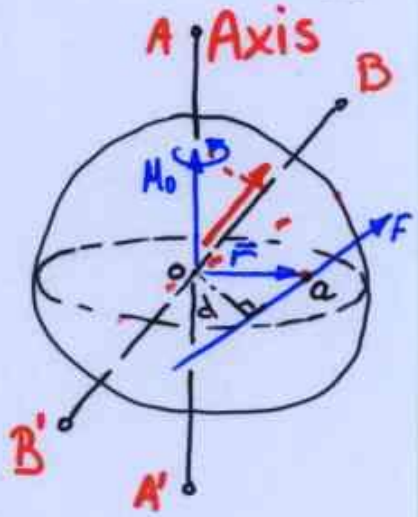
3-D : moment & couple

Sometimes just like 2-D case
Force $\vec{F}$ & point O define a plane
moment of $\vec{F}$ about an AXIS A-A'
normal to this plane is

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

same as before.



If WE WANT moment about Axis B-B', need to do a bit more work.
note: if B-B' was parallel to $\vec{F}$, moment would be ZERO.

$$\vec{M}_B = \left((\vec{r} \times \vec{F}) \cdot \vec{n}\right)\vec{n}$$

WHERE $\vec{n}$ is a unit VECTOR along axis B-B'

TO UNDERSTAND THIS ... BREAK INTO PIECES

$(\vec{r} \times \vec{F}) = \vec{M}_o$ as before.

So $(\vec{r} \times \vec{F}) \cdot \vec{n} \equiv \vec{M}_o \cdot \vec{n} = \|M_o\| \, \|\vec{n}\| \cos\theta$

$\|n\| = 1$ so $\Rightarrow \|M_o\| \cos(\theta)$

NOTE THIS is A SCALAR.

last bit ... mult by $\vec{n}$

So $\vec{M}_B$ is VECTOR // to $\vec{n}$

with magnitude of $\vec{M}_o$

Projected onto $\vec{n}$