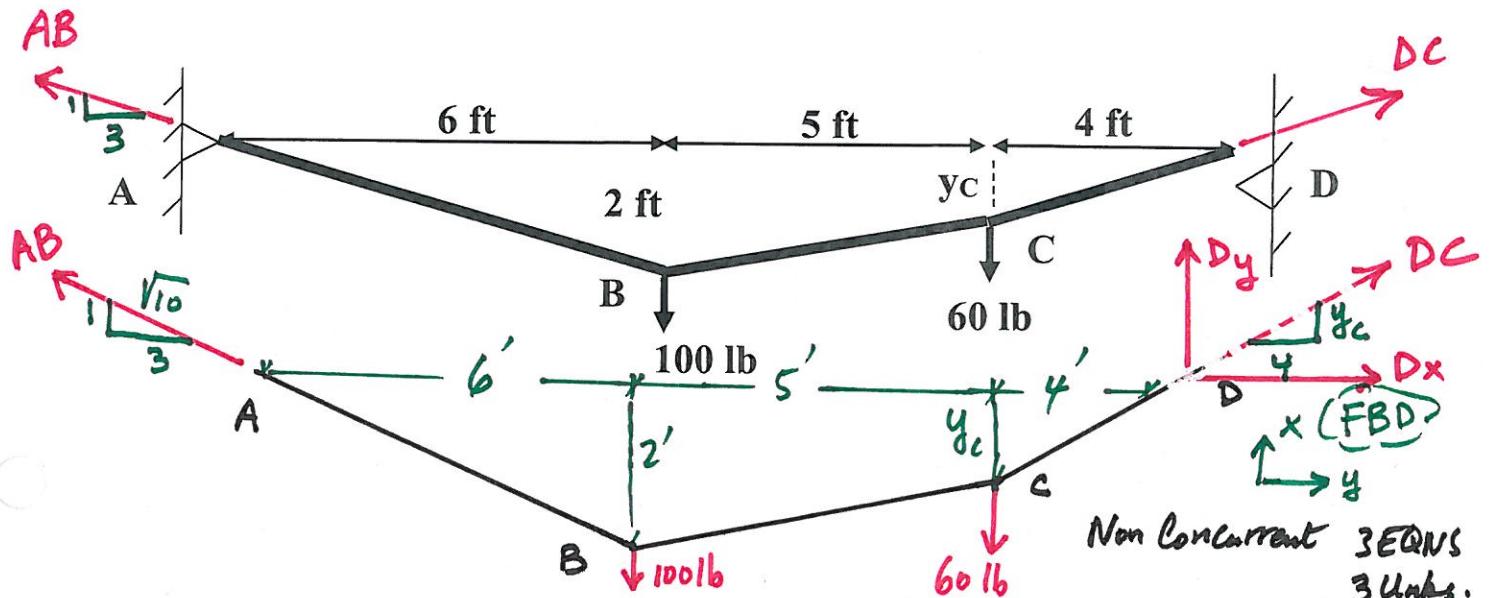


### Problem 1: Cables – Concentrated Loads

The cable supports the concentrated loads as shown. Determine:

- Reactions at supports *A* and *D*.
- The tensions  $T_{AB}$ ,  $T_{BC}$ , and  $T_{CD}$  of the three cable segments.
- The vertical distances  $y_C$ .
- The length,  $L$ , of the cable



$$\sum M_D = 0 = -AB \left(\frac{1}{\sqrt{10}}\right)(15 \text{ ft}) + (100 \text{ lb})(9 \text{ ft}) + 60 \text{ lb}(4 \text{ ft})$$

$$AB = \underline{\underline{240 \text{ lb (T)}}}$$

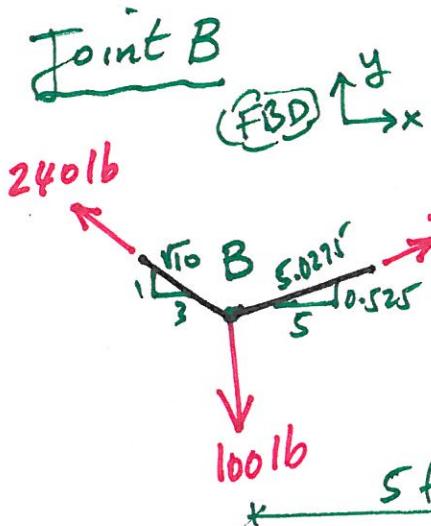
$$\rightarrow \sum F_x = 0 = -AB \left(\frac{3}{\sqrt{10}}\right) + Dx \Rightarrow Dx = \underline{\underline{228 \text{ lb}}}$$

$$\uparrow \sum F_y = 0 = AB \left(\frac{1}{\sqrt{10}}\right) + Dy - 100 \text{ lb} - 60 \text{ lb} \Rightarrow Dy = \underline{\underline{84.1 \text{ lb}}}$$

$$Dy = \frac{4 \text{ ft}}{y_C} = \frac{228 \text{ lb}}{84.1 \text{ lb}} \Rightarrow y_C = \underline{\underline{1.475 \text{ ft}}}$$

$$T_{AB} = AB = \underline{\underline{240 \text{ lb (T)}}}$$

$$T_{DC} = \sqrt{228^2 + 84.1^2} = \underline{\underline{243.0 \text{ lb (T)}}}$$



$$\Rightarrow \sum F_x = 0$$

$$0 = T_{BC} \left( \frac{5}{5.0275} \right) - 240 \left( \frac{3}{\sqrt{10}} \right)$$

$$T_{BC} = \underline{\underline{229 \text{ lb (T)}}}$$

$$L_{TOT} = \sqrt{6^2 + 2^2} + \sqrt{5^2 + 0.525^2} + \sqrt{4^2 + 1.47^2}$$

$$L_{TOT} = \underline{\underline{15.61 \text{ ft}}}$$