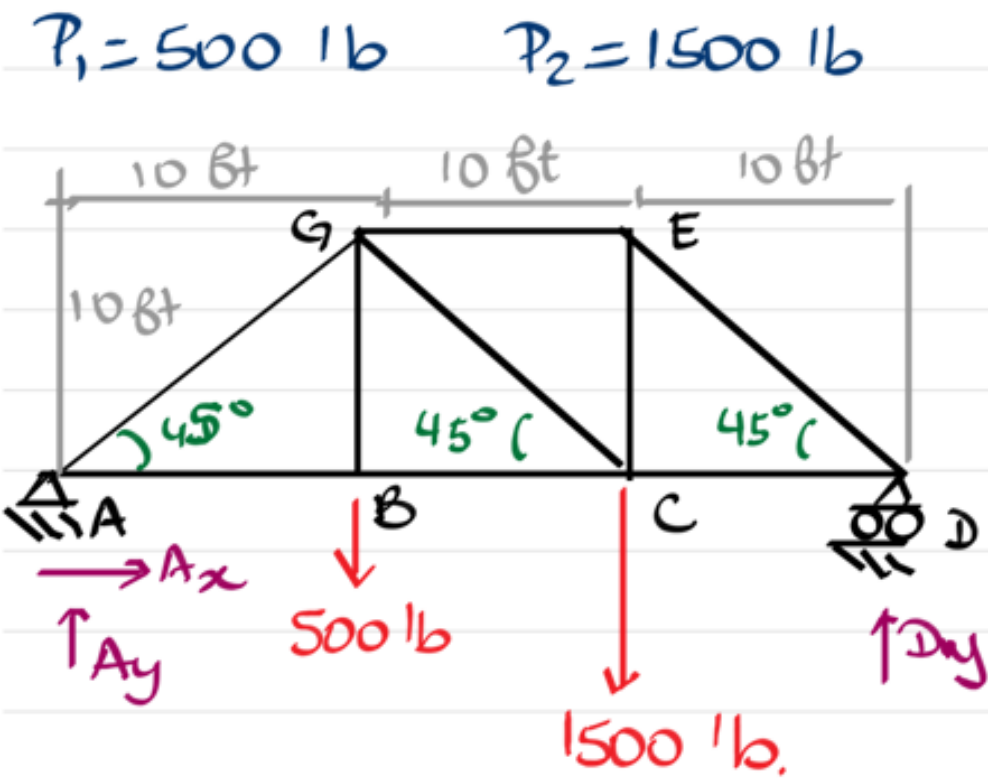


02/23/2018

Problem 1



System: whole truss

$$\sum F_x = 0 \Rightarrow A_x = 0$$

$$\sum \tau_A = 0 \Rightarrow 500 \text{ lb} \times 10 \text{ ft} + 1500 \text{ lb} \times 20 \text{ ft} = D_y \times 30 \text{ ft}$$

$$D_y = \frac{500 + 1500 \times 2}{3} \text{ lb}$$

$$\underline{D_y = 1167 \text{ lb}}$$

$$\sum F_y = 0 \Rightarrow A_y + D_y = 500 \text{ lb} + 1500 \text{ lb}$$

$$\underline{A_y = 833 \text{ lb}}$$

Strategy

Node A \Rightarrow AG, AB

Node B \Rightarrow BG, BC

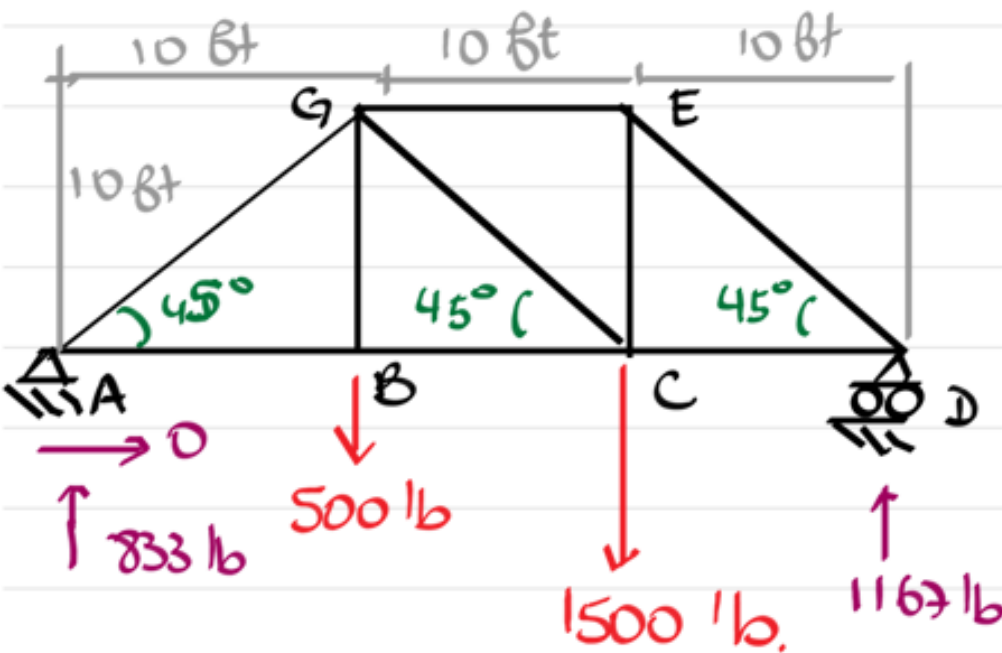
Node D \Rightarrow CD, ED

Node C \Rightarrow CE, GC

Node E \Rightarrow EG.

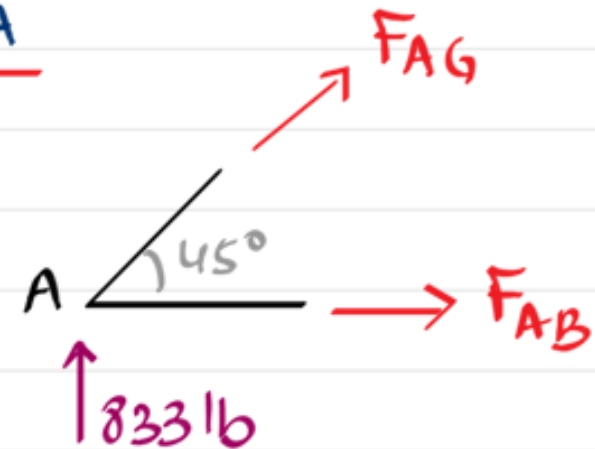
Problem 1

$$P_1 = 500 \text{ lb} \quad P_2 = 1500 \text{ lb}$$



Strategy

Node A \Rightarrow AG, AB
 Node B \Rightarrow BG, BC
 Node D \Rightarrow CD, ED
 Node C \Rightarrow CE, GC
 Node E \Rightarrow EG

Node A

$$\sum F_y = 0 \Rightarrow 833 + F_{AG} \frac{1}{\sqrt{2}} = 0$$

$$\underline{F_{AG} = -833\sqrt{2} \text{ lb (C)}}$$

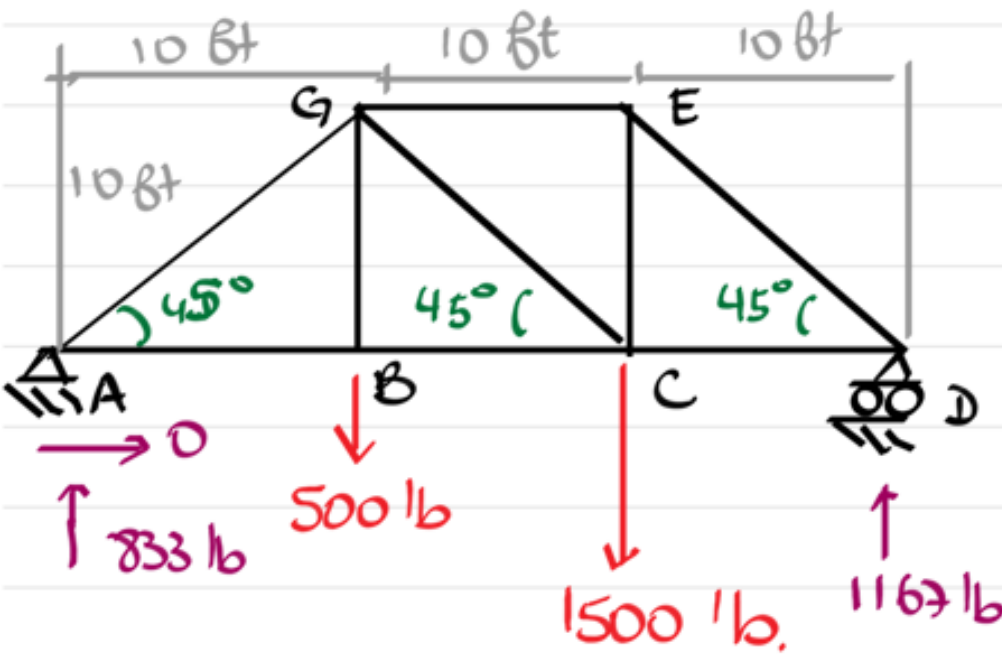
$$\sum F_x = 0 \Rightarrow F_{AG} \frac{1}{\sqrt{2}} + F_{AB} = 0$$

$$\Rightarrow \underline{F_{AB} = 833 \text{ lb (T)}}$$

02/23/2018

Problem 1

$$P_1 = 500 \text{ lb} \quad P_2 = 1500 \text{ lb}$$



Strategy

Node A \Rightarrow AG, AB ✓

Node B \Rightarrow BG, BC

Node D \Rightarrow CD, ED

Node C \Rightarrow CE, GC

Node E \Rightarrow EG

$$F_{AG} = -833\sqrt{2} \text{ (C)}$$

$$F_{AB} = 833 \text{ lb (T)}$$

Node B



$$\sum F_y = 0 \Rightarrow F_{BG} = 500 \text{ lb (T)}$$

$$\sum F_x = 0 \Rightarrow F_{BC} = 833 \text{ lb (T)}$$

Node D



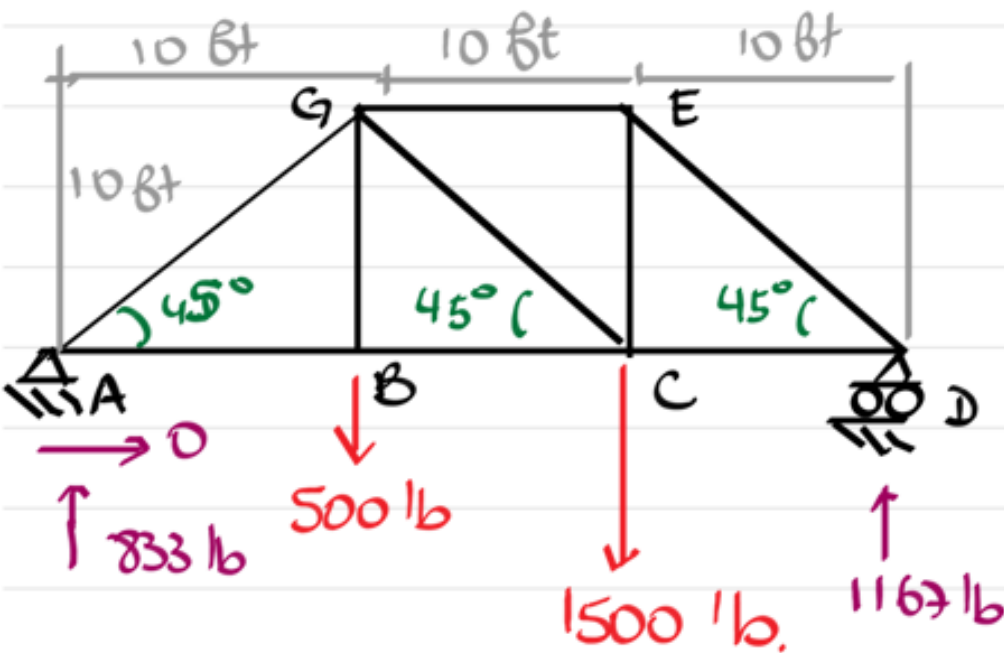
$$\sum F_y = 0 \Rightarrow F_{ED} = -1167\sqrt{2} \text{ lb (C)}$$

$$\sum F_x = 0 \Rightarrow F_{CD} = 1167 \text{ lb (T)}$$

02/23/2018

Problem 1

$$P_1 = 500 \text{ lb} \quad P_2 = 1500 \text{ lb}$$



Strategy

- Node A \Rightarrow AG, AB ✓
- Node B \Rightarrow BG, BC ✓
- Node D \Rightarrow CD, ED ✓
- Node C \Rightarrow CE, GC
- Node E \Rightarrow EG

$$F_{AG} = -833\sqrt{2} \text{ (C)}$$

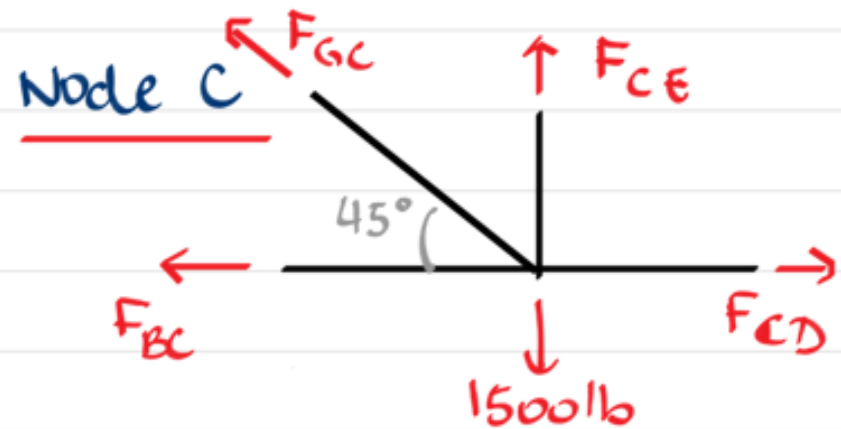
$$F_{AB} = 833 \text{ lb (T)}$$

$$F_{BG} = 500 \text{ lb (T)}$$

$$F_{BC} = 833 \text{ lb (T)}$$

$$F_{CD} = 1167 \text{ lb (T)}$$

$$F_{ED} = -1167\sqrt{2} \text{ lb (C)}$$



$$\sum F_x = 0$$

$$-F_{BC} - F_{GC} \frac{\sqrt{2}}{2} + F_{CD} = 0$$

$$(-833 \text{ lb} + 1167 \text{ lb}) \sqrt{2} = F_{GC}$$

$$F_{GC} = 334\sqrt{2} \text{ lb (T)}$$

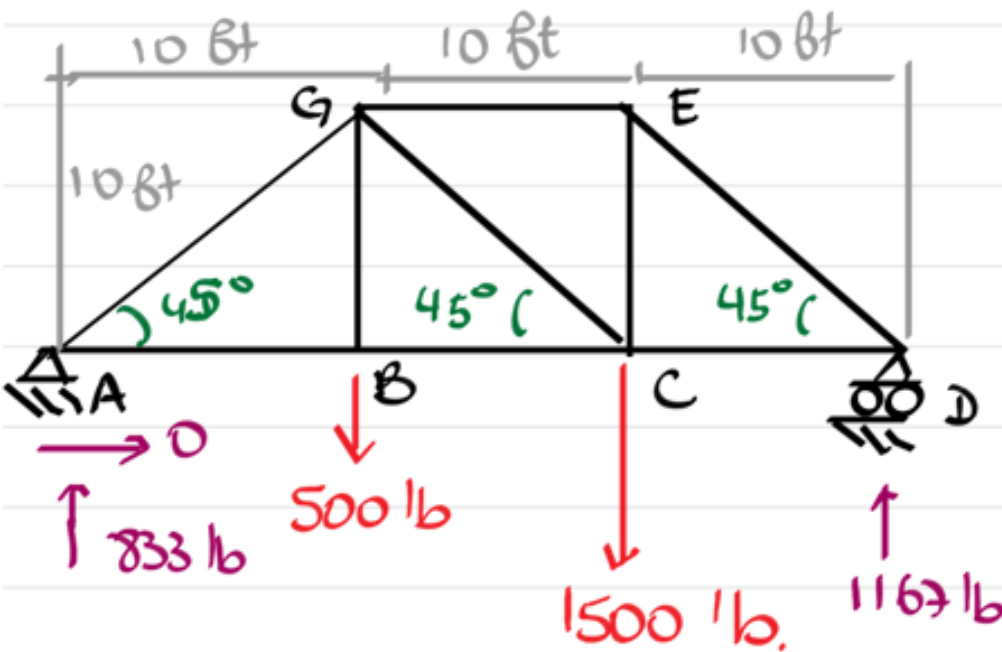
$$\sum F_y = 0 \quad 1500 \text{ lb} = F_{CE} + F_{GC} \frac{1}{\sqrt{2}}$$

$$F_{CE} = 1166 \text{ lb (T)}$$

02/23/2018

Problem 1

$$P_1 = 500 \text{ lb} \quad P_2 = 1500 \text{ lb}$$



Strategy

- Node A \Rightarrow AG, AB ✓
- Node B \Rightarrow BG, BC ✓
- Node D \Rightarrow CD, ED ✓
- Node C \Rightarrow CE, GC ✓
- Node E \Rightarrow EG

$$F_{AG} = -833\sqrt{2} \text{ lb (C)}$$

$$F_{AB} = 833 \text{ lb (T)}$$

$$F_{BG} = 500 \text{ lb (T)}$$

$$F_{BC} = 833 \text{ lb (T)}$$

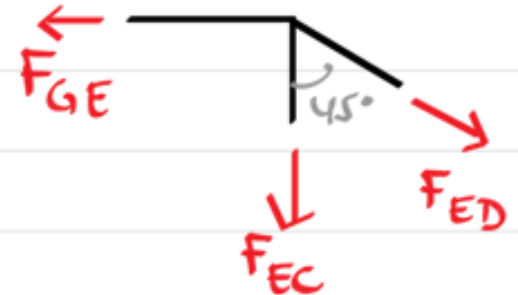
$$F_{CD} = 1167 \text{ lb (T)}$$

$$F_{ED} = -1167\sqrt{2} \text{ lb (C)}$$

$$F_{GC} = 334\sqrt{2} \text{ lb (T)}$$

$$F_{CE} = 1166 \text{ lb (T)}$$

Node E



$$\sum F_x = 0$$

$$-F_{GE} + F_{ED} \frac{1}{\sqrt{2}} = 0$$

$$\underline{F_{GE} = -1167 \text{ lb (C)}}$$

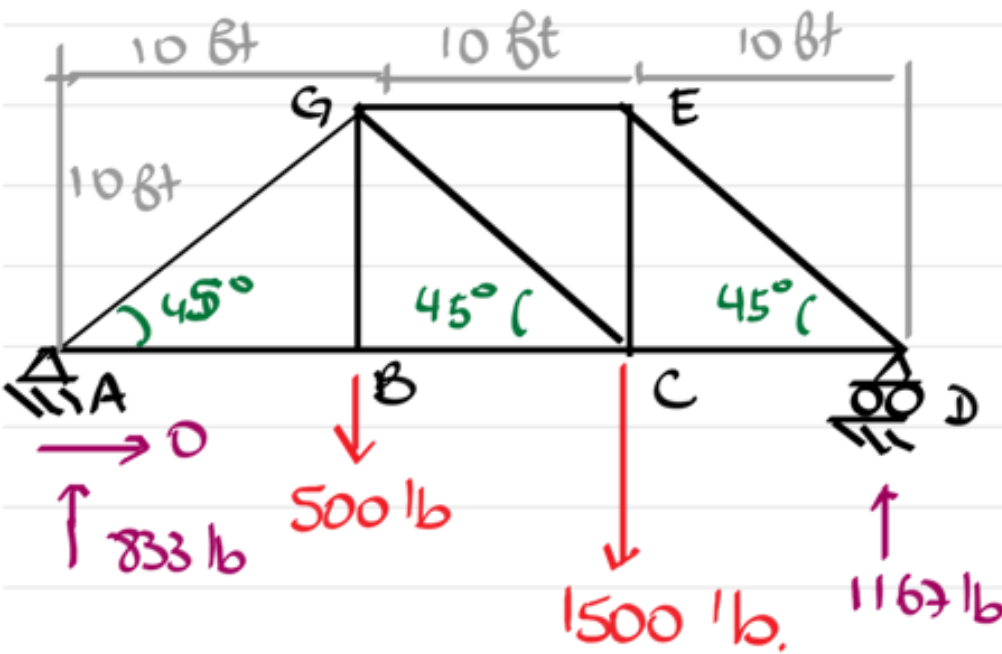
Check: $\sum F_y = ?$

$$F_{EC} + F_{ED} \frac{1}{\sqrt{2}} = 1166 \approx 0$$

02/23/2018

Problem 1

$$P_1 = 500 \text{ lb} \quad P_2 = 1500 \text{ lb}$$



Strategy

- Node A \Rightarrow AG, AB ✓
- Node B \Rightarrow BG, BC ✓
- Node D \Rightarrow CD, ED ✓
- Node C \Rightarrow CE, GC ✓
- Node E \Rightarrow EG ✓

$$F_{AG} = -833\sqrt{2} \text{ lb (C)}$$

$$F_{AB} = 833 \text{ lb (T)}$$

$$F_{BG} = 500 \text{ lb (T)}$$

$$F_{BC} = 833 \text{ lb (T)}$$

$$F_{CD} = 1167 \text{ lb (T)}$$

$$F_{ED} = -1167\sqrt{2} \text{ lb (C)}$$

$$F_{GC} = 334\sqrt{2} \text{ lb (T)}$$

$$F_{CE} = 1166 \text{ lb (T)}$$

$$F_{GE} = -1167 \text{ lb (C)}$$

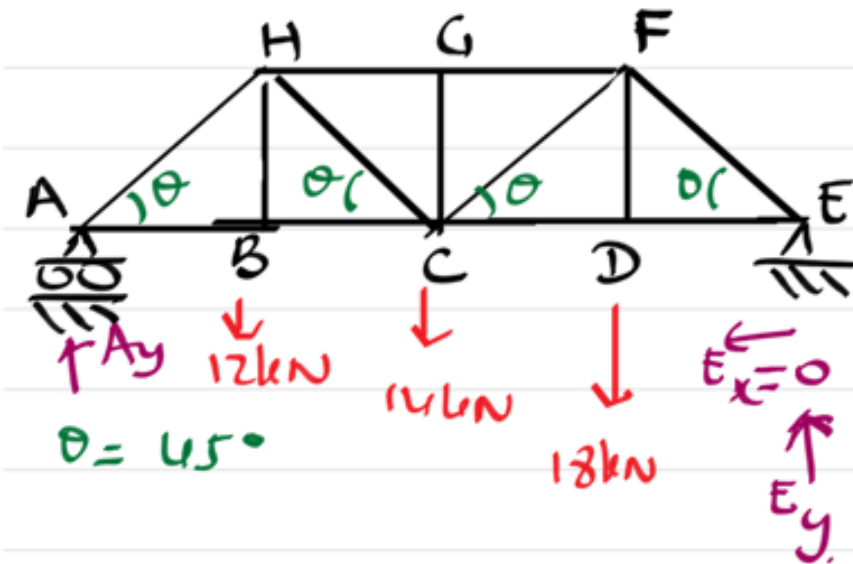
Check Node G



$$\sum F_x: -\frac{F_{AG}}{\sqrt{2}} + F_{GC} \frac{1}{\sqrt{2}} + F_{GE} = 0$$

$$\sum F_y: -\frac{F_{AG}}{\sqrt{2}} - F_{BG} - F_{GC} \frac{1}{\sqrt{2}} = 0$$

Problem 2



System : whole truss

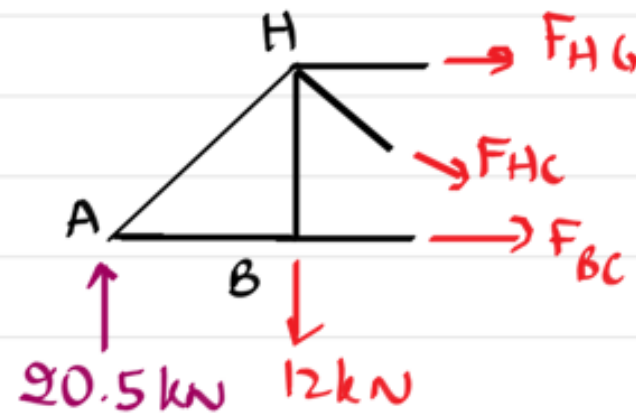
$$\sum M/A = 0 \quad E_y = \frac{12 + 14 \times 2 + 18 \times 3}{4}$$

$$E_y = 23.5 \text{ kN}$$

$$\sum F_y = 0 \quad A_y = 20.5 \text{ kN}$$

HC, HG, BC

Straight Section between H and G



$$\sum M/H = 0 \quad F_{BC} = 20.5 \text{ kN} \frac{AB}{BH}$$

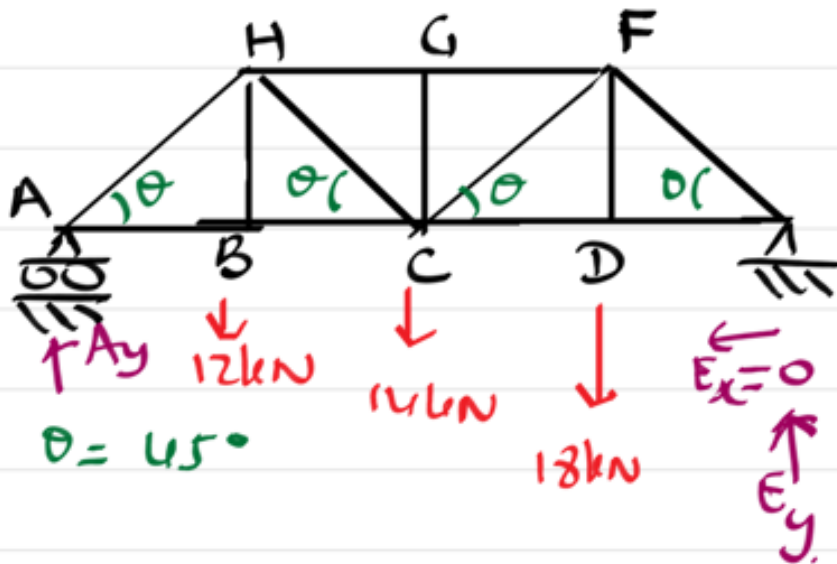
$$F_{BC} = 20.5 \text{ kN (T)}$$

$$\sum M/C = 0$$

$$0 = 20.5 \text{ kN} \times 6\text{m} - 12 \text{ kN} \times 3\text{m} + F_{HG} \times 3\text{m}$$

$$F_{HG} = -29.0 \text{ kN (C)}$$

Problem 2



System : whole truss

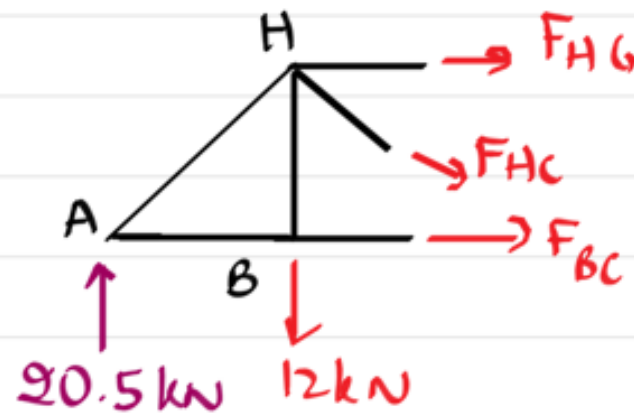
$$\sum M/A = 0 \quad E_y = \frac{12 + 14 \times 2 + 18 \times 3}{4}$$

$$E_y = 23.5 \text{ kN}$$

$$\sum F_y = 0 \quad A_y = 20.5 \text{ kN}$$

HC, HG, BC

Straight Section between H and G



$$F_{BC} = 20.5 \text{ kN (T)}$$

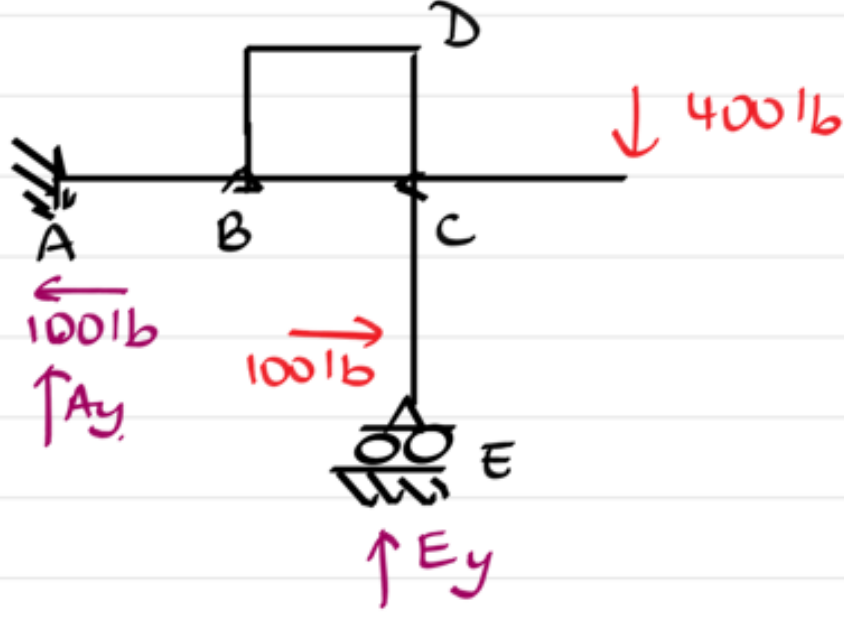
$$F_{HG} = -29.0 \text{ kN (C)}$$

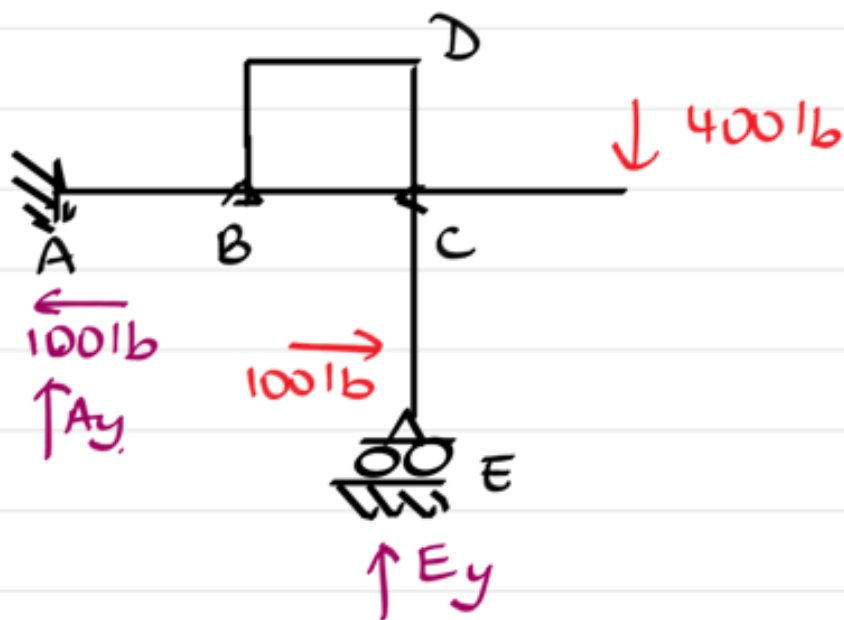
$$\sum F_y = 0$$

$$20.5 \text{ kN} - 12 \text{ kN} - \frac{F_{HC}}{\sqrt{2}} = 0$$

$$F_{HC} = 12 \text{ kN (T)}$$

Problem 3



Problem 3

$$A_y + E_y = 400 \text{ lb}$$

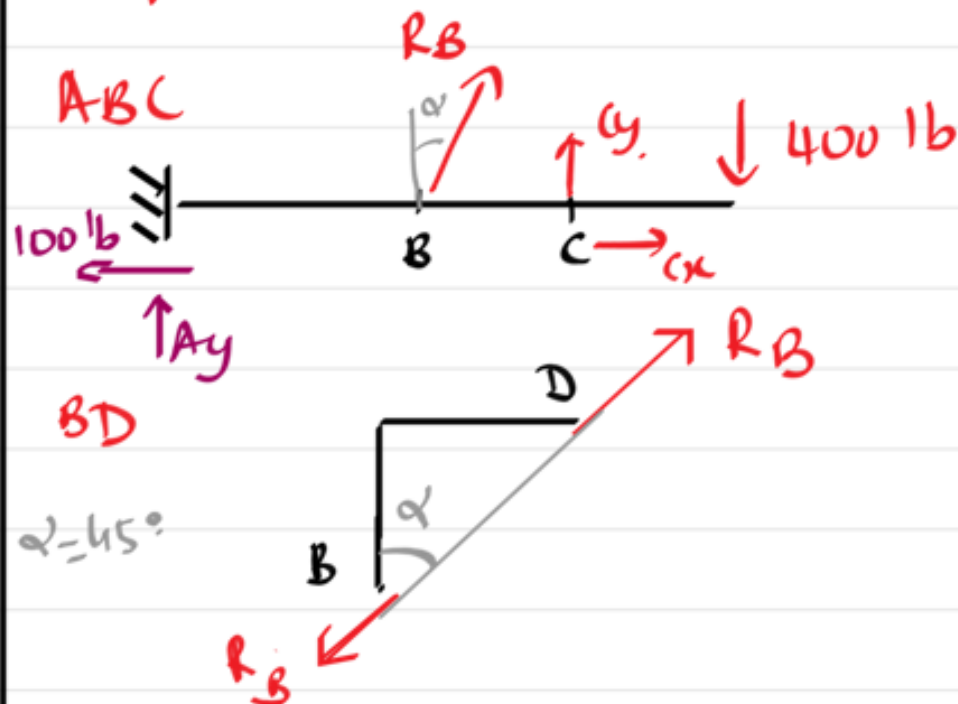
$$\sum \tau / A = 0$$

$$0 = -400 \text{ lb} \times 6 \text{ ft} + 100 \text{ lb} \times 1 \text{ ft} + E_y \times 4 \text{ ft}$$

$$\Downarrow$$

$$E_y, A_y$$

Split the assembly.



BD
 $\alpha = 45^\circ$

DCE

