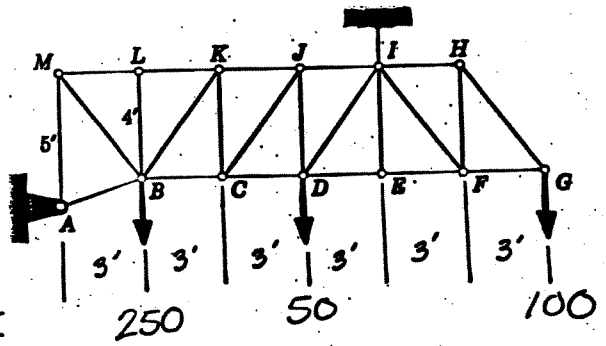
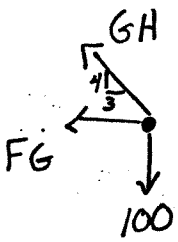
The truss shown is supported by a pin at A and a vertical cable at I. Given the applied loads $F_B = 250$ lb, $F_D = 50$ lb, and $F_G = 100$ lb, determine the forces in members FG, GH, and DI. You MUST solve for at least one member force using a section FBD. Neglect the weight of the truss members and be sure to indicate either tension (T) or compression (C) for each member force reported in the answer box below.



Given $F_B = 250$, $F_D = 50$, $F_G = 100$

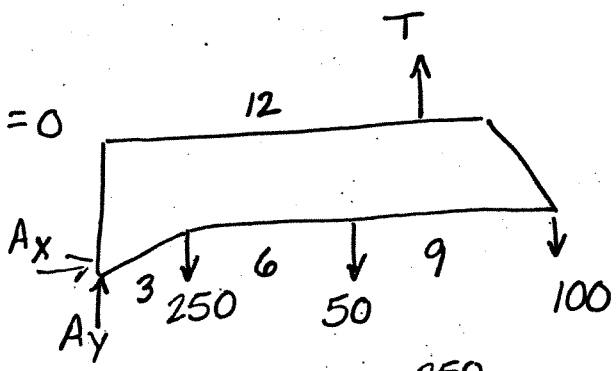
Find FG, GH, DI member forces.

PLAN use pin FBD at G to get FG, GH
use entire FBD to get tension I
use section through JI, DI, DE to get DI force.



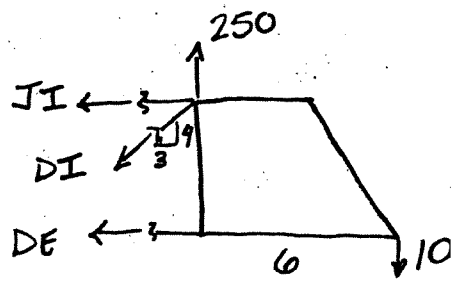
$\uparrow \Sigma F_y = 0 = \frac{4}{5} GH - 100$ $\quad GH = 125$ lb

$\rightarrow \Sigma F_x = 0 = -FG - \frac{3}{5}(125) = 0$ $\quad FG = -75$



$\Sigma M_A = 12T - 250(3) - 50(9) - 100(18) = 0$

$T = 250$



$\uparrow \Sigma F_y = 0 = 250 - 100 - \frac{4}{5} DI$

$DI = 187.5$

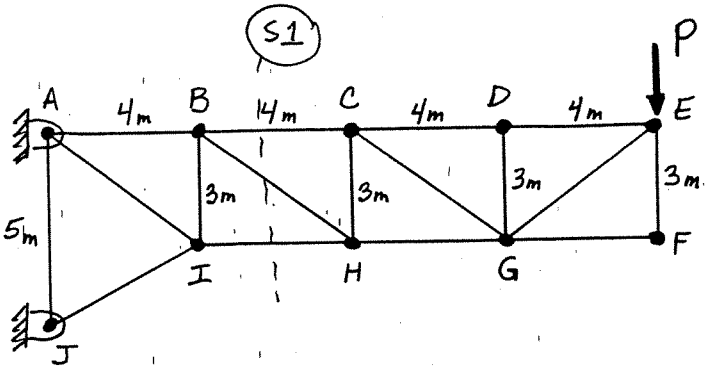
F_{FG} = 75 lb	T or (C)	(circle one)
F_{GH} = 125 lb	(T) or C	(circle one)
F_{DI} = 187.5 lb	(T) or C	(circle one)

It has been determined by the design engineers that members BC, BH and IH are the critical members for support in the truss shown. They are each capable of withstanding a maximum of 60 kN in tension and 40 kN in ~~tension~~ compression. Determine the magnitude of the largest load P that this truss can support without causing any of these three members to fail.

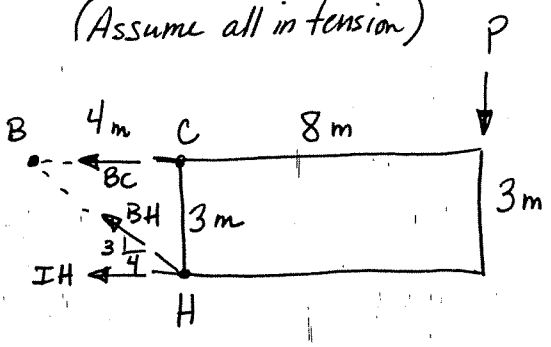
Given $F_{max} = 60$ kN (tension)

$F_{max} = 40$ kN (comp)

Find: P_{max} that won't cause failure



PLAN Analyze FBD of section S1 to get member forces for BC, BH and IH in terms of P. Then use Fmax values to find values for P. Smallest P value will be the first load to cause failure. (Assume all in tension)



$\Sigma M_H \rightarrow BC$

$\Sigma F_y \rightarrow BH$

$\Sigma M_B \rightarrow IH$

(+) $\Sigma M_H = BC(3) - P(8) = 0$, $BC = \frac{8}{3}P$ (positive so it is in tension) $\quad BC = \frac{8}{3}P \leq 60$ kN

$P \leq 22.5$ kN

↑ $\Sigma F_y = BH\left(\frac{3}{5}\right) - P = 0 \quad BH = \frac{5}{3}P$ (again, positive so in tension) but $\frac{5}{3} < \frac{8}{3}$ so BC will fail first

(+) $\Sigma M_B = -IH(3) - P(12) = 0 \quad IH = -4P$ (comp) $\quad 4P \leq 40$ kN

$P \leq 10$ kN

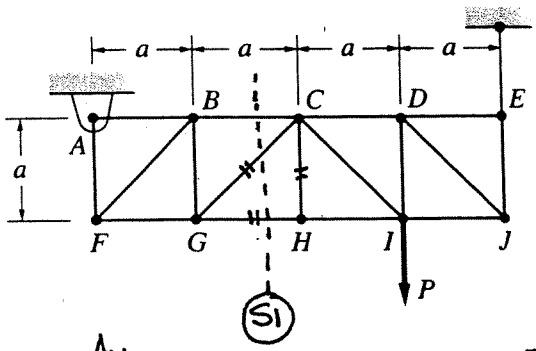
$\Rightarrow$ IH will fail first

$$P_{max} = 10 \text{ kN}$$

For the truss shown, calculate the forces in members **CG**, **CH**, and **GH** where P = 400 N and a = 2m.

Given: $P = 400\ N$, $a = 2\ m$

Find: CG, CH, GH



Support Reactions (FBD of whole truss)

$\overset{+}{\rightarrow} \Sigma F_x = 0 = -A_x$

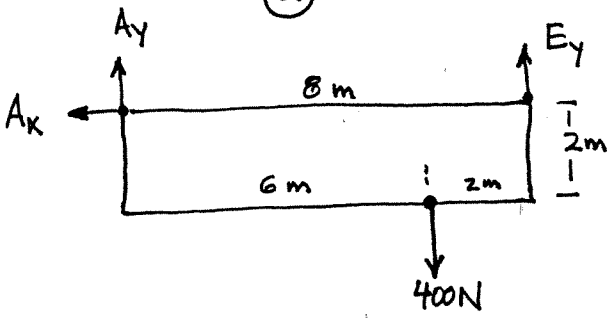
$\therefore \boxed{A_x = 0}$

$\circlearrowleft \Sigma M_A = 0 = -400(6) + E_y(8)$

$\therefore \boxed{E_y = \frac{400(6)}{8} = 300\,N}$

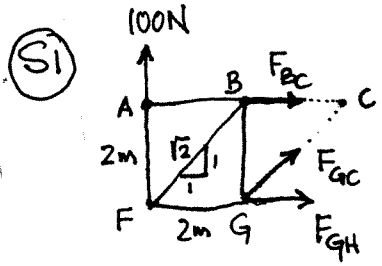
$+\uparrow \Sigma F_y = 0 = A_y + E_y - 400$

$\therefore \boxed{A_y = 400 - 300 = 100\,N}$



F_{CH} is a zero-force member

$\boxed{F_{CH} = 0}$



From FBD of (S1)

$\Sigma M_C = 0 \Rightarrow F_{GH}$

$\circlearrowleft \Sigma M_C = 0 = -(100)(4) + F_{GH}(2)$

$\boxed{F_{GH} = +200\,N}$ in tension

$+\uparrow \Sigma F_y = 0 \Rightarrow F_{CG}$

$\uparrow \Sigma F_y = 0 = F_{CG}\frac{1}{\sqrt{2}} + 100$

$F_{CG} = -100\sqrt{2}$

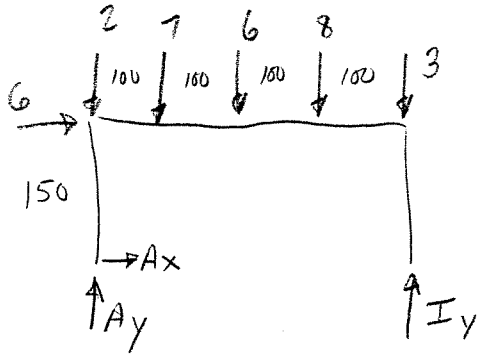
$\boxed{F_{GH} = -141.4\,N}$ in compression

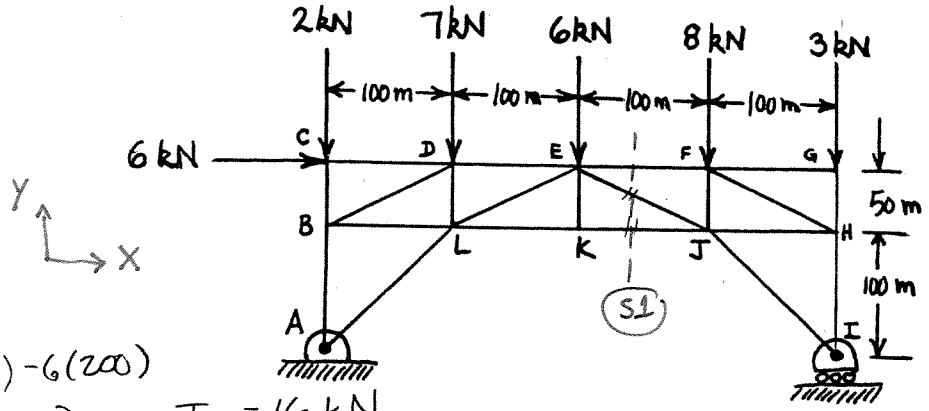
CG = 141.4 N — T or (C)

CH = 0 — T or C

GH = 200 N — (T) or C

A truss, supported by a pin at A and a roller at I, is subjected to structural (vertical) loads at C, D, E, F and G and a wind (horizontal) load at C as shown. Determine the force in members AL, EJ and KJ. Indicate tension (T) or compression (C) for each answer.





$\Sigma M_A = 0 = I_y(400) - 3(400) - 8(300) - 6(200) - 7(100) - 6(150)$

$I_y = 16\ kN$

$\Sigma F_x = 0 \quad A_x = -6\ kN$

$A_x = -6\ kN$

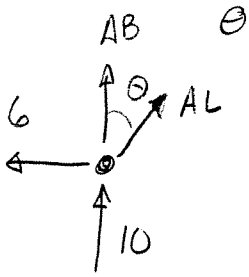
$\Sigma F_y = 0 \quad A_y + 16 = (2+7+6+8+3)$

$A_y = 10\ kN$

Given: ↗

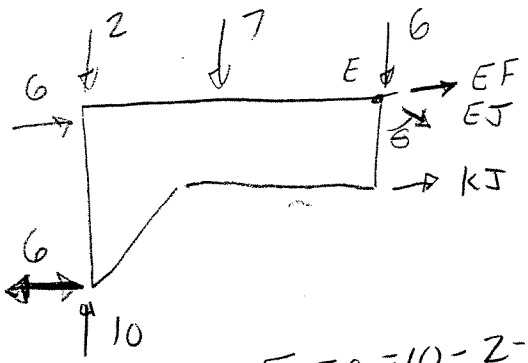
Find: AL, EJ, KJ

PLAN
- Find support reactions using entire FBD
- Use FBD of joint A to find AL
- Use section (S1) FBD to find EJ and KJ



$\Sigma F_x = 0 = AL\sin 45 - 6$

$AL = 8.49\ kN$ (T)



$\tan\theta = \frac{100}{50} \quad \theta = 63.4°$

$\Sigma M_E = 0 = KJ(50) + 7(100) + 2(200) - 6(150) - 10(2a$

$KJ = 36\ kN$ (T)

$\Sigma F_y = 0 = 10 - 2 - 7 - 6 - EJ\cos 63.4$

$EJ = 11.2\ kN$ (C)

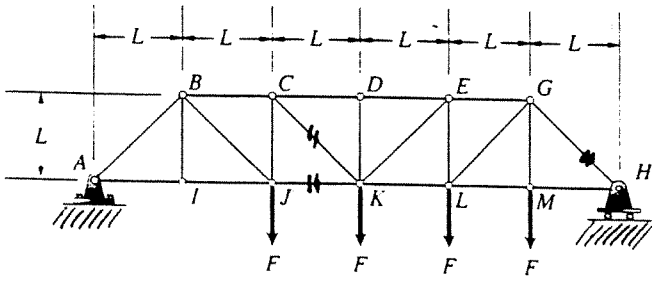
AL = 8.5 kN — (T) or C

EJ = 11.2 kN — T or (C)

KJ = 36 kN — (T) or C

Identify one of the zero force members by listing it's endpoints here: EK, FG, IJ

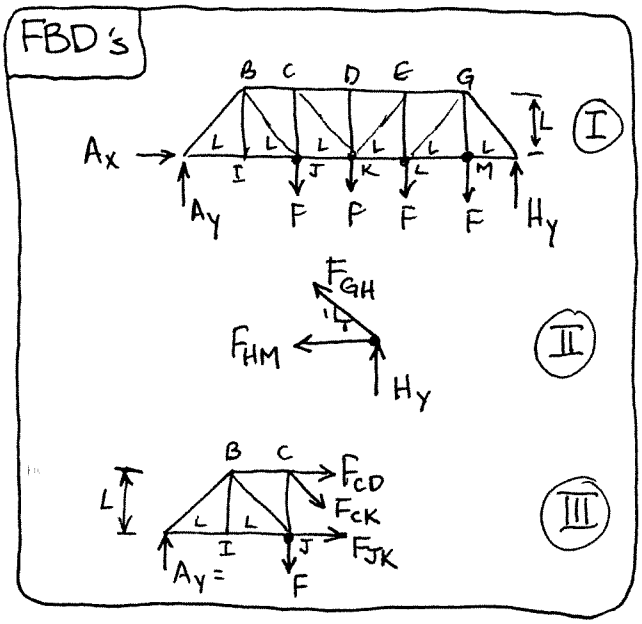
The bridge truss supports four equal forces (**F** = 75 kip = 75,000 lb.) as shown. Determine the axial forces in members **CK**, **JK**, and **GH** and indicate if they are in tension or compression.



Given: F = 75 kip

Find: CK, JK, GH

FBD's



(I) $\Sigma F_x = 0 = A_x$

$\Sigma F_y = 0 = A_y + H_y - 4F$

$= A_y + H_y - 300$

(+↻) $\Sigma M_A = 0 = H_y(6L) - 2L(75) - 3L(75) - 4L(75) - 5L(75)$

$$H_y = \frac{1050L}{6L} = 175 \text{ kip}$$

$A_y = 300 - H_y = 125$ kip

(II) $\Sigma F_y = 0 = H_y + F_{GH}\left(\frac{1}{\sqrt{2}}\right)$

$F_{GH} = -247.5$ kip

$F_{GH} = 247.5$ kip (C)

(III) (+↻) $\Sigma M_C = 0 = F_{JK}(4) - (2L)(125)$ (A_y)

$F_{JK} = +250$ kip (T)

$\Sigma F_y = 0 = A_y - 75 - F_{CK}\left(\frac{1}{\sqrt{2}}\right)$

$F_{CK} = (125 - 75)\sqrt{2}$

$F_{CK} = +70.7$ kip (T)

Circle one

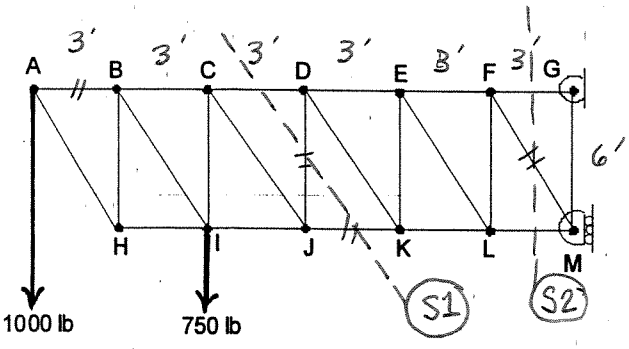
$F_{CK} =$ 70.7 kip (T) or C

$F_{JK} =$ 250 kip (T) or C

$F_{GH} =$ 247.5 kip T or (C)

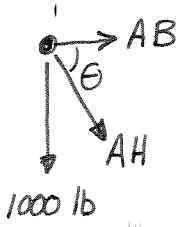
Find: FM, AB, JD, Jk

Find the forces in members FM, AB, JD and JK of the truss shown. The horizontal members of the truss (AB, BC, ..., HI, IJ, ..) are each 3 ft long, while the vertical members (BH, CI, ..) are each 6 ft long.



For AB use FBD of joint A

$\tan\theta = \frac{6}{3}$ $\theta = 63.4°$

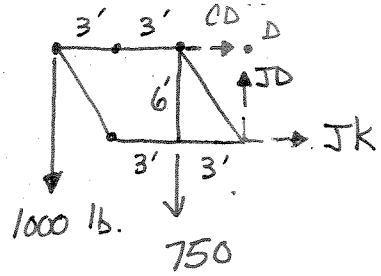


Plan ΣF_y: AH $\rightarrow$ $+\uparrow$ $-1000 - AH\sin 63.4° = 0$ $AH = -1118$ lb $= 1118$ lb (C)

ΣF_x: AH, AB $\rightarrow$ $\stackrel{+}{\rightarrow}$ $AB + AH\cos 63.4 = 0$ $AB = -(-1118\cos 63.4)$

AB = 500 lb (T)

For JD and Jk use FBD of a section through CD, DJ, Jk



PLAN ΣM_D: Jk $\rightarrow$ $\circlearrowleft^{+}$ $Jk(6) + 1000(9) + 750(3) = 0$

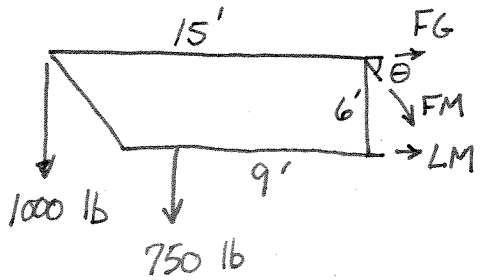
$Jk = -1875$

Jk = 1875 lb (C)

ΣF_y: JD $\uparrow$ $JD - 1000 - 750 = 0$

JD = 1750 lb (T)

For FM use section (S2) FBD



PLAN ΣF_y: FM

$+\uparrow$ $-750 - 1000 - FM\sin 63.4° = 0$

$FM = -1957$ lb.

FM = 1957 lb (C)