

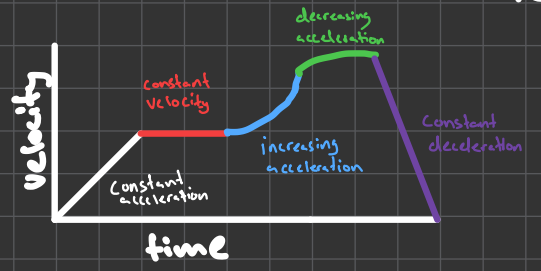
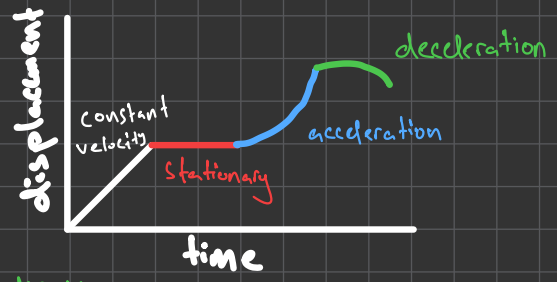
Speed, Velocity, distance, displacement

Scalar quantities: quantity with only magnitude
e.g. Speed, distance

Vector quantities: quantity with magnitude and direction
e.g. velocity, displacement

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

Area under graph = distance



Area under graph = displacement

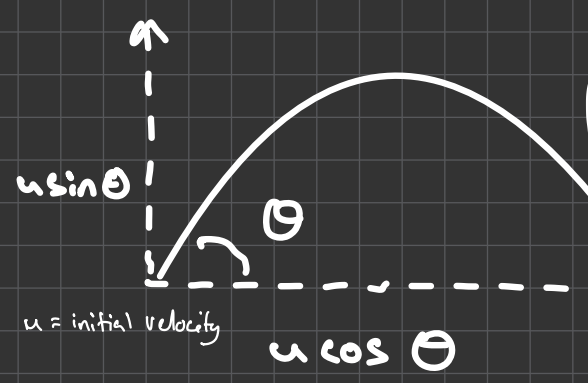
Acceleration = rate of change of velocity

$$a = \frac{v-u}{t}$$

Uniform acceleration equations: SUVAT

g = acceleration due to gravity can replace a with g in equations for motion under freefall

Projectile Motion: an object projected at an angle to the horizontal motion
Has horizontal and vertical components.



$$t = \frac{2u \sin \theta}{g}$$

$$\text{Range} = \frac{u^2 \sin 2\theta}{g}$$

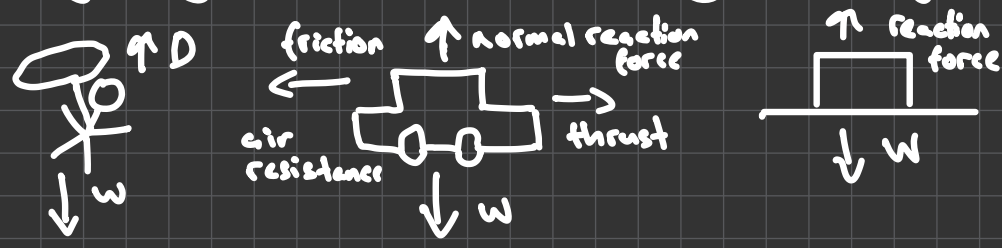
Max range occurs at 45°

Resultant v at any time:

$$v = \sqrt{v_x^2 + v_y^2}$$

Forces

Freebody diagrams: show forces acting on an object



Weight/mass/gravity

Mass: Amount of matter in an object

Weight: force experienced by a mass inside a gravitational field

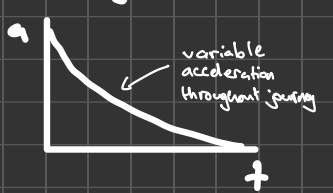
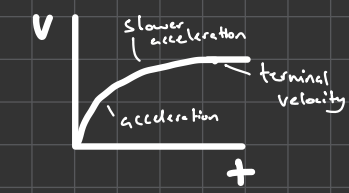
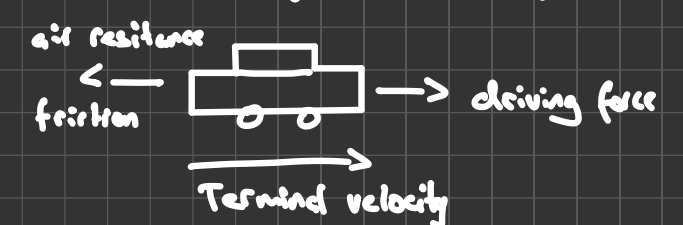
Gravity: the attractive force an object with mass exerts
Centre of mass: The point at which all the mass of an object is said to act

Forces in equilibrium: Resultant = 0

Missing force can be found



Terminal velocity: when the forces acting on an object are in equilibrium



Chapter 3 + 4 Motion and Forces

Stopping distance = thinking distance + braking distance

Thinking distance: Drugs, alcohol, tiredness, distractions

Braking distance: road conditions, brake conditions

rain ↙ ↘ ice fire conditions

Moment = force x perpendicular distance from point

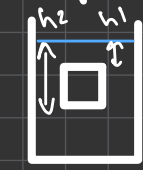
Torque = force x distance from other force

Couple is a pair of forces of equal magnitude and opposite direction

Density and Pressure

$$\rho = \frac{m}{V} \quad P = \frac{F}{A} \quad P = h \rho g \quad \text{fluids}$$

If an object is to float in a fluid the overall density must be less than that of the fluid



$$F_{\text{above}} = PA = h_1 \rho g A$$

$$F_{\text{below}} = h_2 \rho g A$$

Net force (upthrust): $F_{\text{below}} - F_{\text{above}}$

$$= h_2 \rho g A - h_1 \rho g A$$

$$= (h_2 - h_1) \rho g A$$

Archimede's principle

The upthrust exerted on a body immersed in a fluid is equal to the weight of the fluid that the body displaces

Practical motion in a fluid

1. Fill a tube with a viscous fluid
2. Mark consecutive intervals e.g. 10cm
3. Drop ball and record time taken to reach each interval
4. Take multiple readings and find mean to reduce % uncertainty
5. Ensure to be using a long tube in order for ball to reach terminal velocity

