

Translational Idea	What it means
Position \vec{s} Velocity \vec{v} Acceleration \vec{a}	Where is the thing? How is it moving? How is its motion changing?
Kinematics: $\vec{s}(t) = \frac{1}{2}\vec{a}t^2 + \vec{v}_0t + \vec{s}_0$	How does accel relate to position and velocity?
Force \vec{F} Mass m Newton's second law $\vec{F} = m\vec{a}$	What pushes on the thing? How hard is the thing to move? How do forces make things move?
Kinetic energy $KE = \frac{1}{2}mv^2$ Work $W = \vec{F} \cdot \Delta\vec{s}$ Power $P = \vec{F} \cdot \vec{v}$	Energy associated with speed How do forces change objects' speed? At what rate do forces change objects' energy?
Momentum $\vec{p} = m\vec{v}$	The “persistence” of an object's motion

Translation	Rotation
Position \vec{s} Velocity \vec{v} Acceleration \vec{a}	Angle θ Angular velocity ω Angular acceleration α
Kinematics: $\vec{s}(t) = \frac{1}{2}\vec{a}t^2 + \vec{v}_0t + \vec{s}_0$	$\theta(t) = \frac{1}{2}\alpha t^2 + \omega_0t + \theta_0$
Force \vec{F} Mass m Newton's second law $\vec{F} = m\vec{a}$	Torque τ Rotational inertia I Newton's second law for rotation $\tau = I\alpha$
Kinetic energy $KE = \frac{1}{2}mv^2$ Work $W = \vec{F} \cdot \Delta\vec{s}$ Power $P = \vec{F} \cdot \vec{v}$	Kinetic energy $KE = \frac{1}{2}I\omega^2$ Work $W = \tau\Delta\theta$ Power $P = \tau\omega$
Momentum $\vec{p} = m\vec{v}$	Angular momentum $L = I\omega$