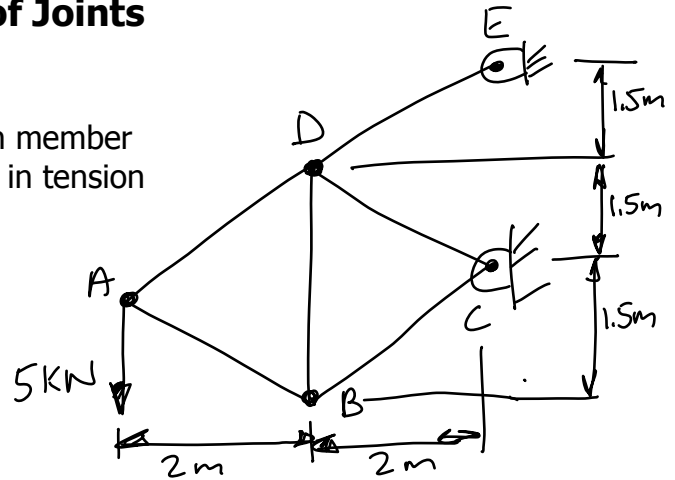


Method of Joints

Problem Statement: Determine the force in each member of the truss, and indicate whether the members are in tension or compression.



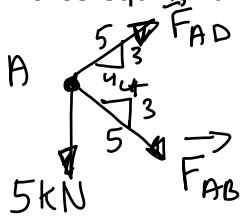
1.) Determine the support reactions if possible.

Not Possible \Rightarrow Statically Indeterminate

2.) Select joints that have at most two unknown forces.

Joint A

3.) Enforce equilibrium on the joint.

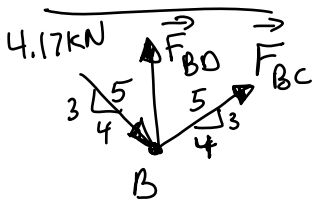


$$\begin{aligned} \rightarrow \sum F_x = 0 &\Rightarrow F_{AD} \left(\frac{4}{5}\right) + F_{AB} \left(\frac{4}{5}\right) = 0 \\ \uparrow \sum F_y = 0 &\Rightarrow F_{AD} \left(\frac{3}{5}\right) - F_{AB} \left(\frac{3}{5}\right) - 5 \text{ kN} = 0 \\ &F_{AD} = 4.17 \text{ kN}, F_{AB} = -4.17 \text{ kN} \end{aligned}$$

$F_{AD} = 4.17 \text{ kN (T)}, F_{AB} = 4.17 \text{ kN (C)}$

4.) Continue to select more joints until all forces are known.

Joint B

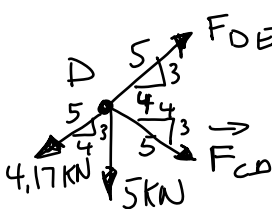


$$\begin{aligned} \rightarrow \sum F_x = 0 &\Rightarrow (4.17 \text{ kN}) \left(\frac{4}{5}\right) + \left(\frac{4}{5}\right) (F_{BC}) = 0 \\ &F_{BC} = -4.17 \text{ kN} \\ \uparrow \sum F_y = 0 &\Rightarrow -(4.17 \text{ kN}) \left(\frac{3}{5}\right) + F_{BO} + (F_{BC}) \left(\frac{3}{5}\right) = 0 \end{aligned}$$

$$F_{BO} = 5 \text{ kN}$$

$F_{BC} = 4.17 \text{ kN (C)}, F_{BO} = 5 \text{ kN (T)}$

Joint D



$$\begin{aligned} \rightarrow \sum F_x = 0 &\Rightarrow -(4.17 \text{ kN}) \left(\frac{4}{5}\right) + (F_{DOE}) \left(\frac{4}{5}\right) + (F_{CD}) \left(\frac{4}{5}\right) = 0 \\ \uparrow \sum F_y = 0 &\Rightarrow -(4.17 \text{ kN}) \left(\frac{3}{5}\right) - 5 \text{ kN} - (F_{CD}) \left(\frac{3}{5}\right) + (F_{DOE}) \left(\frac{3}{5}\right) = 0 \\ &F_{CD} = -4.17 \text{ kN}, F_{DOE} = 8.33 \text{ kN} \end{aligned}$$

$F_{CD} = 4.17 \text{ kN (C)}, F_{DOE} = 8.33 \text{ kN (T)}$