken\ (s)}$

What is the S.I. unit of velocity?

- Metres per second per second (m/s^2)

What is the difference between Acceleration and Deceleration?

- Acceleration is speeding up
- Deceleration is slowing down

Example 1

A car is stopped at traffic lights. When the light goes green, the car accelerates and goes from a velocity of 0m/s to 20m/s in 5s. Calculate the cars acceleration.

Solution

$$\text{Acceleration} = \frac{Change\ in\ velocity\ (m/s)}{Time\ taken\ (s)}$$

$$\text{Acceleration} = \frac{20m/s - 0m/s}{5s}$$

$$\text{Acceleration} = \frac{20m/s}{5s}$$

Acceleration = 4m/s²

Example 2

A skateboarder is skating along a pavement at a speed of 1m/s. He then goes down a hill, and in 8s his velocity increases to 5m/s. What is his acceleration?

Solution

$$\text{Acceleration} = \frac{Change\ in\ velocity\ (m/s)}{Time\ taken\ (s)}$$

Acceleration = (5m/s - 1m/s)/8s

Acceleration = (4m/s)/8s

Acceleration = 0.5m/s²

Example 3

A motorbike is travelling at 30m/s on a motorway. If the bike must stop in 5s, what will be the acceleration of The motorbike?

Solution

$$\text{Acceleration} = \frac{Change\ in\ velocity\ (m/s)}{Time\ taken\ (s)}$$

$$\text{Acceleration} = \frac{0m/s - 30m/s}{5s}$$

$$\text{Acceleration} = \frac{-30m/s}{5s}$$

Acceleration = -6m/s²

Examiner Tip

Don't forget to include the S.I unit of your calculation at the end of your answers!