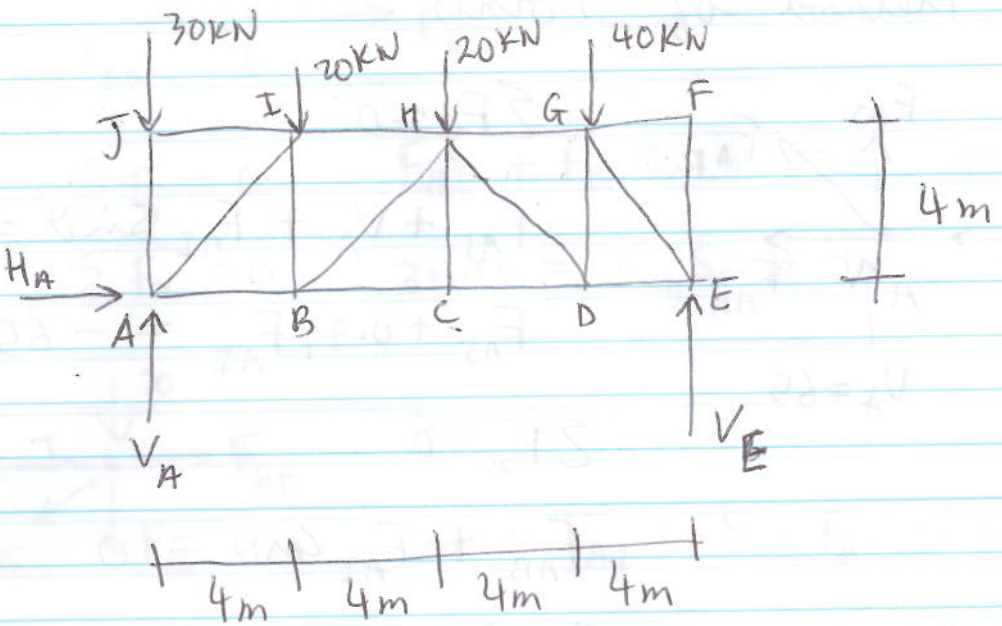
6-33



$$\sum M_E = 0$$

$$16 V_A = 30(16) + 20(12) + 20(8) + 40(4)$$

$$V_A = 65 \text{ KN}$$

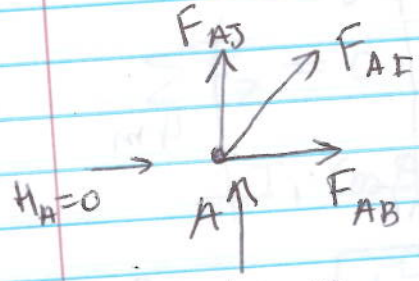
$$\sum F_y = 0$$

$$V_A + V_E = 30 + 20 + 20 + 40$$

$$V_E = 45 \text{ KN}$$

$$\sum F_x = 0 \Rightarrow H_A = 0.$$

Method of Joints



$$\Sigma F_y = 0$$

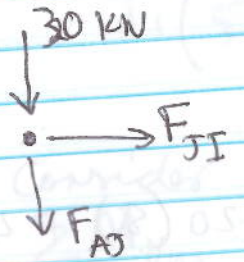
$$F_{AJ} + V_A + F_{AI}\sin\theta = 0$$

$$F_{AJ} + 0.71 F_{AI} = -65 \quad \text{—(1)}$$

$$\Sigma F_x = 0$$

$$F_{AB} + F_{AI}\cos\theta = 0$$

$$F_{AB} + 0.71 F_{AI} = 0 \quad \text{—(2)}$$



$$\Sigma F_y = 0$$

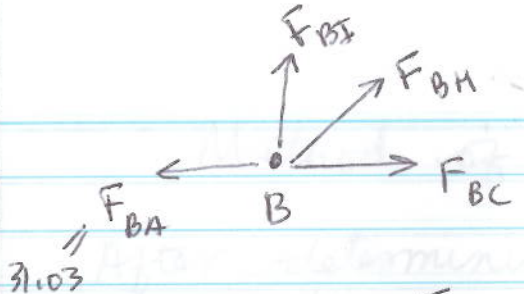
$$-F_{AJ} - 30 = 0$$

$$F_{AJ} = -30\ \text{KN} \quad \text{(compression)}$$

so from (1) $F_{AI} = -65 \mp 0.71(-30) = -43.7\ \text{KN}$ (comp)

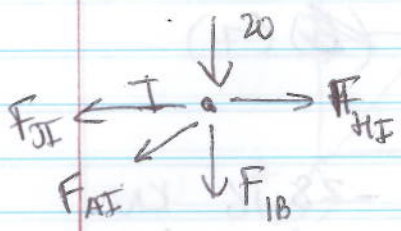
and from (2) $F_{AB} = 0 - 0.71(-43.7) = 31.03\ \text{KN}$ (tension)

$$\Sigma F_x = 0 \Rightarrow F_{JI} = 0.$$



$\sum F_y = 0$ $\quad F_{BI} + F_{BH} \sin\theta = 0$ —(3)

$\sum F_x = 0$ $\quad 31.03 = F_{BH} \sin\theta + F_{BC}$ —(4)



$\sum F_y = 0$

$20 + F_{AI} \sin\theta + F_{BI} = 0$

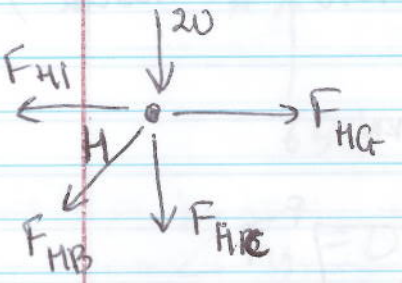
$F_{BI} = -[20 + (-43.7)(0.71)]$

$F_{BI} = 11.03\,KN$ (tension)

$\sum F_x = 0$

$F_{JI} + F_{AI} \cos\theta = F_{HI}$

$F_{HI} = 0 + (-43.7)(0.71) = 31.03\,KN$ (tension)



$\sum F_y = 0$

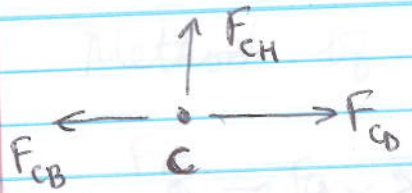
$20 + F_{HB} \sin\theta + F_{HC} = 0$

$0.71 F_{HB} + F_{HC} = -20$ —(5)

$\sum F_x = 0$

$F_{HI} + F_{HB} \cos\theta = F_{HG}$

$0.71 F_{HB} - F_{HG} = -31.03$ —(6)



$\Sigma F_y = 0 \Rightarrow F_{CH} = F_{HC} = 0$

$\Sigma F_x = 0 \qquad F_{CB} = F_{CD}$ —(7)

so from (5)

$$F_{HB} = \frac{-20}{0.71} = -28.16 \text{ KN (comp)}$$

so from (4)

$$F_{BC} = 31.03 - 0.71(-28.16)$$

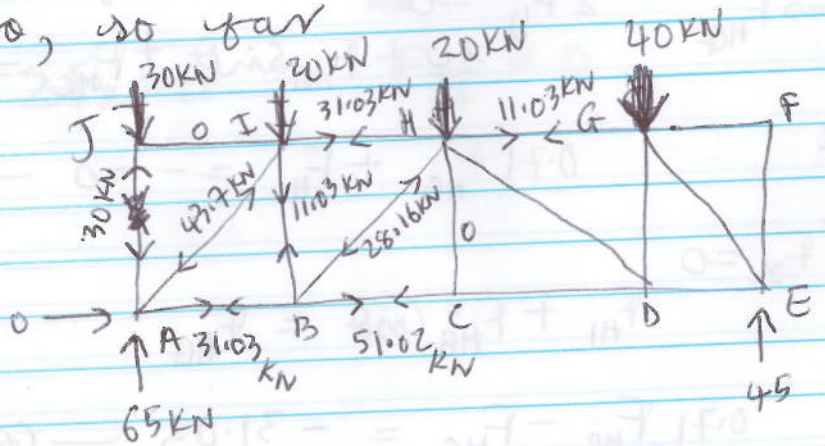
$$= 51.02 \text{ KN (Tension)}$$

from (6)

$$F_{HG} = 0.71(-28.16) + 31.03$$

$$= 11.03 \text{ KN (Tension)}$$

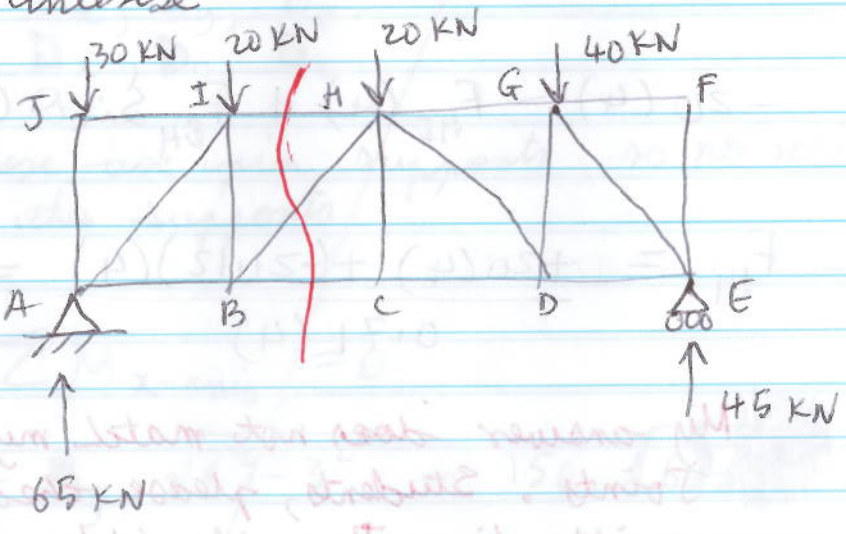
so, so far

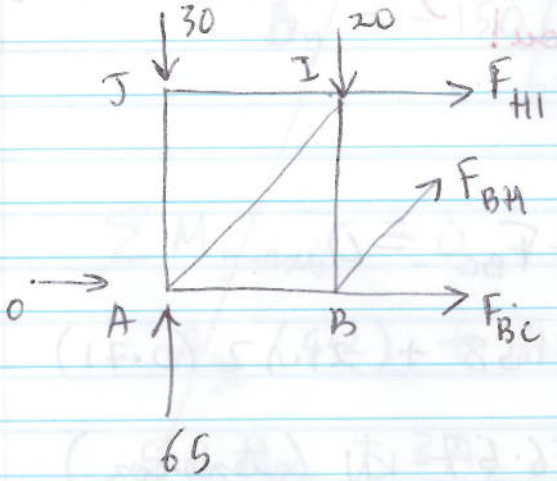


We can continue to get all forces.

Method of Sections.

After determining support reactions, we now make a cut to find a force of interest





OR we can base off of other side of cut, It's your call!

$\sum F_y = 0$

$30 + 20 = 65 + F_{BH} \sin\theta$

$F_{BH} = \dfrac{30+20-65}{0.71} = -21.12$ (comp)

Caution! → So there is an error in my Method of Joints. Students, check my arithmetic!!

$\sum F_x = 0$

$\sum M_A = 0$

$-20(4) - F_{HI}(4) + F_{BH}\sin\theta(4) = 0$

$$F_{HI} = \frac{+20(4) + (-21.12)(4)}{0.71(4)} = -1.58 \text{ KN (compression)}$$

My answer does not match my Method of Joints. Students, please check my arithmetic. They should be the same. Thank you!

$\sum F_x = 0$

$F_{HI} + F_{BH}\cos\theta + F_{BC} = 0$

$F_{BC} = +1.58 + 21.12(0.71)$

$= 16.57 \text{ KN (tension)}$

Again, did not match my Method of Joints calculation; and it should. Please check my arithmetic. Thanks.