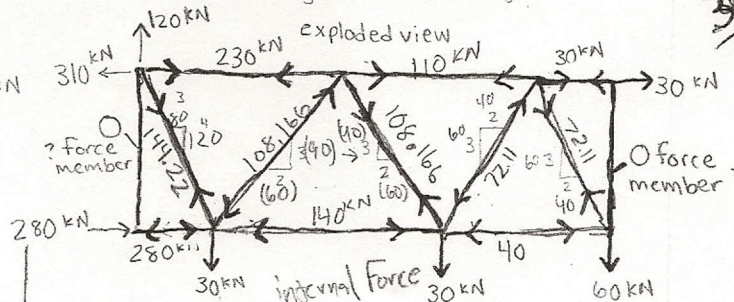


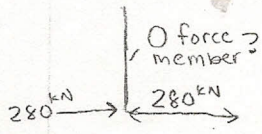
② draw slopes
 $\sum F_y = 0$
 $-30 - 30 - 60 + E_y = 0$
 $E_y = 120 \text{ kN}$
 $\sum F_x = 0$
 $E_x + A_x + 30 = 0 \Rightarrow -310 + 30 + A_x = 0$
 $-280 + A_x = 0$
 $A_x = 280 \text{ kN}$
 $\sum M_A = 0$
 $-30[2] - 30[6] - 60[10] - 30[3] + E_y[3] = 0$
 $-60 - 180 - 600 - 90 + 3E_y = 0$
 $3E_y = 930$
 $E_y = 310 \text{ kN}$

$m+r < 2j$
 $13+3 = 2(8)$
 $16 = 16$
 determinate

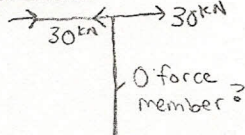


$E_y = 120 \text{ kN} \uparrow$
 $A_x = 280 \text{ kN} \rightarrow$
 $E_x = 310 \text{ kN} \leftarrow$
 Link $\overline{AB} = 280 \text{ kN} \leftarrow (T)$
 Link $\overline{GH} = 30 \text{ kN} \rightarrow (C)$
 Link $\overline{HD} = \text{zero force member?}$
 Link $\overline{EA} = \text{zero force member?}$
 Link $\overline{EF} = 230 \text{ kN} \rightarrow (C)$
 Link $\overline{EB} = 144.22 \text{ kN} \rightarrow (C)$
 $\text{link } \overline{BC} = 140 \text{ kN} (T) \leftarrow$
 $\text{link } \overline{BF} = 108.166 \text{ kN} (T) \leftarrow$
 $\text{link } \overline{FG} = 110 \text{ kN} (D) \rightarrow \leftarrow$
 $\text{link } \overline{FC} = 108.166 (C) \rightarrow \leftarrow$
 $\text{link } \overline{CG} = 72.11 (T) \leftarrow$
 $\text{link } \overline{GD} = 72.11 (C) \rightarrow \leftarrow$
 $\text{link } \overline{CD} = 40 (T) \leftarrow$

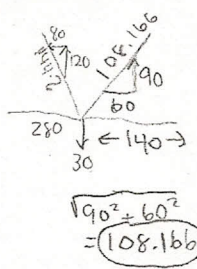
JT A



JT H

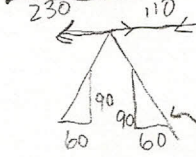


Joint B



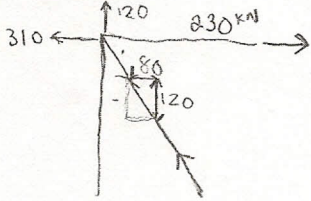
$\sum F = 0$
 $120 - 30 - B_f$
 $90 - B_f$
 $B_f = 90$
 must be ratio 3:2
 makes $x = 60$
 $\frac{90}{60} = \frac{3}{2}$

Joint F



$\sum F_y = 0$
 $-90 + F_c = 0$
 $F_c = 90$
 since slope ratio = 3:2
 $\frac{90}{60} = \frac{3}{2}$
 $\sum F_x = 0$
 $60 + 60 - 230 + F_g = 0$
 $F_g = 110$

Joint E

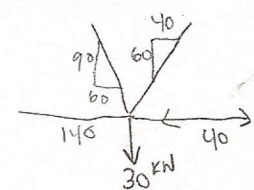


$\sqrt{120^2 + 80^2} = 144.22$
 link EB

Know $\frac{90}{120}$ because dimensions must = 3:2 (80:120)
 we know
 $\sum F_y = 0$
 $120 - F_{EB} = 0$
 $F_{EB} = 120 \downarrow$
 $\sum F_x = 0$
 $-310 + 80 + E F_x = 0$
 $-230 + E F_x = 0$
 $E F_x = 230 \rightarrow (C)$

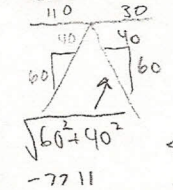
$\sum x = 0$
 $-80 - 60 + 280 + B_c = 0$
 $140 + B_c = 0$
 $B_c = 140$

Joint C



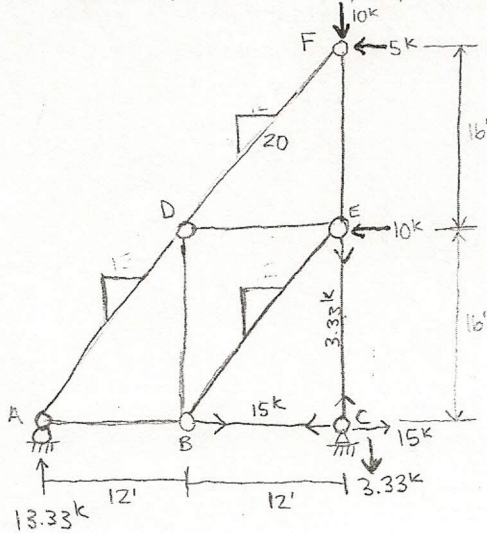
$\sum F_y = 0$
 $+90 - 30 + C_g$
 $C_g = 60$
 ratio 2:3
 $60:40$

Joint G



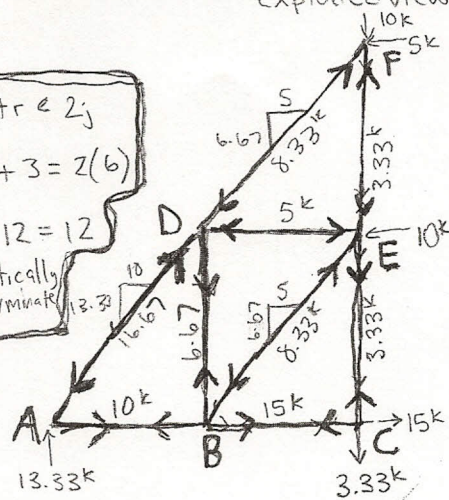
$\sum F_y = 0$
 $60 + 60 - 140 + C_d = 0$
 $C_d = 40 \leftarrow (C)$
 $\sum F_x = 0$
 $40 - 40 + 110 + G H_x = 0$

4.16 Determine the force in each member of the truss shown by the method of joints
 ① Label, Show reactions, exploded view



$m+r \leq 2j$
 $9+3 = 2(6)$
 $12 = 12$
 Statically determinate

* exploded view *



internal /m
 links (internal)
 $\overline{BC} = 15 \rightarrow \leftarrow$
 $\overline{CE} = 3.33 \rightarrow (C)$
 $\overline{EF} = 3.33 \rightarrow (T)$
 $\overline{FD} = 8.33 \rightarrow \leftarrow$
 $\overline{BE} = 8.33 \rightarrow (T)$
 $\overline{DE} = 5 \rightarrow \leftarrow (C)$
 $\overline{AB} = 10 \rightarrow \leftarrow (C)$
 $\overline{AD} = 16.67 \rightarrow \leftarrow (C)$
 $\overline{DB} = 6.67 \rightarrow \leftarrow (C)$

② draw slopes

$\sum F_x = 0$
 $-5 - 10 - C_x = 0$

$C_x = 15 \rightarrow$

$\sum F_y = 0$

$-C_y + A_y - 10 = 0$

$-C_y + 13.33 - 10 = 0$

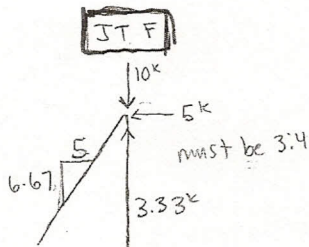
$\sum M_C = 0$ $C_y = 3.33 \uparrow$

$-A_y(24) + 10(16) + 5(30) =$

$-24A_y + 160 + 150 =$

$-24A_y = -320$

$A_y = 13.33$

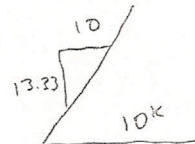


$\sum F_x = 0$
 $5 + F_{Dx} = 0$
 $F_{Dx} = 5$

$\sum F_y = 0$
 $-10 + 6.67 + F_{Cy} = 0$
 $F_{Cy} = 3.33 \uparrow$

$\sqrt{6.67^2 + 5^2}$
 $F_D = 8.33 \uparrow$

JT A



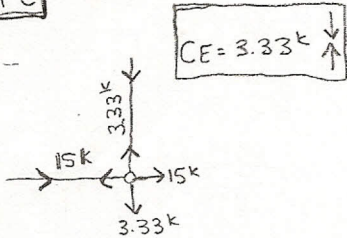
$\sum F_x = 0$
 $A_{Dx} + 10 = 0$
 $A_{Dx} = 10 \leftarrow$

$3:4$
 $10:13:33$

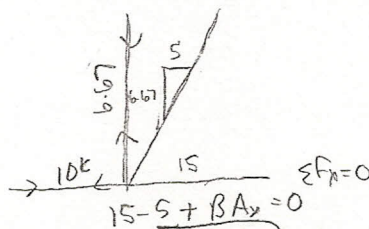
$\sum F_y = 0$
 $10 - 10 = 0 \checkmark$

$\sqrt{13.33^2 + 10^2}$
 $= 16.67 \uparrow = \overline{AD}$

JT C



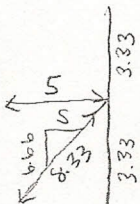
JT B



$\sum F_x = 0$
 $15 - 5 + B_{Ax} = 0$
 $B_{Ax} = 10 \leftarrow$

$\sum F_y = 0$
 $+6.67 + B_{Dy} = 0$
 $B_{Dy} = 6.67 \uparrow$

JT E



$\sum F_y = 0$
 $3.33 + 3.33 + B_{Ey} = 0$
 $B_{Ey} = 6.66 \downarrow$ $B_{Ex} = 5 \leftarrow$

Slope = 3:4
 $5:6.66$
 $\sqrt{6.66^2 + 5^2}$
 $= 8.33 \uparrow = \overline{BE}$

$\sum F_x = 0$
 $-5 + D_{E} = 0$
 $D_{E} = 5 \rightarrow$