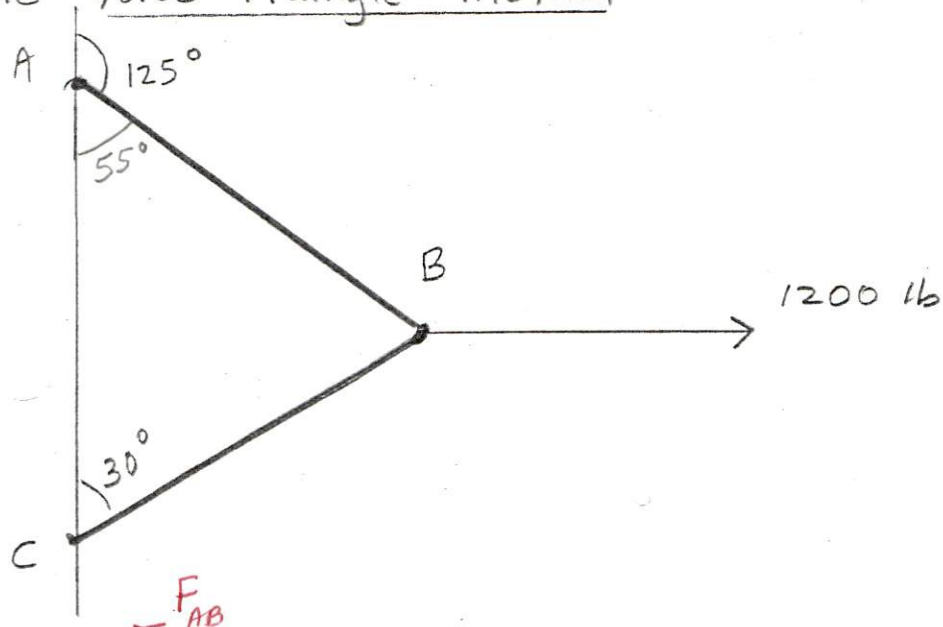
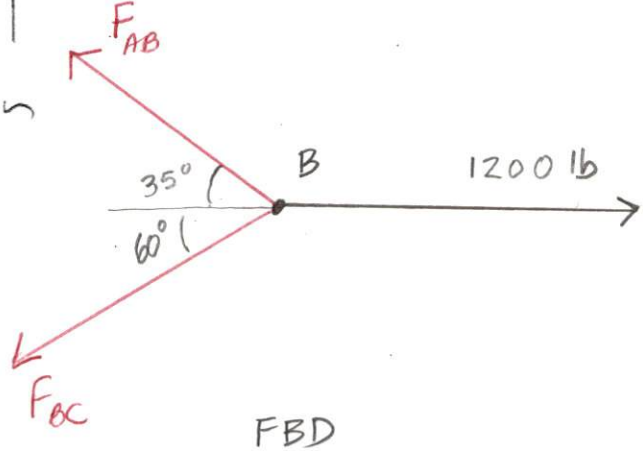
one page of notes. Algebra & Trig cheat sheets. All forces are to be in final form of positive magnitude and true direction.

Name Solution

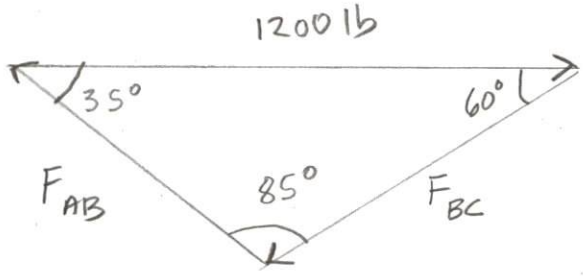
1. Determine the force in each strut using the force triangle method.



Solution



FBD



Force Triangle

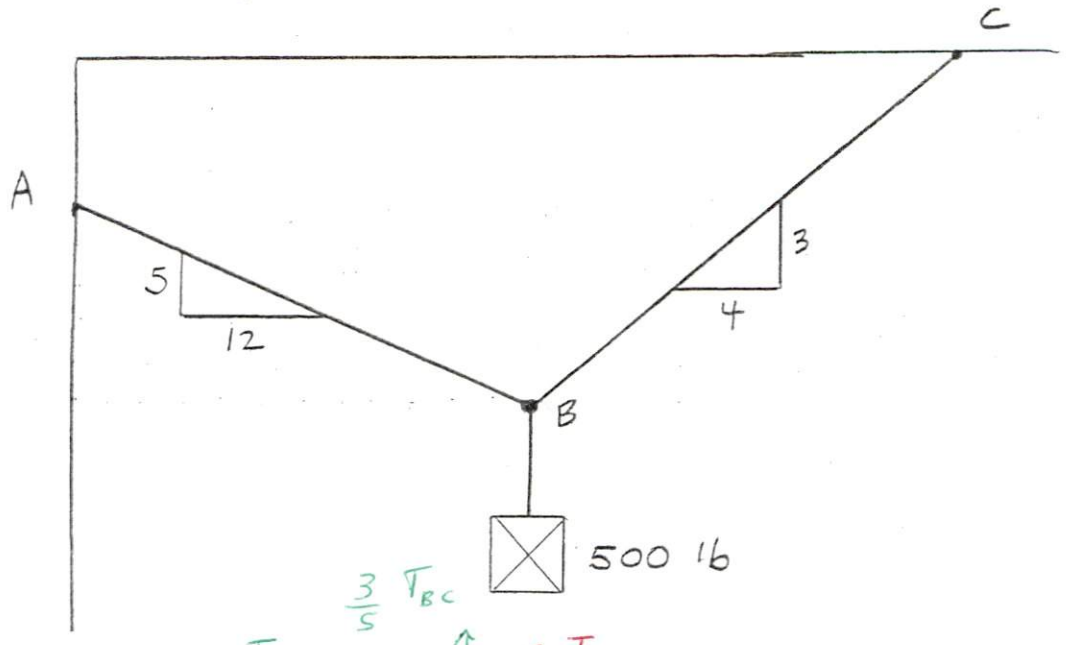
Law of Sines

$$\frac{F_{AB}}{\sin 60^\circ} = \frac{F_{BC}}{\sin 35^\circ} = \frac{1200\text{ lb}}{\sin 85^\circ}$$

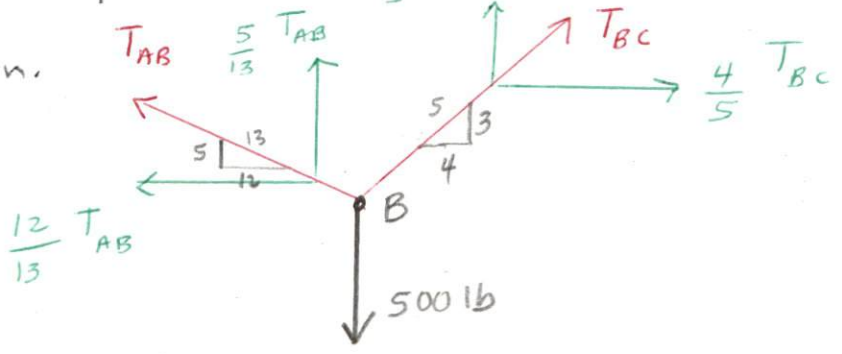
$$F_{AB} = \frac{\sin 60^\circ (1200\text{ lb})}{\sin 85^\circ} = \underline{1043\text{ lb}}$$

$$F_{BC} = \frac{\sin 35^\circ (1200\text{ lb})}{\sin 85^\circ} = \underline{690\text{ lb}}$$

2. Determine the tension in each cable using equilibrium equations.



Solution.



FBD

Equilibrium Equations

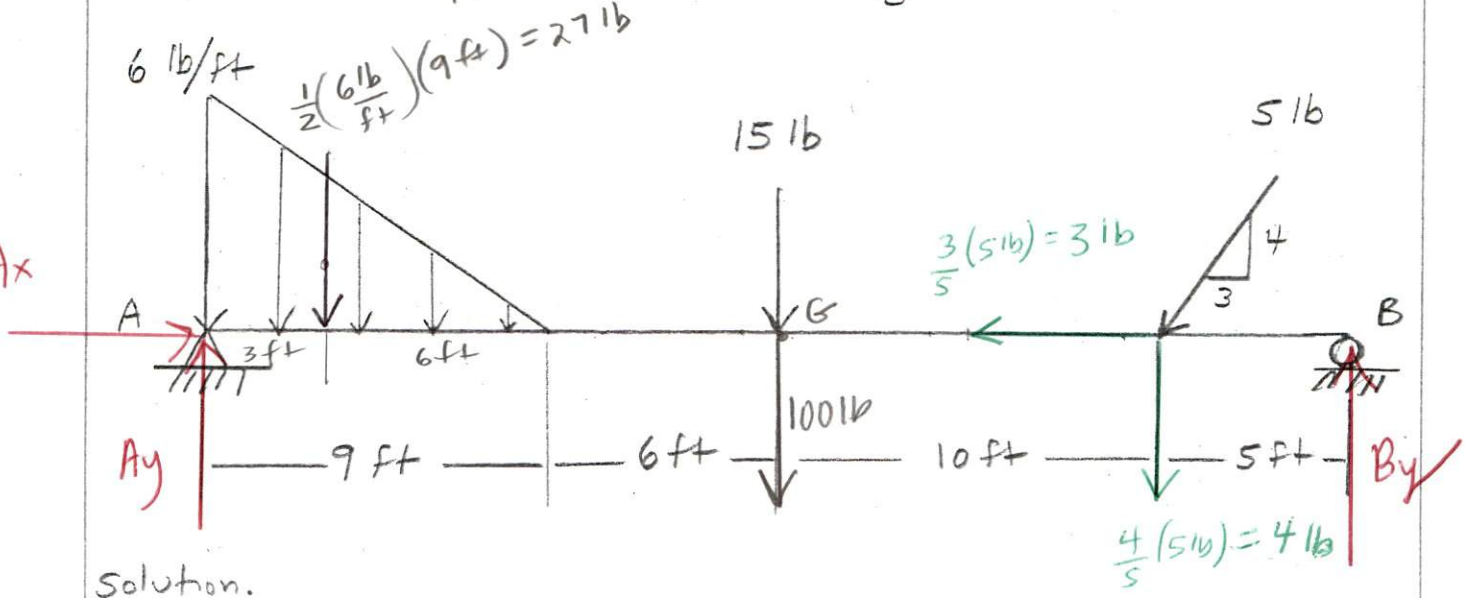
$$[\Sigma F_x = 0] \quad -\frac{12}{13}T_{AB} + \frac{4}{5}T_{BC} = 0 \qquad (1)$$

$$[\Sigma F_y = 0] \quad \frac{5}{13}T_{AB} + \frac{3}{5}T_{BC} - 500\,lb = 0 \qquad (2)$$

Cramer's Rule

$$T_{AB} = \frac{\begin{vmatrix} 0 & 4/5 \\ 500 & 3/5 \end{vmatrix}}{\begin{vmatrix} -\frac{12}{13} & \frac{4}{5} \\ \frac{5}{13} & \frac{3}{5} \end{vmatrix}} = 464\,lb \qquad T_{BC} = \frac{\begin{vmatrix} -\frac{12}{13} & 0 \\ \frac{5}{13} & 500 \end{vmatrix}}{\begin{vmatrix} -\frac{12}{13} & \frac{4}{5} \\ \frac{5}{13} & \frac{3}{5} \end{vmatrix}} = 536\,lb$$

3. Determine the reactions at the supports for the applied load acting on the 100 lb beam.



Solution.

FBD

ccw +M ↺
cw −M ↻

Equilibrium Equations

$[\Sigma M_A = 0]$

$$-27\text{ lb}(3\text{ ft}) - 15\text{ lb}(15\text{ ft}) - 100\text{ lb}(15\text{ ft}) - 4\text{ lb}(25\text{ ft}) + B_y(30\text{ ft}) = 0$$

$$B_y = \frac{1906\text{ lb}\cdot\text{ft}}{30\text{ ft}} = \underline{63.5\text{ lb}} \uparrow$$

$[\Sigma F_x = 0]$ $\quad A_x - 3\text{ lb} = 0$

$$A_x = \underline{3\text{ lb}} \rightarrow$$

$[\Sigma F_y = 0]$ $\quad A_y - 27\text{ lb} - 15\text{ lb} - 100\text{ lb} - 4\text{ lb} + B_y = 0$

$$A_y = 146\text{ lb} - 63.5\text{ lb} = \underline{82.5\text{ lb}} \uparrow$$

w/o beam weight $\quad B_y = 13.5\text{ lb}\uparrow \quad A_y = 32.5\text{ lb}\uparrow$