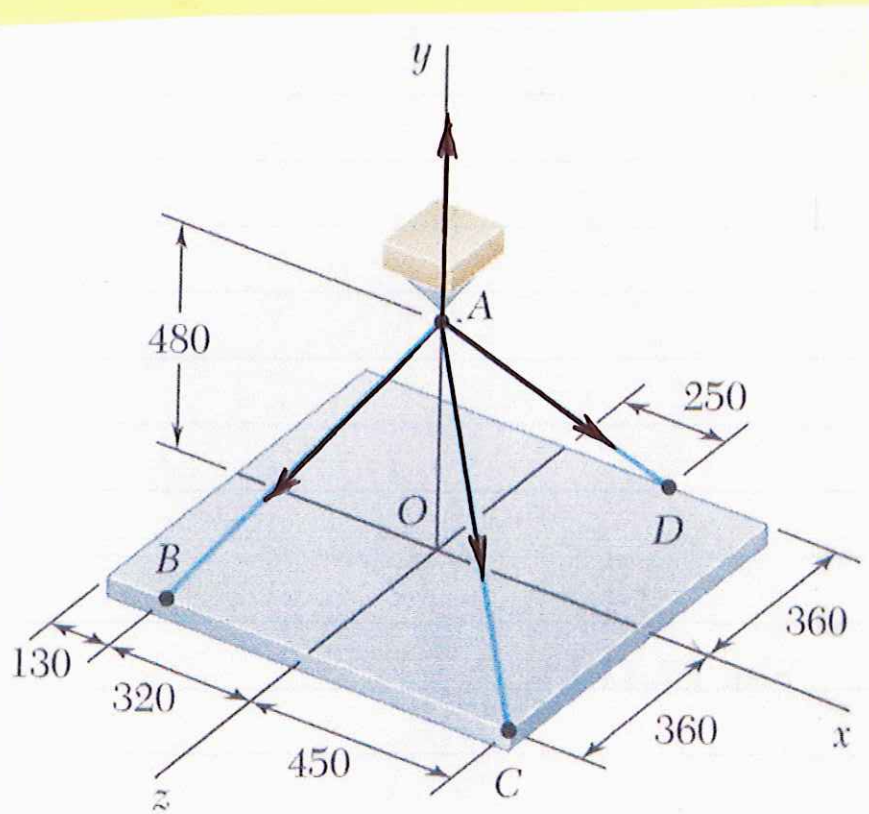


①

PROB. 2.110

$T_{AD} = 520^N$, FIND W



Dimensions in mm

Fig. P2.109 and P2.110

LOCATE POINTS: $A(0, 480, 0)^{mm}$, $B(-320, 0, 360)^{mm}$

$C(450, 0, 360)^{mm}$, $D(250, 0, -360)^{mm}$

\vec{T}_{AB} : $dx = x_B - x_A = -320 - 0 = -320^{mm}$

$dy = y_B - y_A = 0 - 480 = -480^{mm}$

$$dz = z_B - z_A = 360 - 0 = 360 \text{ mm}$$

$$d = \sqrt{320^2 + 480^2 + 360^2} = 680 \text{ mm}$$

$$F_x = F \frac{dx}{d} = T_{AB} \left(\frac{-320}{680} \right) = -0.470 T_{AB}$$

$$F_y = F \frac{dy}{d} = T_{AB} \left(\frac{-480}{680} \right) = -0.706 T_{AB}$$

$$F_z = F \frac{dz}{d} = T_{AB} \left(\frac{360}{680} \right) = 0.529 T_{AB}$$

$$\vec{T}_{AB} = (-0.470 T_{AB}) \hat{i} + (-0.706 T_{AB}) \hat{j} + (0.529 T_{AB}) \hat{k} \text{ N}$$

$$\vec{T}_{AC}: dx = x_C - x_A = 450 - 0 = 450 \text{ mm}$$

$$dy = y_C - y_A = 0 - 480 = -480 \text{ mm}$$

$$dz = z_C - z_A = 360 - 0 = 360 \text{ mm}$$

$$d = \sqrt{450^2 + 480^2 + 360^2} = 750 \text{ mm}$$

$$F_x = F \frac{dx}{d} = T_{AC} \left(\frac{450}{750} \right) = 0.6 T_{AC}$$

$$F_y = F \frac{dy}{d} = T_{AC} \left(\frac{-480}{750} \right) = -0.64 T_{AC}$$

$$F_z = F \frac{dz}{d} = T_{AC} \left(\frac{360}{750} \right) = 0.48 T_{AC}$$

PROB. 2.110 CONT.

(3)

$$\vec{T}_{AC} = (0.6 T_{AC}) \hat{i} + (-0.64 T_{AC}) \hat{j} + (0.48 T_{AC}) \hat{k} \text{ N}$$

$$\vec{T}_{AD}: dx = x_D - x_A = 250 - 0 = 250 \text{ mm}$$

$$dy = y_D - y_A = 0 - 480 = -480 \text{ mm}$$

$$dz = z_D - z_A = -360 - 0 = -360 \text{ mm}$$

$$d = \sqrt{250^2 + 480^2 + 360^2} = 650 \text{ mm}$$

$$F_x = F \frac{dx}{d} = (520) \left(\frac{250}{650} \right) = 200 \text{ N}$$

$$F_y = F \frac{dy}{d} = (520) \left(\frac{-480}{650} \right) = -384 \text{ N}$$

$$F_z = F \frac{dz}{d} = (520) \left(\frac{-360}{650} \right) = -288 \text{ N}$$

$$\vec{T}_{AD} = (200) \hat{i} + (-384) \hat{j} + (-288) \hat{k} \text{ N}$$

$$\vec{W} = (W) \hat{j} \text{ N}$$

EQUILIBRIUM EQUATIONS:

$$\sum F_x = 0: -0.470 T_{AB} + 0.6 T_{AC} + 200 = 0$$

$$T_{AB} = 1.28 T_{AC} + 425$$

PROB. 2.110 CONT.

(4)

$$\sum F_z = 0: 0.529 T_{AB} + 0.48 T_{AC} - 288 = 0$$

$$0.529 (1.28 T_{AC} + 425) + 0.48 T_{AC} = 288$$

$$1.16 T_{AC} = 63.2$$

$$T_{AC} = 54.5^N$$

$$T_{AB} = 1.28 (54.5) + 425 = 495^N$$

$$\sum F_y = 0: -0.706 T_{AB} - 0.64 T_{AC} - 384 + W = 0$$

$$W = 0.706 (495) + 0.64 (54.5) + 384 = \underline{768^N}$$