

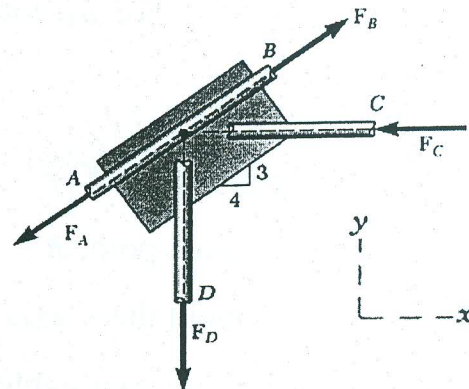


## Answer All Questions

### Question No. 1: (8 Marks)

A welded connection is in equilibrium under the four forces shown.

1. Prove that  $F_D = \frac{3}{4} F_C$
2. Knowing that  $F_A = 5\text{ kN}$  and  $F_D = 12\text{ kN}$ , determine the magnitudes of the other two forces.



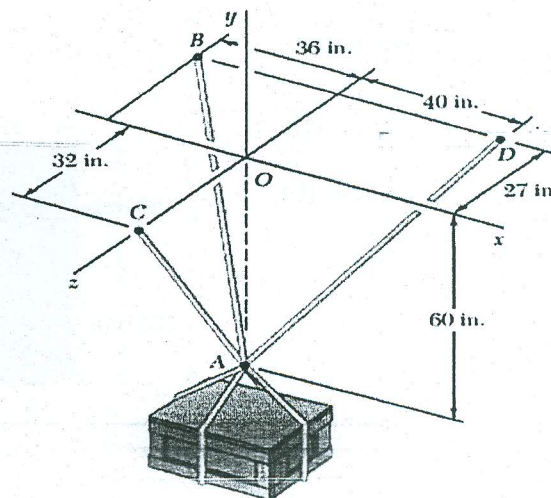
### Question No. 2: (10 Marks)

A crate of weight  $w$  is supported by three cables as shown. Knowing that the tension in cable  $AB$  is 750 lb, determine the crate weight  $w$  and the tensions in cables  $AC$  and  $AD$ .

The coordinate points are:

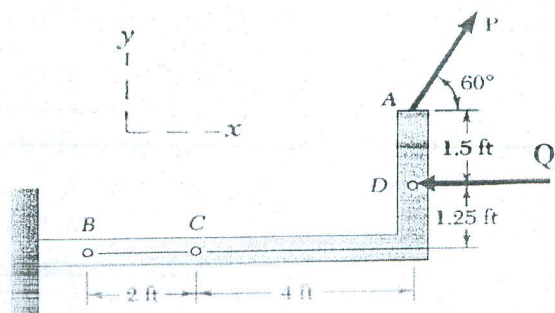
$$A = (0, -60, 0), \quad B = (-36, 0, -27)$$

$$C = (0, 0, 32), \quad D = (40, 0, -27)$$



### Question No. 3: (10 Marks)

The force  $P$  is applied at point  $A$  and its magnitude is 160 lb, and the force  $Q = 80\text{ lb}$  acts horizontally at  $D$ . Replace this force system with an equivalent force-couple at



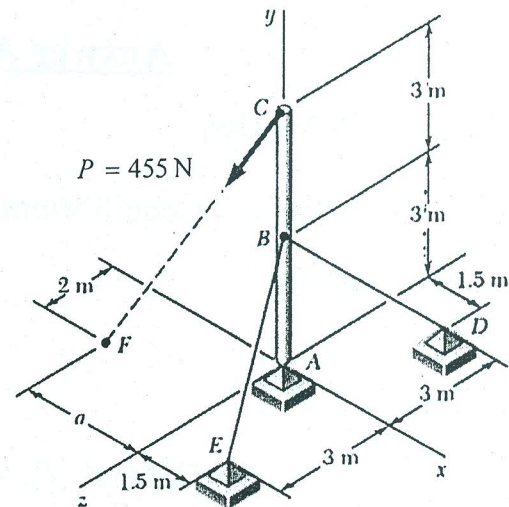
- 1) point  $D$ .
- 2) point  $B$



#### Questions No. 4: (10 Marks)

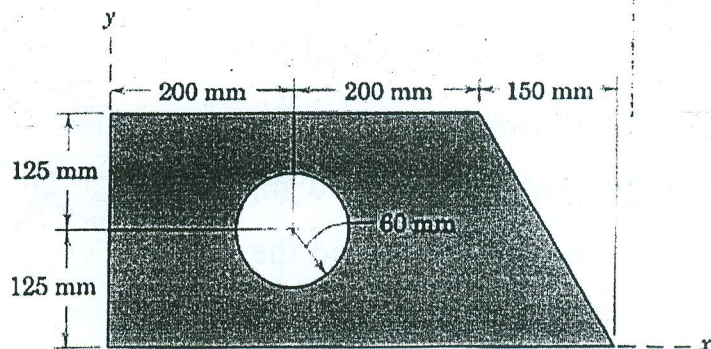
The pole  $ABC$  is pulled by a force  $\bar{P}$  of magnitude  $P = 455 \text{ N}$  acts at point  $C$ , and the two cables  $BD$  and  $BE$ . For  $a = 3 \text{ m}$ , answer the following:

1. Determine the vector form of  $\bar{P}$
2. The moment of  $\bar{P}$  about point  $B$
3. The moment of  $\bar{P}$  about the  $y$  axis
4. The angle between the two cables  $BD$  and  $BE$



#### Questions No. 5: (7 Marks)

For the shaded area shown determine the coordinates of its centroid  $(\bar{X}, \bar{Y})$



#### Questions No. 6: (10 Marks)

The beam shown is supported by a pin at  $A$  and a roller at  $B$ , and is subjected to a combination of a distributed and point loads. Determine the reactions at  $A$  and  $B$ .

