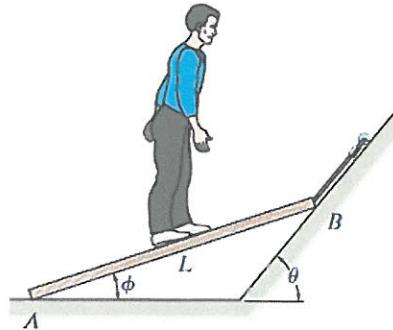
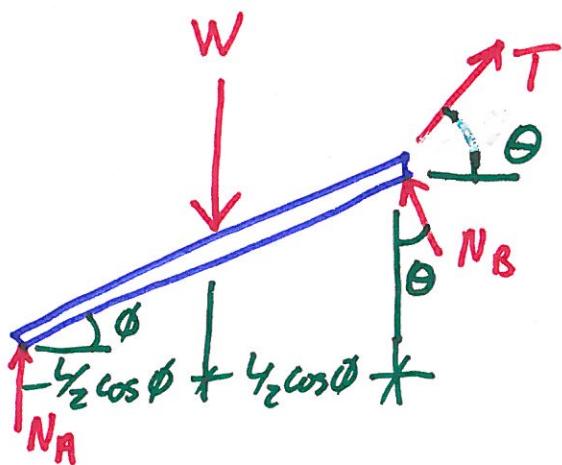


5-3. Draw the free-body diagram for the following problems:

The Man in Problem 5-19

5-19.

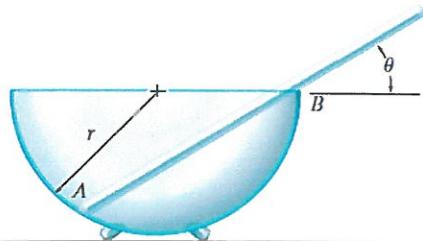
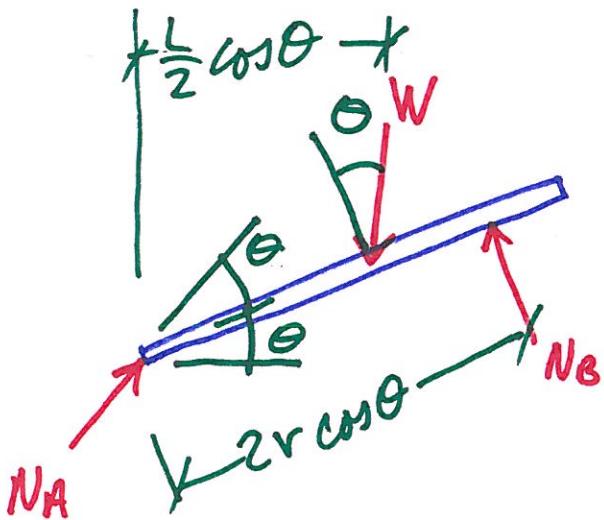
The man has a weight  $W$  and stands at the center of the plank. If the planes at  $A$  and  $B$  are smooth, determine the tension in the cord in terms of  $W$  and  $\theta$ .



The rod in Problem 5-20

\*5-20.

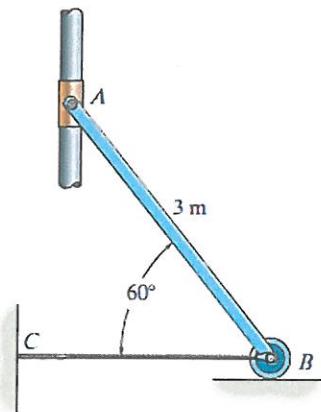
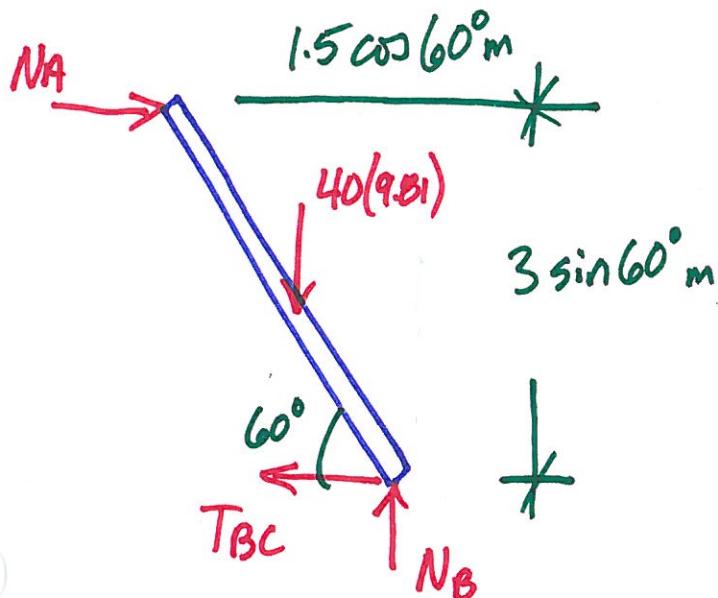
A uniform glass rod having a length  $L$  is placed in the smooth hemispherical bowl having a radius  $r$ . Determine the angle of inclination  $\theta$  for equilibrium.



The beam in Problem 5-21

5-21.

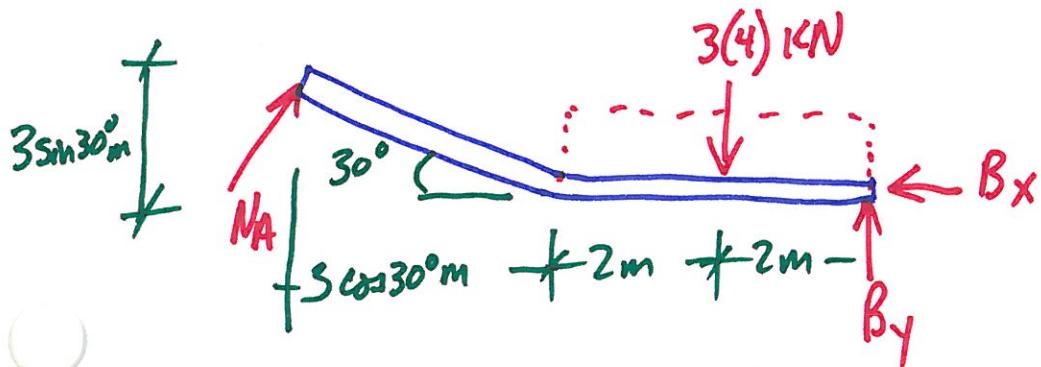
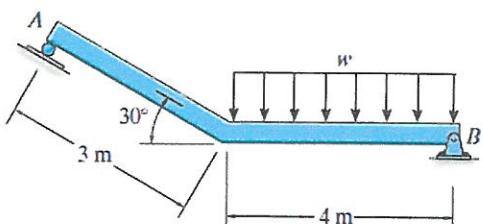
The uniform rod  $AB$  has a mass of 40 kg. Determine the force in the cable when the rod is in the position shown. There is a smooth collar at  $A$ .



The rod in Problem 5-21

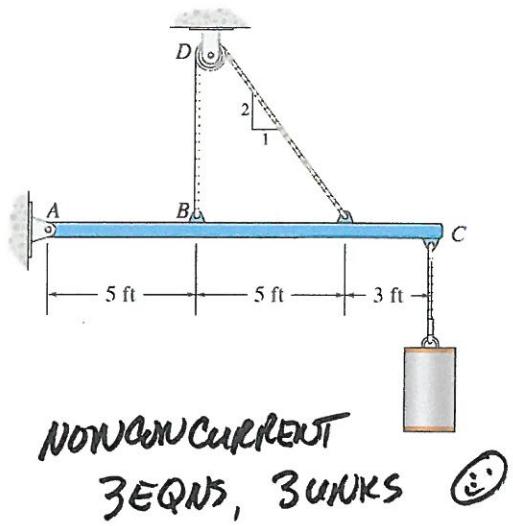
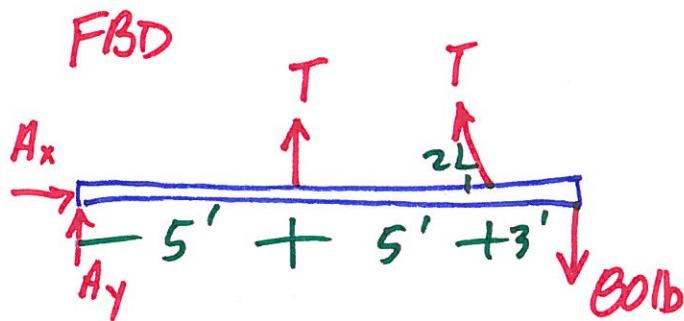
5-22.

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.



$$\text{At } A: \sum M_A = 0 \\ -5T - 10\left(\frac{2}{\sqrt{5}}\right)T + 13(80) = 0$$

$$T = \underline{\underline{74.6 \text{ lb}}}$$

$$\uparrow \sum F_y = 0 \\ A_y + T + \frac{2}{\sqrt{5}}T - 80 = 0$$

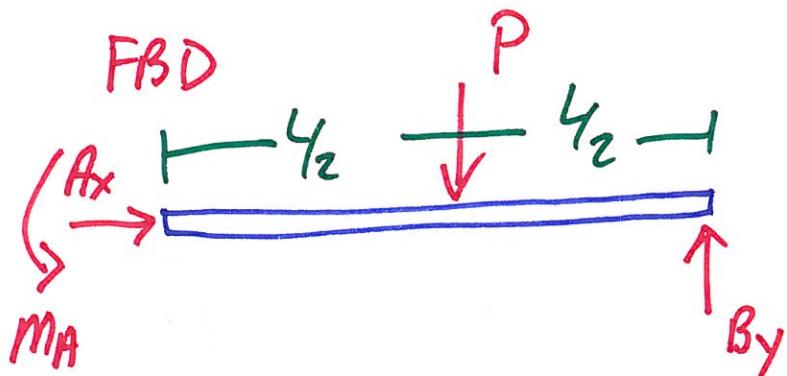
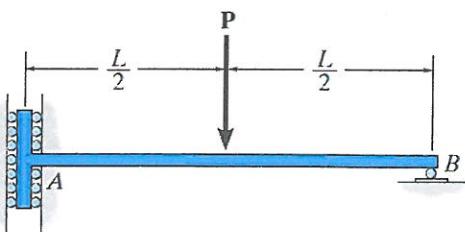
$$A_y = \underline{\underline{61.3 \text{ lb} = 61.3 \text{ lb} \downarrow}}$$

$$\rightarrow \sum F_x = 0 \\ A_x - \frac{1}{\sqrt{5}}T = 0$$

$$A_x = \underline{\underline{33.4 \text{ lb} \rightarrow}}$$

5-18.

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



Nonconcurrent  
3EQUNS, 3UNKS ( $m_A, A_x + B_y$ ) ☺

$$\rightarrow \sum F_x = 0$$

$$\underline{A_x = 0}$$

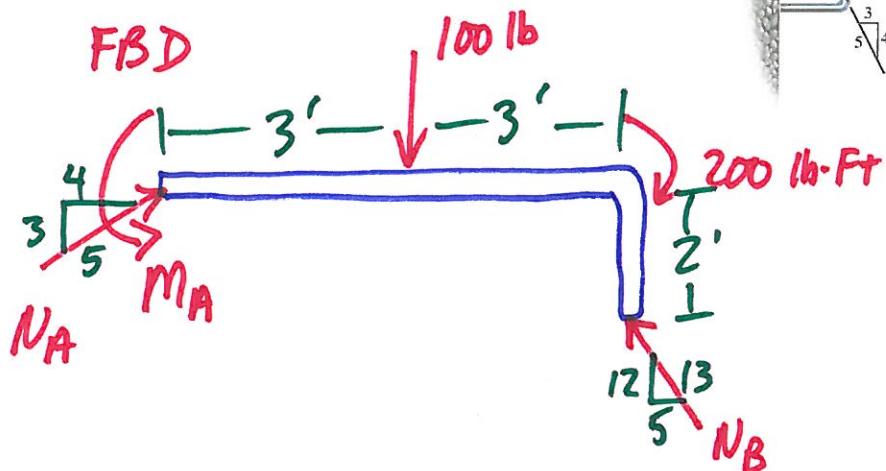
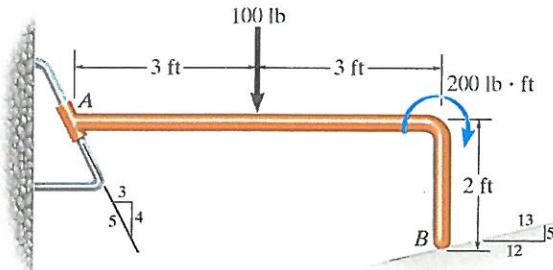
$$\uparrow \sum F_y = 0$$
$$-P + B_y = 0 \quad \underline{\underline{B_y = P \uparrow}}$$

$$\Downarrow \sum M_A = 0$$
$$-m_A + \frac{L}{2}(P) - LB_y \cancel{\uparrow} = 0$$

$$m_A = -\frac{PL}{2} = \frac{PL}{2} \Downarrow$$

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 ☺

$$\rightarrow \sum F_x = 0$$

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

$$\uparrow \sum F_y = 0$$

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

$$0.8N_A - 0.3846N_B = 0$$

$$0.6N_A + 0.9231N_B = 100$$

SOLVE SIMUL.

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

$$\Downarrow \sum M_A = 0$$

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

$$\underline{M_A = 106.5 \text{ Ft-lb}}$$