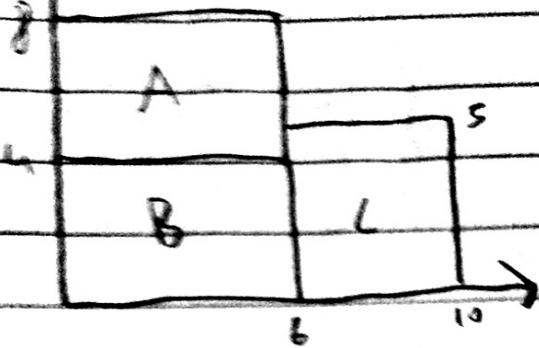


$$A = 27.4 \text{ kg}$$

$$B = 31 \text{ kg}$$

$$C = 70 \text{ kg}$$



$$COM_A = (3, 6)$$

$$COM_B = (3, 2)$$

$$COM_C = (8, 2.5)$$

$$COM_x = \frac{m_A x_A + m_B x_B + m_C x_C}{m_A + m_B + m_C} = \frac{(27.4 \text{ kg} \cdot 3) + (31 \text{ kg} \cdot 3) + (70 \text{ kg} \cdot 8)}{128.4 \text{ kg}}$$

$$= \frac{82.2 + 93 + 560}{128.4} = 5.726$$

X coordinate

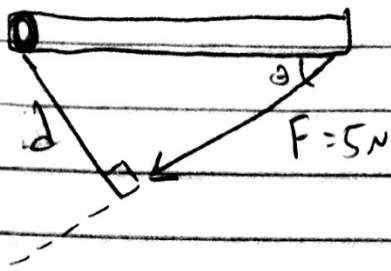
$$COM_y = \frac{m_A y_A + m_B y_B + m_C y_C}{m_A + m_B + m_C} = \frac{(27.4 \cdot 6) + (31 \cdot 2) + (70 \cdot 2.5)}{128.4}$$

$$= \frac{164.4 + 62 + 175}{128.4} = 3.126$$

Y coordinate

$$COM = (5.726, 3.126)$$

2.



$$\theta = 30^\circ$$

$$F = 5 \text{ N}$$

$$\bar{L} = 4.5 \text{ Nm}$$

$$F = 5 \text{ N}$$

$$\sin(\theta) = \left(\frac{d}{L}\right)$$

$$\bar{L} = F \cdot d$$

$$4.5 \text{ Nm} = 5 \text{ N} \cdot d$$

$$d = \frac{4.5}{5} \text{ m}$$

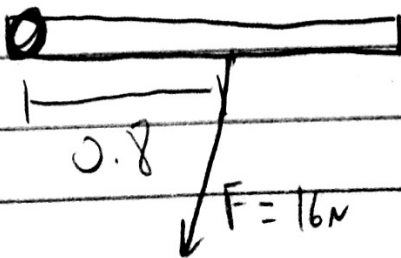
$$d = 0.9 \text{ m}$$

$$\sin(\theta) = \left(\frac{0.9}{L}\right)$$

$$L = \frac{0.9}{\sin(30^\circ)}$$

$$L = 1.8 \text{ m}$$

3.



$$F = 16 \text{ N}$$

$$\bar{L} = 8 \text{ Nm}$$

$$L = 80 \text{ cm} = 0.8 \text{ m}$$

$$\bar{L} = F \cdot d$$

$$8 = 16 \cdot d$$

$$d = \frac{1}{2} \text{ m}$$

$$\sin(\theta) = \left(\frac{d}{L}\right)$$

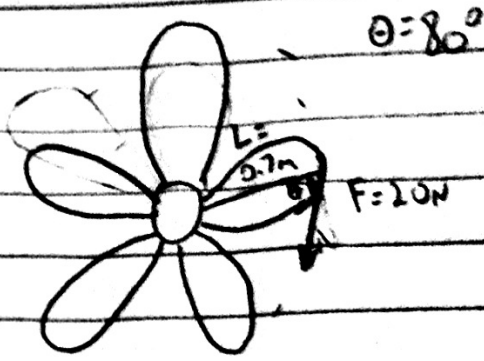
$$\sin(\theta) = \frac{0.5}{0.8}$$

$$\sin(\theta) = 0.625$$

$$\theta = \sin^{-1}(0.625)$$

$$\theta = 38.7^\circ$$

4.



$$\tau = F \cdot d$$

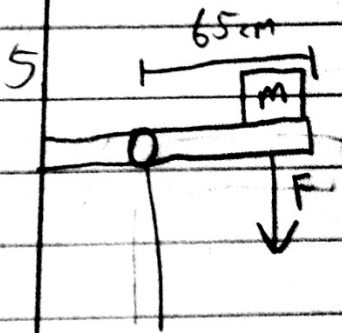
$$\sin(80^\circ) = \frac{d}{L}$$

$$d = 0.7 \text{ m} \sin(80^\circ)$$

$$d = 0.69 \text{ m}$$

$$\tau = 20 \text{ N} \cdot 0.69 \text{ m}$$

$$\tau = 13.8 \text{ N} \cdot \text{m}$$



$$\tau = 7.8 \text{ N} \cdot \text{m}$$

$$\tau = F \cdot d$$

$$d = 0.65 \text{ m}$$

$$F = \frac{7.8}{0.65}$$

$$F = mg$$

$$F = 12 \text{ N}$$

$$F = m(9.8 \text{ m/s}^2)$$

$$m = \frac{12 \text{ N}}{9.8 \text{ m/s}^2} = \boxed{1.22 \text{ kg}}$$