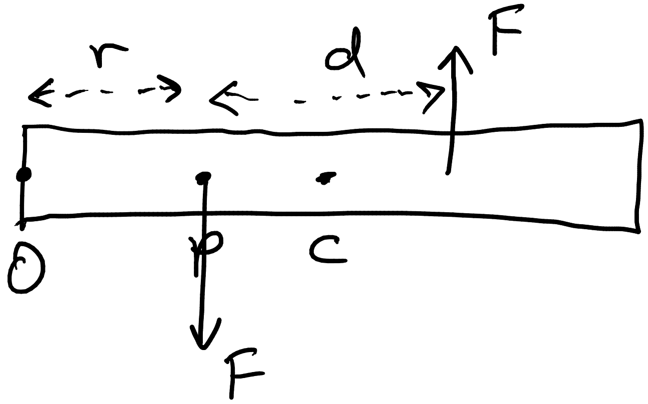
A :	1	16%
B :	2	19%
C :	3	3%
D :	4	43%
E :	>4	18%.

Pure Moments

ex



$\vec{M}_c = M_c \hat{k} = dF\hat{k}$

$\vec{M}_p = M_p \hat{k} = dF\hat{k}$

$\vec{M} = \vec{r} \times \vec{F}$

A: $M_c > M_p$

B: $M_c = M_p \longleftarrow$

C: $M_c < M_p$

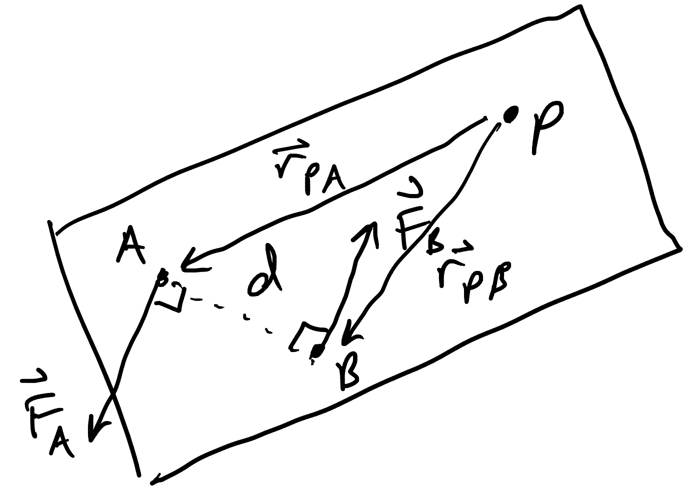
$$\vec{M}_o = (d+r)F\hat{k} - rF\hat{k}$$
$$= dF\hat{k}$$

A: $M_c > M_o$

B: $= \qquad \longleftarrow$

C: $<$

moment is independant
of the point.



$$\vec{M}_P = \vec{r}_{PA} \times \vec{F}_A + \vec{r}_{PB} \times \cancelto{-\vec{F}_A}{\vec{F}_B}$$

$$= (\vec{r}_{PA} - \vec{r}_{PB}) \times \vec{F}_A$$

$$= \vec{r}_{BA} \times \vec{F}_A$$

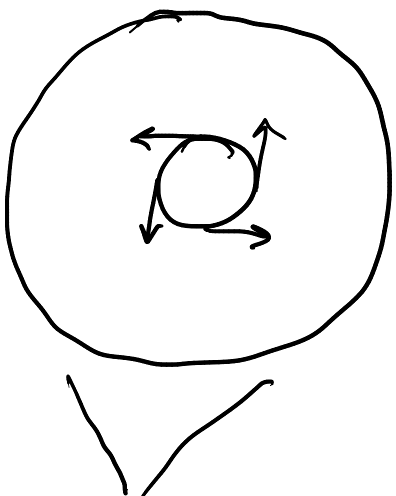
$$= dF\hat{k}$$

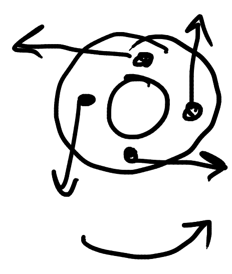
equal and opposite forces offset by a distance $\Big\}$ "pure moment" or "couple"

(or maybe "torque")

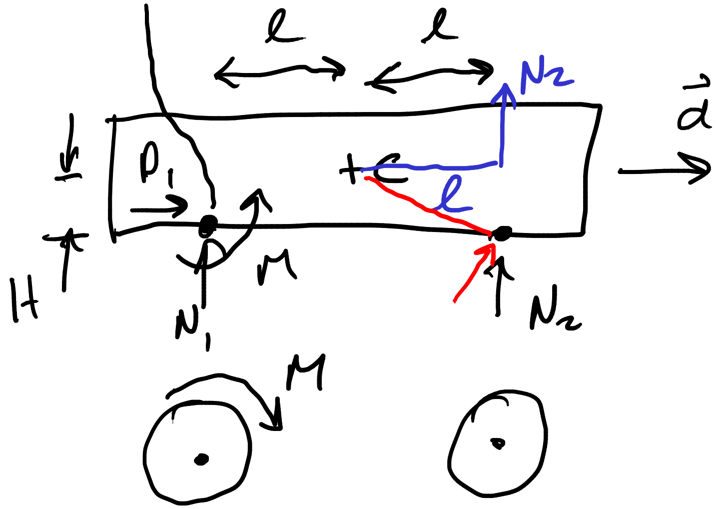
$$\cancelto{0}{\sum \vec{F}} = m\vec{a}_c$$

produce: 1. no net force
2. moment indep. of pos.

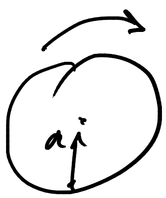


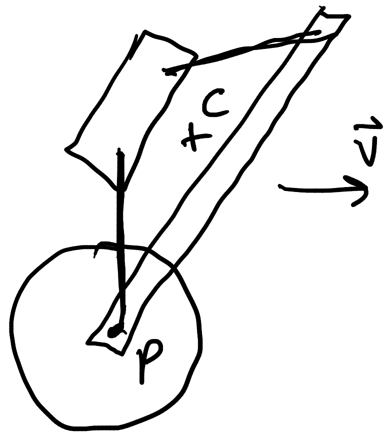


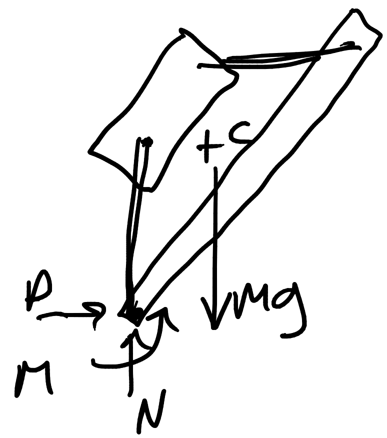
shafts produce pure moments.



$$\vec{M}_c = \ell N_2 \hat{k} - \ell N_1 \hat{k} + H D_1 \hat{k} + M \hat{k}$$





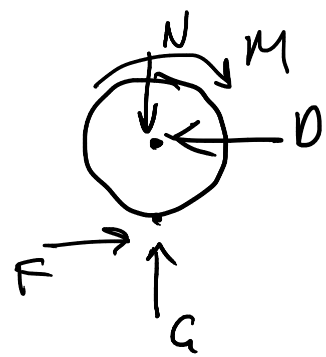


moment balance around C.

$$\sum \vec{M}_c = I_c \vec{\alpha}$$

$$\sum \vec{M}_o = I_o \vec{\alpha} \quad \text{O fixed.}$$

not $\cancel{\sum \vec{M}_p = I_p \vec{\alpha}}$



Note "moment of inertia" in TAM 251 (beams)

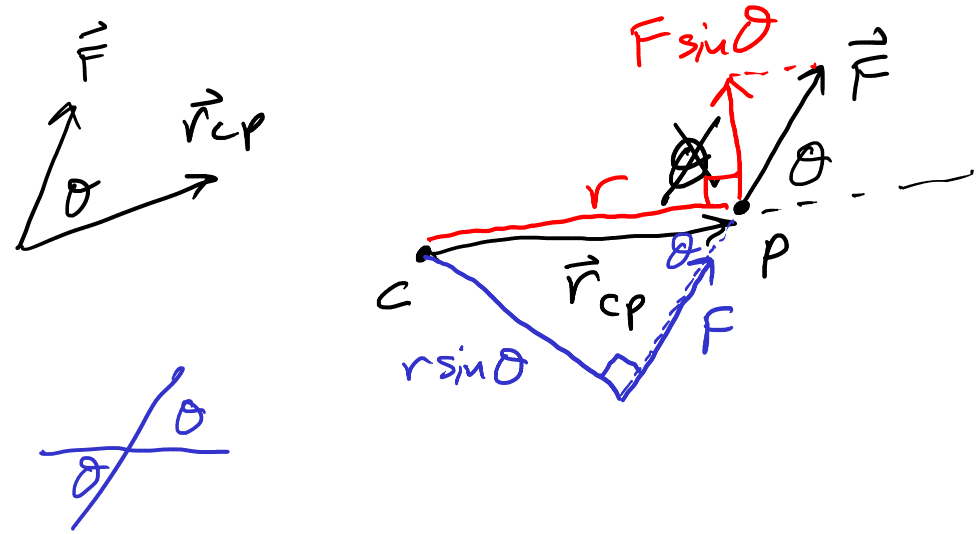
$\neq$ "moment of inertia" in TAM 212.

mass moment of inertia

area moment of inertia.

normally: "moment of inertia" = "mass moment of inertia".

Fast ways to compute moments:



$$\vec{M}_c = \vec{r}_{cp} \times \vec{F}$$

$$M_c = r_{cp} F \sin\theta$$

$$= r_{cp}(F\sin\theta)$$

$$= (r_{cp}\sin\theta)F$$