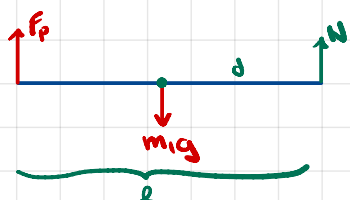


$$N + F_p \sin \alpha = m \cdot g$$

$$F_p \cos \alpha = 0 \Rightarrow \alpha = \pi/2$$



$$\vec{\tau}_{cm} = dN - (l-d)F_p = 0$$

constraints:  $N, F_p$

$$d \cdot N = (l-d)F_p$$

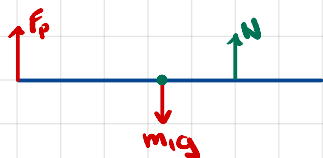
$$N + F_p = mg$$

$$d \cdot N = (l-d)(mg - N)$$

$$= (l-d)mg - (l-d)N$$

$$N(\cancel{l} + l - \cancel{d}) = (l-d)mg$$

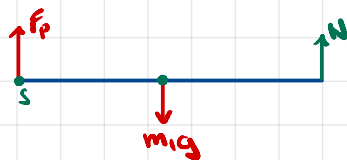
$$N = \frac{l-d}{l} mg$$



$$d = \frac{l}{4} \Rightarrow N = \frac{3}{4} mg$$

$$d = \frac{l}{2} \Rightarrow N = \frac{mg}{2}$$

$$d = -\frac{1}{4}l \Rightarrow N = \frac{5}{4} mg$$



$$\vec{\tau}_s = Nd_n - m \cdot g d_{cm} = 0$$

$$N + F_p = m \cdot g$$

constraints:  $N, F_p$

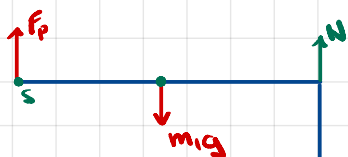
$$Nd_n = m \cdot g d_{cm} \Rightarrow N = \frac{m \cdot g d_{cm}}{d_n}$$

ex:  $d_{cm} = l/2, d_n = l$

$$N = \frac{m \cdot g l/2}{l} = \frac{m \cdot g}{2}$$

$$\Rightarrow F_p = N = \frac{m \cdot g}{2}$$

ex:  $d_{cm} = l/2, N = \frac{m \cdot g l}{2d_n}$



$$\vec{\tau}_s = Nd_n - m \cdot g d_{cm} - F d_f = 0$$

$$N + F_p = m \cdot g + F$$

$$\Rightarrow N = \frac{m \cdot g d_{cm} + F d_f}{d_n}$$

$$F_p = \frac{-m \cdot g d_{cm} - F d_f + m \cdot g d_n + F d_n}{d_n}$$

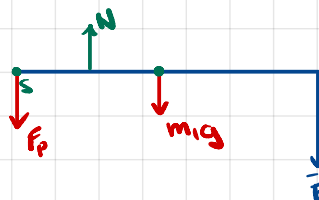
$$F_p = \frac{m \cdot g (d_n - d_{cm}) + F (d_n - d_f)}{d_n}$$

ex:  $d_{cm} = l/2, d_f = d_n = l$

$$\Rightarrow N = \frac{m \cdot g \frac{l}{2} + Fl}{l} = \frac{m \cdot g + 2F}{2}$$

$$= F + \frac{m \cdot g}{2}$$

$$F_p = \frac{m \cdot g \frac{l}{2} + F \cdot 0}{l} = \frac{m \cdot g}{2}$$

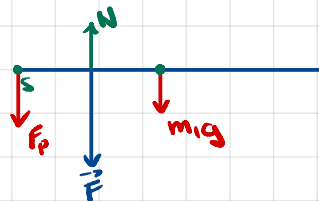


ex:  $d_{cm} = l/2, d_f = l, d_n = \frac{l}{4}$

$$N = \frac{m \cdot g \frac{l}{2} + Fl}{\frac{l}{4}} = \frac{2(m \cdot g + 2F)}{\frac{l}{4}} = 4 \left( \frac{m \cdot g + 2F}{2} \right)$$

$$F_p = \frac{m \cdot g \left( -\frac{l}{4} \right) + F \left( -\frac{3l}{4} \right)}{\frac{l}{4}}$$

$$= -m \cdot g - 3F$$



$d_{cm} = l/2, d_f = d_n = l/4$

$$N = \frac{m \cdot g \frac{l}{2} + F \frac{l}{4}}{l/4}$$

$$= 2m \cdot g + F$$

$$F_p = \frac{m \cdot g \left( -\frac{l}{4} \right) + F(0)}{l/4}$$

$$= -m \cdot g$$