PROB. 2.94

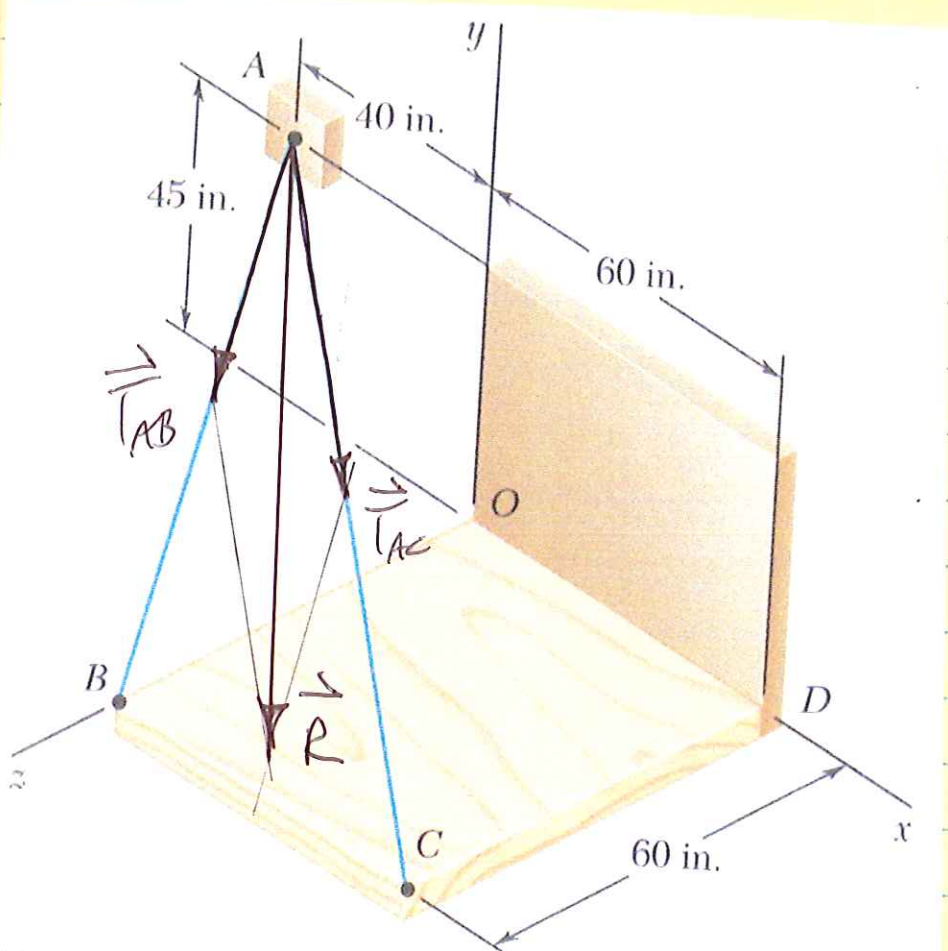$T_{AB} = 510^{LB}$, $T_{AC} = 425^{LB}$, FIND RESULTANT

Fig. P2.93 and P2.94

$$\vec{R} = \vec{T}_{AB} + \vec{T}_{AC}$$

LOCATE POINTS: $A(-40, 45, 0)^{IN}$, $B(0, 0, 60)^{IN}$,

$C(60, 0, 60)^{IN}$

PROB. 2.94 CONT.

$\vec{T}_{AB}:$ $dx = X_B - X_A = 0 - (-40) = 40^{IN}$

$dy = Y_B - Y_A = 0 - 45 = -45^{IN}$

$dz = Z_B - Z_A = 60 - 0 = 60^{IN}$

$d = \sqrt{40^2 + 45^2 + 60^2} = 85^{IN}$

$F_x = F\dfrac{dx}{d} = (510)\left(\dfrac{40}{85}\right) = 240^{LB}$

$F_y = F\dfrac{dy}{d} = (510)\left(\dfrac{-45}{85}\right) = -270^{LB}$

$F_z = F\dfrac{dz}{d} = (510)\left(\dfrac{60}{85}\right) = 360^{LB}$

$\vec{T}_{AB} = (240)\hat{i} + (-270)\hat{j} + (360)\hat{k} \quad^{LB}$

$\vec{T}_{AC}:$ $dx = X_C - X_A = 60 - (-40) = 100^{IN}$

$dy = Y_C - Y_A = 0 - 45 = -45^{IN}$

$dz = Z_C - Z_X = 60 - 0 = 60^{IN}$

$d = \sqrt{100^2 + 45^2 + 60^2} = 125^{IN}$

$F_x = F\dfrac{dx}{d} = (425)\left(\dfrac{100}{125}\right) = 340^{LB}$

$$F_y = F\frac{dy}{d} = (425)\left(\frac{-45}{125}\right) = -153 \ ^{LB}$$

$$F_z = F\frac{dz}{d} = (425)\left(\frac{60}{125}\right) = 204 \ ^{LB}$$

$$\vec{T}_{AC} = (340)\,\hat{\imath} + (-153)\,\hat{\jmath} + (204)\,\hat{k} \ ^{LB}$$

$$\vec{R} = (240+340)\,\hat{\imath} + (-270-153)\,\hat{\jmath} + (360+204)\,\hat{k}$$

$$\vec{R} = (580)\,\hat{\imath} + (-423)\,\hat{\jmath} + (564)\,\hat{k} \ ^{LB}$$

$$|\vec{R}| = \sqrt{580^2 + 423^2 + 564^2} = \underline{913} \ ^{LB}$$

$$\theta_x = \cos^{-1}\left(\frac{R_x}{R}\right) = \cos^{-1}\left(\frac{580}{913}\right) = \underline{50.6^\circ}$$

$$\theta_y = \cos^{-1}\left(\frac{R_y}{R}\right) = \cos^{-1}\left(\frac{-423}{913}\right) = \underline{117.6^\circ}$$

$$\theta_z = \cos^{-1}\left(\frac{R_z}{R}\right) = \cos^{-1}\left(\frac{564}{913}\right) = \underline{51.8^\circ}$$