Práctico 7: Estática

Repaso:

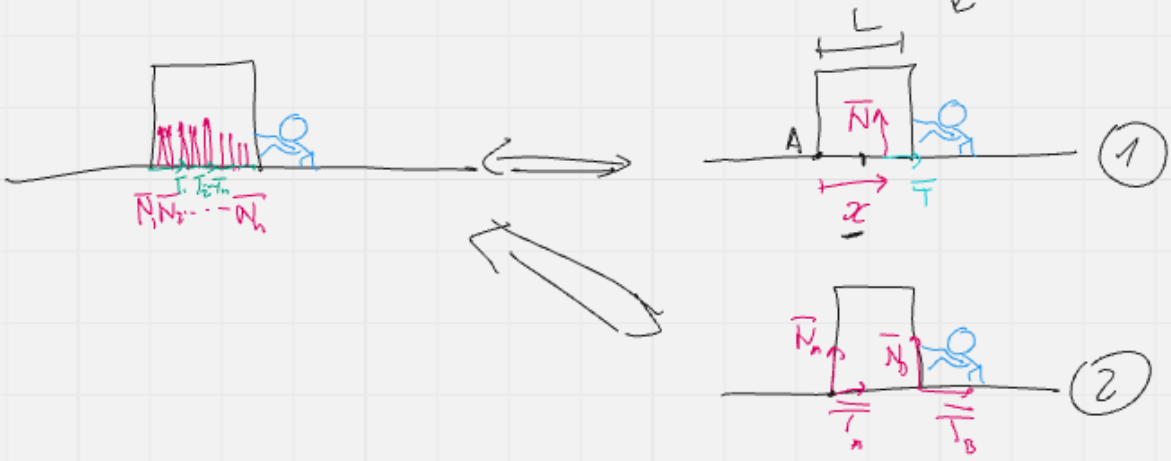
$$\begin{cases} \bar{a}_G = 0 \\ \dot{\bar{\omega}} = 0 \end{cases}$$

Dado el reposo del rígido, este permanece quieto.

$$\Rightarrow (1) \begin{cases} \bar{R}^{EXT} = 0 \\ \bar{\pi}_Q^{EXT} = 0 \end{cases}$$

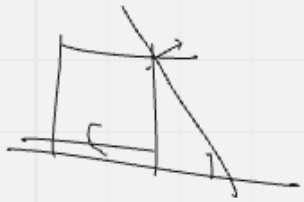
Además: Sist de fuerzas $\Leftrightarrow$ Una $\bar{R}$ en algún punto P y un momento en P.

Cómo usamos esto? Con las normales



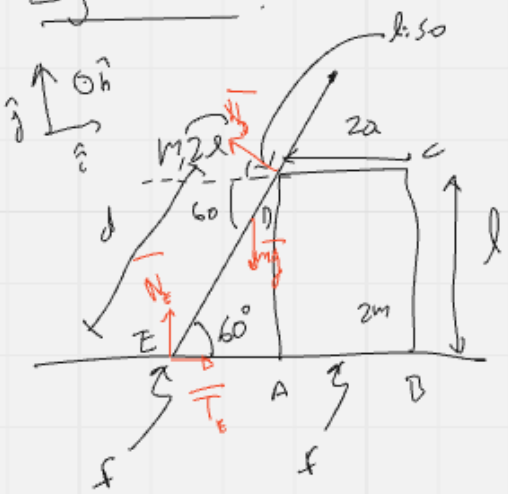
(2) **Condición de no vuelco:** $\begin{cases} 0 \leq x \leq L \\ N_A > 0 \ \text{y} \ N_B > 0 \end{cases}$

(3) Rozamiento estático $|T| \leq \mu |N|$ (En todos los contactos)



(4) Corroborar $N_i > 0$

Ejercicio 2:



Barra 1°C:
$$\begin{cases} T_E = N_D \sin(60) \\ N_E + N_D \cos(60) = mg \end{cases} \quad \left| \begin{array}{l} \sin 60 = \sqrt{3}/2 \\ \cos 60 = 1/2 \end{array} \right.$$

$$\Rightarrow \begin{cases} T_E = N_D \sqrt{3}/2 \\ N_E + \frac{N_D}{2} = mg \end{cases}$$

$d \sin 60 = l$

$\Rightarrow \boxed{d = l/\sin 60}$

2°C: (E)
$$N_D d = mg\, l \cos(60) = mg\, l/2$$

$$N_D \frac{l}{\sin 60} = 2 N_D \frac{l}{\sqrt{3}} = mg\, l/2$$

$$\Rightarrow \boxed{N_D = \frac{\sqrt{3} mg}{4}} > 0 \quad \checkmark$$

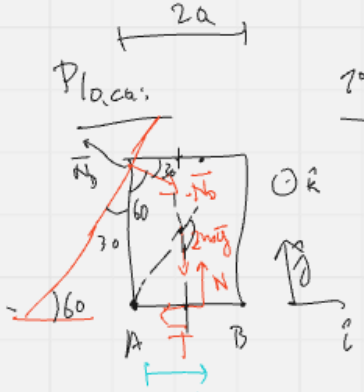
$$T_E = N_D \sin(60) \Rightarrow \boxed{T_E = \frac{3 mg}{8}}$$

$$N_E + N_D \cos(60) = mg$$

$$N_E = mg - \frac{\sqrt{3} mg}{8} = \boxed{mg\left(1 - \sqrt{3}/8\right) = N_E} > 0 \quad \checkmark$$

$$|\vec{T}_E| \le f\,|\vec{N}_E| \iff \frac{3mg}{8} \le f\,mg\left(1-\frac{\sqrt{3}}{8}\right)$$

$$\iff f \ge \frac{3}{8}\cdot\frac{1}{1-\sqrt{3}/8} \iff \boxed{f \ge \frac{3}{8-\sqrt{3}}} \quad !!!$$

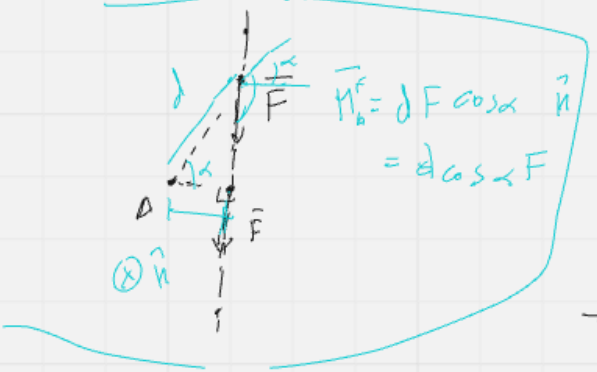


T.C: $\begin{cases} \frac{\sqrt{3}mg}{4}\cos(30) = T \iff T = \frac{3mg}{8} > 0 \\ N = 2mg + \frac{\sqrt{3}mg}{4}\sin(30) = mg\left(2+\frac{\sqrt{3}}{8}\right) > 0 \end{cases}$

$\sum \tau_{(A)}$: $Nx = N_b\, l \sin 60 + 2mga$

$$x = \frac{\frac{3mg}{8}l + 2mga}{mg\left(2+\frac{\sqrt{3}}{8}\right)}$$

$$\Rightarrow \boxed{x = \frac{\frac{3l}{8}+2a}{2+\sqrt{3}/8}}$$



$\vec{N}_b^F = d\,F\cos\alpha\,\vec{n}$

$= d\cos\alpha\,F$

No desliz. de la placa:

$T \le f\,N$

$$\frac{3mg}{8} \le f\,mg\left(2+\frac{\sqrt{3}}{8}\right)$$

$$f \ge \frac{3}{8}\cdot\frac{1}{2+\sqrt{3}/8} = \boxed{\frac{3}{16+\sqrt{3}}}$$

Cond de no-vuelco:

$0 < x < 2a$

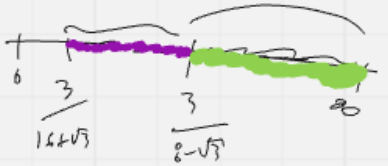
① ②

① $x > 0 \iff \frac{\frac{3l}{8}+2a}{2+\sqrt{3}/8} > 0$ Vale siempre

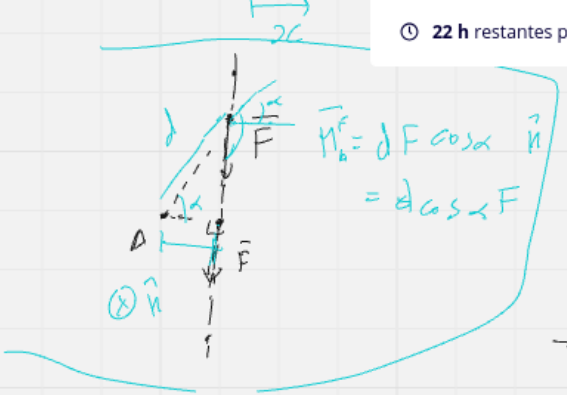
Esta condición es más restrictiva.

Cond de la barra:

$$\boxed{f \ge \frac{3}{8-\sqrt{3}}}$$



Me quedo siempre con la más restrictiva



$$x = \frac{\frac{3mg}{8}l + 2mga}{mg\left(2+\frac{\sqrt{3}}{8}\right)}$$

$$x = \frac{\frac{3}{8}l + 2a}{2+\frac{\sqrt{3}}{8}}$$

placa:

$T \le f\,N$

$$\frac{3mg}{8} \le F\,mg\left(2+\frac{\sqrt{3}}{8}\right)$$

$$F \ge \frac{3}{8}\cdot\frac{1}{2+\frac{\sqrt{3}}{8}} = \frac{3}{16+\sqrt{3}}$$

Cond de la barra:

$$F \ge \frac{3}{8-\sqrt{3}}$$

Cond de NO-VUELCO:

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① $x > 0 \iff \frac{\frac{3}{8}l + 2a}{2+\frac{\sqrt{3}}{8}} > 0$ Vale siempre

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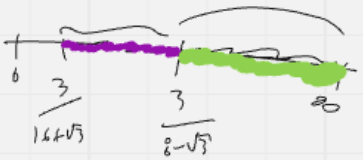
Me quedo siempre con la más restrictiva.



② $\frac{\frac{3}{8}l + 2a}{2+\frac{\sqrt{3}}{8}} < 2a$

$$\Rightarrow \frac{3}{8}l + 2a < 4a + \frac{\sqrt{3}}{4}a \iff \frac{3}{8}l < 2a + \frac{\sqrt{3}}{4}a = a\left(2+\frac{\sqrt{3}}{4}\right)$$

$$\Rightarrow l < a\frac{8}{3}\left(2+\frac{\sqrt{3}}{4}\right)$$

$$l < a\left(\frac{16+2\sqrt{3}}{3}\right)$$

$$F \ge \frac{3}{8-\sqrt{3}}$$