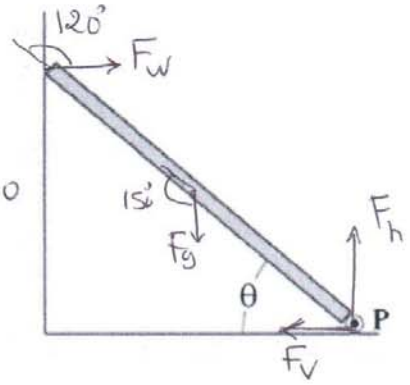
QUIZ#11- CHAPTER 12
DATE: 11/12/17

Name: Key Id#: Sect.#:

1. The figure shows a uniform beam of mass 100 kg and length 3.0 m. It is held at its lower end by a pin P and its upper end leans against a frictionless wall. Find the force of the wall on the beam if $\theta = 60^0$.



$$\tau_p = F_g \frac{\ell}{2} \sin 150^\circ - F_w \ell \sin 120^\circ = 0$$

$$\frac{mg}{2} \sin 150^\circ = F_w \sin 120^\circ$$

$$F_w = \frac{245}{0.866} = \boxed{283\,N}$$

2. What increase in pressure is necessary to decrease the volume of a solid aluminum sphere by 0.050 % (Bulk Modulus of Aluminum = $7.0 \times 10^{10}\ N/m^2$)

$$\frac{F}{A} = B \frac{\Delta V}{V}$$

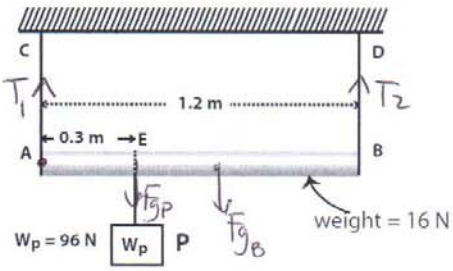
$$\frac{\Delta V}{V} = \frac{0.05}{100}$$

$$\frac{F}{A} = \frac{0.05}{100} \times 7 \times 10^{10} = \boxed{3.5 \times 10^{7}\ Pa\left(\frac{N}{m^2}\right)}$$

QUIZ#11- CHAPTER 12
DATE: 11/12/17

Name: Key Id#: Sect.#:

1. A uniform rod AB is 1.2 m long and weighs 16 N. It is suspended by strings AC and BD as shown in the figure. A block P weighing 96 N is attached at point E, 0.30 m from A. Calculate the tension in the string BD.



$$\tau_A = -W_P(0.3)\sin 90^\circ - W_B(0.6)\sin 90^\circ + T_2(1.2)\sin 90^\circ = 0$$

$$+96\times 0.3 + 16\times 0.6 = T_2 \times 1.2$$

$$\boxed{T_2 = 32\,N}$$

2. A horizontal steel rod of length 81 cm and radius 9.5 mm is fixed at one end. It stretches by 0.90 mm when a horizontal force of magnitude F is applied to its free end. Find the magnitude of F (Young modulus of steel is $20 \times 1010\ N/m^2$).

$$\frac{F}{A} = Y\,\frac{\Delta L}{L}$$

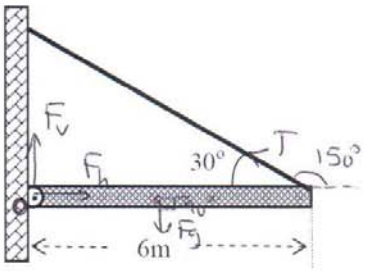
$$F = A\left(Y\,\frac{\Delta L}{L}\right) = \frac{\pi r^2 Y \Delta L}{L}$$

$$= \frac{\pi (9.5\times 10^{-3})^2 \times 20\times 10^{10} \times 0.9\times 10^{-3}}{0.81} = \boxed{63006\,N}$$

QUIZ#11- CHAPTER 12
DATE: 11/12/17

Name: Key Id#: Sect.#:

1. A horizontal uniform beam of mass 200 kg and length L = 6.0 m is supported by a hinge and a cable as shown in the figure. The system is in equilibrium. Find the tension in the cable.

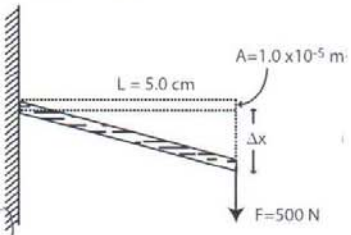


$$\tau_0 = -mg\frac{L}{2}\sin 90^\circ + TL\sin 150^\circ = 0$$

$$T = \frac{\frac{mg}{2}}{\sin 150^\circ} = \boxed{1960\,N}$$

2. A horizontal aluminum rod, shear modulus $= 2.5 \times 10^{10}\ N/m^2$, projects L = 5.0 cm from the wall as shown in the figure. The cross section area of the rod is $1.0 \times 10^{-5}\ m^2$. A shearing force of 500 N is applied at the end of the rod. Find the vertical deflection Δx of the end of the rod.

$$\frac{F}{A} = G\frac{\Delta x}{L} \qquad \Delta x = \frac{(F/A)L}{G}$$



$$\Delta x = \frac{\left(\frac{500}{1\times10^{-5}}\right)\times 5\times10^{-2}}{2.5\times10^{10}} = 0.01\times10^{-2} = \boxed{1\times10^{-4}\ m}$$

~~$\Delta x = 1\ cm$~~