Physics Equations Trimester 1

$$\Delta t = t_f - t_i$$

$$\Delta x = x_f - x_i$$

$$\bar{v} = \frac{\Delta x}{\Delta t}$$

$$x = \bar{v}t + x_i$$

$$\Delta v = v_f - v_i$$

$$\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$$

$$v_f = v_i + \bar{a}\Delta t$$

$$x_f = x_i + v_i t_f + \left(\frac{1}{2}\right) a t_f^2$$

$$v_f^2 = v_i^2 + 2a(x_f - x_i)$$

$$a = \frac{F_{net}}{m}$$

$$F_g = mg$$

$$F_{f,kinetic} = \mu_k F_N$$

$$F_{f,static} \leq \mu_s F_N$$

$$a_c = \frac{v^2}{r}$$

$$F_{net} = ma_c$$

$$\left(\frac{T_A}{T_B}\right)^2 = \left(\frac{r_A}{r_B}\right)^3$$

$$F_g = \frac{Gm_1 m_2}{r^2}$$

$$T = 2\pi\sqrt{\frac{r^3}{Gm_s}}$$

$$v = \sqrt{\frac{Gm_E}{r}}$$

$$g = \frac{Gm}{r^2}$$

$$m_g = \frac{r^2 F_g}{Gm}$$

$$x = r\theta$$

$$\omega = \frac{\Delta\theta}{\Delta t}$$

$$v = r\omega$$

$$a = r\alpha$$

$$\alpha = \frac{\Delta\omega}{\Delta t}$$

$$\Delta\omega = \omega_f - \omega_i$$

$$\tau = Fr\sin\theta$$

$$I = mr^2$$

$$\alpha = \frac{\tau_{net}}{I}$$

$$W = Fd\cos\theta$$

$$W = \Delta E$$

$$KE_{trans} = \frac{1}{2}mv^2$$

$$P = \frac{\Delta E}{t} = \frac{W}{t}$$

$$MA = \frac{F_r}{F_e}$$

$$IMA = \frac{d_e}{d_r}$$

$$e = \frac{W_o}{W_i} x100$$

$$e = \left(\frac{MA}{IMA}\right) x100$$

$$p = mv$$

$$F\Delta t = p_f - p_i$$

$$L = I\omega$$

$$\tau\Delta t = L_f - L_i$$

Mathematical relationships:

$$R^2 = A^2 + B^2$$

$$\frac{R}{\sin\theta} = \frac{A}{\sin a} = \frac{B}{\sin b}$$

$$R^2 = A^2 + B^2 - 2AB\cos\theta$$

Moment of Inertia of Common Shapes

Thin hoop

$$I = mr^2$$

Solid cylinder

$$I = \left(\frac{1}{2}\right)mr^2$$

Uniform Sphere

$$I = \left(\frac{2}{5}\right)mr^2$$

Long rod (through centre)

$$I = \left(\frac{1}{12}\right)ml^2$$

Long rod (about end)

$$I = \left(\frac{1}{3}\right)ml^2$$

Physical Constants:

Quantity	Symbol	Value
Gravitational constant	G	$6.67 \times 10^{-11} Nm^2/kg^2$
Charge on an electron	e	$1.602 \times 10^{-19} C$
Planck's constant	h	$6.63 \times 10^{-34} Js$
Gravitational field strength on Earth	g	9.8 N/kg