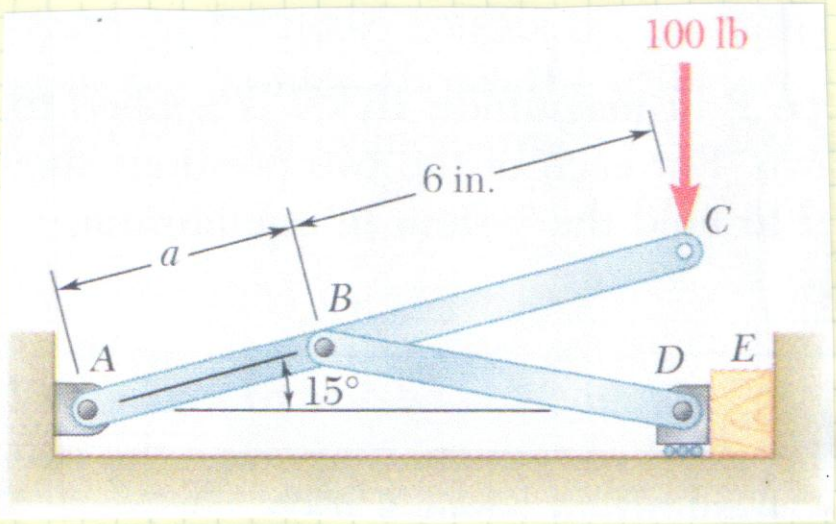
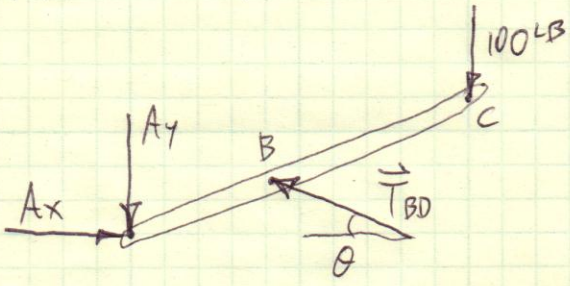
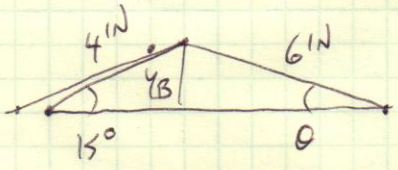
PROB. 6.123



FIND HORIZONTAL FORCE ON E.

FBD: LINK BD IS A TWO-FORCE MEMBER.





$\sin 15° = \frac{y_B}{4}$

$y_B = 4 \cdot \sin 15° = 1.035$ IN

$\sin\theta = \frac{y_B}{6}$, $\theta = \sin^{-1}\left(\frac{1.035}{6}\right) = 9.936°$

$\vec{T}_{BD} = (-T \cdot \cos 9.936°)\hat{i} + (T \cdot \sin 9.936°)\hat{j}$

$\vec{T}_{BD} = (-0.985\,T)\hat{i} + (0.1725 \cdot T)\hat{j}$ LB

$\Sigma F_x = 0$: $A_x - 0.985 \cdot T = 0$

$\Sigma F_y = 0$: $-A_y + 0.1725 \cdot T + 100 = 0$

$\Sigma M_A = 0$:

POSITION VECTOR FROM A TO B:

$X_B = 4 \cdot \cos 15^\circ = 3.864^{IN}$

$\vec{r}_B = (3.864)\hat{i} + (1.035)\hat{j}^{LB}$

$$\vec{r}_B \times \vec{T}_{BD} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3.864 & 1.035 & 0 \\ -0.985T & 0.1725 \cdot T & 0 \end{vmatrix}$$

$= [(3.864)(0.1725 \cdot T) - (1.035)(-0.985 \cdot T)]\hat{k} = (1.686 \cdot T)\hat{k}^{IN-LB}$

$X_C = 10 \cdot \cos 15^\circ = 9.659^{IN}$

$1.686 \cdot T - (9.659^{IN})(100^{LB}) = 0 \Rightarrow \boxed{T = 572.9^{LB}}$

$\boxed{A_X = 0.985(572.9) = 564.3^{LB}}$

$\boxed{A_Y = 0.1725(572.9) + 100 = 198.8^{LB}}$

$\vec{T}_{BD} = [-0.985(572.9)]\hat{i} + [0.1725(572.9)]\hat{j}$

$\vec{T}_{BD} = (-564.3)\hat{i} + (98.8)\hat{j}^{LB}$

AT POINT D,

$\vec{D} = -\vec{T}_{BD} = (564.3)\hat{i} + (-98.8)\hat{j}^{LB}$

HORIZONTAL FORCE ON E:

$\boxed{E_x = D_x = 564.3^{LB} \rightarrow}$