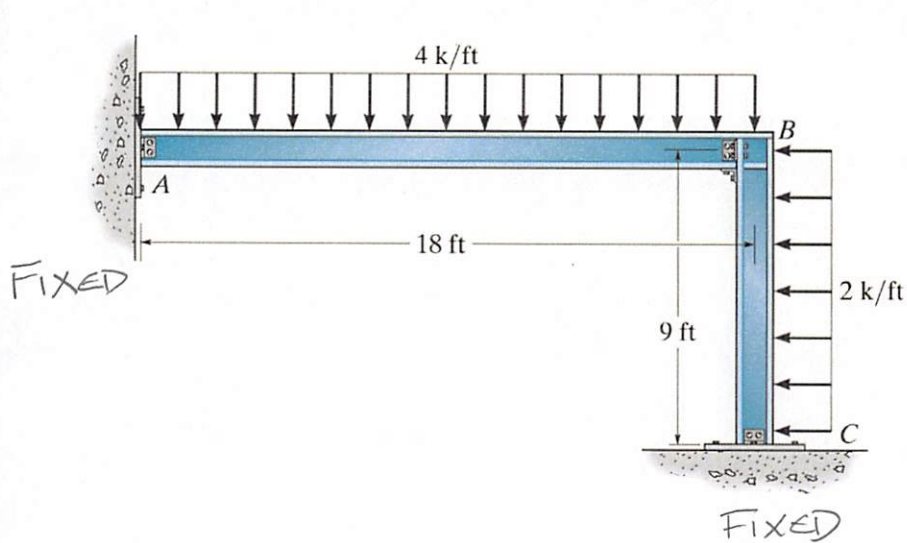


Problem 10b-1 – Determine the reactions at the supports. Assume the connections at A, B, and C are fixed, and EI is constant.



$$\frac{WL^2}{12} \quad \left(\begin{array}{c} \text{Diagram of a beam of length } L \text{ with a uniformly distributed load } W \\ \text{acting downwards. The formula } \frac{WL^2}{12} \text{ is shown on both sides of the beam.} \end{array} \right)$$

SECTION AB

$$\frac{4 \text{ k/ft} (18 \text{ ft})^2}{12} = \pm 108 \text{ kft}$$

SECTION BC

$$\frac{2 \text{ k/ft} (9 \text{ ft})^2}{12} = \pm 13.5 \text{ kft}$$

SECTION AB - 2 EQNS

$$M_{AB} = \frac{2EI}{18 \text{ ft}} \left[2\theta_A^\circ + \theta_B^\circ - 3\psi^\circ \right] - 108 \text{ kft} \quad (1)$$

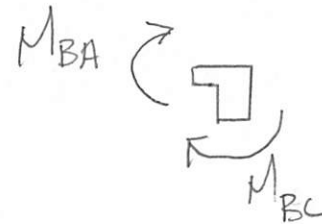
$$M_{BA} = \frac{2EI}{18 \text{ ft}} \left[2\theta_B^\circ + \theta_A^\circ - 3\psi^\circ \right] + 108 \text{ kft} \quad (2)$$

SECTION BC - 2 EQNS

$$M_{BC} = \frac{2EI}{9 \text{ ft}} \left[2\theta_B^\circ + \theta_C^\circ - 3\psi^\circ \right] - 13.5 \text{ kft} \quad (3)$$

$$M_{CB} = \frac{2EI}{9 \text{ ft}} \left[2\theta_C^\circ + \theta_B^\circ - 3\psi^\circ \right] + 13.5 \text{ kft} \quad (4)$$

JOINT B



$$\sum M_B = 0 = -M_{BA} - M_{BC}$$

$$M_{BA} + M_{BC} = 0 \quad (5)$$

Problem 10b-1 – Determine the reactions at the supports. Assume the connections at A, B, and C are fixed, and EI is constant.

$$\textcircled{5} \quad M_{BA} + M_{BC} = 0 = \frac{2EI}{18\text{ft}} [2\theta_B] + 108\text{kft} + \frac{2EI}{9\text{ft}} [2\theta_B] - 13.5\text{kft}$$
$$\frac{2}{3} \theta_B = -94.5\text{kft}/EI \quad \theta_B = -\frac{141.75\text{kft}^2}{EI}$$

SECTION AB

$$M_{AB} = \frac{2EI}{18\text{ft}} [\theta_B] - 108\text{kft} = \underline{-123.75\text{kft}}$$

$$M_{BA} = \frac{2EI}{18\text{ft}} [2\theta_B] + 108\text{kft} = \underline{76.5\text{kft}}$$

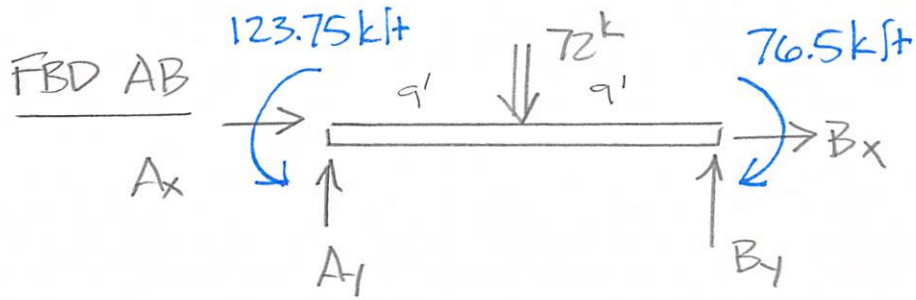
SECTION BC

$$M_{BC} = \frac{2EI}{9\text{ft}} [2\theta_B] - 13.5\text{kft} = \underline{-76.5\text{kft}}$$

$$M_{CB} = \frac{2EI}{9\text{ft}} [\theta_B] + 13.5\text{kft} = \underline{-18\text{kft}}$$

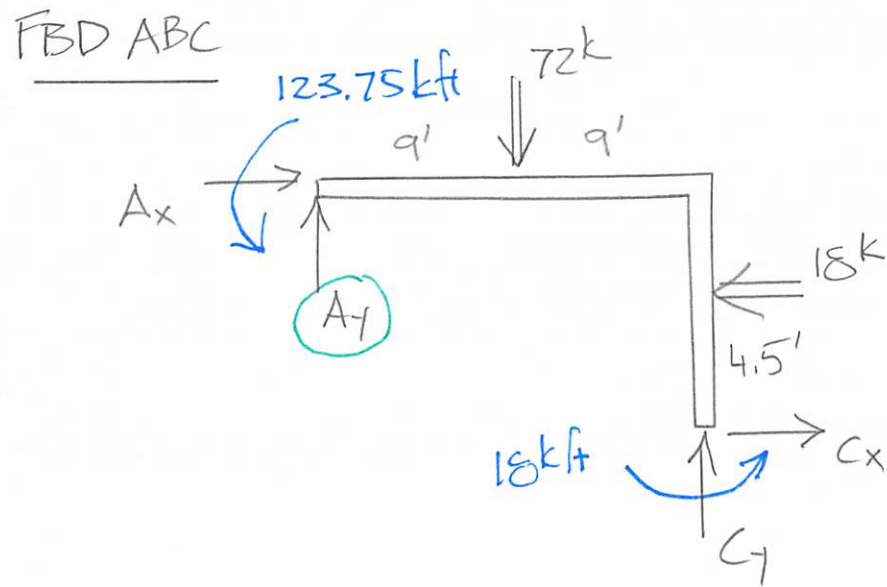
$$M_{BA} + M_{BC} = 0 \quad \checkmark$$

Problem 10b-1 – Determine the reactions at the supports. Assume the connections at A, B, and C are fixed, and EI is constant.



$$\begin{aligned} \sum M_B = 0 &= 123.75 \text{ kft} - 76.5 \text{ kft} + 72 \text{ k}(9') \\ &\quad - A_y(18') \end{aligned}$$

$$\underline{\underline{A_y = 38.63 \text{ k}}}$$



$$\begin{aligned} \sum M_C = 0 &= 18 \text{ k}(4.5 \text{ ft}) + 72 \text{ k}(9 \text{ ft}) + 18 \text{ kft} \\ &\quad + 123.75 \text{ kft} - A_y(18 \text{ ft}) - A_x(9 \text{ ft}) \end{aligned}$$

$$\underline{\underline{A_x = 19.49 \text{ k}}}$$

$$\begin{aligned} \sum F_y = 0 &= A_y + C_y - 72 \text{ k} \end{aligned}$$

$$\underline{\underline{C_y = 33.37 \text{ k}}}$$

$$\begin{aligned} \sum F_x = 0 &= A_x + C_x - 18 \text{ k} \end{aligned}$$

$$\underline{\underline{C_x = -1.49 \text{ k}}}$$