

III
C-Q
-
B
-
P
-
M

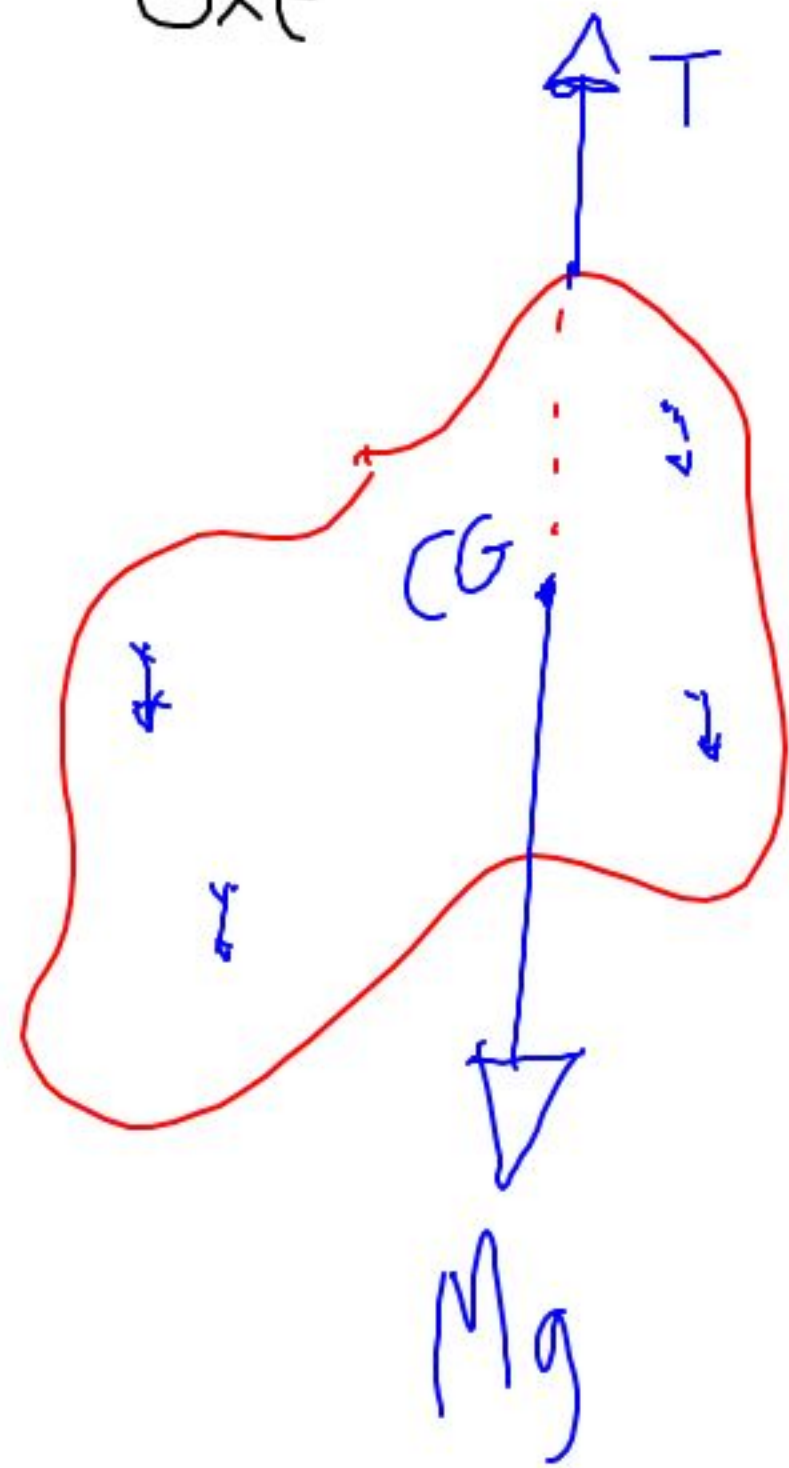
$$\sum_{\text{ext}} \underline{F} = 0 \Rightarrow \underline{P} = \text{const}$$

&

$$\sum_{\text{ext}} \underline{L} = 0 \Rightarrow \underline{L} = \text{const}$$

Static
equilibrium

$$\underline{P} = 0 = \underline{L}$$



$$CG = CM$$

(g is constant)

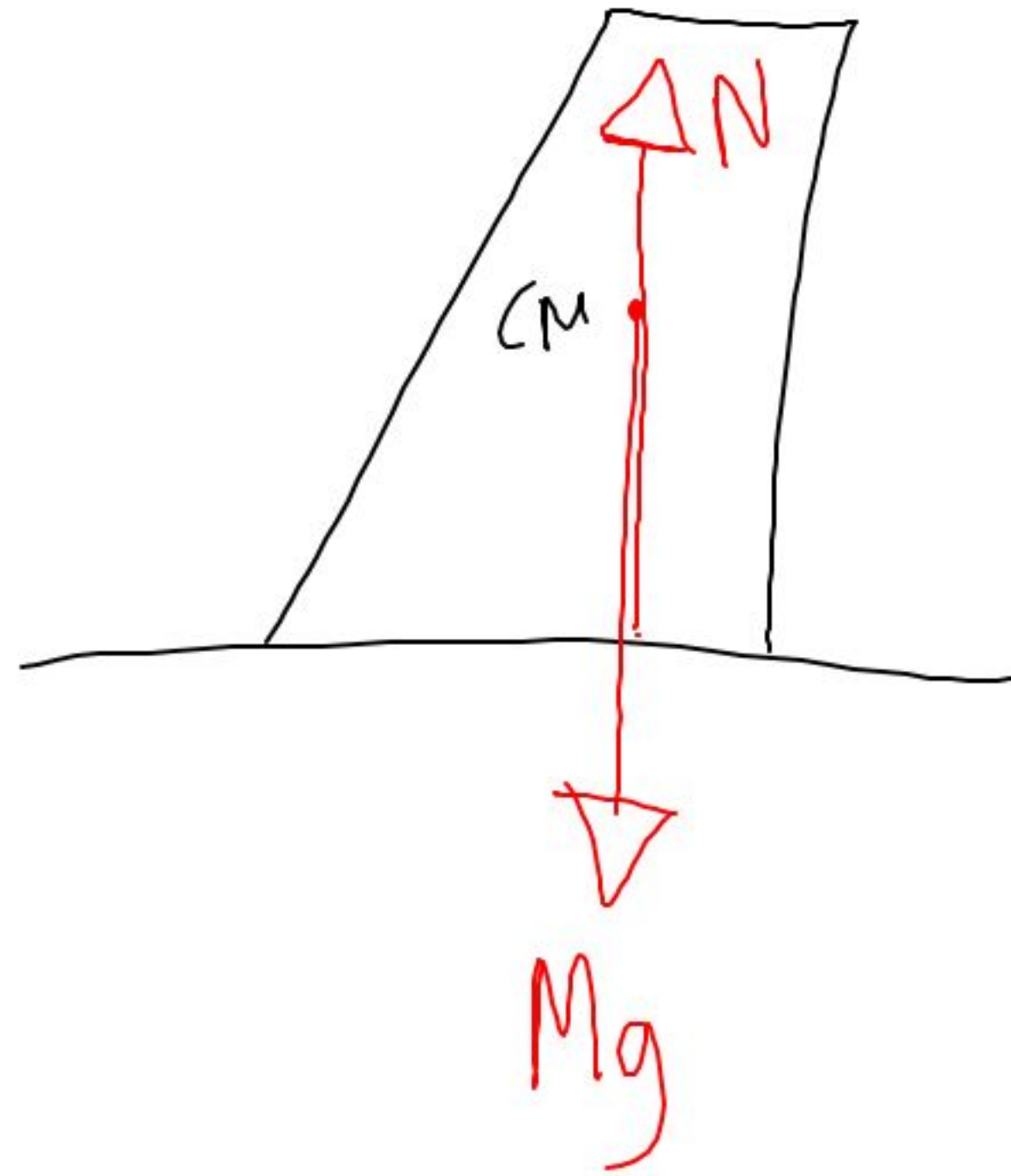
Force equil

Torque equil

$$T - Mg = 0$$

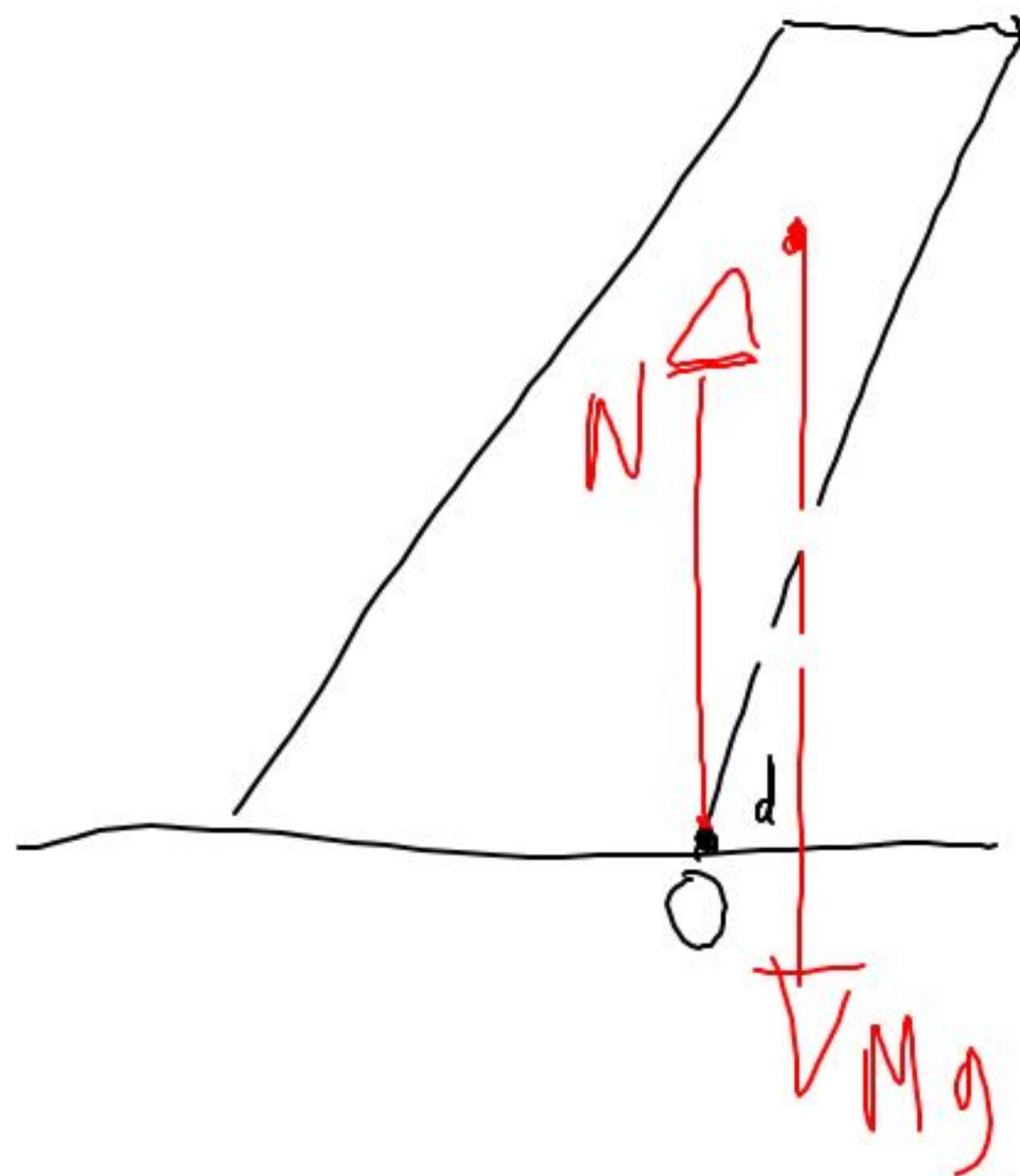
forces line up

↑ +



Force eq : $N - Mg = 0$

Torque eq : N, Mg line up

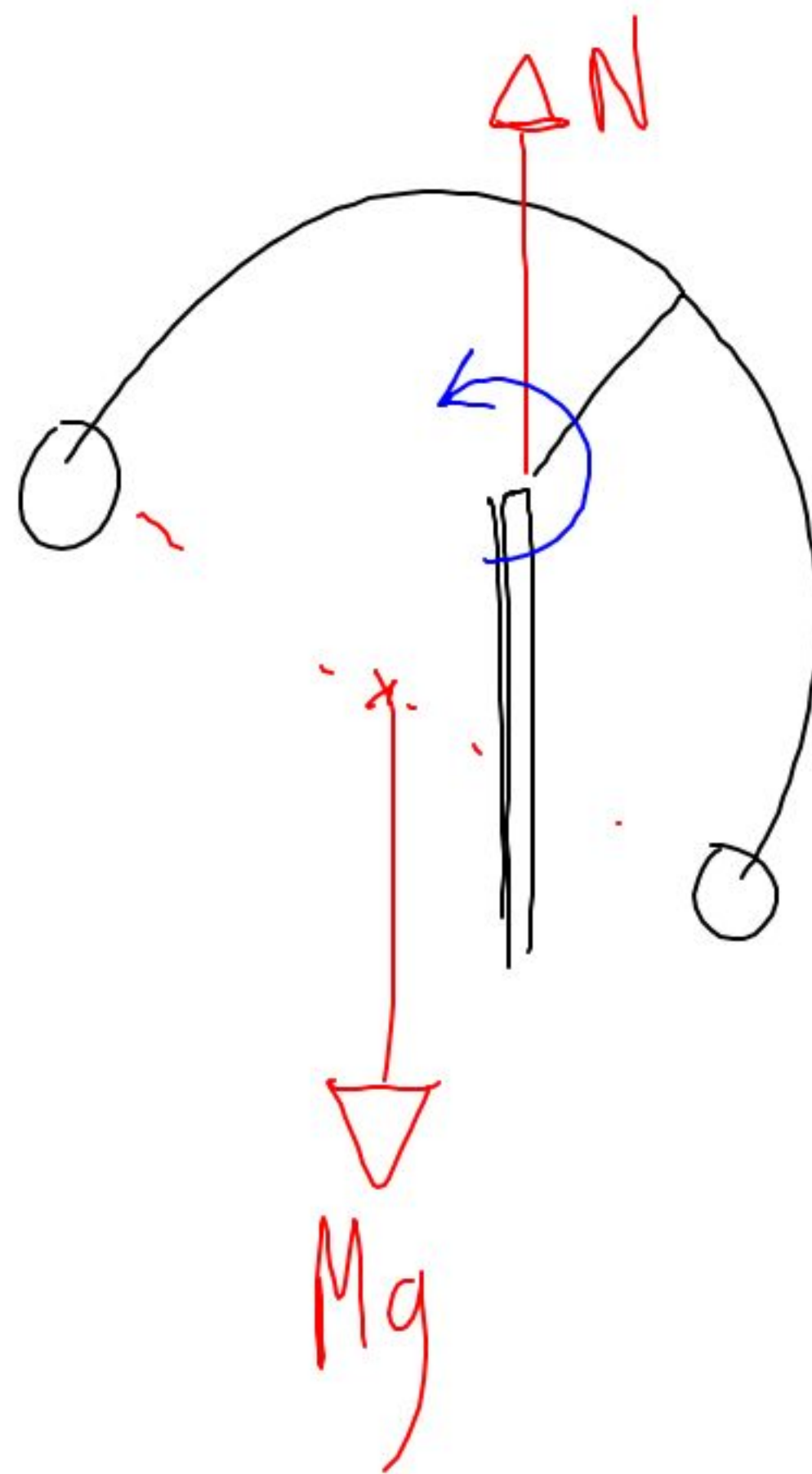
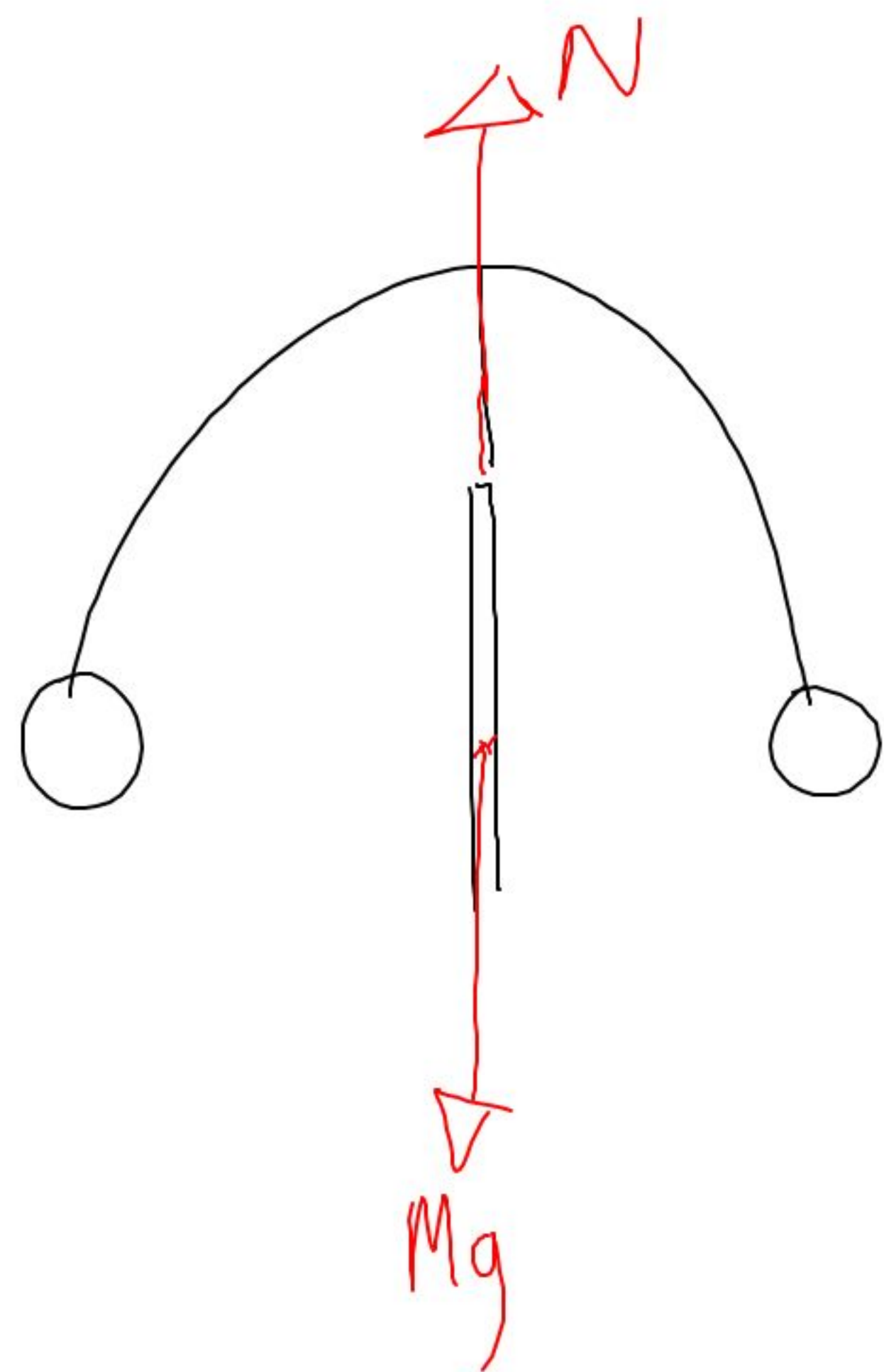


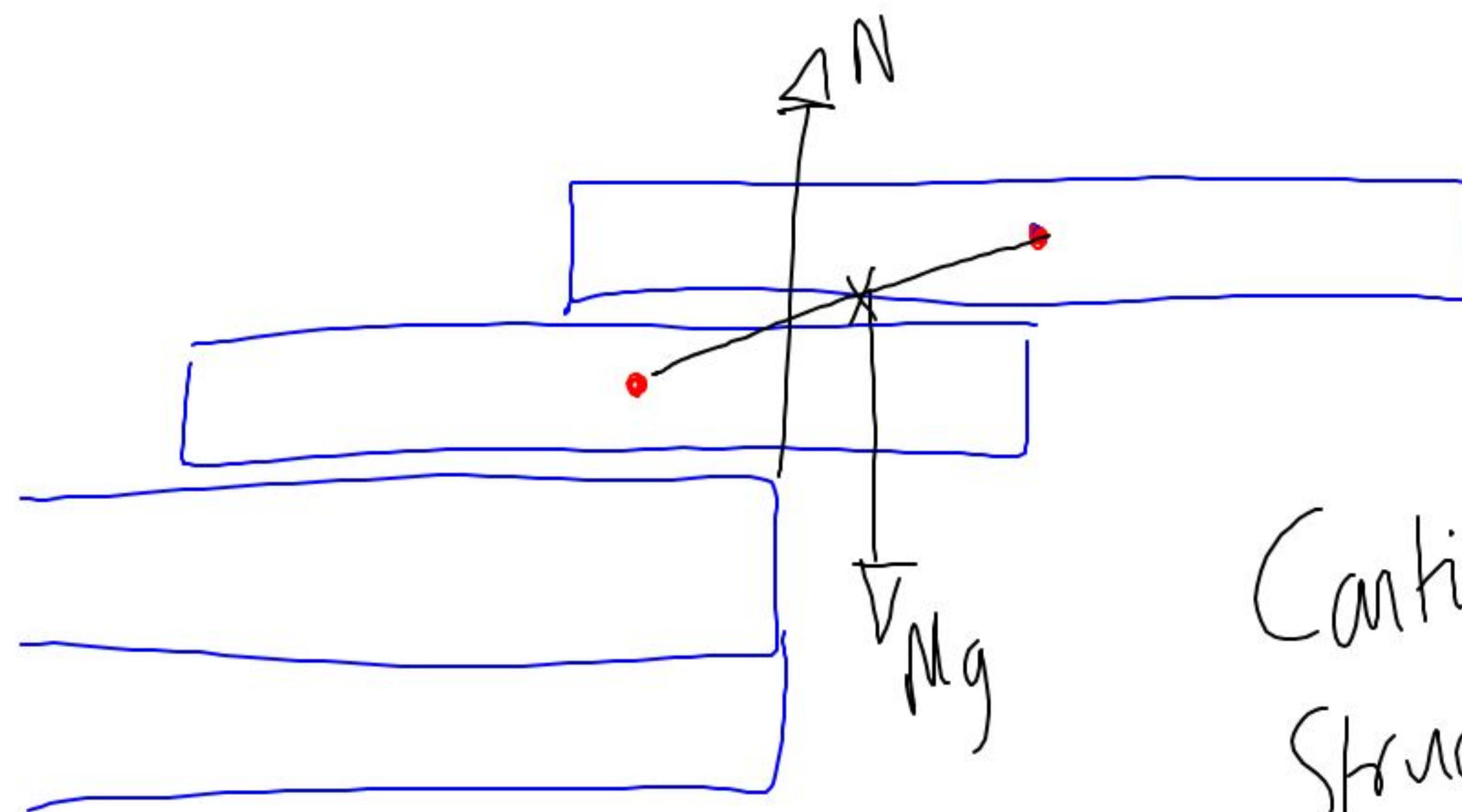
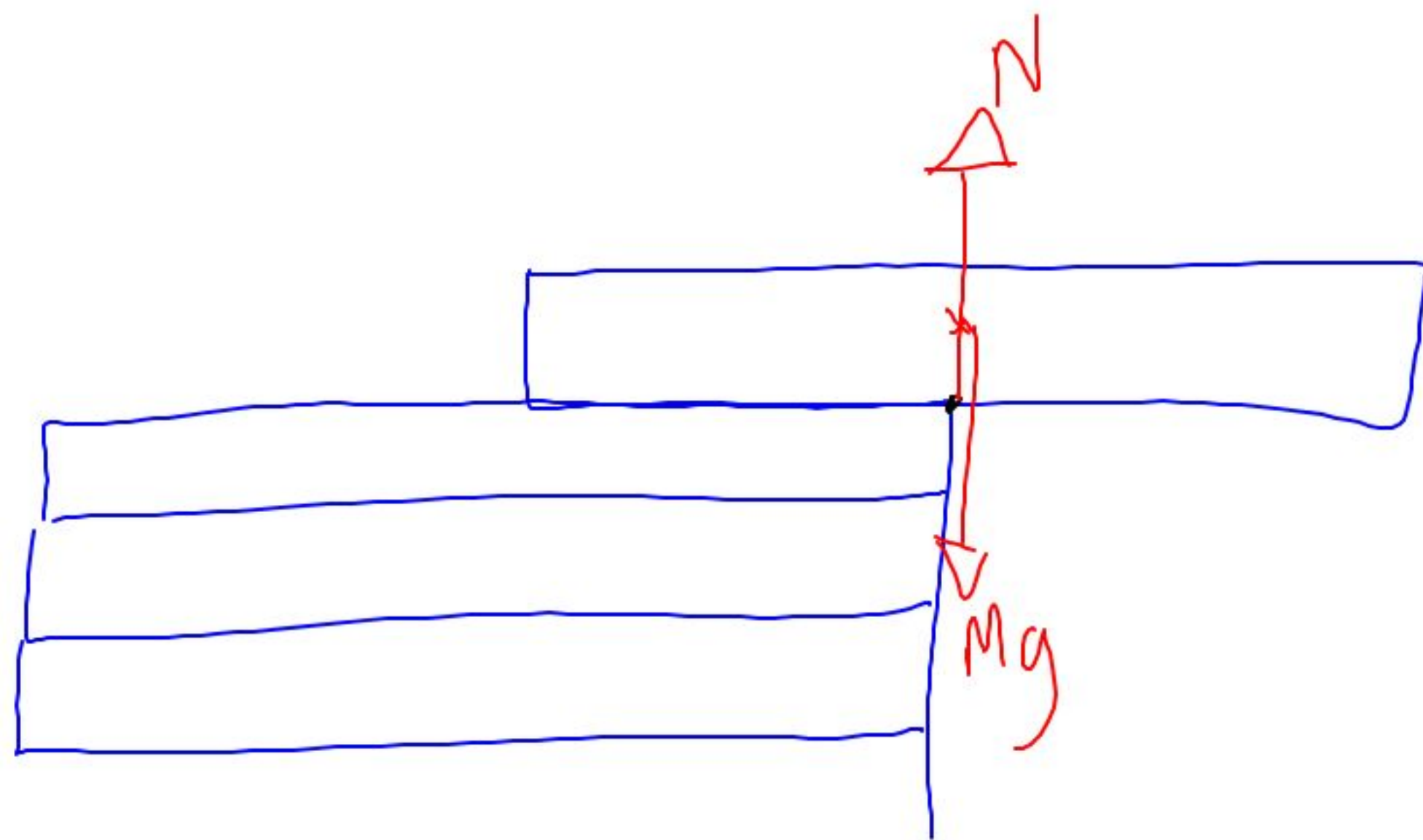
Force eq : $N = Mg$

No torque equil.



$$\sum \tau_o = dMg + 0 \neq 0$$





Cantilever
Structure

$$\frac{1}{2}$$

$$\sum 1/2$$

$$3/4$$

$$\frac{1}{4}$$

$$11/12$$

$$25/24$$

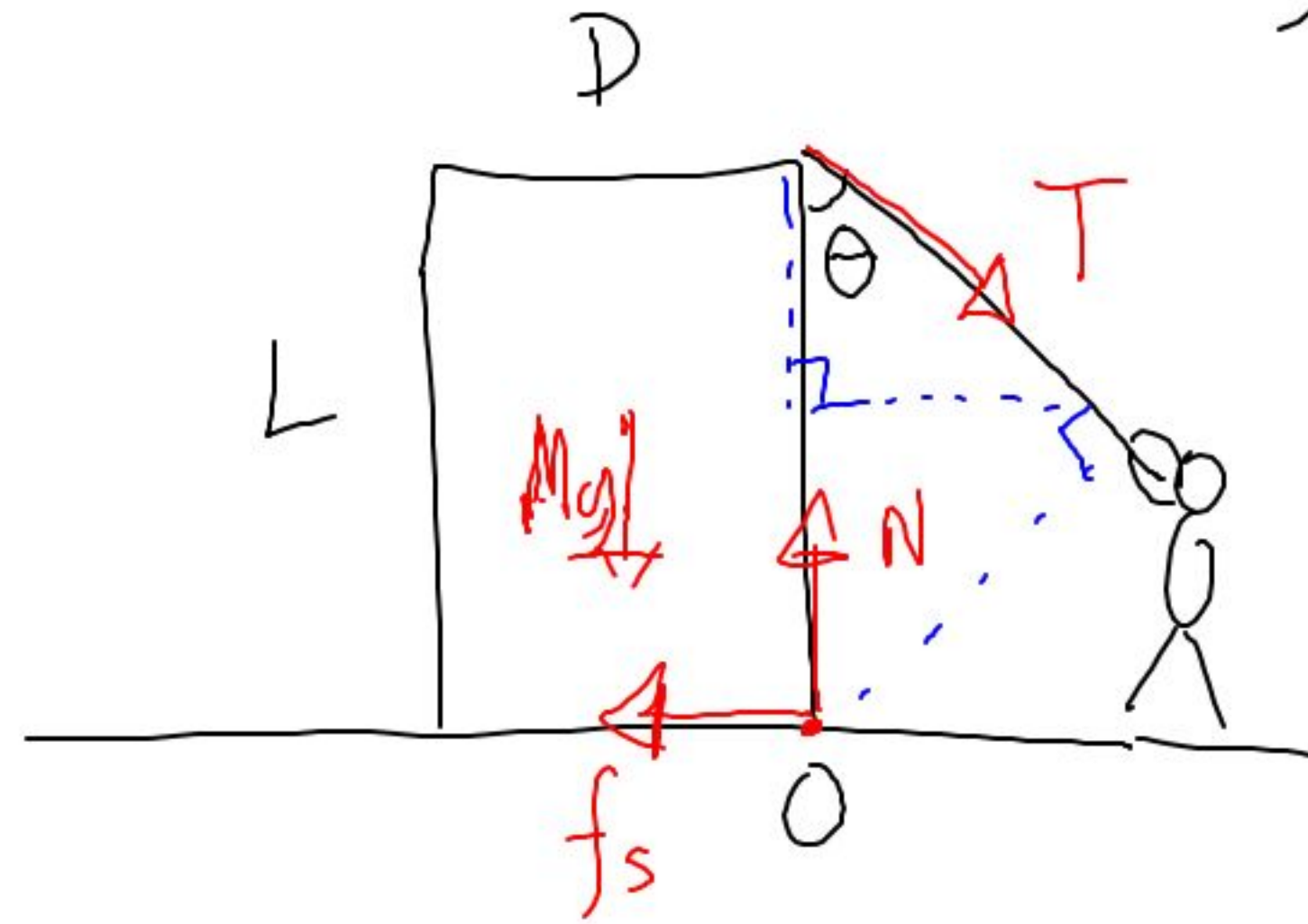
$$\frac{1}{6}$$

$$\frac{1}{8}$$

$$\frac{1}{10}$$

$$\frac{1}{12}$$

Tipping vs Sliding



Verge of Tipping: $\sum \tau_o = 0$



$$+ Mg \frac{D}{2} - TL \sin \theta = 0$$

$$T = \frac{Mg D}{2 L \sin \theta}$$

Verge of sliding: $\sum F = 0$

$\begin{matrix} y \\ \uparrow \\ x \end{matrix}$
 $\sum F_x = 0 = -\mu_s N + T \sin \theta$

$$\sum F_y = 0 = +N - Mg - T \cos \theta$$

$$T = \frac{\mu Mg}{\sin \theta - \mu \cos \theta}$$

Which ever is smaller wins