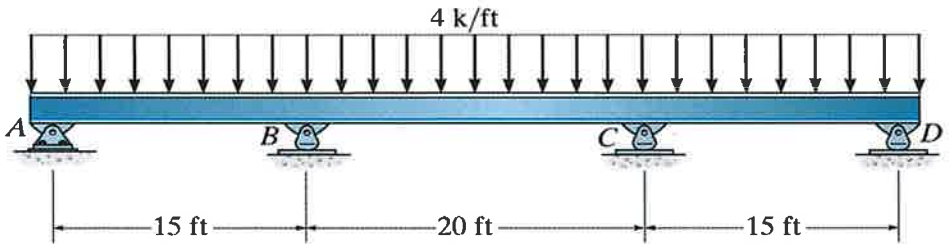
Problem 10a-3 – Determine the internal moments at the supports B and C. Assume *EI* is constant.



$$FEM_{BC} = F_{CB} = \frac{WL^2}{12} = \frac{4k/ft(20')^2}{12}$$

$$= \pm 133.33\ k\,ft$$

$$FEM_{BA} = FEM_{CD} = \frac{WL^2}{8} = \frac{4k/ft(15')^2}{8}$$

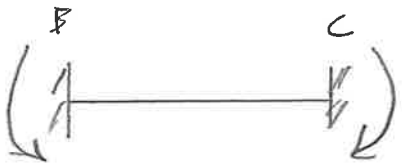
$$= \pm 112.5\ k\,ft$$

$$M_{BA} = \frac{3EI}{L_{AB}}\left[\theta_B\right] + 112.5\ k\,ft \quad (1)$$

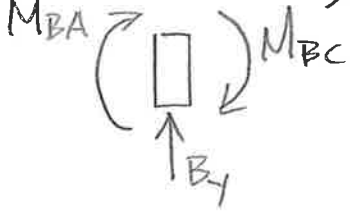
$$M_{BC} = \frac{2EI}{L_{BC}}\left[2\theta_B + \theta_C\right] - 133.33\ k\,ft \quad (2)$$

$$M_{CB} = \frac{2EI}{L_{BC}}\left[2\theta_C + \theta_B\right] + 133.33\ k\,ft \quad (3)$$

$$M_{CD} = \frac{3EI}{L_{CD}}\left[\theta_C\right] - 112.5\ k\,ft \quad (4)$$



JOINT B

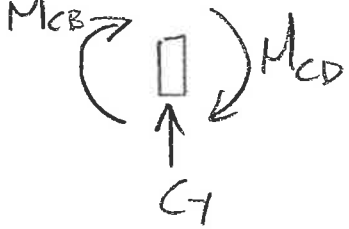


$$\circlearrowleft + \sum M_B = 0$$

$$= -M_{BA} - M_{BC}$$

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

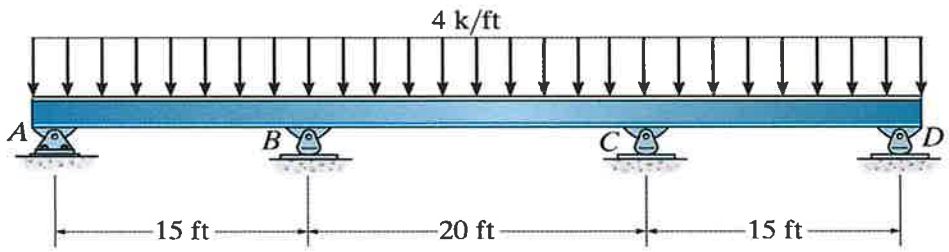
JOINT C



$$\circlearrowleft + \sum M_C = 0 = -M_{CB} - M_{CD}$$

$$M_{CB} + M_{CD} = 0 \quad (6)$$

Problem 10a-3 – Determine the internal moments at the supports B and C. Assume *EI* is constant.



(5) $M_{BA} + M_{BC} = 0 = \frac{3EI}{15}\left[\theta_B\right] + 112.5\,k\text{ft} + \frac{2EI}{20}\left[2\theta_B + \theta_C\right] - 133.33\,k\text{ft}$

(5a) $0.4\,\theta_B + 0.1\,\theta_C = 20.83\,k\text{ft}/EI$

(6) $M_{CB} + M_{CD} = 0 = \frac{2EI}{20}\left[2\theta_C + \theta_B\right] + 133.33\,k\text{ft} + \frac{3EI}{15}\left[\theta_C\right] - 112.5\,k\text{ft}$

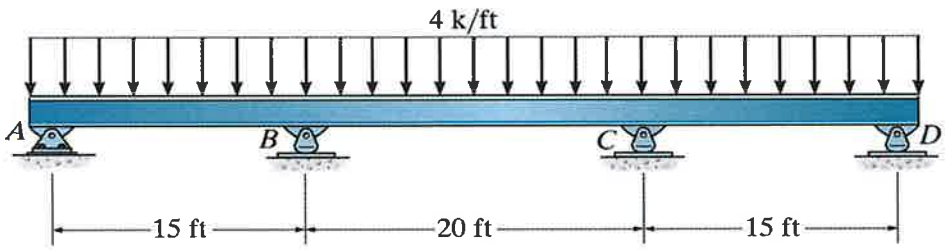
(6a) $0.1\,\theta_B + 0.4\,\theta_C = -20.83\,k\text{ft}/EI$

(5a) $- 4 \times$ (6a) $\Rightarrow -1.5\,\theta_C = 104.15\,k\text{ft}/EI$ $\qquad \theta_C = -\frac{69.43\,k\text{ft}^2}{EI}$

FROM (5a) $0.4\,\theta_B + 0.1\left[-\frac{69.43\,k\text{ft}^3}{EI}\right] = \frac{20.83\,k\text{ft}}{EI}$

$$\theta_B = \frac{69.43\,k\text{ft}^2}{EI}$$

Problem 10a-3 – Determine the internal moments at the supports B and C. Assume *EI* is constant.



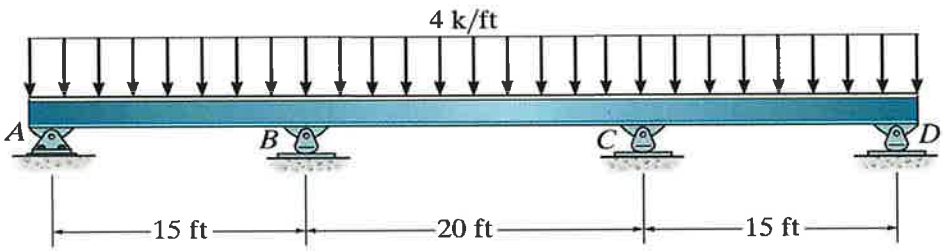
$$M_{BA} = \frac{3EI}{15ft}\left[\theta_B\right] + 112.5kft = \underline{\underline{126.39kft}}$$

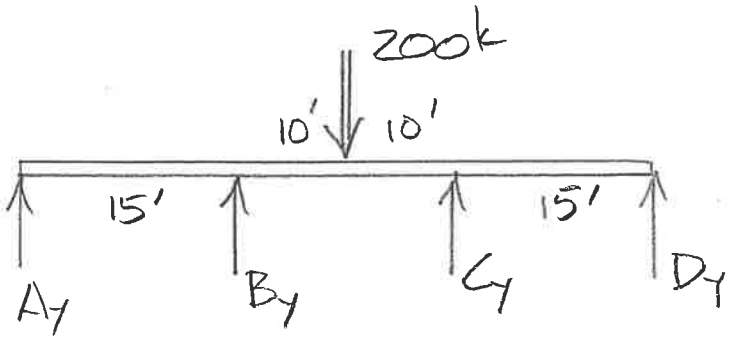
$$M_{BC} = \frac{2EI}{20ft}\left[2\theta_B + \theta_C\right] - 133.33kft = \underline{\underline{-126.39kft}}$$

$$M_{CB} = \frac{2EI}{20ft}\left[2\theta_C + \theta_B\right] + 133.33kft = \underline{\underline{126.39kft}}$$

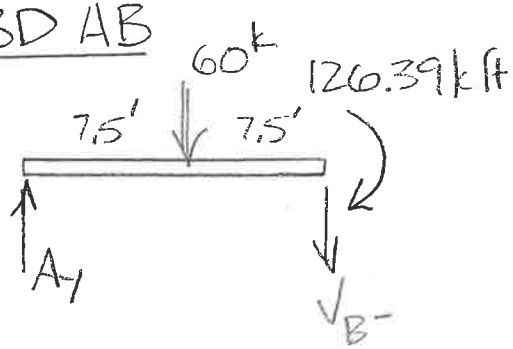
$$M_{CD} = \frac{3EI}{15ft}\left[\theta_C\right] - 112.5kft = \underline{\underline{-126.39kft}}$$

Problem 10a-3 – Determine the internal moments at the supports B and C. Assume *EI* is constant.





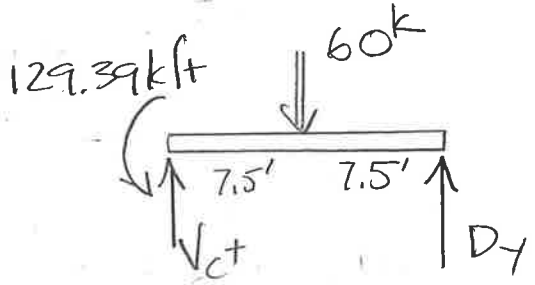
FBD AB



$$\circlearrowleft + \Sigma M_B = 0$$

$$= 60^k(7.5') - 126.39\,kft - A_y(15')$$

$$A_y = 21.57k$$



$$\circlearrowleft + \Sigma M_C = 0$$

$$= -60^k(7.5') + 129.39\,kft + D_y(15')$$

$$D_y = 21.57k$$

$$\circlearrowleft + \Sigma M_B = 0$$

$$= -A_y(15') + C_y(20') + D_y(35') - 200^k(10')$$

$$C_y = 78.43k$$

$$+\uparrow \Sigma F_y = 0$$

$$= A_y + B_y + C_y + D_y - 200k$$

$$B_y = 78.43k$$