ROTATION & TORQUE

Tangential Velocity

- $V_T = \frac{d}{t} = \frac{2\pi r}{T}$
- Distance = circumference
- Time = period

Equilibrium

- Forces must be balanced in the x and y directions.
- But for rotation:

  "Clockwise torques must be equal to counter-clockwise torques."

- $\tau = F X r$
- Example...

Angular Momentum

- Just like bodies have linear momentum p=mv, they have angular momentum:

$$\mathbf{L = I\omega.}$$

- I is the object's moment of inertia (the rotational version of mass).
- ω is the angular velocity, where $\boldsymbol{\omega = 2\pi r}$ and is measured in rad/s.
- L is measured in kg m^2 /s

Conservation of L

Angular momentum, just like regular momentum, is always conserved in a closed system.

Angular Momentum

- An object with angular momentum tends to keep moving, unless the torques become unbalanced.
- Just like how an object with linear momentum tends to keep moving.

Angular Momentum

- For a point mass undergoing circular motion:

$$\mathbf{L = mvr}$$

where m is the mass of the object
v is the tangential velocity,
r is the radius of the circle