Physics Year 13 (NCEA Level 3)

Comparison Linear and Rotational Motion

Summary

Physical Quantity	Linear		Relationship	Rotational	
	Unit	Symbol		Symbol	Unit
Displacement	m	d	$d = r\theta$	θ	rad
Velocity	ms^{-1}	v	$v = r\omega$	ω	$rads^{-1}$
Acceleration	ms^{-2}	a	$a = r\alpha$	α	$rads^{-2}$
Equations of Motion	$v_f = v_i + at$ $v_f^2 = v_i^2 + 2ad$ $d = v_i t + \frac{1}{2}at^2$			$\omega_f = \omega_i + \alpha t$ $\omega_f^2 = \omega_i^2 + 2\alpha\theta$ $\theta = \omega_i t + \frac{1}{2}\alpha t^2$	
Force / Torque	N	F	$\tau = Fr$	τ	Nm
Newton's law	$F = ma$			$\tau = I\alpha$	
Mass / Rotational Inertia	kg	m	$I = \sum mr^2$	I	kgm^2
Work	J (Nm)	$W = Fd$		$W = \tau\theta$	J (Nm)
Kinetic Energy	J	$E_{kin}^{lin} = \frac{1}{2}mv^2$		$E_{kin}^{rot} = \frac{1}{2}I\omega^2$	J
Momentum	$kgms^{-1}$	$p = mv$	$L = mvr$ (particle)	$L = I\omega$	kgm^2s^{-1}