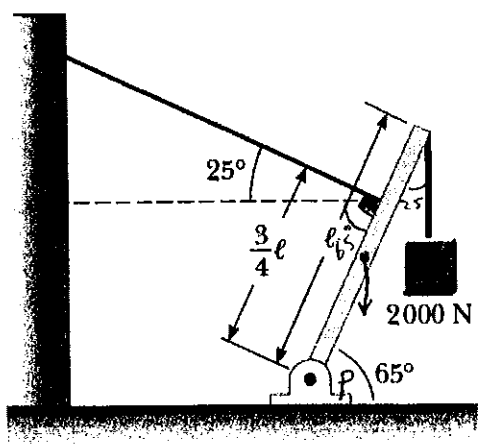
Phys101 – Sec # 40 **Quiz # 9 (Chapter 12)**

Name: Key **ID #** _____

A 1 200-N uniform boom is supported by a cable as in Figure P12.46. The boom is pivoted at the bottom, and a 2 000-N object hangs from its top. Find the tension in the cable and the components of the reaction force exerted by the floor on the boom.

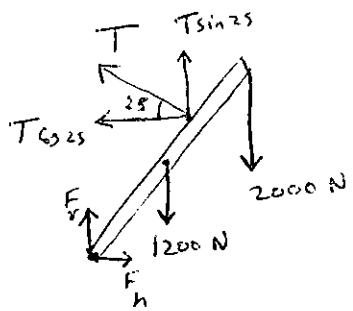


$\vec{\tau}_{net,P} = 0$

$(T \sin 90)\frac{3}{4}\ell - 2000\,\ell \sin 25 - 1200\,\frac{\ell}{2}\sin 25 = 0$

$$T = \frac{4\left(2000 \sin 25 + \frac{1200}{2}\sin 25\right)}{3 \sin 90}$$

$$= 1.465 \times 10^3 \text{ N}$$



$F_{net,x} = 0$

$F_h = T \cos 25 = 1.465 \times 10^3 \cos 25$

$= 1.328 \times 10^3$ N

$F_{net,y} = 0$

$F_v = 1200 + 2000 - T \sin 25$

$= 3200 - 619$

$= 2581$ N

A 90-kg mountain climber is tied to one end of an elastic rope of unstretched length 15 m and diameter 9.6 mm. The climber falls, and the rope is stretched by 3 cm. Find Young's modulus of the rope.

$$\frac{F}{A} = E \frac{\Delta L}{L}$$

$$E = \frac{FL}{A\Delta L} = \frac{882 * 15}{7.2 \times 10^{-5} * 0.03}$$

$$E = 6.1 \times 10^{9} \frac{N}{m^2}$$

$$F = mg = 90\ (9.8) = 882\ N$$

$$A = \pi r^2 = \pi \left(\frac{d}{2}\right)^2 = \pi \left(\frac{9.6 \times 10^{-3}}{2}\right)^2$$

$$= 7.2 \times 10^{-5}\ m^2$$

$$\Delta L = 0.03\ m$$

$$L = 15\ m$$