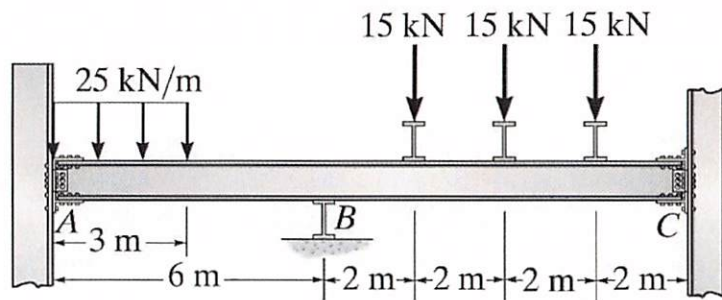


Problem 10-1 – Determine the moments at the supports, then draw the moment diagram. Assume B is a roller, A and C are fixed, and EI is constant. 1/4



$$FEM_{AB} = \frac{11WL^2}{192} \quad \left(\begin{array}{c} \text{Diagram of a beam of length } L \text{ with a UDL } W \\ \text{Divided into two segments of } L/2 \end{array} \right) \quad \frac{5WL^2}{192}$$

$$FEM_{BC} = \frac{5PL}{16} \quad \left(\begin{array}{c} \text{Diagram of a beam of length } L \text{ with three point loads } P \\ \text{Divided into four segments of } L/4 \end{array} \right) \quad \frac{5PL}{16}$$

$$M_{AB} = \frac{ZEI}{L_{AB}} \left[2\phi_A + \phi_B - 3\psi \right] - \frac{11(25\text{kN/m})(6\text{m})^2}{192} \quad (1)$$

$$M_{BA} = \frac{ZEI}{L_{AB}} \left[2\phi_B + \phi_A - 3\psi \right] + \frac{5(25\text{kN/m})(6\text{m})^2}{192} \quad (2)$$

$$M_{BC} = \frac{ZEI}{L_{BC}} \left[2\phi_B + \phi_C - 3\psi \right] - \frac{5(15\text{kN})(8\text{m})}{16} \quad (3)$$

$$M_{CB} = \frac{ZEI}{L_{BC}} \left[2\phi_C + \phi_B - 3\psi \right] + \frac{5(15\text{kN})(8\text{m})}{16} \quad (4)$$

5 EQUATIONS

5 UNKNOWNNS

$$\begin{array}{c} M_{BA} \\ \curvearrowright \\ \boxed{} \\ \uparrow B_y \\ \curvearrowleft M_{BC} \end{array} \quad \textcircled{+} \sum M_B = 0 = -M_{BA} - M_{BC} \quad (5)$$

Problem 10-1 – Determine the moments at the supports, then draw the moment diagram. Assume B is a roller, A and C are fixed, and EI is constant. ^{3/4}

$$\textcircled{5} \quad M_{BA} + M_{BC} = 0 = \frac{2EI}{6m} [2\theta_B] + 23.4375 \text{ kNm} + \frac{2EI}{8m} [2\theta_B] - 37.5 \text{ kNm}$$
$$\Rightarrow 1.1667 \theta_B = \frac{14.0625 \text{ kNm}}{EI} \quad \theta_B = \frac{12.0536 \text{ kNm}^2}{EI}$$

$$M_{AB} = \frac{2EI}{6m} [\theta_B] - 51.5625 \text{ kNm} = \underline{\underline{-47.54 \text{ kNm}}}$$

$$M_{BA} = \frac{2EI}{6m} [2\theta_B] + 23.4375 \text{ kNm} = \underline{\underline{31.47 \text{ kNm}}}$$

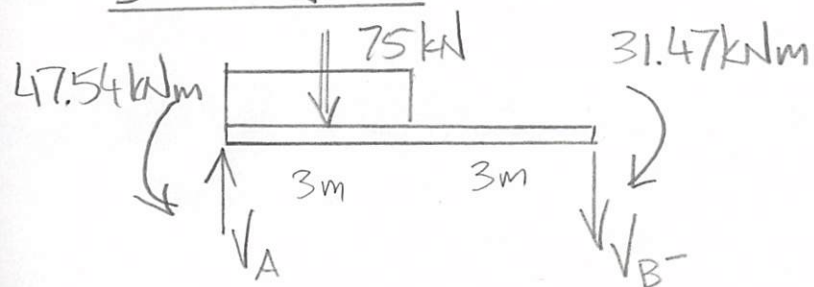
$$M_{BC} = \frac{2EI}{8m} [2\theta_B] - 37.5 \text{ kNm} = \underline{\underline{-31.47 \text{ kNm}}}$$

$$M_{CB} = \frac{2EI}{8m} [\theta_B] + 37.5 \text{ kNm} = \underline{\underline{40.51 \text{ kNm}}}$$

Problem 10-1 – Determine the moments at the supports, then draw the moment diagram. Assume B is a roller, A and C are fixed, and EI is constant.

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SECTION AB



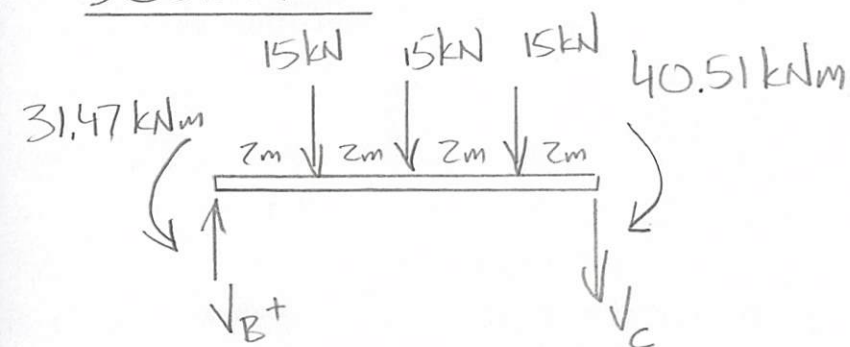
$$\sum M_B = 0 = -31.47 \text{ kNm} + 47.54 \text{ kNm} + 75 \text{ kN}(4.5 \text{ m}) - V_A(6 \text{ m})$$

$$V_A = 58.92 \text{ kN}$$

$$\sum F_y = 0 = V_A - V_B - 75 \text{ kN}$$

$$V_B = -16.07 \text{ kN}$$

SECTION BC



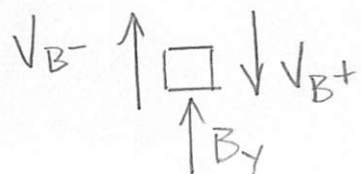
$$\sum M_C = 0 = -40.51 \text{ kNm} + 31.47 \text{ kNm} + 15 \text{ kN}(2 \text{ m} + 4 \text{ m} + 6 \text{ m}) - V_B(8 \text{ m})$$

$$V_B = 21.37 \text{ kN}$$

$$\sum F_y = 0 = V_B - V_C - 3(15 \text{ kN})$$

$$V_C = -23.63 \text{ kN}$$

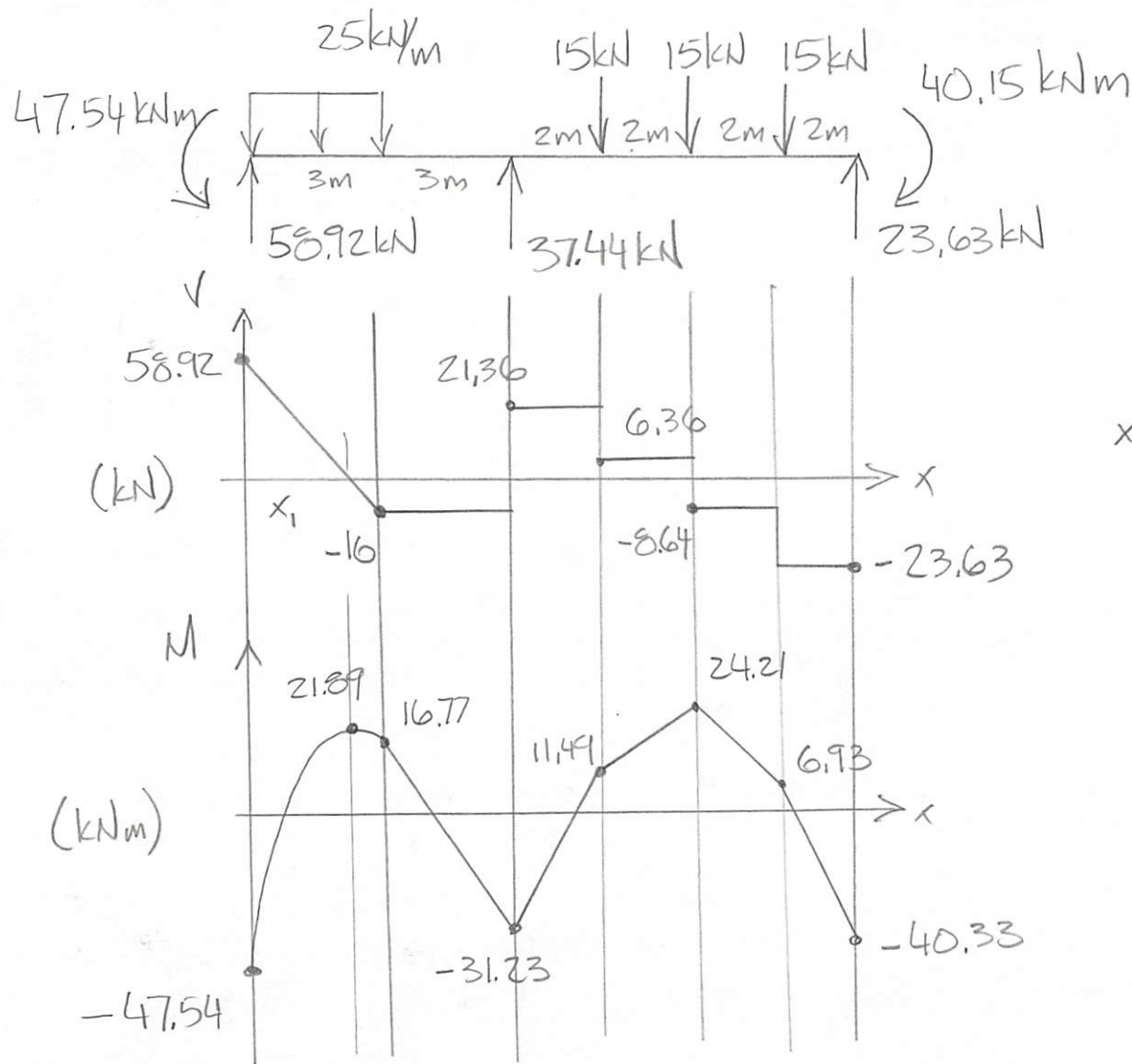
SECTION B



$$\sum F_y = 0 = V_B - V_B + B_y$$

$$B_y = 37.44 \text{ kN}$$

Problem 10-1 – Determine the moments at the supports, then draw the moment diagram. Assume B is a roller, A and C are fixed, and EI is constant. 4/4



$$x_1 = \frac{58.92 \text{ kN}}{25 \text{ kN/m}} = 2.36 \text{ m}$$