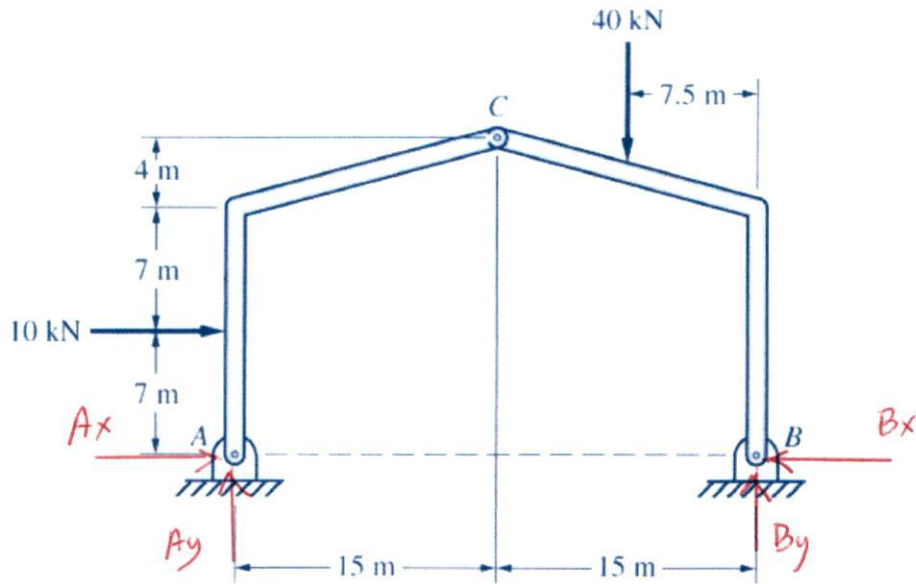


4-33 The three-hinged frame in Fig. P4-33, p. 186, is subjected to the loads shown. Find the reactions at supports A and B.

Solution.



FBD - Entire Frame

ccw + M ↺
cw - M ↻

Equilibrium Equations

$$[\sum M_A = 0] \quad -10 \text{ kN}(7 \text{ m}) - 40 \text{ kN}(22.5 \text{ m}) + B_y(30 \text{ m}) = 0$$

$$B_y = \frac{970 \text{ kN}\cdot\text{m}}{30 \text{ m}} = \underline{\underline{32.33 \text{ kN} \uparrow}}$$

$$[\sum F_y = 0] \quad A_y - 40 \text{ kN} + B_y = 0$$

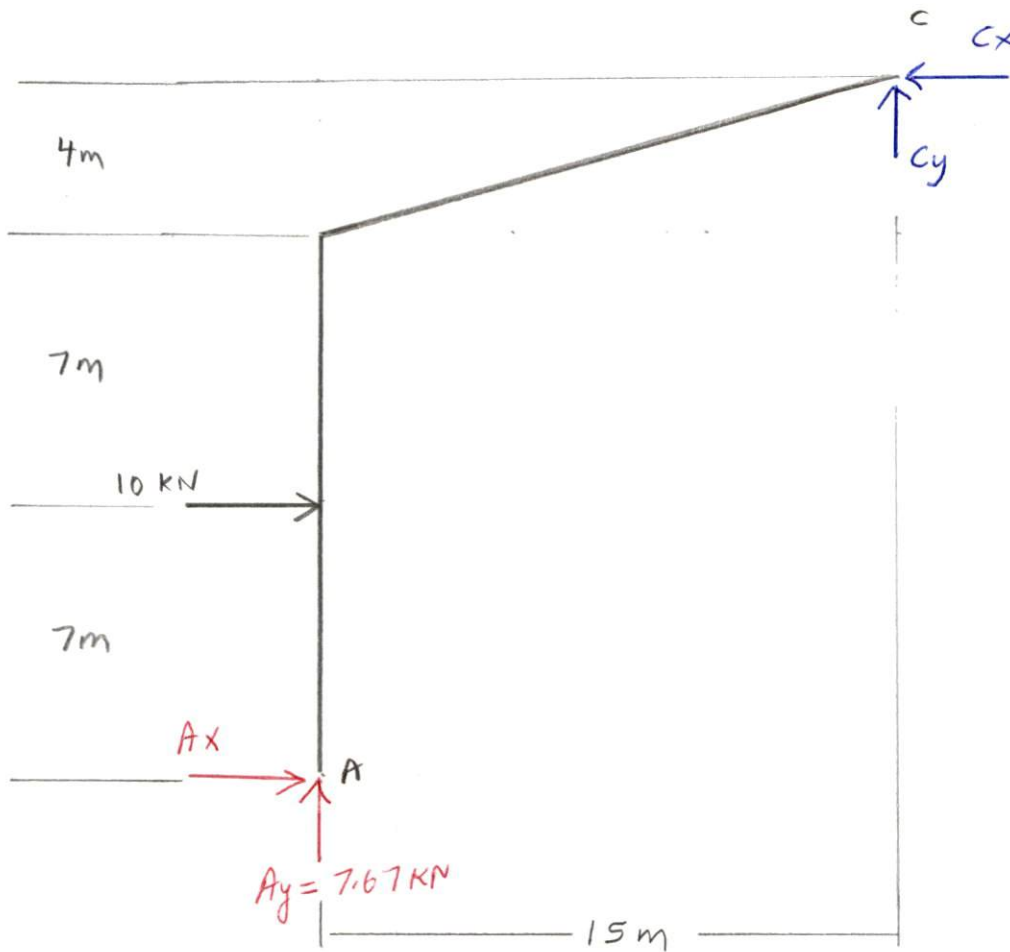
$$A_y = 40 \text{ kN} - 32.33 \text{ kN} = \underline{\underline{7.67 \text{ kN} \uparrow}}$$

$$[\sum F_x = 0] \quad A_x + 10 \text{ kN} - B_x = 0 \quad (\text{EQN 1}) \quad \text{can't solve yet}$$

From member AC

$$B_x = A_x + 10 \text{ kN} = 0.28 \text{ kN} + 10 \text{ kN} = \underline{\underline{10.28 \text{ kN} \leftarrow}}$$

member AC



ccw + M ↺
cw - M ↻

FBD - member AC

Equilibrium Equations

$$[\sum F_y = 0] \quad 7.67 \text{ kN} + C_y = 0$$

$$C_y = -7.67 \text{ kN} \uparrow \quad \text{and} \quad \boxed{C_y = 7.67 \text{ kN} \downarrow}$$

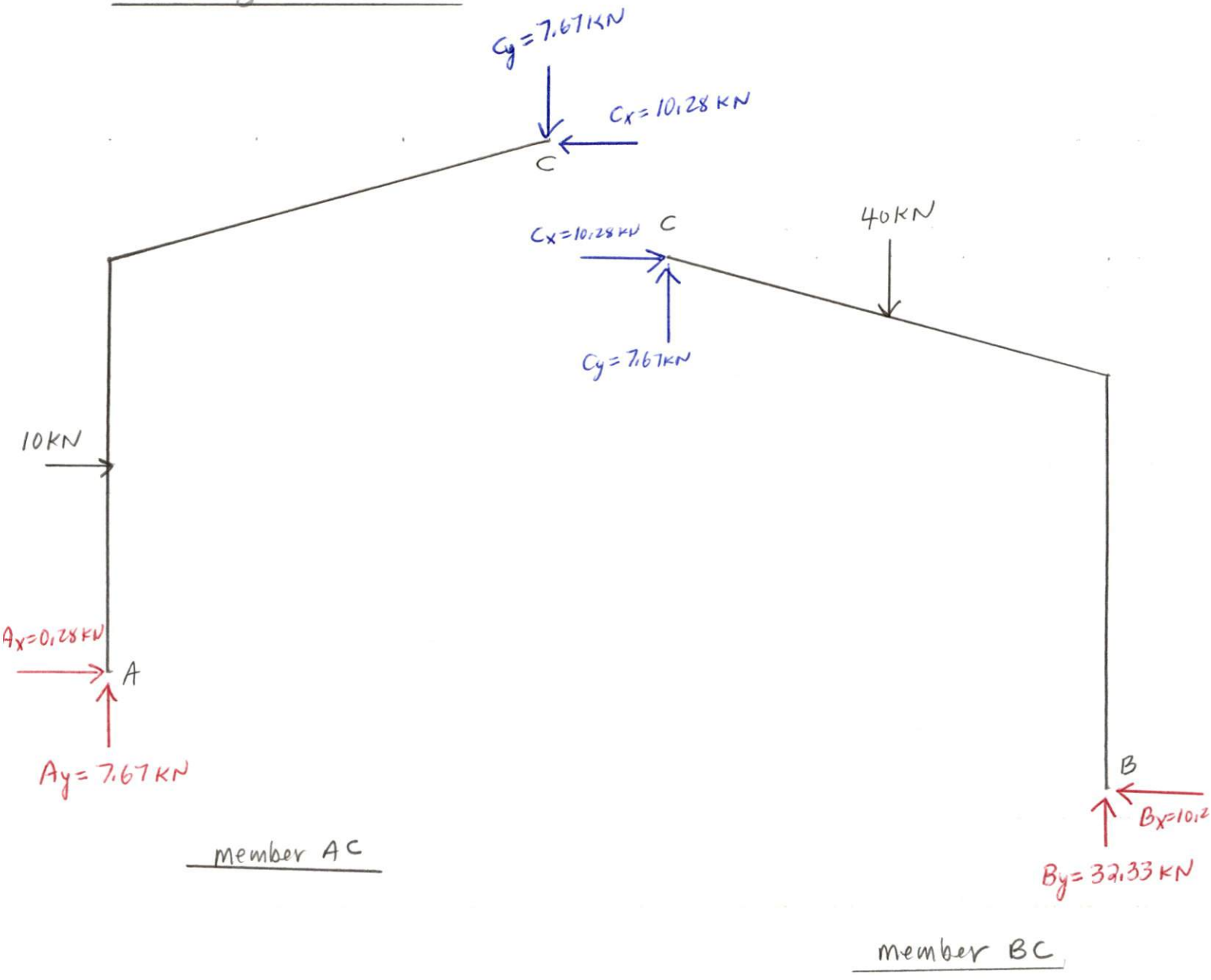
$$[\sum M_A = 0] \quad -10 \text{ kN}(7 \text{ m}) + C_y(15 \text{ m}) + C_x(18 \text{ m}) = 0$$

$$C_x = \frac{70 \text{ kN} \cdot \text{m} - (-7.67 \text{ kN})(15 \text{ m})}{18 \text{ m}} = 10.28 \text{ kN} \leftarrow$$

$$[\sum F_x = 0] \quad A_x - C_x + 10 \text{ kN} = 0$$

$$A_x = -10 \text{ kN} + 10.28 \text{ kN} = \underline{\underline{0.28 \text{ kN}}} \rightarrow$$

Summarize Results



Both members are in equilibrium ✓