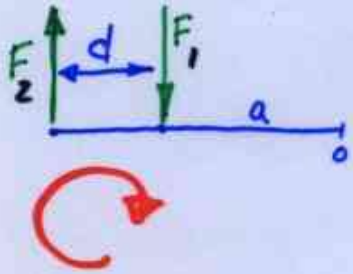
PROOF: $M_O = \vec{r} \times \vec{F}$; $\vec{F} = \vec{P} + \vec{Q}$ COMPONENTS

$\Rightarrow M_O = \vec{r} \times (\vec{P} + \vec{Q})$

CROSS PRODUCT is DISTRIBUTIVE SO...

$M_O = \vec{r} \times \vec{P} + \vec{r} \times \vec{Q}$ i.e. SUM OF MOMENTS.

COUPLE: CONSIDER 2 EQUAL AND OPPOSITE FORCES. NETT FORCE = $\vec{0}$.



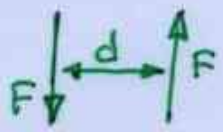
WHAT is MOMENT?

$M_O = +F_1 . a - F_2 (a+d)$

$= -Fd$

i.e. "a" DOES NOT MATTER.

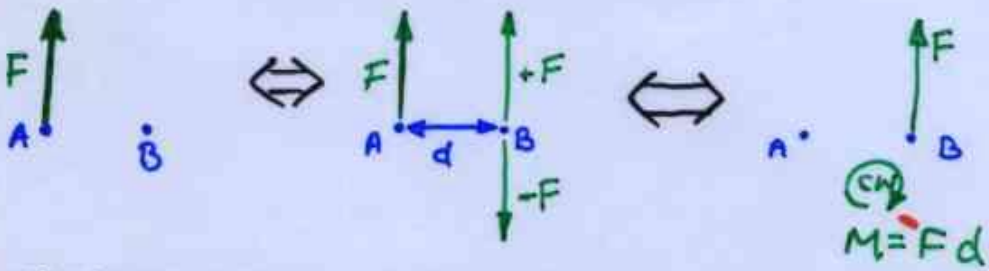
MOMENT OF COUPLE SAME ABOUT ALL POINTS

NOTE SIGN... if WE HAD 

then $\vec{M} = +Fd$ (RIGHT HAND RULE, AGAIN)

FORCE - Couple SYSTEMS:

YOU CAN REPLACE A FORCE BY AN EQUAL PARALLEL FORCE PLUS A MOMENT:



RIGHT HAND RULE GIVES DIRECTION OF COUPLE (clockwise/NEGATIVE HERE)