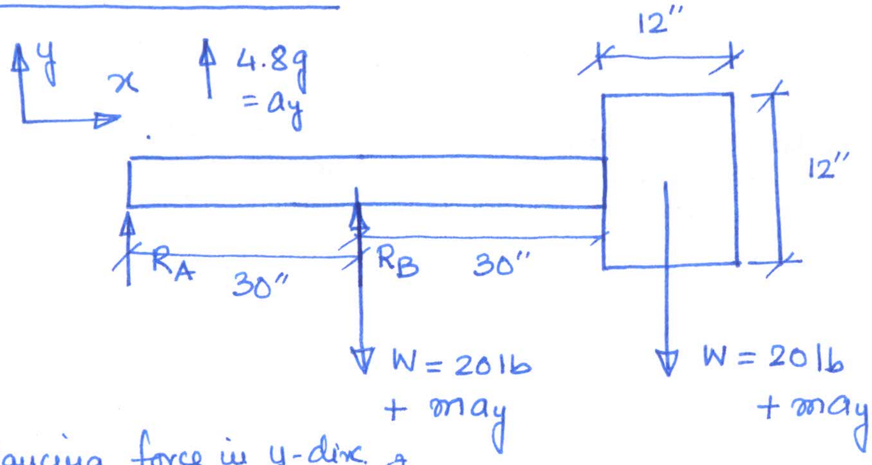
Tutorial 1: Solution

1.



Balancing force in y-dirc. :

$$R_A + R_B - 2\left(W + \frac{W}{g}a_y\right) = 0$$

$$\Rightarrow \quad R_A + R_B = 2W(1+4.8) = 2 \times 5.8 \times W \qquad (1)$$

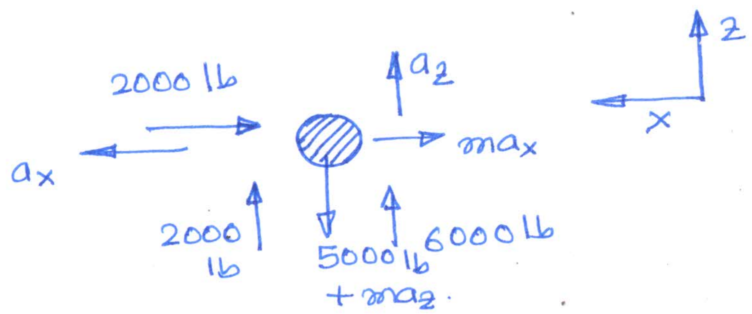
Balancing moment at B

$$30R_A + W\left(1+\frac{a_y}{g}\right) \times (30+6) = 0$$

$$\Rightarrow \quad R_A = -\frac{36}{30} \times W \times 5.8 = -139.2 \text{ lb}$$

$$R_B = 371.2 \text{ lb}$$

2.



Load factor in z-dirc $= \dfrac{2000+6000}{5000} = 1.6 \; (n_z)$

Load factor in x-dirc $= \dfrac{-2000}{5000} = -0.4 \; (n_x)$

Apparent weight in z-dirc of a 5lb object $= 5 \times 1.6 = 8 \text{ lb} \downarrow$

" " in x-dir $= 0.4 \times 5 = 2\text{lb} \rightarrow$

3(a)

mass $= \rho A L$
$\downarrow$ free variable.

$I = \dfrac{t^4}{12}$ (for a square c/s, t = depth/width).

$\delta = \dfrac{FL^3}{3EI} = \dfrac{4FL^3}{EA^2}$ $\Rightarrow$ $A = 2\sqrt{\dfrac{FL^3}{E\delta}}$

$\therefore$ mass $= 2\rho\sqrt{\dfrac{FL^3}{E\delta}}\,L = 2\sqrt{\dfrac{FL^3}{\delta}}\left(\dfrac{\rho}{\sqrt{E}}\right)$ $\leftarrow$ min^m value will give min^m mass.