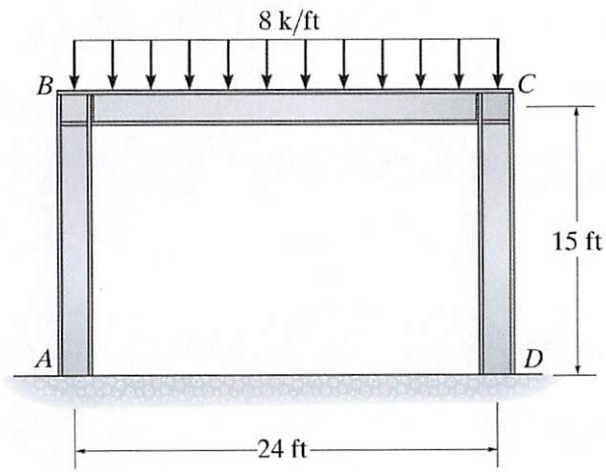
Problem 10b-4 – Determine the reactions at *A* and *D*. Assume the supports at *A* and *D* are fixed, *B* and *C* are fixed connected, and *EI* is constant.



$$FEM_{BC} = FEM_{CB} = \frac{WL^2}{12} = \frac{(8k/ft)(24ft)^2}{12} = \pm 384\,k\text{-}ft$$

$$M_{AB} = \frac{2EI}{15'}\left[\theta_B\right] \quad (1)$$

$$M_{BA} = \frac{2EI}{15'}\left[2\theta_B\right] \quad (2)$$

$$M_{BC} = \frac{2EI}{24'}\left[2\theta_B + \theta_C\right] - 384\,k\text{-}ft \quad (3)$$

$$M_{CB} = \frac{2EI}{24'}\left[2\theta_C + \theta_B\right] + 384\,k\text{-}ft \quad (4)$$

$$M_{CD} = \frac{2EI}{15'}\left[2\theta_C\right] \quad (5)$$

$$M_{DC} = \frac{2EI}{15'}\left[\theta_C\right] \quad (6)$$

JOINT B $\quad M_{BA} + M_{BC} = 0 \quad (7)$

JOINT C $\quad M_{CB} + M_{CD} = 0 \quad (8)$

8 EQUATIONS

8 UNKNOWNS

Problem 10b-4 – Determine the reactions at *A* and *D*. Assume the supports at *A* and *D* are fixed, *B* and *C* are fixed connected, and *EI* is constant.

(7) $M_{BA} + M_{BC} = 0 = \frac{2EI}{15'}[2\theta_B] + \frac{2EI}{24'}[2\theta_B + \theta_C] - 384\,k\text{-}ft$

$$\Rightarrow \frac{13}{30}\theta_B + \frac{1}{12}\theta_C = \frac{384\,k\text{-}ft^2}{EI} \quad (7a)$$

(8) $M_{CB} + M_{CD} = 0 = \frac{2EI}{24'}[2\theta_C + \theta_B] + 384\,k\text{-}ft + \frac{2EI}{15'}[2\theta_C]$

$$\Rightarrow \frac{1}{12}\theta_B + \frac{13}{30}\theta_C = -\frac{384\,k\text{-}ft^2}{EI} \quad (8a)$$

$5.2 \times (7a) - (8a) \Rightarrow 2.17\theta_B = \frac{2{,}380.8\,k\text{-}ft^2}{EI}$

$$\theta_B = \frac{1{,}097.14\,k\text{-}ft^2}{EI}$$

$$\theta_C = -\frac{1{,}097.14\,k\text{-}ft^2}{EI}$$

Problem 10b-4 – Determine the reactions at *A* and *D*. Assume the supports at *A* and *D* are fixed, *B* and *C* are fixed connected, and *EI* is constant.

$$M_{AB} = \frac{2EI}{15'}\left[\theta_B\right] = \underline{146.29\ k\text{-}ft}$$

$$M_{BA} = \frac{2EI}{15'}\left[2\theta_B\right] = \underline{292.57\ k\text{-}ft}$$

$$M_{BC} = \frac{2EI}{24'}\left[2\theta_B + \theta_C\right] - 384\ k\text{-}ft = \underline{-292.57\ k\text{-}ft}$$

$M_{BA} + M_{BC} = 0$ ✓

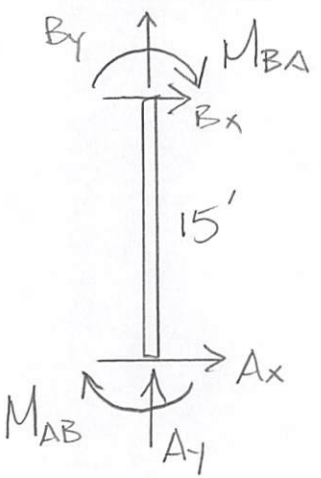
$$M_{CB} = \frac{2EI}{24'}\left[2\theta_C + \theta_B\right] + 384\ k\text{-}ft = \underline{292.57\ k\text{-}ft}$$

$$M_{CD} = \frac{2EI}{15'}\left[2\theta_C\right] = \underline{-292.57\ k\text{-}ft}$$

$M_{CB} + M_{CD} = 0$ ✓

$$M_{DC} = \frac{2EI}{15'}\left[\theta_C\right] = \underline{-146.29\ k\text{-}ft}$$

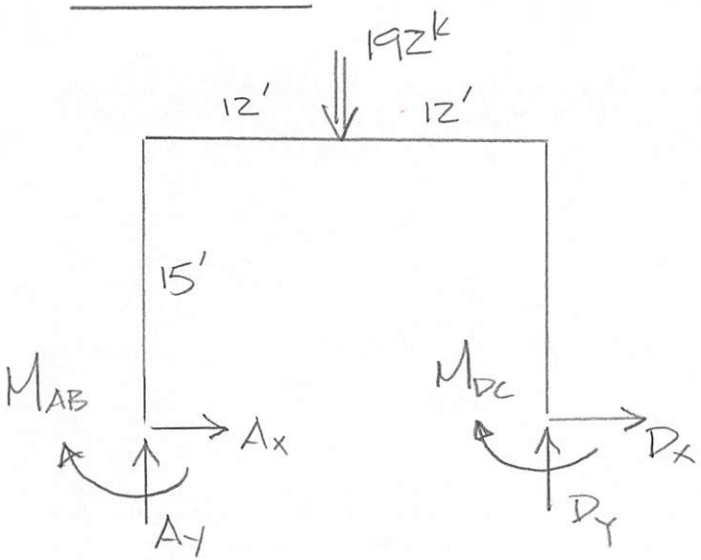
FBD AB



$\circlearrowleft + \sum M_B = 0 = -M_{BA} - M_{AB} + A_x(15')$ $\quad \underline{A_x = 29.26\ k}$

Problem 10b-4 – Determine the reactions at *A* and *D*. Assume the supports at *A* and *D* are fixed, *B* and *C* are fixed connected, and *EI* is constant.

FBD ABCD



$$\circlearrowleft + \sum M_D = 0 = -M_{AB} - M_{DC} + 192^k(12') - A_y(24')$$

$$A_y = 96^k$$

$$+\uparrow \sum F_y = 0 = A_y + D_y - 192^k \qquad D_y = 96^k$$

$$\xrightarrow{+} \sum F_x = 0 = A_x + D_x \qquad D_x = -29.26^k$$