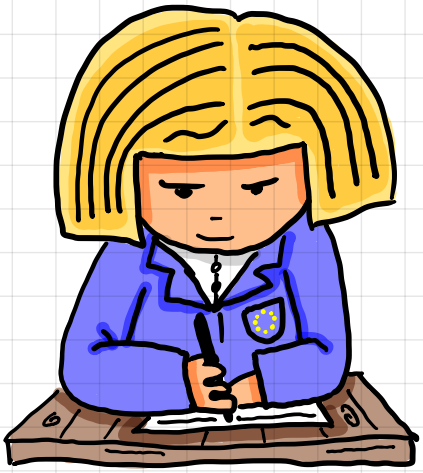


Acceleration - 1

1. Define accelertion.
2. Learn and use the formula to calculate accelertion
3. Calculate the acceleration and displacement of an object from a velocity - time graph (Higher tier only)

Acceleration - 1

Review

- The velocity of an object is its speed in a given direction
- Velocity is a **vector** quantity as it has both **magnitude** and **direction.**

Acceleration

- The acceleration of an object tells us the **change** in velocity over **time.**
  The formula to calculate acceleration is:
  acceleration (m/s^2) = change in velocity (m/s) ÷ time (s)
- The symbol equation is: $a = \Delta v \div t$ (Δv = final velocity - initial velocity)

  Δ means change

Example question #1

- A car is travelling at a velocity of 15 m/s North. It accelerates to a velocity of 35 m/s North in 20 seconds. Calculate the acceleration of the car.
- Write out the equation. Acceleration = change in velocity ÷ time
  Calculate the change in velocity = final velocity - initial velocity
  Change in velocity = 35 - 15 = 20 m/s
  Put the values into the equation: acceleration = 20m/s ÷ 20s
  acceleration = 1 m/s^2
- This means that over the time period, the car increases its velocity by 1 m/s every second.

Example question #2

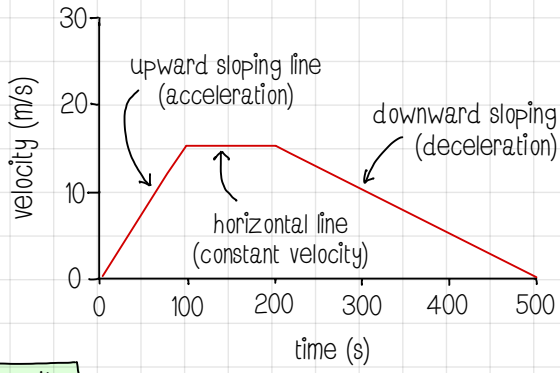
- A cyclist is travelling at a velocity of 6 m/s East. Her velocity reduces to zero in 12 seconds. Calculate the acceleration of the cyclist.
- Write out the equation. Acceleration = change in velocity ÷ time
  Calculate the change in velocity = final velocity - initial velocity
  Change in velocity = 0 - 6 = -6 m/s
  Put the values into the equation: acceleration = -6 m/s ÷ 12s
  acceleration = -0.5 m/s^2
- The **negative acceleration** shows that object is **slowing** down. This is called **deceleration.** Acceleration has magnitude and direction, so it is vector.

Acceleration - 1 ...

Velocity - time graph

The acceleration of an object can also be calculated using a velocity - time graph.

The gradient of a velocity - time graph tells us the acceleration of the object.



Example question #1

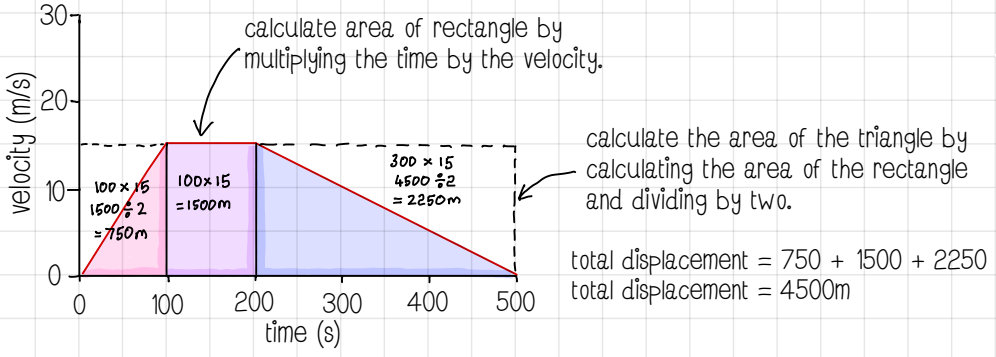
Use the graph get the values for upward sloping line.
Acceleration = change in velocity ÷ time
Calculate the change in velocity = final velocity - initial velocity
Change in velocity = 15 - 0 = 15 m/s
Put the values into the equation: acceleration = 15 m/s ÷ 100s
acceleration = 0.15 m/s^2

Example question #2

Use the graph get the values for downward sloping line.
Acceleration = change in velocity ÷ time
Change in velocity = 0 - 15 = -15 m/s
acceleration = -15 m/s ÷ 300s so acceleration = -0.05 m/s^2

Calculating displacement

The total area under the graph can be used to calculate the distance travelled in a specific direction (displacement).



total displacement = 750 + 1500 + 2250
total displacement = 4500m

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