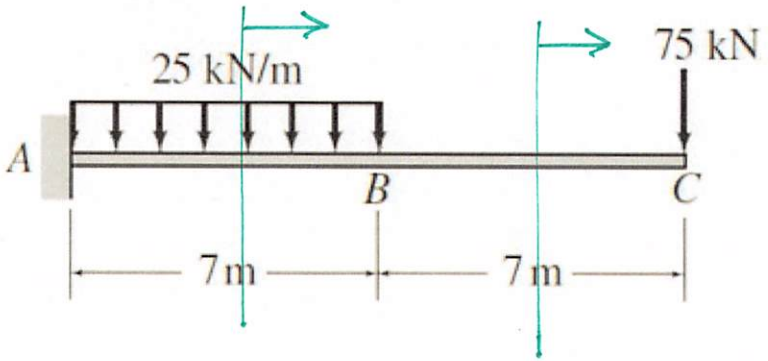
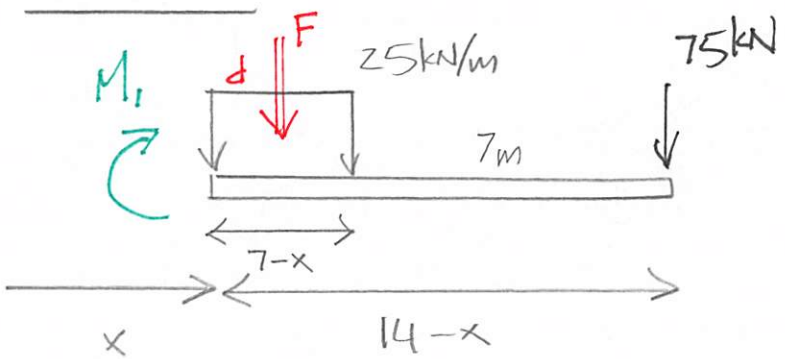
Example 8b-3: Determine the slope and displacement at *C*. Assume $I = 2{,}340\ (10^6)\ \text{mm}^4$ and 70 GPa.

Real loads



$0 \le x \le 7\text{m}$



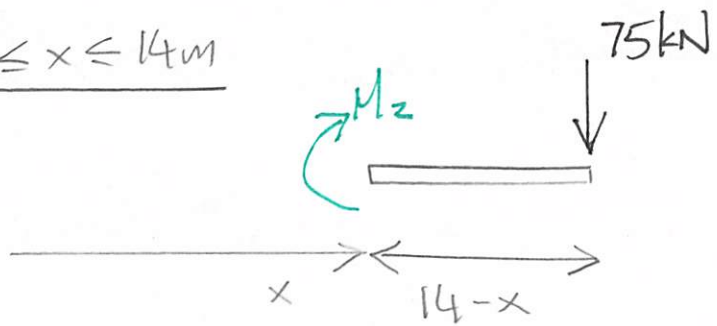
$+\circlearrowleft \Sigma M_{cut} = 0 = -M_1 - Fd - 75\text{kN}(14-x)$

$M_1 = \left[-\frac{25}{2}(7-x)^2 - 75(14-x)\right]\text{kNm}$

$F = 25\text{kN/m}(7-x)\text{m} = 25(7-x)\text{kN}$

$d = \frac{1}{2}(7-x)\text{ ft}$

$7 \le x \le 14\text{m}$

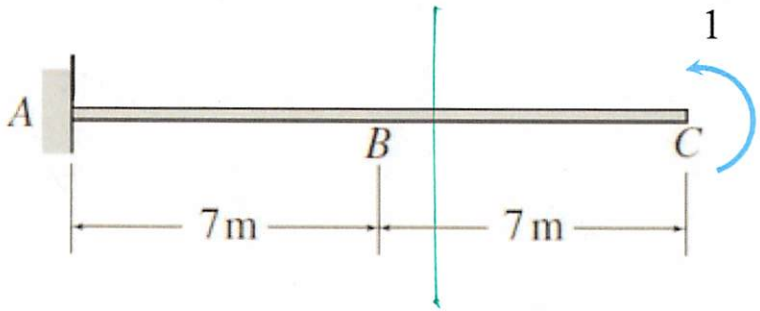


$+\circlearrowleft \Sigma M_{cut} = 0 = -M_2 - 75\text{kN}(14-x)$

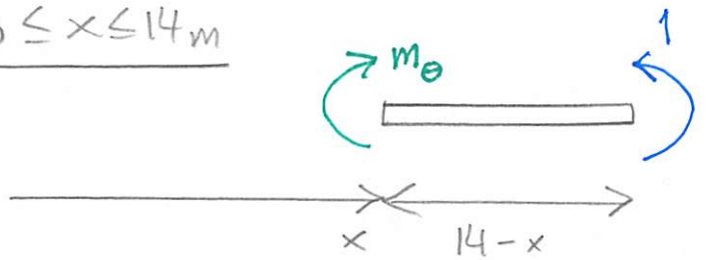
$M_2 = -75(14-x)\text{kNm}$

Example 8b-3: Determine the slope and displacement at C. Assume $I = 2{,}340\ (10^6)\ mm^4$ and 70 GPa.

Virtual moment



$0 \le x \le 14\ m$



$$+\circlearrowleft \Sigma M_{cut} = 0 = -m_\theta + 1 \qquad m_\theta = 1$$

$$\theta_c = \int_0^{14} \frac{M m_\theta}{EI} dx = \frac{1}{EI}\left[\int_0^7 M_1 m_\theta dx + \int_7^{14} M_2 m_\theta dx\right]$$

$$= \frac{1}{EI}\left[\left[-\frac{25x^3}{6} + 125x^2 - \frac{3{,}325x}{2}\right]_0^7 + \left[\frac{75x^2}{2} - 1{,}050x\right]_7^{14}\right]$$

$$= \frac{1}{EI}\left[-\frac{20{,}825}{3} - \frac{3{,}675}{2}\right] = -\frac{52{,}675\ kN m^2}{6EI}$$

$$= -\frac{52{,}675\ kN m^2}{70(10^6)\ kN} \frac{m^2}{2{,}340(10^6)\ mm^4}\left[\frac{10^3\ mm}{m}\right]^4 = -0.0536\ \text{RADIANS}$$