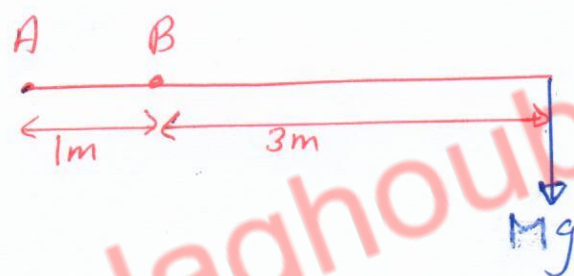


The University of Jordan
 Physics Department
 solutions to chapter 9
 Giancoli 7th edition
 Prof. Mahmoud Jaghoub

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Q4] $\overset{+}{\curvearrowleft} A$ $\tau = -(Mg)(4) = -1800$
 $\therefore M = \frac{1800}{4g} \approx 45.9 \text{ kg}$



Q5] (a) ignore mass of beam.

$\overset{+}{\curvearrowleft} A$ $F_B(1) - Mg(4) = 0$

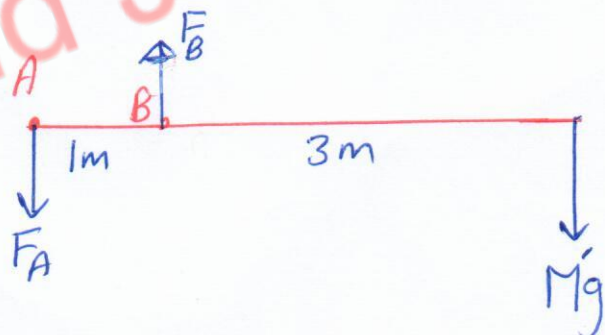
$F_B = 4Mg = 4(52)(9.8)$
 $= 2038.4 \text{ N.}$

$\overset{+}{\uparrow} F_B - F_A - Mg = 0 \Rightarrow F_A = F_B - Mg$

$F_A = 1528.8 \text{ N.}$

Alternatively take torque about point B.

(b) Mass of the board = 28 kg, which acts at the center of the board.



+ve @ B

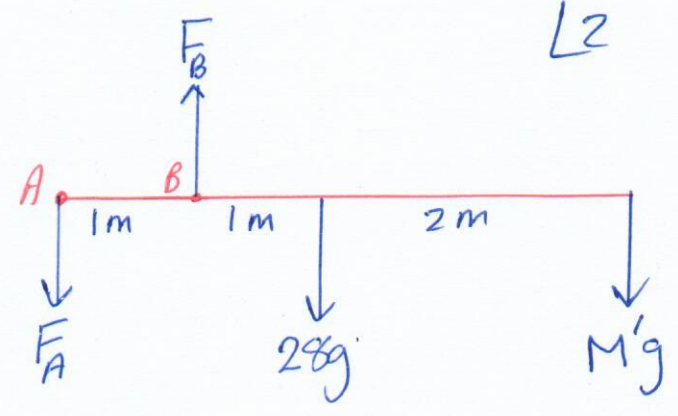
$$\tau = F_A(1) - 28g(1) - M'g(3) = 0$$

$$F_A = 28g + 52g(3) = 1803 \text{ N}$$

+ve @ A $F_B(1) - 28g(2) - M'g(4) = 0$

$$F_B = 2587.2 \text{ N}$$

Alternatively use $\Sigma F_y = 0$



Q16] $\Sigma F_y = 0$

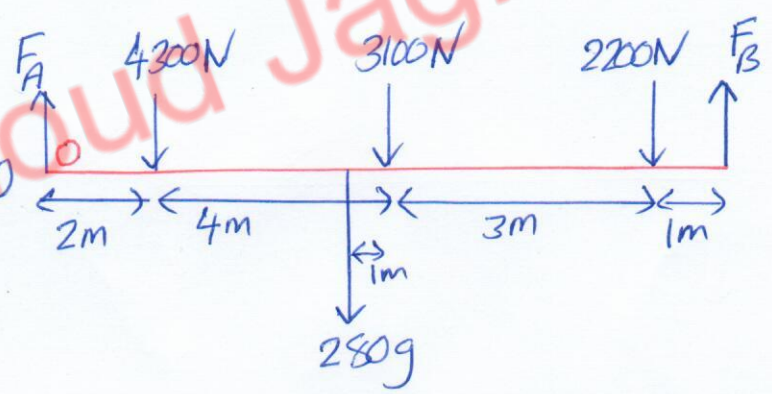
$$F_A + F_B - 4300 - 3100 - 2200 - 280g = 0$$

$$F_A + F_B - 9600 - 280g = 0$$

+ve @ A $F_B(10) - 2200(9) - 3100(6) - 280g(5) - 4300(2) = 0$

$$\therefore F_B \approx 6072 \text{ N}$$

$$\Rightarrow F_A = 6272 \text{ N}$$



Q17]

+ve

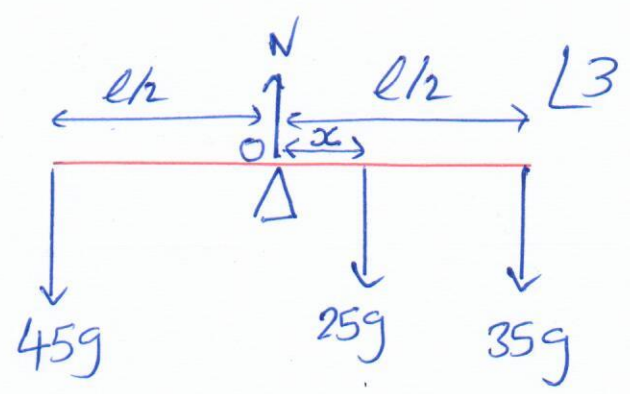
$$45g\left(\frac{l}{2}\right) - 25g(x) - 35g\left(\frac{l}{2}\right) = 0$$

$$25x = 40l$$

$$x = \frac{5}{25}l = \frac{1}{5}l$$

$$x = \frac{1}{5}(3.2) = 0.64 \text{ m}$$

to the right of the pivot, closer to the lighter mass.



ignore mass of board.

Q18] static equilibrium \Rightarrow

$$\sum \vec{\tau} = 0 \text{ and } \sum \vec{F} = 0$$

+ve

$$(T \sin 35)(1.35) - 155(0.85) - 215(1.7) = 0$$

$$T = 642 \text{ N}$$

Guess the directions of H_x and H_y .

$$\sum F_x = 0 \Rightarrow H_x - T \cos 35 = 0$$

$$\therefore H_x \sim 526 \text{ N}$$

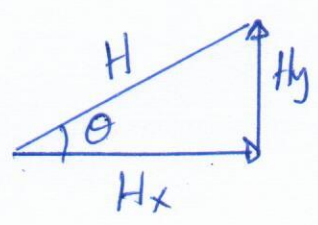
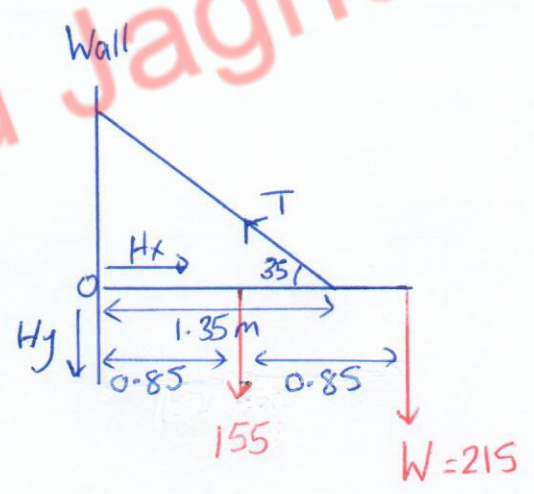
$$\sum F_y = 0 \Rightarrow T \sin 35 - 155 - 215 - H_y = 0$$

$\therefore H_y = -1.8$ (minus sign means H_y acts upwards NOT downwards but magnitude is correct)

$$H = \sqrt{H_x^2 + H_y^2} \approx 526 \text{ N}$$

$$\tan \theta = \left| \frac{H_y}{H_x} \right| \Rightarrow \theta \sim 0.19^\circ$$

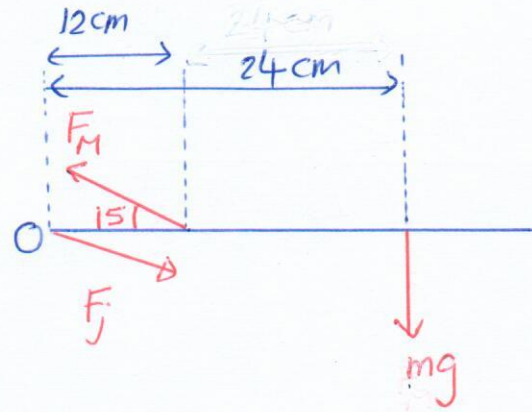
i.e H lies in first quadrant



32] $m = 33 \text{ kg}$

static equilibrium \Rightarrow

$\Sigma \vec{\tau} = 0$ and $\Sigma \vec{F} = 0$



L4

$\Sigma \tau = (F_M \sin 15)(0.12) - mg(0.24) = 0$

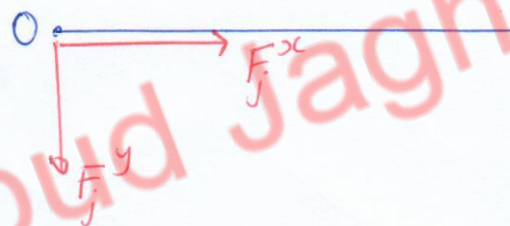
$\therefore F_M \approx 250 \text{ N}$

Resolve F_j into horizontal F_j^x and vertical F_j^y components

$\Sigma F_x = 0 \Rightarrow$

$\rightarrow + F_j^x - F_M \cos 15 = 0$

$F_j^x = 241.5 \text{ N}$



$\Sigma F_y = 0 \Rightarrow \uparrow F_M \sin 15 - F_j^y - mg = 0$
 $\therefore F_j^y = 32.4 \text{ N}$

$F_j = \sqrt{(F_j^x)^2 + (F_j^y)^2} \approx 243.7 \text{ N}$

$\tan \alpha = \left| \frac{F_j^y}{F_j^x} \right| \Rightarrow \alpha \sim 7.6^\circ$

$\theta = 360 - \alpha = 352.4^\circ$

