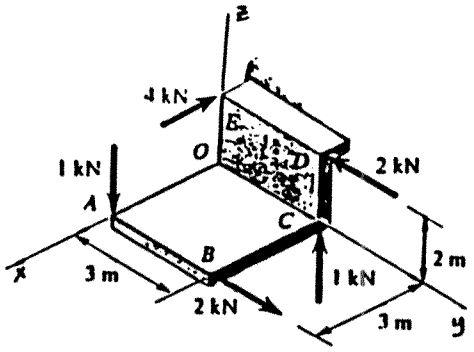
STATICS - WINTER 1992

Dept. Avg. = 64.6%

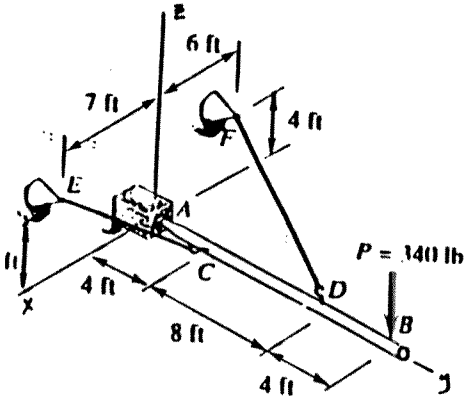
1. Resolve the system of forces shown below into a resultant force, $\bar{F}_R$ and moment, $\bar{M}_R$, acting at the origin, O. Express the answers as Cartesian vectors.



$\bar{F}_R = -4\hat{i}$ kN

$\bar{M}_{R_O} = 7\hat{i} - 5\hat{j} + 6\hat{k}$ kN·m

2. A 16 ft steel boom AB which weighs 100 lb is acted on by a force P of 340 lb as shown. Assuming the weight force acts through the midpoint of the boom, determine the tension in cables CE and DF and the reactions at the ball joint at A.



$T_{CE} = 1620$ Lb.

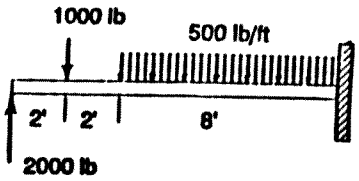
$T_{DF} = 980$ Lb.

$A_x = -840$ Lb.

$A_y = 1560$ Lb.

$A_z = -560$ Lb.

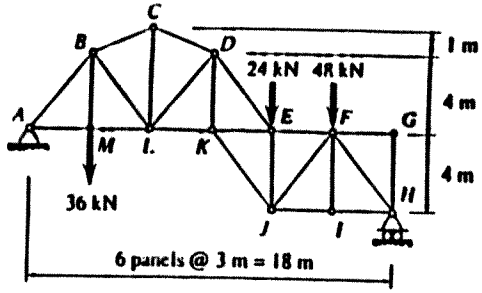
3. The beam shown below is cantilevered at its right end. Draw the shear and moment diagrams for the beam. Be sure to give numerical values at all critical points.



$V_{max} = -3000$ Lb.

$M_{max} = -7000$ Lb.ft.

4. For the truss shown below, please do the following:
   (a) Determine the forces in members ML and CD.
   (b) Identify any zero force members.

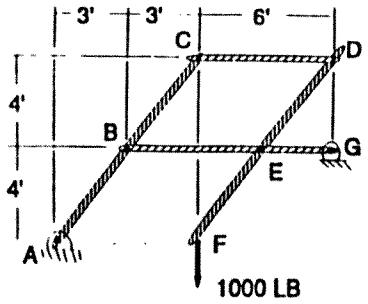


$ML = 34.5$ kN (T)

$CD = 35.4$ kN (C)

FG, GH, FI = 0

5. The pin connected frame carries the 1000 lb load as shown. Determine the components of pin reaction at D and E on member DEF.

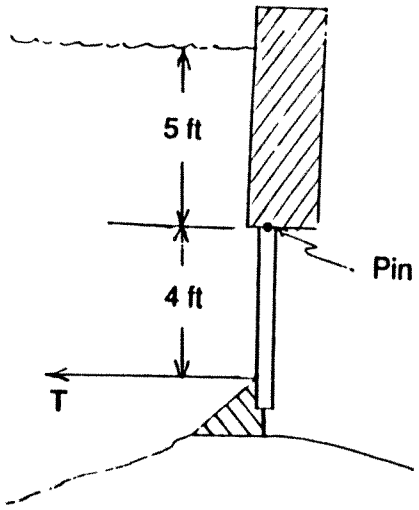


$D_x = 750$ Lb. →

$E_x = 750$ Lb. ←

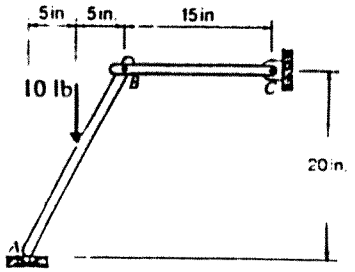
$E_y = 1000$ Lb. ↑

7. The sluice gate pictured below has a width of 4 feet and other dimensions as shown. Find the tension T in the cable necessary to keep the gate shut. Water has a specific weight of 62.4 lb/cuft.



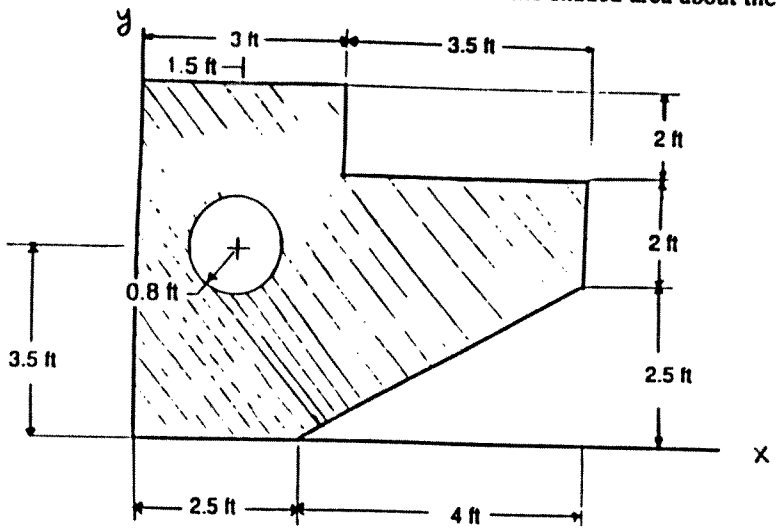
$T = 3827$ Lb.

6. A vertical 10 lb load is applied to the midpoint of bar AB as shown. If the bars have negligible mass, find the minimum coefficient of static friction at end A required for static equilibrium.



$\mu = 0.25$

8. Find the moment of inertia of the shaded area about the x axis.



$I_x = 350.8$ ft^4