Q48

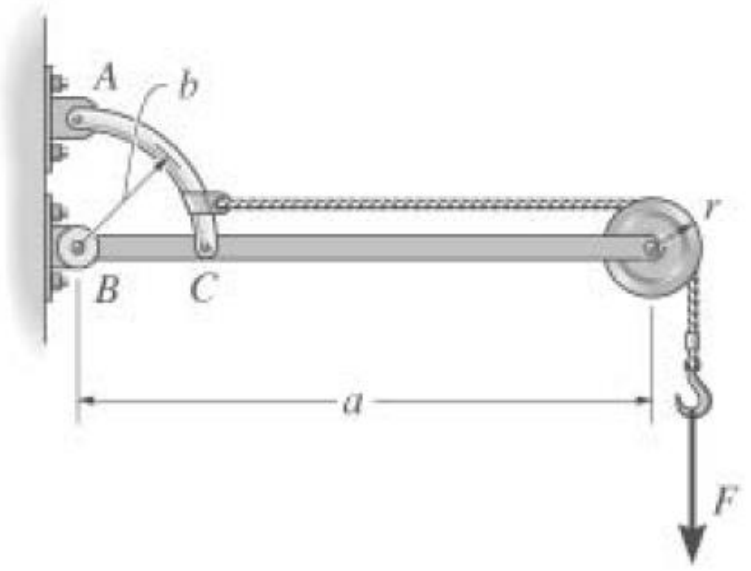
Determine the horizontal and vertical components of force that the pins at A, B, and C exert on their connecting members.

$F = 800$ N

$a = 1$ m

$r = 50$ mm

$b = 0.2$ m



Q49

Determine the horizontal and vertical components of force which the pins at A, B, and C exert on member ABC of the frame.

$F_1 = 400$ N

$F_2 = 300$ N

$F_3 = 300$ N

$a = 1.5$ m

$b = 2$ m

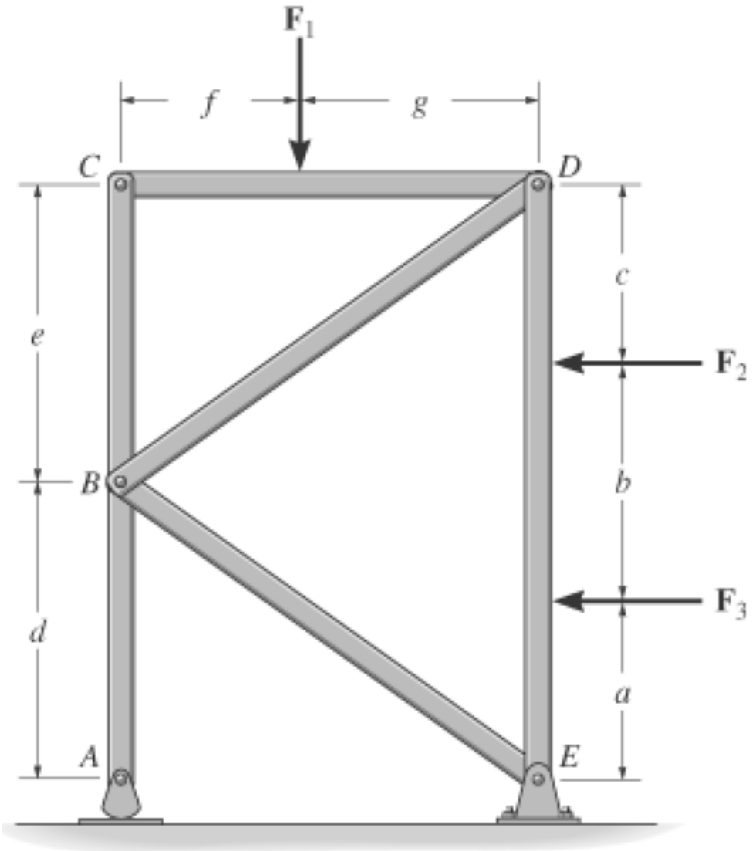
$c = 1.5$ m

$d = 2.5$ m

$f = 1.5$ m

$g = 2$ m

$e = a + b + c - d$

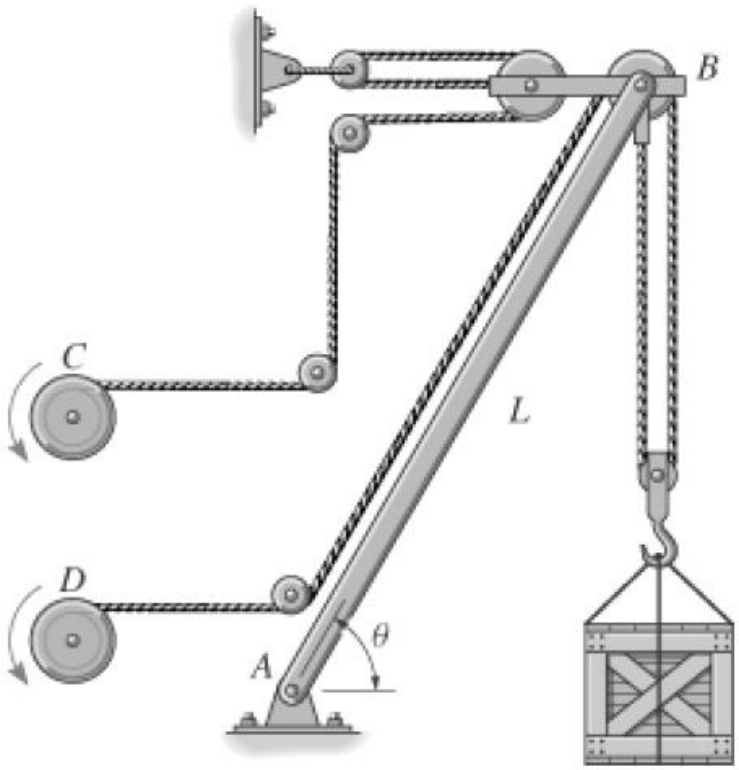


Q50

The derrick is pin-connected to the pivot at A. Determine the largest mass that can be supported by the derrick if the maximum force that can be sustained by the pin at A is F_{max}.

$$g = 9.81 \frac{\text{m}}{\text{s}^2}$$

$$\text{Mg} = 10^3 \text{ kg}$$



Q51

Determine the horizontal and vertical components of force at pins A and C of the two-member frame.

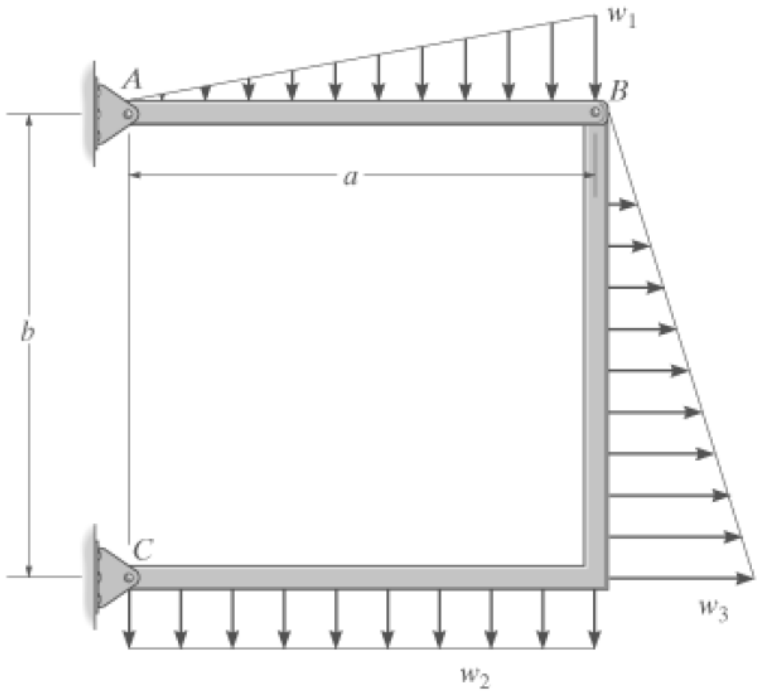
$$w_1 = 500 \frac{\text{N}}{\text{m}}$$

$$w_2 = 400 \frac{\text{N}}{\text{m}}$$

$$w_3 = 600 \frac{\text{N}}{\text{m}}$$

$$a = 3 \text{ m}$$

$$b = 3 \text{ m}$$



Q52

The truck rests on the scale, which consists of a series of compound levers. If a mass M_1 is placed on the pan P and it is required that the weight is located at a distance x to balance the "beam" ABC, determine the mass of the truck. There are pins at all lettered points. Is it necessary for the truck to be symmetrically placed on the scale? Explain.

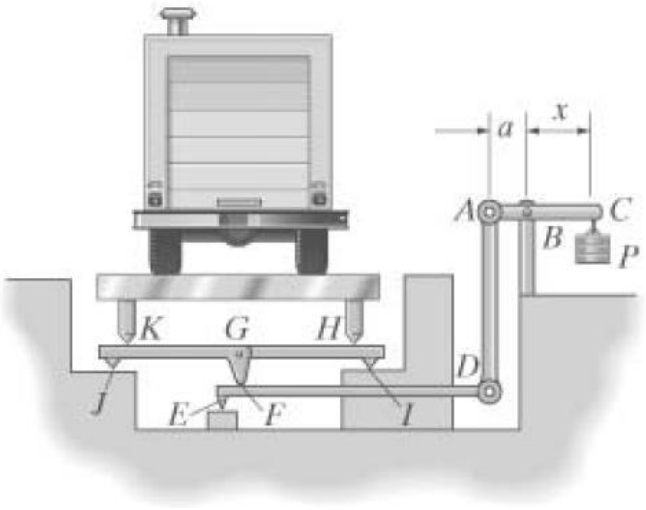
$M_1 = 15$ kg $FD = 3$ m

$x = 0.480$ m $EF = 0.2$ m

$a = 0.2$ m

$HI = 0.1$ m $GH = 2.5$ m

$KJ = HI$ $KG = GH$



Q53

The pillar crane is subjected to the load having a mass M. Determine the force developed in the tie rod AB and the horizontal and vertical reactions at the pin support C when the boom is tied in the position shown.

$M = 500$ kg

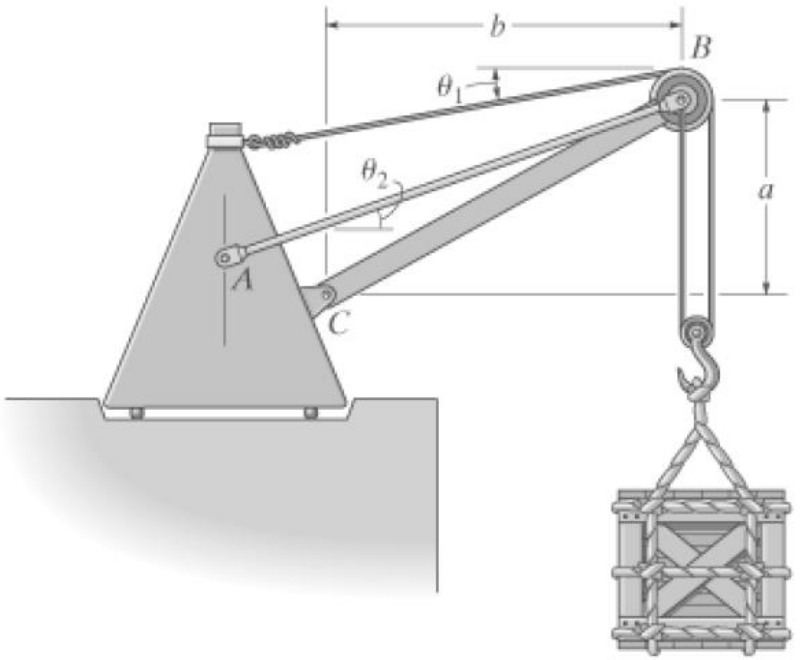
$a = 1.8$ m

$b = 2.4$ m

$\theta_1 = 10$ deg

$\theta_2 = 20$ deg

$g = 9.81 \dfrac{\text{m}}{\text{s}^2}$

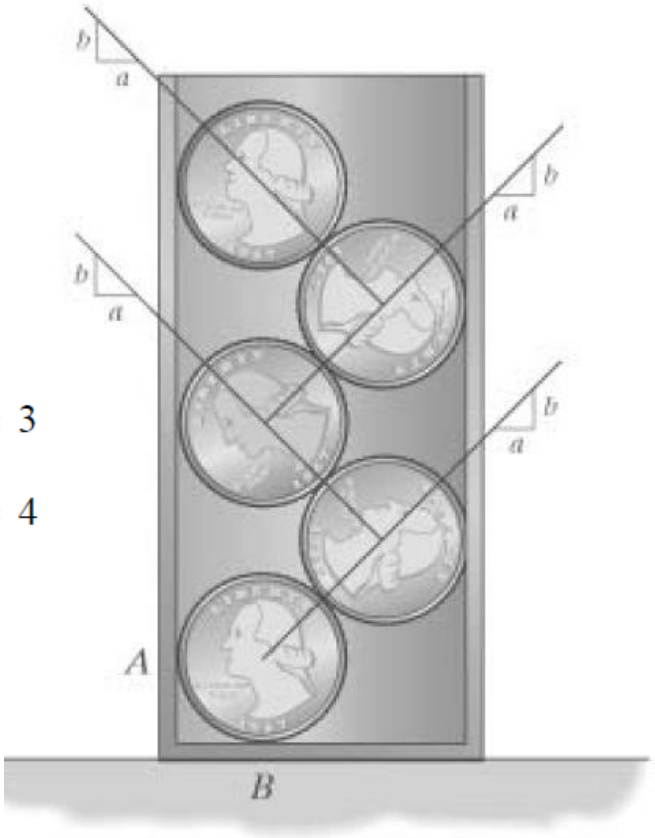


Q54

Five coins are stacked in the smooth plastic container shown. If each coin has weight W, determine the normal reactions of the bottom coin on the container at points A and B.

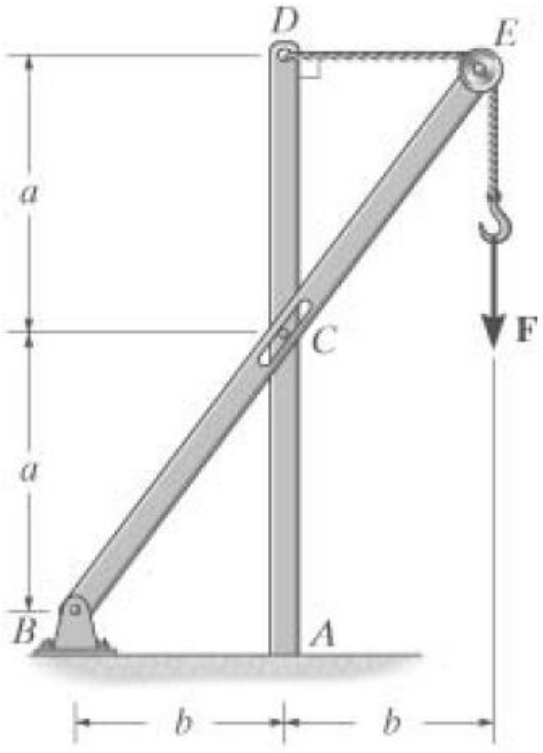
$a = 3$

$b = 4$



Q55

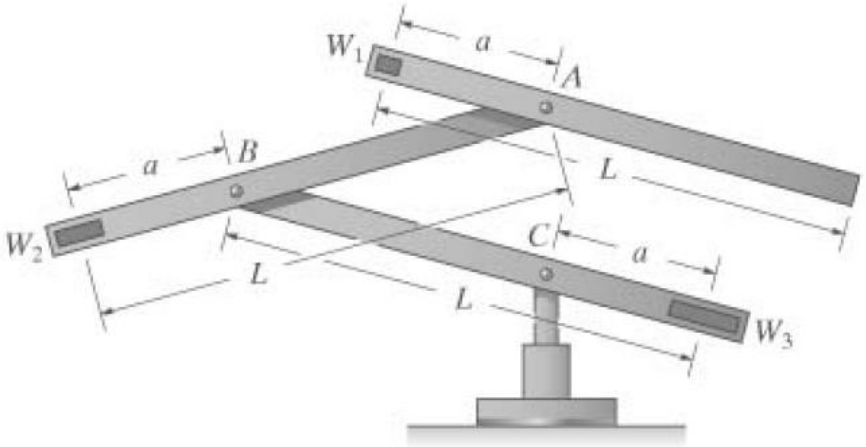
Determine the horizontal and vertical components of force at pin B and the normal force the pin at C exerts on the smooth slot. Also, determine the moment and horizontal and vertical reactions of force at A. There is a pulley at E.



Q56

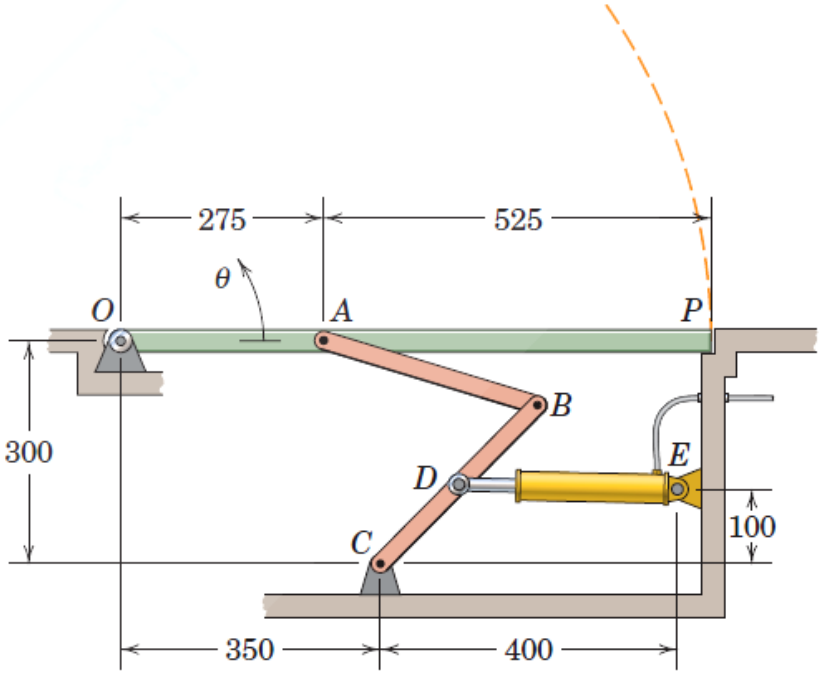
The kinetic sculpture requires that each of the three pinned beams be in perfect balance at all times during its slow motion. If each member has a uniform weight density γ and length L, determine the necessary counterweights W_1, W_2 and W_3 which must be added to the ends of each member to keep the system in balance for any position. Neglect the size of the counterweights.

γ=30 N/m
L=1 m
a=0.30 m



Q57

The uniform 30-kg ventilation door *OAP* is opened by the mechanism shown. Plot the required force in the cylinder *DE* as a function of the door opening angle θ over the range $0 \le \theta \le \theta_{max}$, where θ_{max} is the maximum opening. Determine the minimum and maximum values of this force and the angles at which these extremes occur. Note that the cylinder is not horizontal when $\theta = 0$.



$\overline{AB} = 300$ $\overline{CD} = \overline{DB} = 150$

Dimensions in millimeters