Angular Momentum

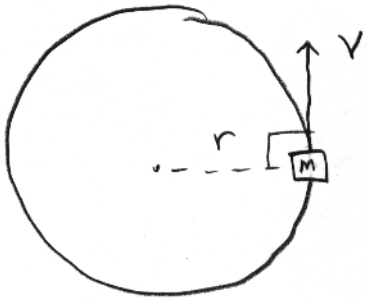
$\tau = F \cdot r$

$$r \cdot F = \frac{\Delta p}{\Delta t} = \frac{\Delta mv}{\Delta t} \cdot r$$

$$\tau = \frac{\Delta m v r}{\Delta t} \leftarrow \text{Angular momentum}$$

$$\boxed{L = m_{\perp} v r}$$

Angular momentum



$L = mvr\sin\theta$

-or-

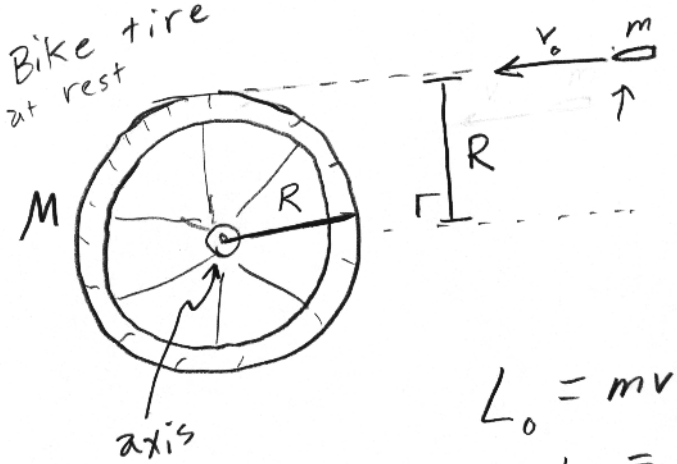
$$\boxed{L = I\omega}$$ ← analogies

Conservation of Angular Momentum

COAM

$L_0 = L$ when $\Sigma\tau = \emptyset$

- Even objects moving in a straight line have angular momentum in relation to an axis point.



Bullet gets stuck in tire.

What is v_0 after collision?

$L_0 = mvR\sin 90°$

$L_0 = L$

$mv_0R = I\omega + mvR$

$mv_0R = Mr^2\frac{v}{R} + mvR$

$\omega = \frac{v}{R}$

$$mv_0R = V\left(Mr^2\frac{1}{R} + mv\right)$$

$$\boxed{V = \frac{mv_0R}{\left(\frac{Mr^2}{R} + mv\right)}}$$