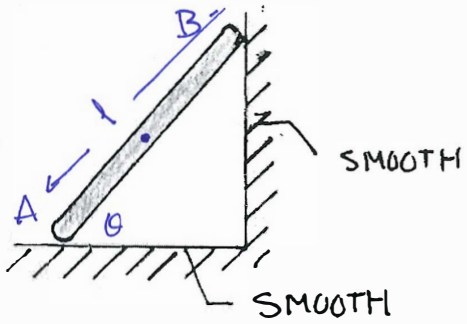
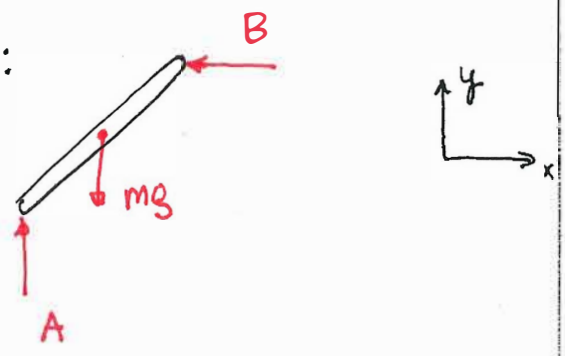
CONSIDER A LADDER ON SMOOTH SURFACES:



F.B.D.:



APPLY EQUILIBRIUM:

$\sum F_x = 0 = -B \Rightarrow B = 0$

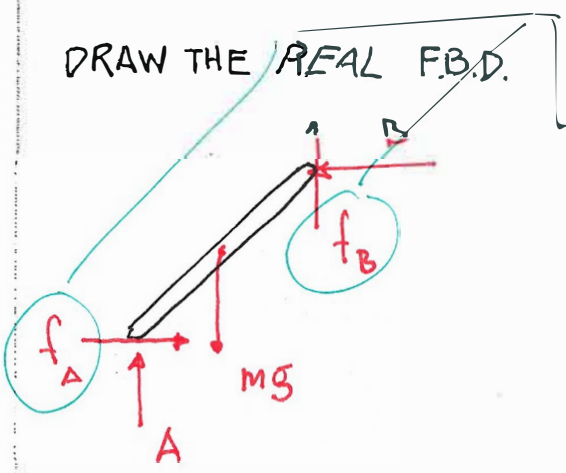
$\sum F_y = 0 = A - mg \Rightarrow A = mg$

$\sum M_A = 0 = -\frac{l}{2}\cos\theta(mg) + l\sin\theta B = 0$ ← 0!

- EITHER $B \neq 0$ &: $\sum F_x \neq 0$
- OR $B = 0$ &: $\sum M_A \neq 0$

→ NO EQUILIBRIUM!

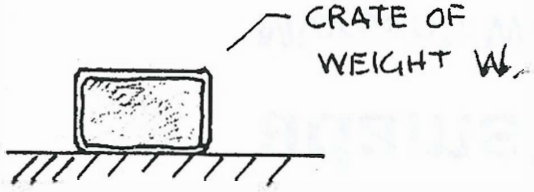
DRAW THE REAL F.B.D.



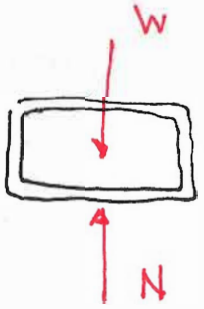
→ FRICTION FORCES DEVELOP TO OPPOSE RELATIVE MOTION (OR EITHER ACTUAL OR POTENTIAL.)

(ES201, ES204) HERE

CONSIDER A CRATE ON A HORIZONTAL SURFACE

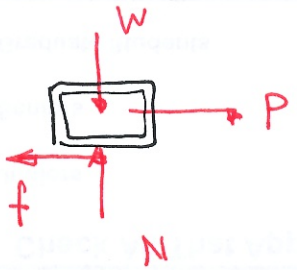


F.B.D.



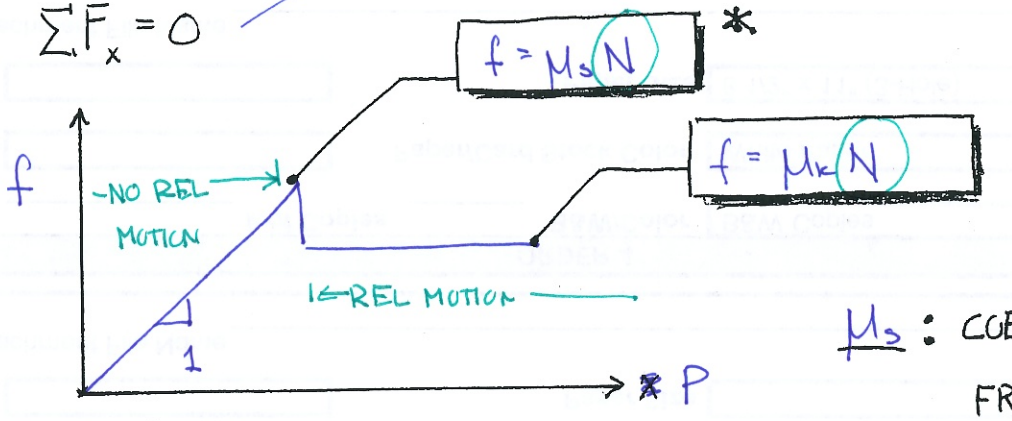
NOW APPLY A HORIZONTAL FORCE P.

F.B.D.



FOR EQUILIBRIUM $f = P$

$\sum F_x = 0$



μ_s : COEFF of STATIC FRICTION

μ_k : COEFF of KINETIC FRICTION

* AT IMPENDING MOTION ONLY !

FOR EQUILIBRIUM, THEN

$$0 \leq f \leq \mu_s N$$

LIMIT FOR NO REL. MOTION, NOT JUST NO MOTION

Don't always assume:

- $f = \mu_s N$
- $f = \mu_s W$ ($N \overset{\text{MIGHT}}{\underset{\text{NOT}}{=}} W$)
- f OPPOSITE DIR of MOTION (REM, REL. MOTION)