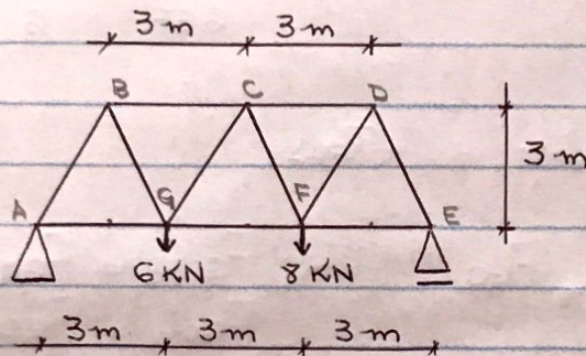


Aula 8

Mecânica Geral

Treliza - Método das Seções ou Ritter

1 - Determine as forças que atuam em BC, CG e GF.



1º - cálculo das forças de reação dos apoios

$$\sum F_x = 0$$

$$F_{Ax} = 0$$

$$\sum F_y = 0$$

$$F_{Ay} + F_{Ey} - 6 - 8 = 0$$

$$F_{Ay} + F_{Ey} = 14 \text{ kN}$$

$$\sum M_A = 0$$

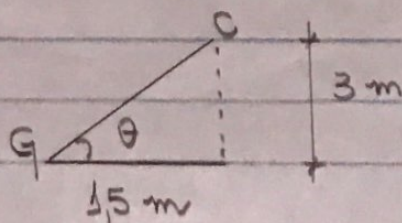
$$(-6 \cdot 3) + (-8 \cdot 6) + (F_{Ey} \cdot 9) = 0$$

$$-18 - 48 = -F_{Ey} \cdot 9$$

$$F_{Ey} = 7,33 \text{ kN}$$

$$F_{Ay} = 6,67 \text{ kN}$$

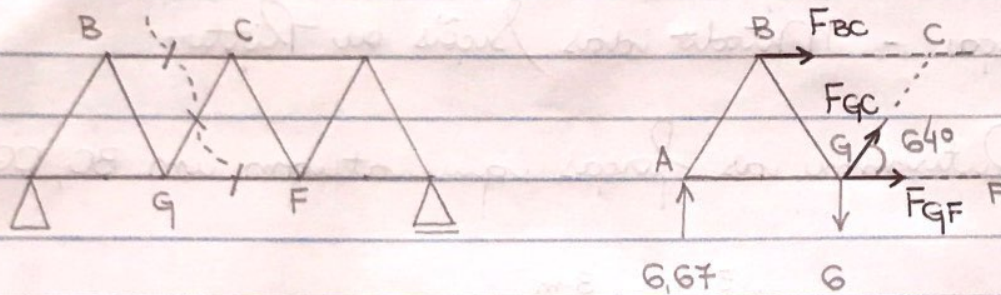
2º - cálculo do ângulo



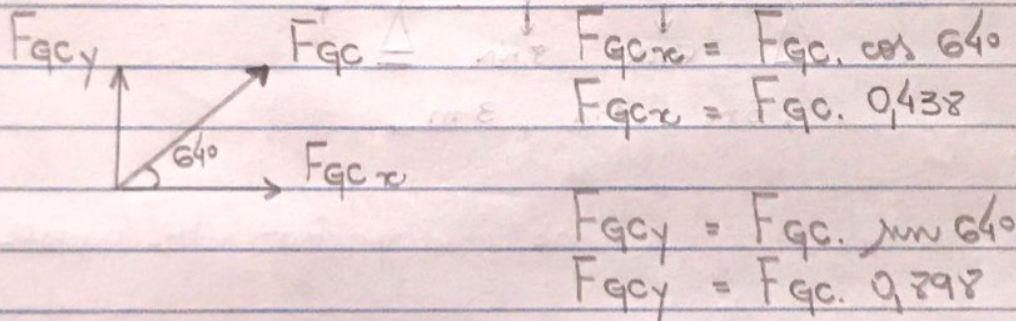
$$\operatorname{tg} \theta = \frac{CO}{CA} = \frac{3}{1,5} = 2$$

$$\theta \approx 64^\circ$$

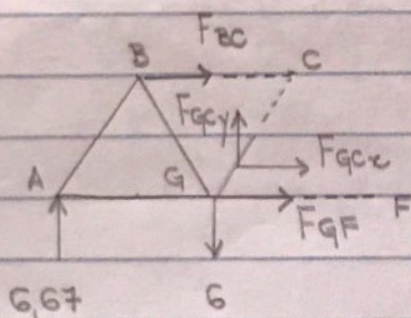
3ª - corte (um até 3 barras)



4ª - decomposição do vetor



5ª - somatória das forças



$$\sum F_x = 0$$

$$F_{BC} + F_{GF} + F_{GC} \cdot 0,438 = 0$$

$$\sum F_y = 0$$

$$6,67 - 6 + F_{GC} \cdot 0,898 = 0$$

$$0,67 + F_{GC} \cdot 0,898 = 0$$

$$F_{GC} = \frac{-0,67}{0,898}$$

$$F_{GC} = -0,746 \text{ kN (C)}$$

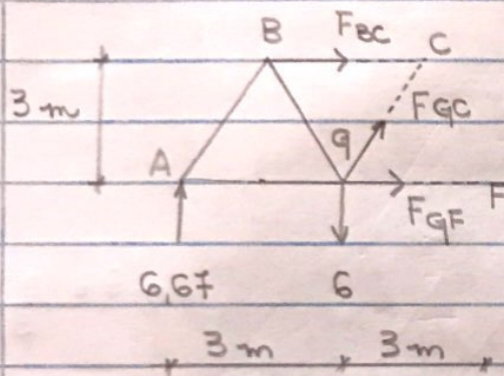
$$F_{BC} + F_{GF} + F_{GC} \cdot 0,437 = 0$$

$$F_{BC} + F_{GF} + (-0,746 \cdot 0,437) = 0$$

$$F_{BC} + F_{GF} - 0,326 = 0$$

$$F_{BC} + F_{GF} = 0,326 \text{ kN}$$

$\sum M_c = 0$ - momento



$$\sum M_c = 0$$

$$(-6,67 \cdot 4,5) + (6 \cdot 1,5) + (F_{GF} \cdot 3) = 0$$

$$-30,015 + 9 = -F_{GF} \cdot 3$$

$$-21,015 = -F_{GF} \cdot 3$$

$$F_{GF} = 7 \text{ kN (T)}$$

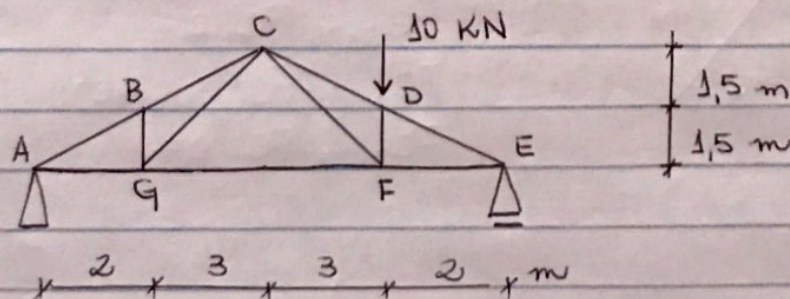
$$F_{BC} + F_{GF} = 0,326$$

$$F_{BC} + 7 = 0,326$$

$$F_{BC} = 0,326 - 7$$

$$F_{BC} = -6,674 \text{ kN (C)}$$

2 - Determine as forças que atuam em FG, FC, CD.



$$\sum F_x = 0$$

$$F_{Ax} = 0$$

$$\sum F_y = 0$$

$$F_{Ay} + F_{Ey} - 10 = 0$$

$$F_{Ay} + F_{Ey} = 10 \text{ kN}$$

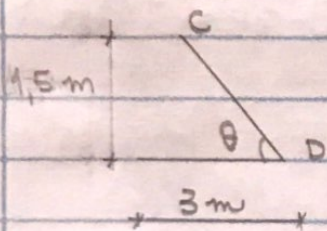
$$\sum M_A = 0$$

$$(-10 \cdot 8) + (F_{Ey} \cdot 10) = 0$$

$$-80 = -F_{Ey} \cdot 10$$

$$F_{Ey} = 8 \text{ kN}$$

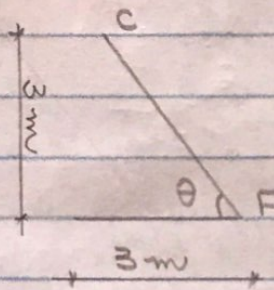
$$F_{Ay} = 2 \text{ kN}$$



$$\text{tg } \theta = \frac{1,5}{3}$$

$$\text{tg } \theta = 0,5$$

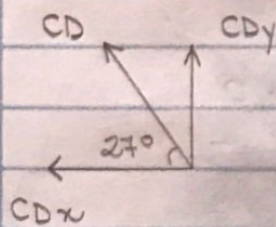
$$\theta = 27^\circ$$



$$\text{tg } \theta = \frac{3}{3}$$

$$\text{tg } \theta = 1$$

$$\theta = 45^\circ$$

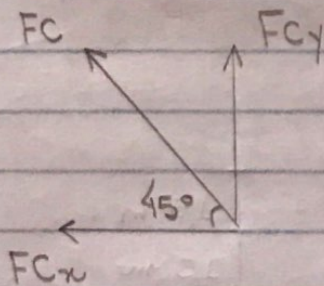


$$CD_x = CD \cdot \cos 27^\circ$$

$$CD_x = CD \cdot 0,89$$

$$CD_y = CD \cdot \sin 27^\circ$$

$$CD_y = CD \cdot 0,45$$

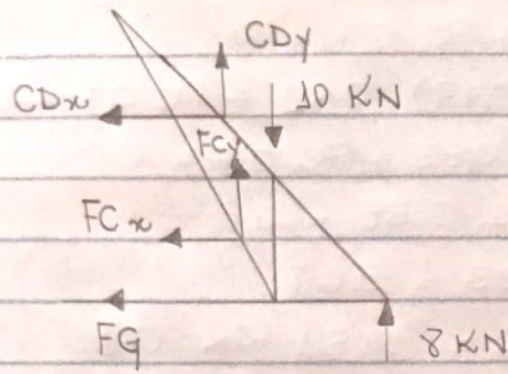


$$FC_x = FC \cdot \cos 45^\circ$$

$$FC_x = FC \cdot 0,7$$

$$FC_y = FC \cdot \sin 45^\circ$$

$$FC_y = FC \cdot 0,7$$



$$\sum F_x = 0$$

$$-FG - CD_x - F_{cx} = 0$$

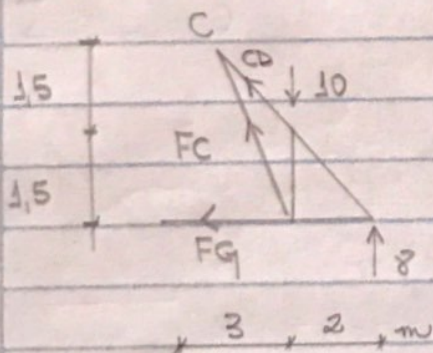
$$-FG - CD \cdot 0,89 - FC \cdot 0,7 = 0$$

$$\sum F_y = 0$$

$$8 - 10 + CD_y + F_{cy} = 0$$

$$-2 + CD \cdot 0,45 + FC \cdot 0,7 = 0$$

$$CD \cdot 0,45 + FC \cdot 0,7 = 2 \text{ kN}$$



$$\sum M_c = 0$$

$$(8 \cdot 5) + (-10 \cdot 3) + (-FG \cdot 3) = 0$$

$$40 - 30 = FG \cdot 3$$

$$10 = FG \cdot 3$$

$$FG = 3,33 \text{ kN (T)}$$

$$-FG - CD \cdot 0,89 - FC \cdot 0,7 = 0$$

$$-3,33 - CD \cdot 0,89 - FC \cdot 0,7 = 0$$

$$-CD \cdot 0,89 - FC \cdot 0,7 = 3,33$$

$$-CD \cdot 0,89 = 3,33 + FC \cdot 0,7$$

$$-CD = 3,74 + FC \cdot 0,78 \quad (*) - 1)$$

$$CD = -3,74 - FC \cdot 0,78$$

$$CD \cdot 0,45 + FC \cdot 0,7 = 2$$

$$(-3,74 - FC \cdot 0,78) \cdot 0,45 + FC \cdot 0,7 = 2$$

$$-1,68 - FC \cdot 0,35 + FC \cdot 0,7 = 2$$

$$-1,68 + FC \cdot 0,35 = 2$$

$$FC \cdot 0,35 = 3,68$$

$$FC = 10,51 \text{ kN (T)}$$

$$CD = -3,74 - (10,51) \cdot 0,78$$

$$CD = -3,74 - 8,19$$

$$CD = -11,93 \text{ kN (C)}$$