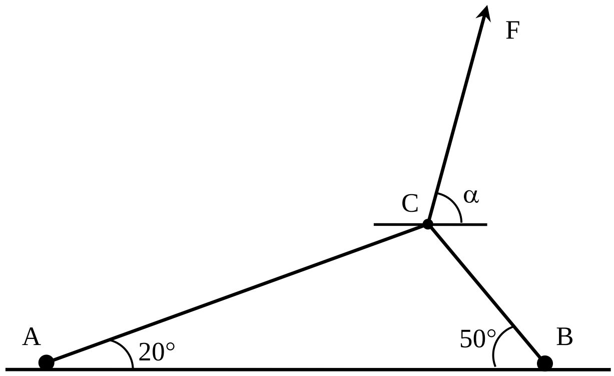
2.37 Two ropes are tied together at C .If the maximum permissible tension in each rope is 750 lb, what is the maximum force **F** that may be applied ? In what direction must this maximum force act ?



$$T_{AC} = T_{BC} = T_{\max} = 750 lb$$

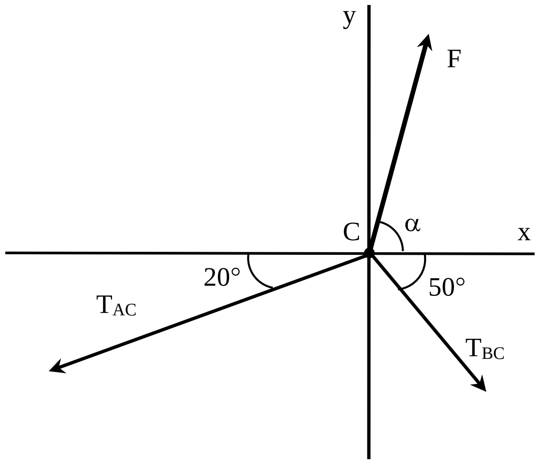
$$\Sigma F_x = 0$$

$$F \cos\alpha + T_{BC} \cos 50° - T_{AC} \cos 20° = 0$$

$$F \cos\alpha + 750 \cos 50° + 750 \cos 20° = 0$$

$$F \cos\alpha - 222.678 = 0$$

$$F = \frac{222.678}{\cos\alpha} \text{.................................(1)}$$



$$\Sigma F_y = 0$$

$$F \sin\alpha - T_{BC} \sin 50° - T_{AC} \sin 20° = 0$$

$$F \sin\alpha - 750 \sin 50° - 750 \sin 20° = 0$$

$$F \sin\alpha = 831.048 \text{.........................(2)}$$

$$from..(1)..and..(2)$$

$$\frac{222.678}{\cos\alpha} \sin\alpha = 831.048$$

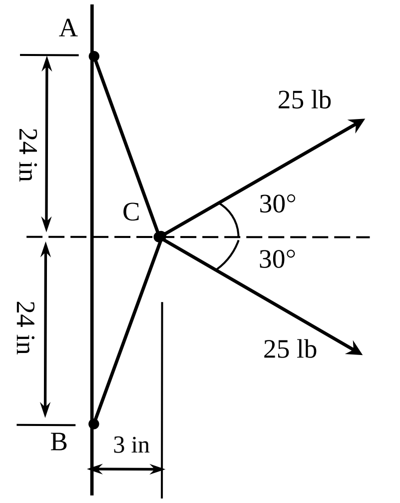
$$\tan\alpha = \frac{831.048}{222.678} = 3.732$$

$$\alpha = 74.9998°$$

$$F = 860.36 lb$$

....

2.38 Two strings are tied together at *C*. Determine the tension in *AC* and *BC*.



$\alpha = \tan^{-1}\frac{24}{3} = 82.87°$

$\Sigma F_x = 0$

$25\cos 30° + 25\cos 30° - T_{AC}\cos\alpha - T_{BC}\cos\alpha = 0$

$(T_{AC} + T_{BC})\cos 82.87° = 43.3$

$T_{AC} + T_{BC} = 348.853$..................................(1)

$\Sigma F_y = 0$

$25\sin 30° - 25\sin 30° - T_{AC}\sin\alpha - T_{BC}\sin\alpha = 0$

$T_{AC}\sin\alpha = T_{BC}\sin\alpha$

$T_{AC} = T_{BC}$...(2)

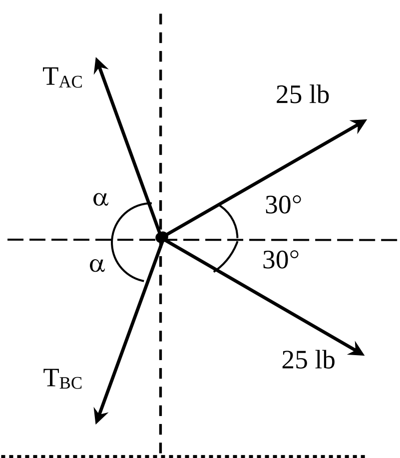
from..(1)..*and*..(2)

$T_{AC} + T_{AC} = 348.853$

$2T_{AC} = 348.853$

$T_{AC} = 174.42 lb$

$T_{BC} = 174.42 lb$



2.40 Two forces ***P*** and ***Q*** are applied to the aircraft connection shown. At a certain instant, when the connection is in equilibrium, it is found that T_1= **560** lb and T_2=**120** lb. Determine the corresponding values of ***P*** and ***Q***.

$\Sigma F_x = 0$

$T_1 - T_2\cos 60° - Q\cos 15° = 0$

$Q = \frac{560 + 120\cos 60°}{\cos 15°}$

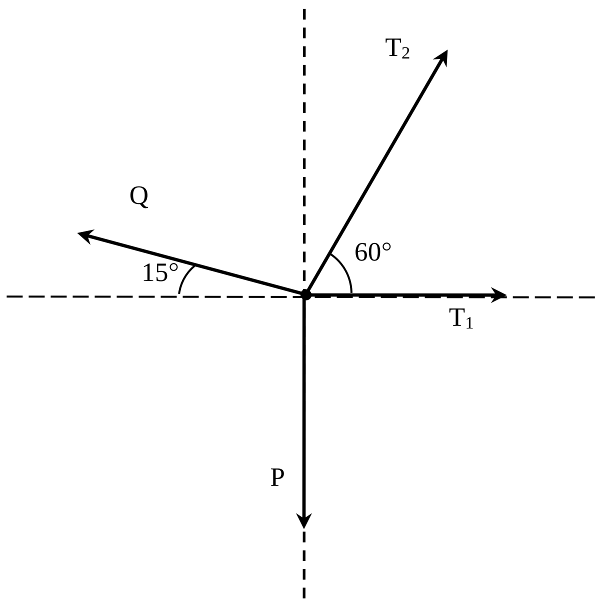
$Q = 641.87 lb$

$\Sigma F_y = 0$

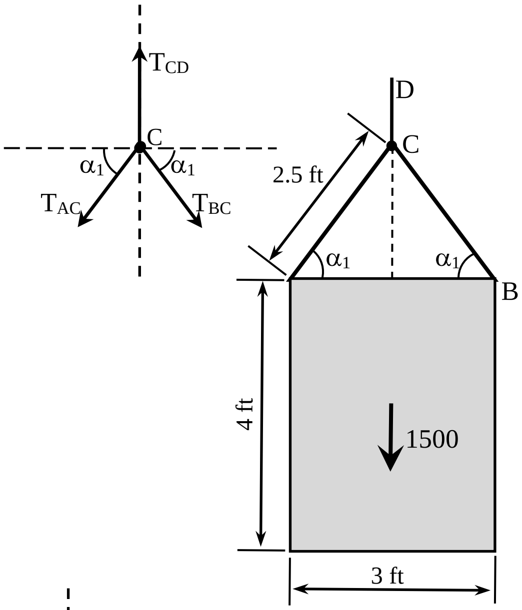
$T_2\sin 60° - Q\sin 15° - P = 0$

$P = 120\sin 60° + 641.87\sin 15°$

$P = 270 lb$



2.44 A **1,500**-lb crate is lifted by a crane cable CD . A cable sling ACB is **5** ft long and can be attached to the crate in each of the two ways shown . Determine the tension in the cable sling in each case.



$T_{CD} = 1500 lb$

$(a): \alpha_1 = \cos^{-1}\frac{1.5}{2.5} = 53.13°$

$\Sigma F_x = T_{AC}\cos\alpha_1 - T_{BC}\cos\alpha_1 = 0$

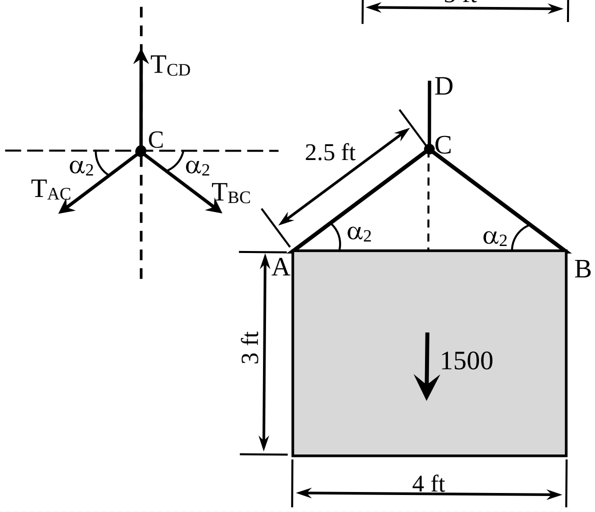
$T_{AC} = T_{BC}$..................................(1)

$\Sigma F_y = T_{CD} - T_{AC}\sin\alpha_1 - T_{BC}\sin\alpha_1 = 0$

$T_{CD} - 2T_{AC}\sin 53.13° = 0$

$T_{AC} = \frac{1500}{2\sin 53.13°} = 937.5 lb$

$T_{BC} = 937.5 lb$



$(b): \alpha_2 = \cos^{-1}\frac{2}{2.5} = 36.869°$

$\Sigma F_x = T_{AC}\cos\alpha_2 - T_{BC}\cos\alpha_2 = 0$

$T_{AC} = T_{BC}$.....................................(2)

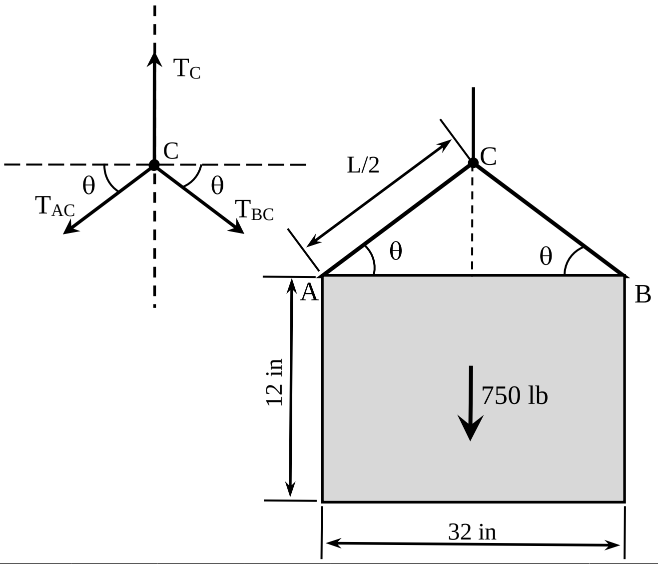
$\Sigma F_y = T_{CD} - T_{AC}\sin\alpha_2 - T_{BC}\sin\alpha_2 = 0$

$T_{CD} - 2T_{AC}\sin 36.869° = 0$

$T_{AC} = \frac{1500}{2\sin 36.869°} = 1250 lb$

$T_{BC} = 1250 lb$

2.45 A portable bin and its contents weigh 750 lb. Determine the shortest chain sling ACB which may be used to left the loaded bin if the tension in the chain sling is not to exceed 900 lb.



$w = 750lb; T_{max} = 900lb$

$T_C = w = 750lb$

$\Sigma F_x = -T_{AC}\cos\theta + T_{BC}\cos\theta = 0$

$T_{AC} = T_{BC} = 900lb$

$\Sigma F_y = T_C - T_{AC}\sin\theta - T_{BC}\sin\theta = 0$

$750 - 900\sin\theta - 900\sin\theta = 0$

$1800\sin\theta = 750 \Rightarrow \sin\theta = \frac{750}{1800}$

$\sin\theta = 0.41667 \Rightarrow \theta = 24.624°$

$\frac{L}{2} = \frac{32/2}{\cos\theta} \Rightarrow L = 35.2\,ft$