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P2 Describing motion

P2.01 Understanding speed

1. Distance, time and speed

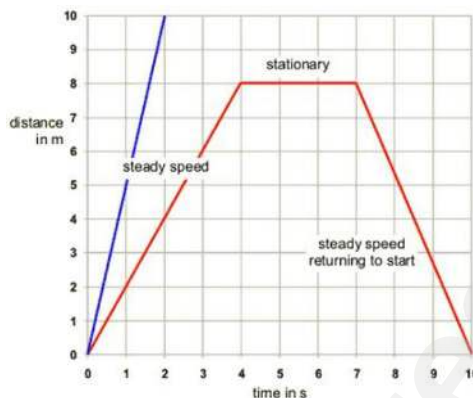
$$\text{speed} = \frac{\text{distance}}{\text{Time}} \quad \text{Average speed} = \frac{\text{Total distance}}{\text{Total Time}}$$

Units

Quantity	Standard unit	Other units	
distance	m	km	miles
time	s	h	hour
speed	m/s	km/h	mph

P2.02 Distance-time graphs

Distance-time graph: tells us how fast the object moves



- Graph slopes up gently - travel at slow speed
- Graph slopes steeper - travel more rapidly
- Graph is horizontal - doesn't travel, stationary
- Graph goes to y=0 - go back to starting point

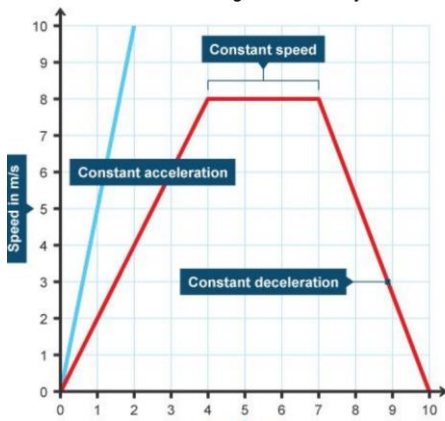
P2.03 Understanding acceleration

Acceleration: the change in speed per time

$$\text{Acceleration}(a) = \frac{\text{Change in speed}(v-u)}{\text{Time taken}(t)}$$

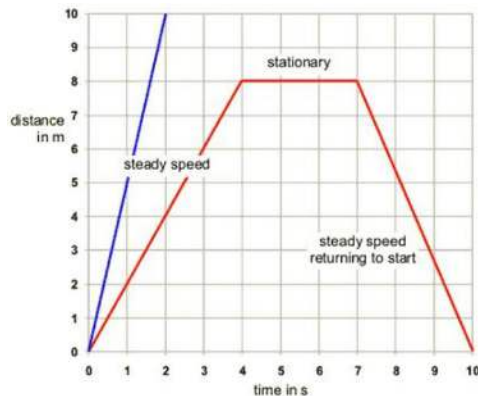
Acceleration of free fall(g): constant value of acceleration near the surface of the earth (9.8 m/s^2)

1. Speed-time graphs



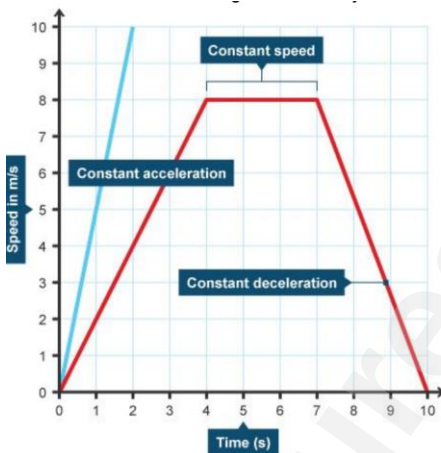
- Sloping upwards - constant acceleration
- Steeper the slope, the greater the acceleration
- Horizontal - speed constant
- Sloping downwards - constant deceleration
- Horizontal at 0 - stationary
- Curved - acceleration is changing
- **Time x speed = area of graph = distance**

P2.04 Calculating speed and acceleration



- Gradient = distance / time = speed
- Speed - km/h or m/s

1. Calculating acceleration



- Subtract final speed to initial speed
- Divide the result value by time
- Acceleration - m/s^2

2. Speed and velocity

- **Velocity:** object's speed in a particular stated direction
 - Must give the direction of the velocity
 - 200m/s due north
- **Speed:** without direction