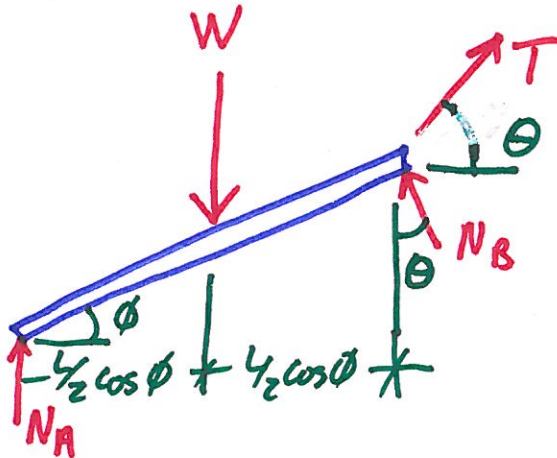
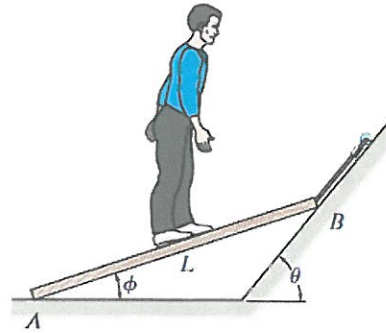


5-3. Draw the free-body diagram for the following problems:

The Man in Problem 5-19

5-19.

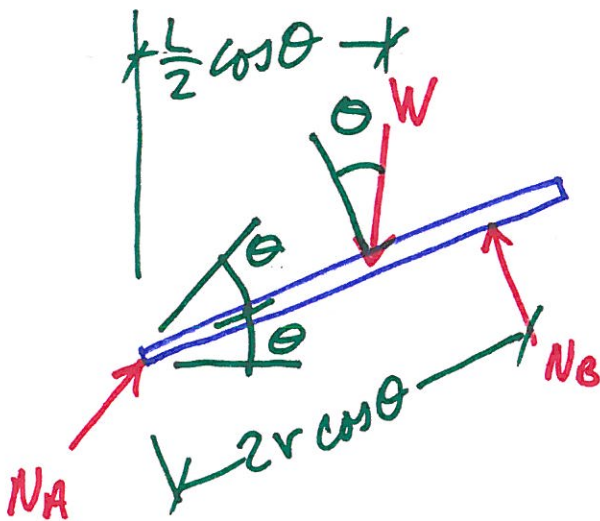
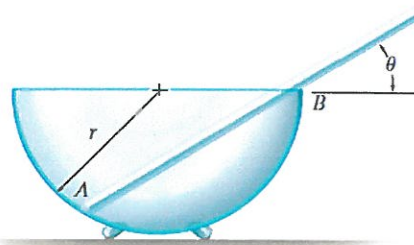
The man has a weight W and stands at the center of the plank. If the planes at A and B are smooth, determine the tension in the cord in terms of W and θ .



The rod in Problem 5-20

*5-20.

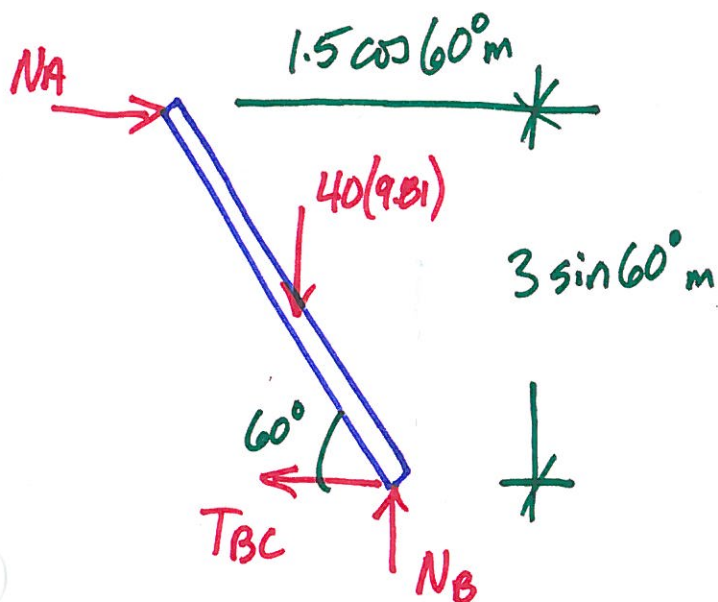
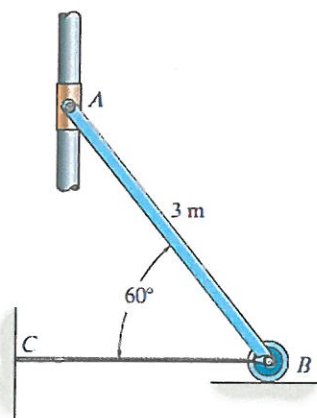
A uniform glass rod having a length L is placed in the smooth hemispherical bowl having a radius r . Determine the angle of inclination θ for equilibrium.



The beam in Problem 5-21

5-21.

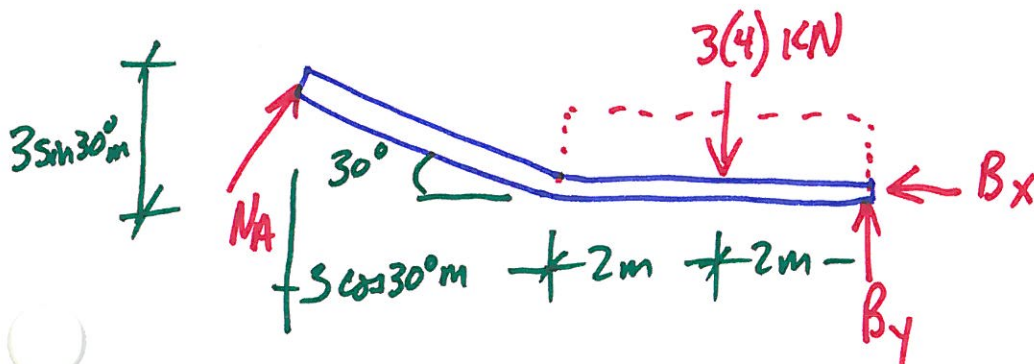
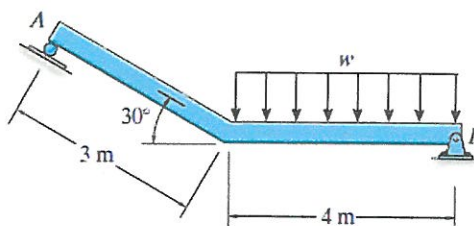
The uniform rod AB has a mass of 40 kg. Determine the force in the cable when the rod is in the position shown. There is a smooth collar at A .



The rod in Problem 5-21

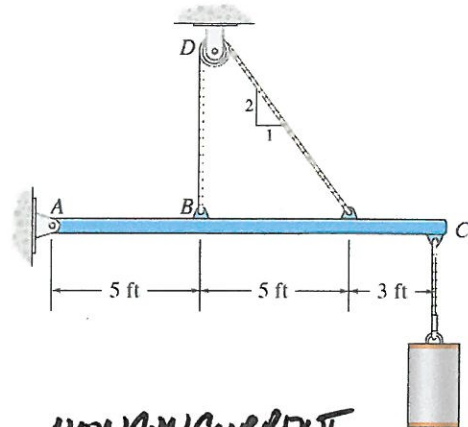
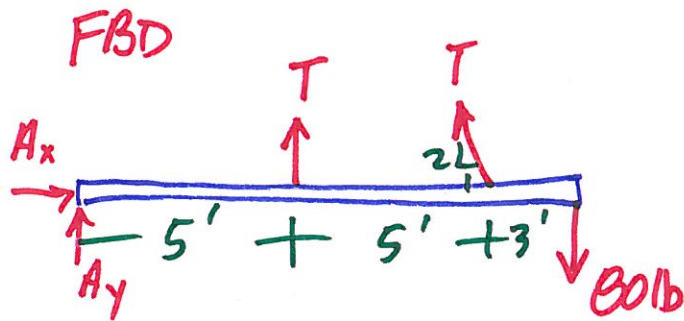
5-22.

If the intensity of the distributed load acting on the beam is $w = 3 \text{ kN/m}$, determine the reactions at the roller A and pin B .



*5-16.

Determine the tension in the cable and the horizontal and vertical components of reaction of the pin A. The pulley at D is frictionless and the cylinder weighs 80 lb.



NONCONCURRENT
3 EQNS, 3 UNKS ☺

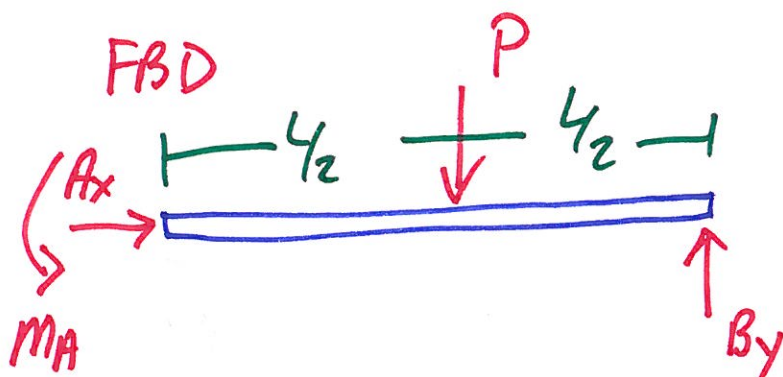
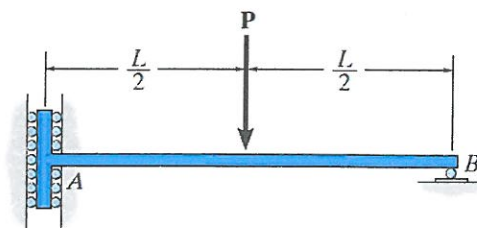
$$\begin{aligned} \curvearrowleft \sum M_A &= 0 \\ -5T - 10\left(\frac{2}{\sqrt{5}}\right)T + 13(80) &= 0 \\ T &= \underline{\underline{74.6 \text{ lb}}} \end{aligned}$$

$$\begin{aligned} \uparrow \sum F_y &= 0 \\ A_y + T + \frac{2}{\sqrt{5}}T - 80 &= 0 \\ A_y &= \underline{\underline{61.3 \text{ lb} = 61.3 \text{ lb} \downarrow}} \end{aligned}$$

$$\begin{aligned} \rightarrow \sum F_x &= 0 \\ A_x - \frac{1}{\sqrt{5}}T &= 0 \\ A_x &= \underline{\underline{33.4 \text{ lb} \rightarrow}} \end{aligned}$$

5-18.

Determine the components of reaction at the supports A and B on the rod.



Non concurrent
3 EQNS, 3 UNKS ($M_A, A_x + B_y$) ☺

$$\rightarrow \sum F_x = 0$$

$$\underline{A_x = 0}$$

$$\uparrow \sum F_y = 0$$

$$-P + B_y = 0 \quad \underline{B_y = P \uparrow}$$

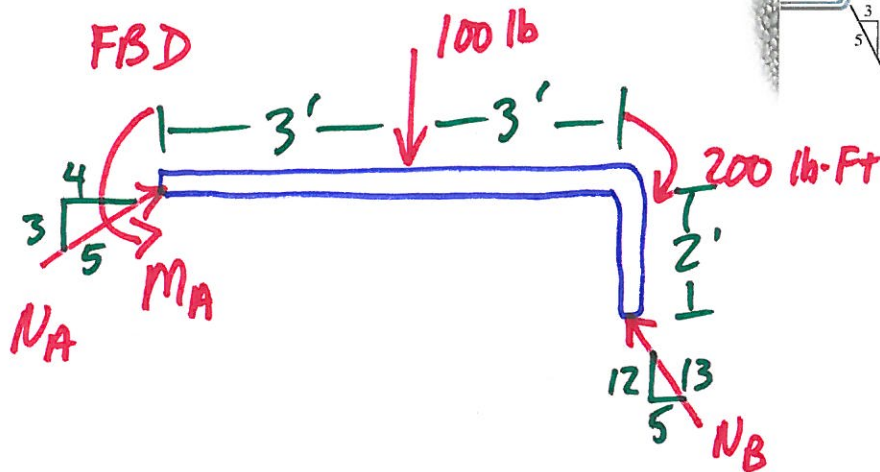
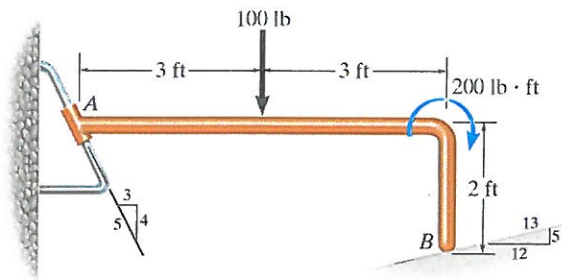
$$\curvearrowleft \sum M_A = 0$$

$$-M_A + \frac{L}{2}(P) - L\cancel{B_y} = 0$$

$$\underline{M_A = -\frac{PL}{2} = \frac{PL}{2} \curvearrowleft}$$

5-25.

Determine the reactions on the bent rod which is supported by a smooth surface at B and by a collar at A , which is fixed to the rod and is free to slide over the fixed inclined rod.



NONCONCURRENT
3 EQNS. 3 UNKS ☺

$$\rightarrow \sum F_x = 0$$

$$\frac{4}{5} N_A - \frac{5}{13} N_B = 0$$

$$\uparrow \sum F_y = 0$$

$$\frac{3}{5} N_A + \frac{12}{13} N_B - 100 = 0$$

$$\begin{cases} 0.8 N_A - 0.3846 N_B = 0 \\ 0.6 N_A + 0.9231 N_B = 100 \end{cases}$$

SOLVE SIMUL.

$$\underline{N_A = 39.7 \text{ lb}} \quad \underline{N_B = 82.5 \text{ lb}}$$

$$\curvearrowright \sum M_A = 0$$

$$-M_A + 3(100) + 200 + 2\left(\frac{5}{13}\right)N_B - 6\left(\frac{12}{13}\right)N_B = 0$$

$$\underline{M_A = 106.5 \text{ Ft}\cdot\text{lb} \curvearrowright}$$