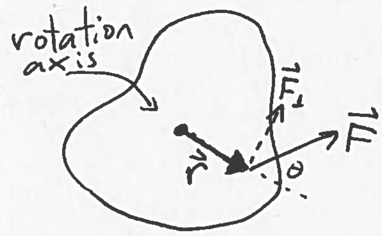
TOP + CLICKER

LAST TIME: TORQUE

gives rise to

ANGULAR ACCELERATION

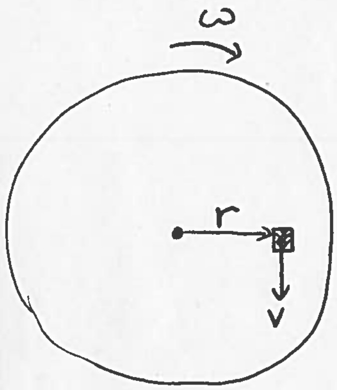


$$\tau = |\vec{r}|\,|\vec{F}_\perp|$$
$$= |\vec{r}|\,|\vec{F}|\sin\theta$$

$\tau = I\alpha$ (if I constant. Generally $\tau = \dfrac{dL}{dt}$ where $L=$

WORKSHEET T.P. DEMO.

CLICKER 2
CLICKER 3



For rotating body, regular speed of some part related to angular speed by

$$v = \omega \cdot r$$

Why: for 2π rotation, this part travel distance $2\pi r$

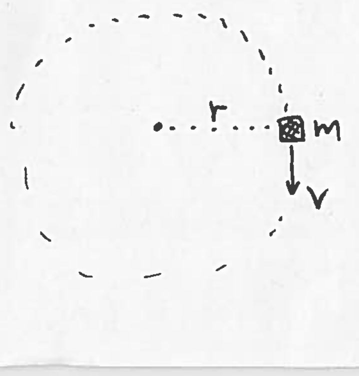
$\therefore$ distance traveled $= r\cdot\Delta\theta$

$\therefore$ $\dfrac{\text{distance traveled}}{\Delta t} = r\dfrac{\Delta\theta}{\Delta t}$

$$\Rightarrow v = \omega\cdot r$$

CLICKER 4

How much angular momentum does this part carry?

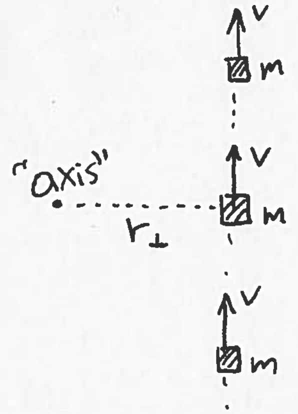


$$I = mr^2$$

so $L = (mr^2)\,\omega$

$= mr^2\cdot\dfrac{v}{r}$

$\Rightarrow \boxed{L = mvr}$ ← Mark's initials!!

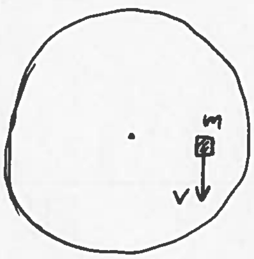


If object not constrained to move around rotation axis, its angular moment must still be conserved, so

$$L = m v r_{\perp}$$

ROTATIONAL ENERGY:

rotating object has kinetic energy even if its center of mass is fixed.



Add up K.E. for all the parts

mass of bit

$$K.E. = \sum_{\text{bits}} \frac{1}{2} m v^2$$

$$= \sum_{\text{bits}} \frac{1}{2} m r^2 \cdot \omega^2$$

$$= \frac{1}{2} M \left[\sum_{\text{bits}} \frac{m}{M} r^2 \right] \omega^2$$

total mass

this is the average r^2

$$= \frac{1}{2} I \omega^2$$

Total kinetic energy of a moving rotating object:

$$E_{kin} = \frac{1}{2} M v^2 + \frac{1}{2} I \omega^2$$

CLICKER 5