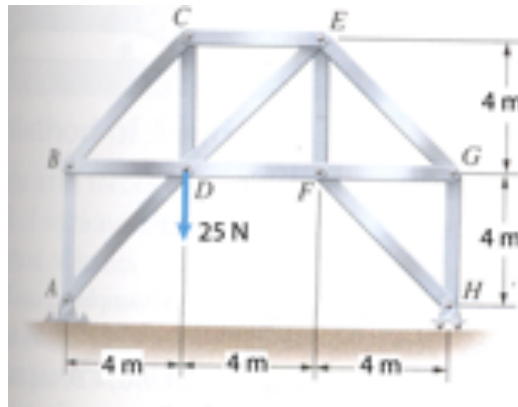
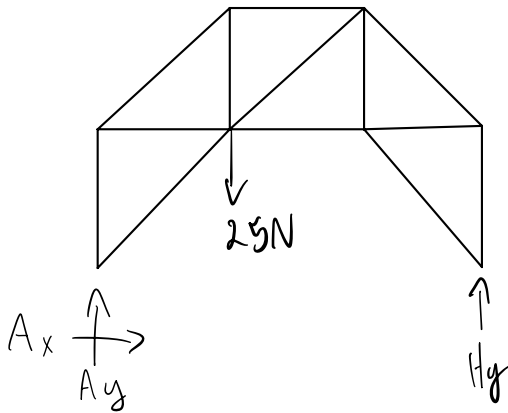


**Truss project computational method validation problem**

Determine the loads in each of the members and whether they are in tension or compression. Analyze the loads using yourselves (yes, that means do it out by hand) and MATLAB (results should match!).



AB	-16.67 N	FH	0
AD	0 N	HG	-11.76
BC	-23.57 N	EF	0
BD	16.67 N		
CE	-16.67 N		
CD	16.67 N		
DE	11.79 N		
DF	8.33 N		
FG	8.33 N		
GE	-11.79 N		



$$\sum F_x = A_x = 0$$

$$\sum F_y = 0 = A_y + H_y - 25 \text{ N}$$

$$\sum M_A = (-)(4)(25) + 16 H_y$$

$$H_y = \frac{100}{16} = 6.25 \text{ N}$$

$$A_y = 25 - 6.25 = 18.75 \text{ N}$$

$$S_{x1} = 0 \text{ N}$$

$$S_{y1} = 18.75 \text{ N}$$

$$S_{y2} = 6.25 \text{ N}$$

+ = comp  
- = tension

# Method of Joints

Joint A

$AB = -6.25$   
 $AD = 0$   
 $\sum F_x = AB + AD \frac{\sqrt{2}}{2} = 0$   
 $AD \frac{\sqrt{2}}{2} = 0 \quad AD = 0$   
 $\sum F_y = AB + Ay = 0 \quad AB = -6.25$   
 $A_x = 0$   
 $A_y = 6.25 \text{ N}$

$AB = -16.67$   
 $AD = 0$

Joint B

$\sum F_x = BD + BC \frac{\sqrt{2}}{2} = 0$   
 $\sum F_y = +6.25 + BC \frac{\sqrt{2}}{2} = 0$   
 $BC = AB \cdot \frac{\sqrt{2}}{2}$   
 $BD = -BC \frac{\sqrt{2}}{2}$

$BD = 16.67$   
 $BC = -23.57$

Joint C

$\sum F_x = CE - CB \frac{\sqrt{2}}{2} = 0$   
 $\sum F_y = -CD - CB \frac{\sqrt{2}}{2} = 0$   
 $CE = BC \frac{\sqrt{2}}{2}$   
 $CD = -CB \frac{\sqrt{2}}{2}$

$CE = -16.67$   
 $CD = 16.67$

Joint D

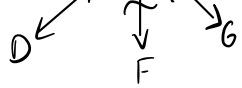
$\sum F_x = -BD + DF + DE \frac{\sqrt{2}}{2} = 0$   
 $\sum F_y = CD - 25 + DE \frac{\sqrt{2}}{2} = 0$   
 $DE = \frac{2}{\sqrt{2}} (-CD + 25)$   
 $DF = -DE \frac{\sqrt{2}}{2} + BD$

$DE = 11.78$   
 $DF = 8.34$

Joint E

$\sum F_x = -EG - ED \frac{\sqrt{2}}{2} + EF \frac{\sqrt{2}}{2} = 0$   
 $\sum F_y = -ED \frac{\sqrt{2}}{2} - EF - EG \frac{\sqrt{2}}{2} = 0$   
 $EG = 2 (-CD + 25)$

$EG = -11.79$   
 $EF = 0$



$$L G = \frac{\partial}{\partial z} (C E + D E \frac{\sqrt{2}}{2})$$

$$E F = -D E \frac{\sqrt{2}}{2} - E G \frac{\sqrt{2}}{2}$$

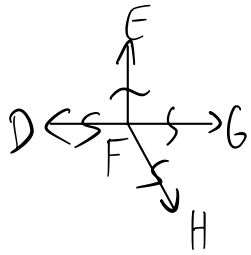
Joint F

$$\sum F_x = -F D + F G + F H \frac{\sqrt{2}}{2} = 0$$

$$\sum F_y = F E - F H \frac{\sqrt{2}}{2} = 0$$

$$F H = E F \frac{\sqrt{2}}{2}$$

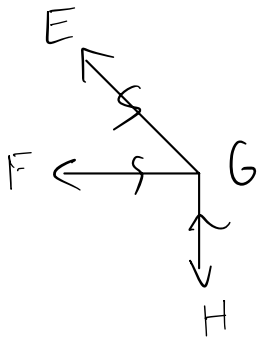
$$F G = -F H \frac{\sqrt{2}}{2} + D F$$



$$F H = 0$$

$$F G = 8.33$$

Joint G



$$\sum F_x = 0 = -G F - G E \frac{\sqrt{2}}{2}$$

$$\sum F_y = 0 = -G H + G E \frac{\sqrt{2}}{2}$$

$$G E = -\frac{\sqrt{2}}{2} G F$$

$$G H = G E \frac{\sqrt{2}}{2}$$

$$G E = -11.79$$

$$G H = -8.33$$