Equations to remember

Equations not given in the formula sheet

Equations of motion

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$s = vt - \frac{1}{2}at^2$$

$$s = (\frac{u + v}{2})t$$

Momentum

$$\boldsymbol{Impulse = Final\ momentum - initial\ momentum}$$

$$= mv - mu$$

$$\boldsymbol{Momentum\ before\ collision\ =\ Momentum\ after\ collision}$$

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

Moment

$$Moment = Force \times Perpendicular\ distance$$

$$\boldsymbol{Moment\ Equillbrium\ (about\ a\ selected\ point)}$$

$$Anti - clockwise\ moments = Clockwise\ moments$$

Position Vectors

$$\boldsymbol{Position\ Vector = Original\ Position + (velocity\ vector)time}$$

$$r = r_0 + vt$$

Displacement from AB = Position vector of B – Position Vector of A

$$\boldsymbol{Distance\ (magnitude\ of\ displacement\ pi + qj) = \sqrt{p^2 + q^2}}$$

C

$$F = \mu R$$

$$\mu = coefficient\ of\ friction$$

$$R = Reaction\ force$$

Tips

- When an object is at rest (or constant velocity)
  - Horizontal forces are equal
  - Vertical forces are equal

- When an object is moving
  - Resultant force = mass x acceleration

$$F = ma$$

Momentum

- Remember to select a positive direction in momentum problems. Velocity and Impulse can change signs depending on the direction.

- During a collision, the impulse on both particles are the same but in opposite directions.

Connected systems

- In a connected system, tension is the same for both particles.

- You can draw force diagrams for the particles separately or as one system.

Parallel vectors

- If two vectors are parallel, you can use the ratio method to find the answer.

$$\frac{p_1 i}{p_1 j} = \frac{p_2 i}{p_2 j}$$

- Eg.

$$\mathbf{v} = (7 - 5t)\mathbf{i} + (12t - 20)\mathbf{j}$$

(d) Find the value of t when P is moving in the direction of the vector $(-5\mathbf{i} + 8\mathbf{j})$

$$\frac{(7 - 5t)}{12t - 20} = \frac{-5}{8}$$

- When they give you an angle such as $\sin \propto = \frac{3}{4}$, you can find $\tan \propto$ OR $cos \propto$ by drawing a right angle triangle.