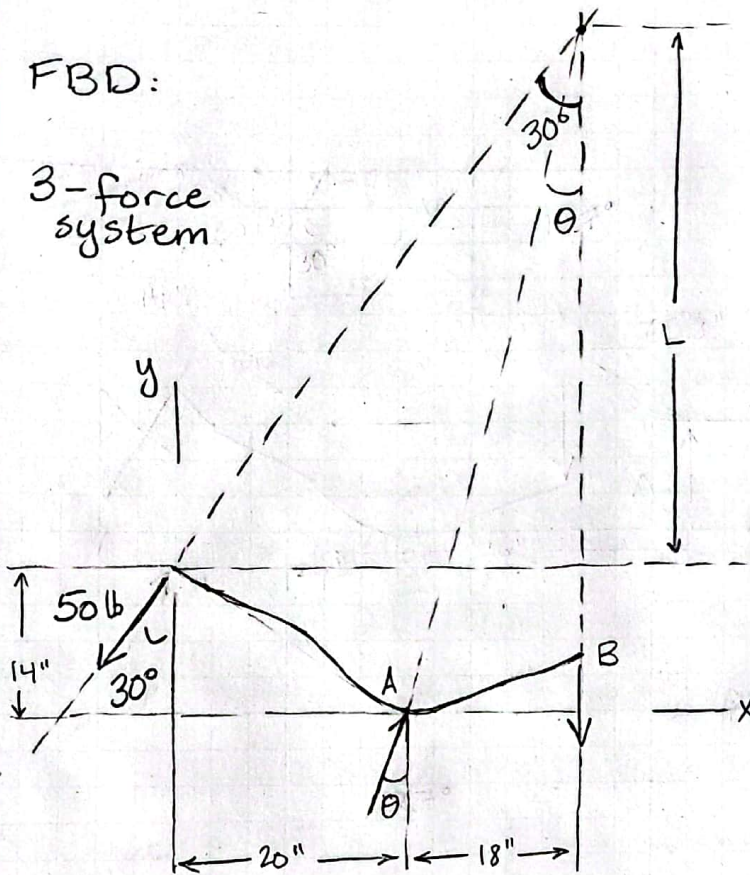


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SI Statics
Worksheet #8

Solution

FBD:

3-force
system

$$\tan 30^\circ = \frac{38 \text{ in}}{L}$$

$$\Rightarrow L = 65.8 \text{ in}$$

$$\tan \theta = \frac{18 \text{ in}}{65.8 \text{ in} + 14 \text{ in}}$$

$$\Rightarrow \boxed{\theta = 12.7^\circ}$$

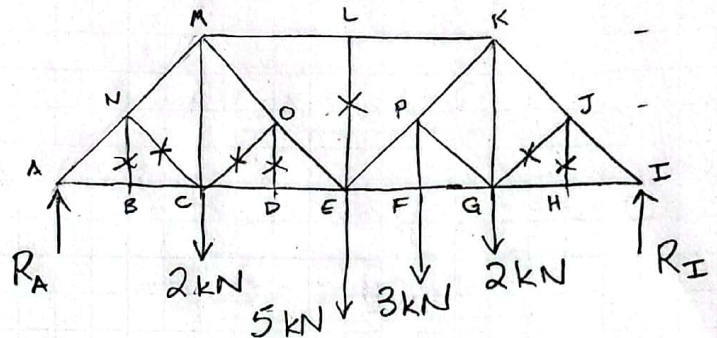
$$\Sigma F_x = 0 = R_A \sin 12.7^\circ - 50 \text{ lb} \sin 30^\circ \Rightarrow \boxed{R_A = 113.7 \text{ lb}}$$

$$\Sigma F_y = 0 = R_A \cos 12.7^\circ - R_B - 50 \text{ lb} \cos 30^\circ$$

$$\Rightarrow \boxed{R_B = 67.6 \text{ lb}}$$

Truss Problem

FBD:

scale $\overline{2m}$ by inspection, all
angles are either
 90° or 45° 

First, find reactions at A and I

$$\sum \overset{\curvearrowleft}{M}_A = 0 = R_I(16m) - 2kN(12m) - 3kN(10m) - 5kN(8m) - 2kN(4m) \Rightarrow R_I = 6.375 kN$$

$$\sum \overset{\curvearrowleft}{M}_I = 0 = 2kN(4m) + 3kN(6m) + 5kN(8m) + 2kN(12m) - R_A(16m) \Rightarrow R_A = 5.625 kN$$

$$\text{Check: } \sum F_y = 6.375 kN + 5.625 kN - 2 kN - 5 kN - 3 kN - 2 kN = 0 \checkmark$$

Next, identify zero-force members (x on FBD)

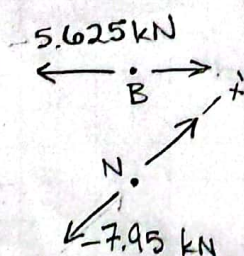
by inspection $\boxed{EL=0, BN=0, DO=0, HJ=0}$ once these are identified, several more
become apparent: $\boxed{CN=0, CO=0, GJ=0}$

Finally, find forces in all other members

FBD

$$\sum F_y = 0 = 5.625 kN + AN \sin 45^\circ \Rightarrow \boxed{AN = -7.955 kN}$$

$$\sum F_x = 0 = AB - 7.95 kN \cos 45^\circ \Rightarrow \boxed{AB = 5.625 kN}$$



$$\sum F_x = 0 \Rightarrow \boxed{BC = 5.625 kN}$$

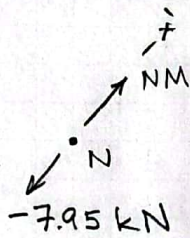
$$\sum F_{x'} = 0 \Rightarrow \boxed{NM = -7.955 kN}$$

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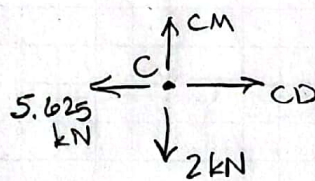
SI Statics
Worksheet #8

Solution

Truss problem, continued (alternate: only Method of Joints)

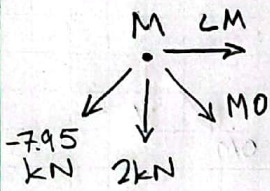


$$\sum F_{x'} = 0 \Rightarrow \boxed{NM = -7.955 \text{ kN}}$$



$$\sum F_x = 0 \Rightarrow \boxed{CD = 5.625 \text{ kN}}$$

$$\sum F_y = 0 \Rightarrow \boxed{CM = 2 \text{ kN}}$$

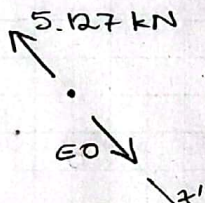


$$\sum F_y = 0 = -2 \text{ kN} - (-7.95 \text{ kN} \sin 45^\circ) - MO \sin 45^\circ$$

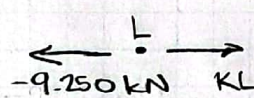
$$\Rightarrow \boxed{MO = 5.127 \text{ kN}}$$

$$\sum F_x = 0 = LM + 5.127 \text{ kN} \sin 45^\circ - (-7.955 \text{ kN} \sin 45^\circ)$$

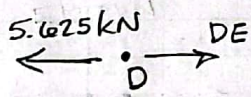
$$\Rightarrow \boxed{LM = -9.250 \text{ kN}}$$



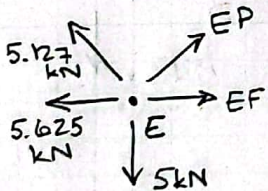
$$\sum F_{x'} = 0 \Rightarrow \boxed{EO = 5.127 \text{ kN}}$$



$$\sum F_x = 0 \Rightarrow \boxed{KL = -9.250 \text{ kN}}$$



$$\sum F_x = 0 \Rightarrow \boxed{DE = 5.625 \text{ kN}}$$

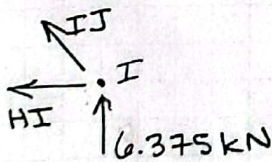


$$\sum F_y = 0 = 5.127 \text{ kN} \sin 45^\circ + EP \sin 45^\circ - 5 \text{ kN}$$

$$\Rightarrow \boxed{EP = 1.944 \text{ kN}}$$

$$\sum F_x = 0 = 1.944 \text{ kN} \sin 45^\circ + EF - 5.127 \text{ kN} \sin 45^\circ - 5.625 \text{ kN}$$

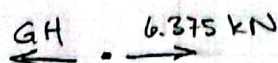
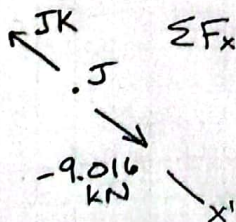
$$\Rightarrow \boxed{EF = 7.875 \text{ kN}}$$



$$\sum F_y = 0 = 6.375 \text{ kN} + IJ \sin 45^\circ \Rightarrow \boxed{IJ = -9.016 \text{ kN}}$$

$$\sum F_x = 0 = -HI - (-9.016 \text{ kN} \sin 45^\circ) \Rightarrow \boxed{HI = 6.375 \text{ kN}}$$

$$\sum F_{x'} = 0 \Rightarrow \boxed{JK = -9.016 \text{ kN}}$$



$$\sum F_x = 0 \Rightarrow \boxed{GH = 6.375 \text{ kN}}$$

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SI Statics
Worksheets #8

Solution

Truss problem, continued (alternate: only Method of Joints)

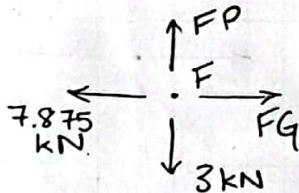
$$\sum F_x = 0 = -9.016 \text{ kN} \sin 45^\circ - (-9.250 \text{ kN}) - KP \sin 45^\circ$$

$$\Rightarrow KP = 4.065 \text{ kN}$$



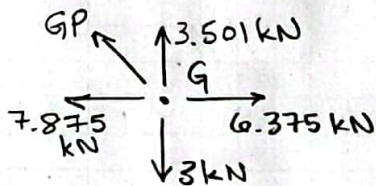
$$\sum F_y = 0 = -GK - (-9.016 \text{ kN} \sin 45^\circ) - 4.065 \text{ kN} \sin 45^\circ$$

$$\Rightarrow GK = 3.501 \text{ kN}$$



$$\sum F_x = 0 \Rightarrow FG = 7.875 \text{ kN}$$

$$\sum F_y = 0 \Rightarrow FP = 3 \text{ kN}$$



$$\sum F_x = 0 = 6.375 \text{ kN} - 7.875 \text{ kN} - GP \sin 45^\circ$$

$$\Rightarrow GP = -2.121 \text{ kN}$$