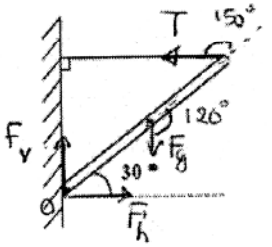
Physics 101Rec
Quiz#9-Sect 05
Chapter 12

Name: Key Id:

1. A uniform beam having a mass of 20 kg and a length of 12 m is supported by a pin and a horizontal cable as shown in the figure. What is the magnitude of the force of the pin on the beam?



$\Sigma F_y = 0 \Rightarrow F_v - F_g = 0$

$\Rightarrow F_v = F_g = mg = 20 \times 9.8$

$= 196\,N$

$\Sigma F_x = 0 \Rightarrow F_h - T = 0$

$\Rightarrow F_h = T$

$\Sigma \tau_o = 0 \Rightarrow -mg\frac{\ell}{2}\sin 120^\circ + T\ell \sin 150^\circ = 0$

$\Rightarrow \ell\left(-\frac{mg}{2}\sin 120^\circ + T\sin 150^\circ\right) = 0$

$\Rightarrow T = \frac{mg \sin 120^\circ}{2 \sin 150^\circ} = 170\,N$

$\Rightarrow F_h = 170\,N$

$F = \sqrt{F_h^2 + F_v^2} = \boxed{259\,N}$

2. A steel rod has a radius of 8.5 mm and a length of 100 cm. A force of 60 kN stretches it along its length. Take Young's modulus for steel as 11×10^{11} N/m^2. What is the increase in length of the rod in meters?

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

$\frac{60 \times 10^3}{\pi (8.5 \times 10^{-3})^2} = 11 \times 10^{11}\frac{\Delta L}{1} \Rightarrow \boxed{\Delta L = 2.4 \times 10^{-4}\,m}$