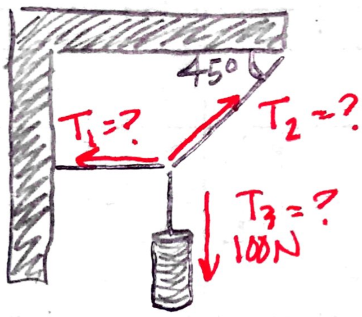
12.26a

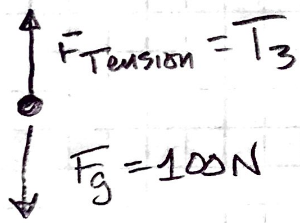


System is in static equilibrium, so

$\Sigma F_x = 0$ &

$\Sigma F_y = 0$.

For T_3:

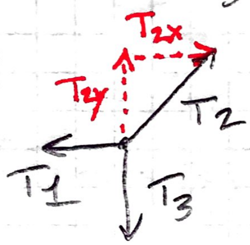


$\Sigma F_y = 0$

$F_T = T_3 \mp F_g = 0$

$T_3 = F_g = \boxed{100N}$

For T_2:



$\Sigma F_y = 0$

$T_{2y} - T_3 = 0$

$T_2 \sin 45 = T_3 = 100N$

$T_2 = \frac{100}{\sin 45} = \boxed{141 N}$

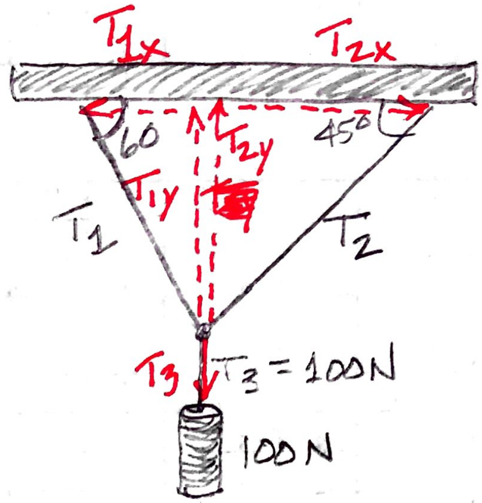
For T_1: $\Sigma F_x = 0$

$T_{2x} - T_1 = 0$

$T_{2x} = T_1 \rightarrow T_1 = T_2 \cos 45 = (141) \cos 45$

$= \boxed{100N}$

12.26c



$$\Sigma F_x = 0 : \quad T_{2x} + -T_{1x} = 0$$

$$T_2 \sin 45 = T_1 \cos 60$$

$$T_2 = T_1\left(\frac{\cos 60}{\sin 45}\right) = 0.707\, T_1$$

$$\Sigma F_y = 0 : \quad T_{1y} + T_{2y} + T_3 = 0$$

$$T_1 \sin 60 + T_2 \sin 45 + -100 = 0$$

$$T_1 \sin 60 + 0.707 T_1 \sin 45 = 100$$

$$T_1 (1.37) = 100$$

$$T_1 = \boxed{73.2N}$$

Subbing back in

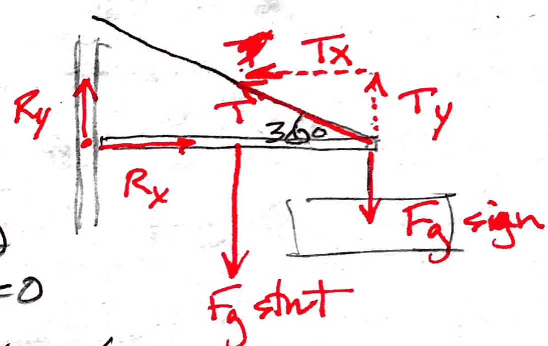
$$T_2 = (0.707)(73.2N) = \boxed{51.8N}$$

12.38

They said to assume sign was attached at end of strut, so it should look more like this.

Find force on hinge, & tension in cable.

Free-body diagram:



(A) $\Sigma \tau = 0$ Use hinge as axis of rotation

$\tau_{tension} - \tau_{strut} - \tau_{sign} = 0$

$\tau = r \times F = rF\sin\theta$

$L \cdot T_y - L(200) - \frac{L}{2}(400) = 0$

$\cancel{L}\, T\sin 30 = 200L + 200L = 400\cancel{L}$

$T = 400/\sin 30 = \boxed{800\text{ N}}$

(B) $\Sigma F_y = 0$: $R_y + T_y - F_{g\,strut} - F_{g\,sign} = 0$

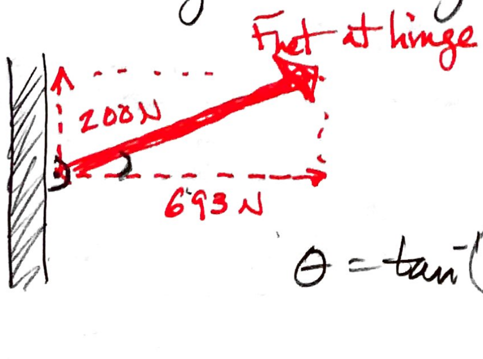
$R_y + T\sin 30 - 400 - 200 = 0$

$R_y = 400 + 200 - 800\sin 30 = \boxed{200\text{ N}}$

(C) $\Sigma F_x = 0$: $R_x - T_x = 0$

$R_x = T_x = T\cos 30 = 800\cos 30 = \boxed{693\text{N}}$

Combine these to get the single net force at the hinge:



$F_{net} = \sqrt{F_x^2 + F_y^2}$

$= \sqrt{693^2 + 200^2}$

$= \boxed{721\text{N}}$

$\theta = \tan^{-1}\left(\frac{200}{693}\right) = \boxed{16.1°}$