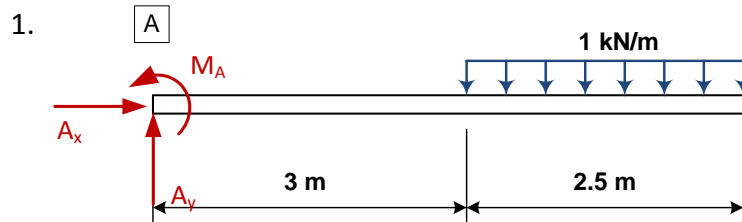
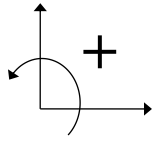
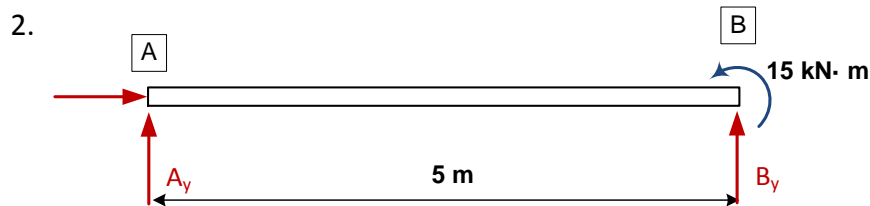


CVG 2140 – Solution to Assignment No. 1 (External Reactions)

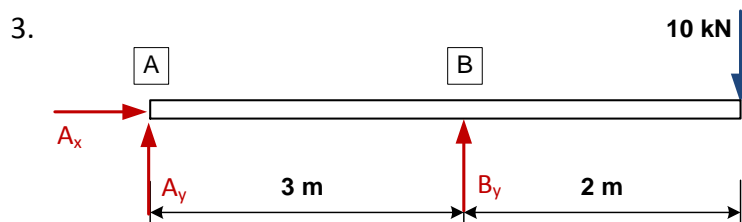
Sign convention



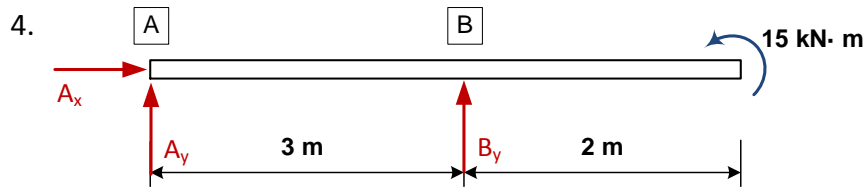
$$\left. \begin{aligned} \sum F_x &= A_x = 0 \\ \sum F_y &= A_y - (1)(2.5) = 0 \\ \sum M_A &= M_A - [(1) \times (2.5) \times (3 + 1.25)] = 0 \end{aligned} \right\} \Rightarrow \begin{aligned} A_x &= 0 \\ A_y &= 2.5 \text{ kN} \\ M_A &= 10.6 \text{ kN} \cdot \text{m} \end{aligned}$$



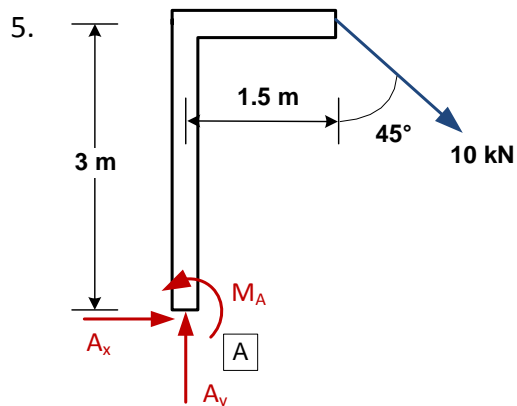
$$\left. \begin{aligned} \sum F_x &= A_x = 0 \\ \sum F_y &= A_y + B_y = 0 \\ \sum M_A &= 15 + (B_y \times 5) = 0 \end{aligned} \right\} \Rightarrow \begin{aligned} A_x &= 0 \\ A_y &= 3 \text{ kN} \\ B_y &= -3 \text{ kN} \end{aligned}$$



$$\left. \begin{aligned} \sum F_x &= A_x = 0 \\ \sum F_y &= A_y + B_y - 10 = 0 \\ \sum M_A &= (B_y \times 3) - (10 \times 5) = 0 \end{aligned} \right\} \Rightarrow \begin{aligned} A_x &= 0 \\ A_y &= -6.7 \text{ kN} \\ B_y &= 16.7 \text{ kN} \end{aligned}$$

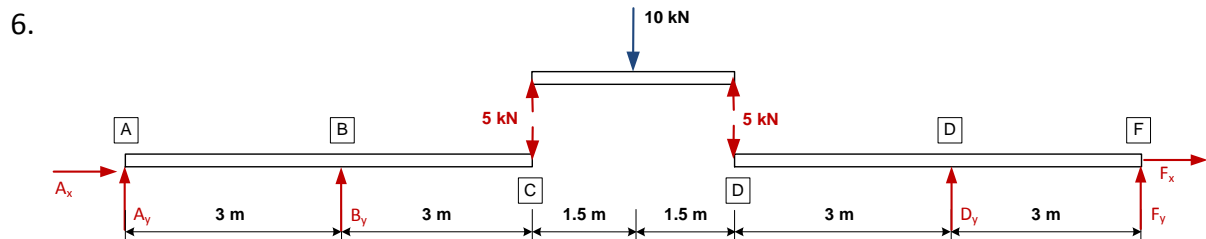


$$\left. \begin{aligned} \sum F_x = A_x = 0 \\ \sum F_y = A_y + B_y = 0 \\ \sum M_A = (B_y \times 3) + 15 = 0 \end{aligned} \right\} \Rightarrow \begin{aligned} A_x = 0 \\ A_y = 5 \text{ kN} \\ B_y = -5 \text{ kN} \end{aligned}$$



$$\begin{aligned} \sum F_x = A_x + 10 \sin 45^\circ = 0 \\ \sum F_y = A_y - 10 \cos 45^\circ = 0 \\ \sum M_A = M_A - (10 \cos 45^\circ \times 1.5) - (10 \sin 45^\circ \times 3) = 0 \end{aligned}$$

$A_x = -7.1 \text{ kN}, \quad A_y = 7.1 \text{ kN}, \quad M_A = 31.9 \text{ kN} \cdot \text{m}$



By establishing equilibrium on segment *ABC*:

$$\left. \begin{aligned} \sum F_x = A_x = 0 \\ \sum F_y = A_y + B_y - 5 = 0 \\ \sum M_A = (B_y \times 3) - (5 \times 6) = 0 \end{aligned} \right\} \Rightarrow \begin{aligned} A_x = 0 \\ A_y = -5 \text{ kN} \\ B_y = 10 \text{ kN} \end{aligned}$$

Likewise, by establishing equilibrium on segment *DEF*:

$$\left. \begin{aligned} \sum F_x = F_x = 0 \\ \sum F_y = D_y + F_y - 5 = 0 \\ \sum M_F = -(D_y \times 3) + (5 \times 6) = 0 \end{aligned} \right\} \Rightarrow \begin{aligned} F_x = 0 \\ F_y = -5 \text{ kN} \\ D_y = 10 \text{ kN} \end{aligned}$$