TRANSLATIONAL & ROTATIONAL QUANTITIES COMPARED

	translational	connection	rotational
base quantities			
coordinates			
velocity			
acceleration			
equations of motion			
cause of change			
resistance to change			
newton's second law			
equilibrium			
momentum			
work			
kinetic energy			
power			

TRANSLATIONAL & ROTATIONAL QUANTITIES COMPARED

	translational	connection	rotational
base quantities	$\mathbf{r}$, $\mathbf{s}$	$\mathbf{s} = \boldsymbol{\theta} \times \mathbf{r}$	$\boldsymbol{\theta}$
coordinates	$\mathbf{r} = x\,\mathbf{i} + y\,\mathbf{j}$	$x = r\cos\theta$ $y = r\sin\theta$ $r = \sqrt{x^2 + y^2}$ $\tan\theta = y / x$	$\mathbf{r} = r\,\mathbf{r} + \theta\,\boldsymbol{\theta}$
velocity	$\mathbf{v} = \frac{d}{dt}\mathbf{r}$	$\mathbf{v} = \boldsymbol{\omega} \times \mathbf{r}$	$\boldsymbol{\omega} = \frac{d}{dt}\boldsymbol{\theta}$
acceleration	$\mathbf{a} = \frac{d}{dt}\mathbf{v} = \frac{d^2}{dt^2}\mathbf{r}$	$\mathbf{a} = \boldsymbol{\alpha} \times \mathbf{r} - \omega^2\,\mathbf{r}$	$\boldsymbol{\alpha} = \frac{d}{dt}\boldsymbol{\omega} = \frac{d^2}{dt^2}\boldsymbol{\theta}$
equations of motion	$v = v_0 + at$ $x = x_0 + v_0 t + \frac{1}{2}at^2$ $v^2 = v_0^2 + 2a(x - x_0)$		$\omega = \omega_0 + \alpha t$ $\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$ $\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$
cause of change	$\mathbf{F}$	$\boldsymbol{\tau} = \mathbf{r} \times \mathbf{F}$	$\boldsymbol{\tau}$
resistance to change	m	$I = \sum r_i^2 m_i = \int r^2\,dm$	I
newton's second law	$\sum \mathbf{F} = m\,\mathbf{a}$		$\sum \boldsymbol{\tau} = I\,\boldsymbol{\alpha}$
equilibrium	$\sum \mathbf{F} = 0$		$\sum \boldsymbol{\tau} = 0$
momentum	$\mathbf{p} = m\,\mathbf{v}$	$\mathbf{L} = \mathbf{r} \times \mathbf{p} = m\,\mathbf{r} \times \mathbf{v}$	$\mathbf{L} = I\,\boldsymbol{\omega}$
work	$W = \int \mathbf{F} \cdot d\mathbf{s}$		$W = \int \boldsymbol{\tau} \cdot d\boldsymbol{\theta}$
kinetic energy	$K_t = \frac{1}{2}mv^2$		$K_r = \frac{1}{2}I\omega^2$
power	$P = \mathbf{F} \cdot \mathbf{v}$		$P = \boldsymbol{\tau} \cdot \boldsymbol{\omega}$