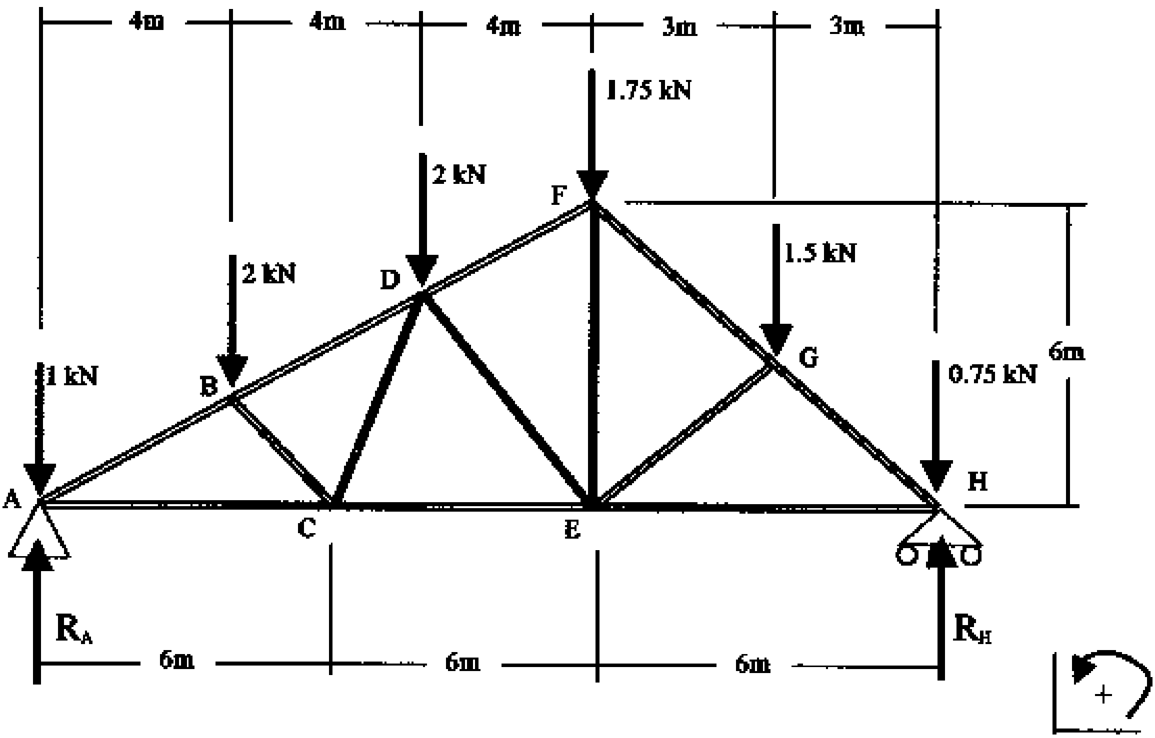


<u>Step.1.</u>
The truss is not symmetrical and the loading is not symmetrical so you must do the work.

$$\Sigma M_A = 0 = -(2kN)(4m) - (2kN)(8m) - (1.75kN)(12m) - (1.5kN)(15m) - (0.75kN)(18m) + R_H(18m)$$

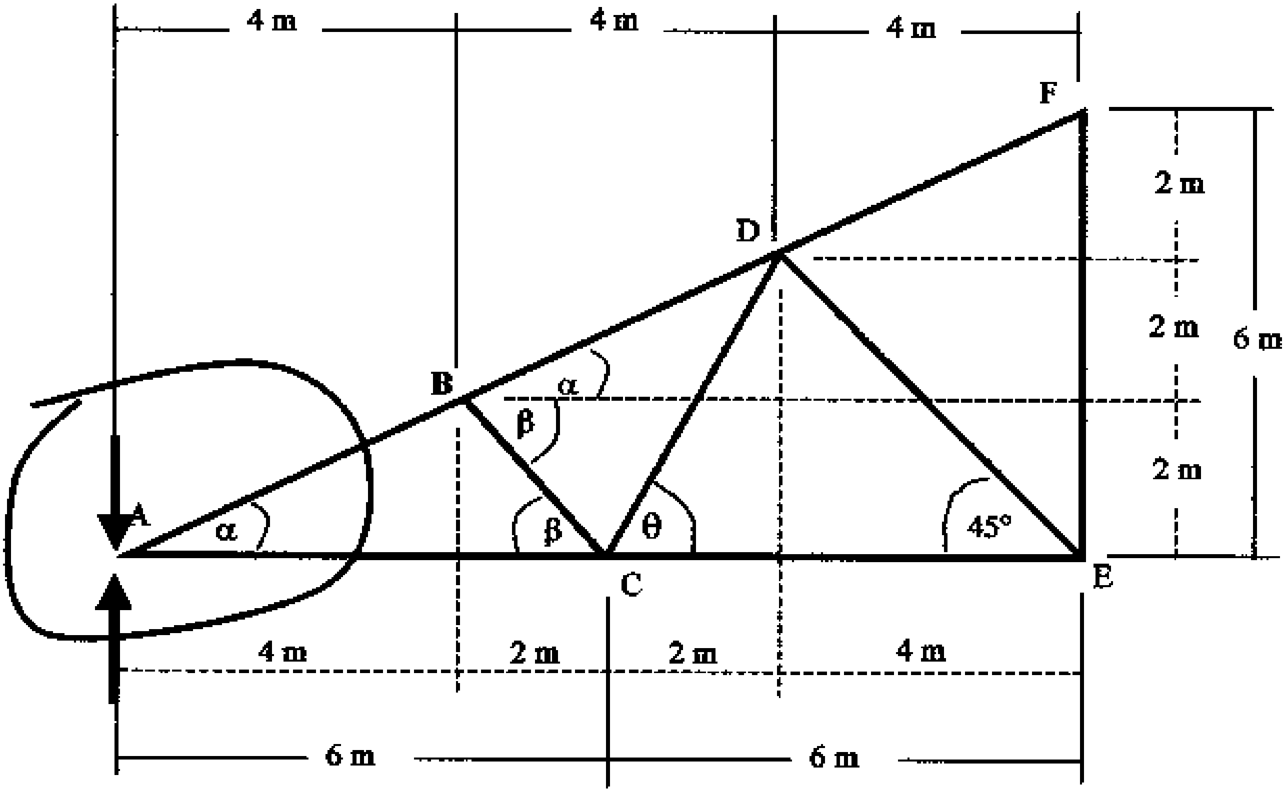
$$R_H = \frac{8 + 16 + 21 + 22.5 + 13.5}{18\text{ m}} = \frac{81\text{ kNm}}{18\text{ m}} = 4.5\text{ kN}$$

$$\Sigma F_y = 0 = -1 - 2 - 2 - 1.75 - 1.5 - 0.75 + R_A + R_H$$ Therefore, $R_A = 4.5$ kN

Interesting that even though there is no symmetry, the reactions at the supports are equal.

<u>Step.2.</u>
Now begins the long, tedious process of the Joint Method analysis.

Work out the geometry first. You'll need it for the components. See next sheet.

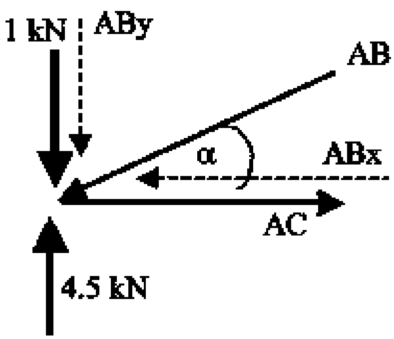


$\alpha = \tan^{-1}\left[\frac{2}{4}\right] = 26.56°$ therefore, $BD_x = BD \cos 26.56° = .894\ BD$
and $BD_y = BD \sin 26.56° = .447\ BD$

$\beta = \tan^{-1}\left[\frac{2}{2}\right] = 45°$ therefore, $BC_x = BC \cos 45° = .707\ BC$
and $BC_y = BC \sin 45° = .707\ BC$

$\theta = \tan^{-1}\left[\frac{4}{2}\right] = 63.43°$ therefore, $CD_x = BC \cos 63.43° = .447\ CD$
and $CD_y = CD \sin 63.43° = .894\ CD$

<u>Jt. A</u>

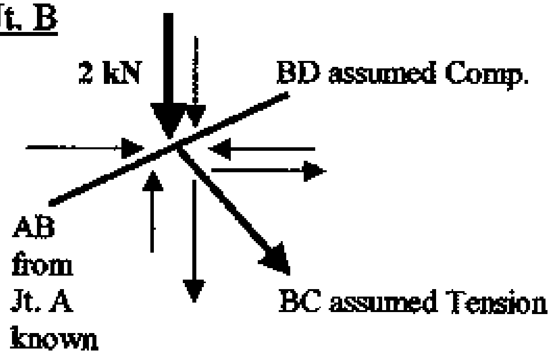


$\Sigma Fy = 0 = -1 + 4.5 - AB \sin 22.56°$
$\mathbf{AB} = 3.5 / \sin 26.56° = \mathbf{7.83\ kN\ (C)}$

$\Sigma Fx = 0 - AB \cos 26.56° + AC$
$\mathbf{AC} = (7.83) \cos 26.56° = \mathbf{7.00\ kN\ (T)}$

Carry this over to <u>Jt. B</u>

Jt. B



AB components are sin and cos α
BC components are sin and cos β
BD components are sin and cos α

Don't forget the applied load.
And you'll need to solve the two equations simultaneously.

$\Sigma Fx = 0 = AB \cos 26.56° + BC \cos 45° - BD \cos 26.56°$

$7.00 = -.707\ BC + .894\ BD$

$\Sigma Fy = 0 = AB \sin 26.56° - 2\ kN - BC \sin 45° - BD \sin 26.56°$

$(7.83) \sin 26.56° - 2 = .707\ BC + .447\ BD$

$1.50 = .707\ BC + .447\ BD$

Add these two equations and you eliminate BC as one unknown:

$8.50 = 1.341\ BD$

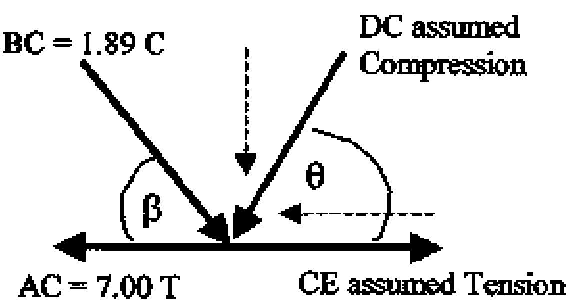
Therefore, **BD = 6.34 kN (C)**

Back substitute into the first equation to find BC,

$7.00 = -.707\ BC + .894\ (6.34\ kN)$

Therefore, **BC = - 1.89 = 1.89 kN (C)**

Carry this over to **Jt. C**



$\Sigma Fy = 0 = -1.89 \sin 45° - DCy$

$DC = -(1.89)(.707) / (.894) = -1.5$

Therefore, **DC = 1.5 kN (T)**

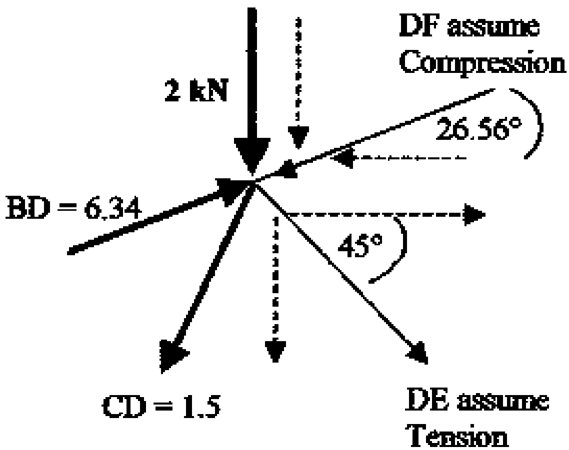
$\Sigma Fx = 0 = -7 + 1.89 \cos 45° + CE - DCx$

$CE = 7 - (1.89)(.707) + (.447)(-1.5)$

Therefore, **CE = 5.00 kN (T)**

Continue and carry this over to **Jt. D**

Jt. D



$$\Sigma F_x = 0 = 6.34\cos 26.56° - 1.5\cos 63.43° - DF\cos 26.56° + DE\cos 45°$$

$$5.00 = .894\,DF - .707\,DE$$

$$\Sigma F_y = 0 = -2 + 6.34\sin 26.56° - 1.5\sin 63.43° - DF\sin 26.56° - DE\sin 45°$$

$$-.507 = .447\,DF + .707\,DE$$

Add these two equations to eliminate DE

Therefore, $4.493 = 1.341\,DF$

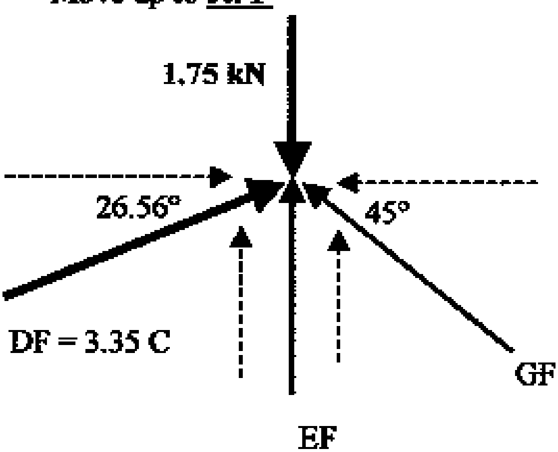
Therefore, **DF = 3.35 kN (C)**

Back substitute in the first or second equation, $5.00 - .894(3.35) = -.707\,DE$

Therefore, DE = - 2.83 opp.dir.

Therefore, **DE = 2.83 kN (C)**

Move up to <u>Jt. F</u>



$$\Sigma F_x = 0 = 3.35\cos 26.56° - GF\cos 45°$$

$$3.00 = .707\,GF$$

Therefore, **GF = 4.24 kN (C)**

$$\Sigma F_y = 0 = -1.75 + 3.35\sin 26.56° + EF + GF\sin 45°$$

$$EF = 1.75 - 1.497 - (4.24)(.707)$$

Therefore, EF = - 2.745 opp. dir.

Therefore, **EF = 2.75 (T)**

Only 2 more joints to solve, then do a check for equilibrium at the last <u>Jt. E.</u>