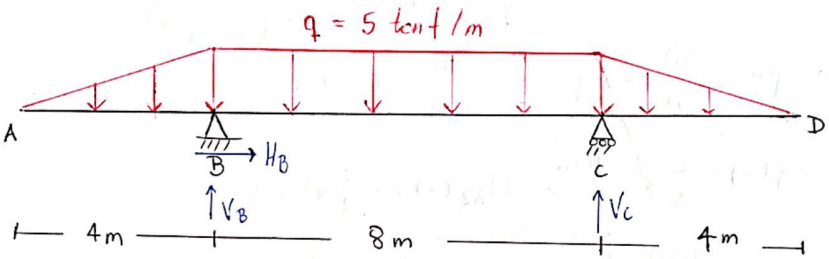
Pauta Auxiliar 1 - P2

Luis Cárcamo Del Río

Como dice el enunciado, debemos calcular reacciones y diagramar para la primera viga expuesta:



Equilibrio de fuerzas

$\sum F_x = 0$: $H_B = 0$ tonf ✓

$\sum F_y = 0$: $V_B + V_C = 2\left(\frac{1}{2} \cdot 5 \cdot 4\right) + 5 \cdot 8$

$2F$ F

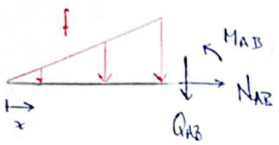
$\longrightarrow V_B + V_C = 60$

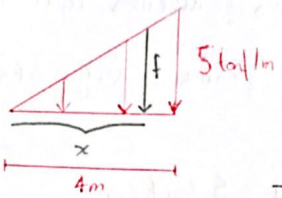
pero $V_B = V_C$, porque la simetría que existe en la viga ☺

$\therefore \boxed{V_B = V_C = 30 \text{ tonf}}$

Esfuerzos Internos

· Tramo AB :





Por Thales

$$\frac{f}{x} = \frac{5}{4} \rightarrow \boxed{f = \frac{5}{4}x}$$

Recordando que $\frac{\partial Q}{\partial x} = -q$ ∧ $\frac{\partial M}{\partial x} = Q(x)$:

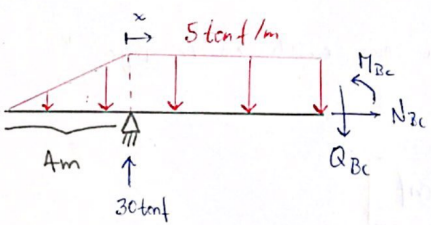
$$\frac{\partial Q(x)}{\partial x} = -q(x) = \frac{5}{4}x \xrightarrow{\int()dx} Q_{AB}(x) = -\frac{5}{8}x^2 + C_1$$

$$Q_{AB}(x=0) = 0 \xrightarrow{C_1=0} \boxed{Q_{AB}(x) = -\frac{5}{8}x^2}$$

$$\frac{\partial M(x)}{\partial x} = Q(x) = -\frac{5}{8}x^2 \xrightarrow{\int()dx} M_{AB}(x) = -\frac{5}{24}x^3 + C_2$$

$$M_{AB}(x=0) = 0 \xrightarrow{C_2=0} \boxed{M_{AB}(x) = -\frac{5}{24}x^3}$$

· Tramo BC :



$$N_{BC} = 0 \text{ tonf}$$

$$Q_{BC} = 30 - 4 \cdot 5 \cdot \frac{1}{2} - 5x$$

$$\rightarrow \boxed{Q_{BC}(x) = 20 - 5x}$$

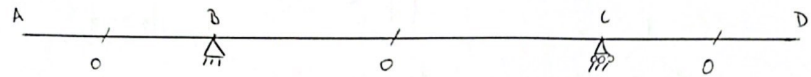
$$M_{BC} = 30 \cdot x - 5 \cdot x \cdot \frac{x}{2} - 4 \cdot 5 \cdot \frac{1}{2}\left(x + \frac{4}{3}\right)$$

$$\rightarrow \boxed{M_{BC}(x) = -\frac{40}{3} + 20x - \frac{5}{2}x^2}$$

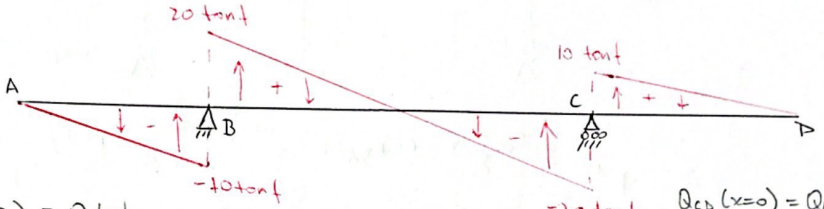
- Tramo CD : Simetrico con Tramo AB !!

Diagramas :

N(x) :



Q(x) :



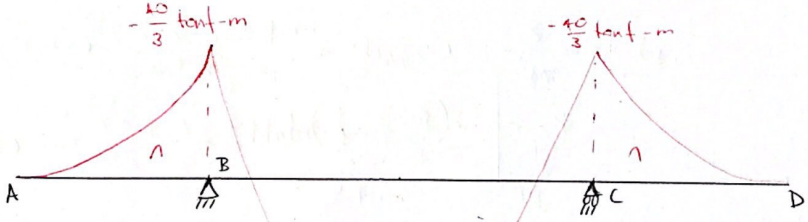
$Q_{AB}(x=0) = 0\ tonf$

$Q_{AB}(x=4) = -10\ tonf$

$Q_{BC}(x=8) = -20\ tonf$

$Q_{CD}(x=0) = Q_{AB}(x=0)$

M(x) :



¿Donde esta el máximo?

- Claramente al medio

↳ De todos modos lo determinaremos analíticamente :

U

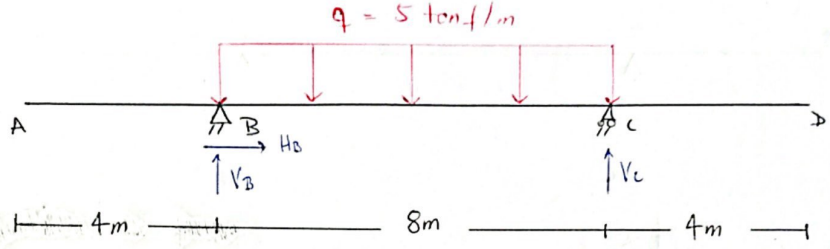
$\frac{80}{3}$ tonf-m

$$\frac{\partial M_{BC}(x)}{\partial x} \overset{!}{=} 0 \longrightarrow 20 = 5x \longrightarrow M_{MÁX} = M_{BC}(x=4) = \frac{80}{3}\ tonf\text{-}m$$

$x = 4\ m$ //

$\therefore M_{MAX} < 35\ tonf\text{-}m$ ✓✓

Ahora, analicemos lo que el/la compañero/a propone:



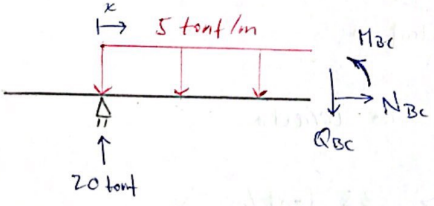
Equilibrio de fuerzas:

$\sum F_x = 0$: $H_B = 0$ tonf ✓

$\sum F_y = 0$: $V_B + V_C = 5 \cdot 8 \rightarrow$ $\boxed{V_B = V_C = 20 \text{ tonf}}$

Como en los voladizos AB y CD no hay cargas, sus esfuerzos internos son nulos. Luego, solo queda analizar BC.

- Tramo BC:



$N_{BC} = 0$ tonf

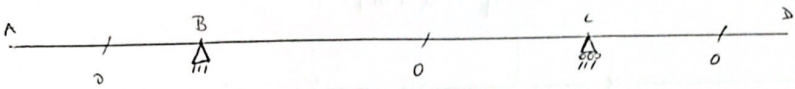
$Q_{BC} = 20 - 5x$

$M_{BC} = 20x - \frac{5}{2}x^2$

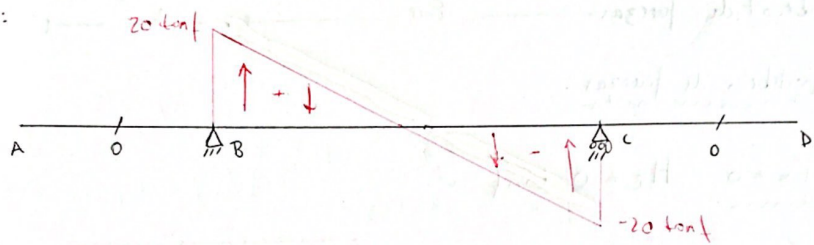
- $Q_{BC}(x=0) = 20$ tonf
- $Q_{BC}(x=8) = -20$ tonf
- $M_{BC}(x=0) = M_{BC}(x=8)$

Diagramas:

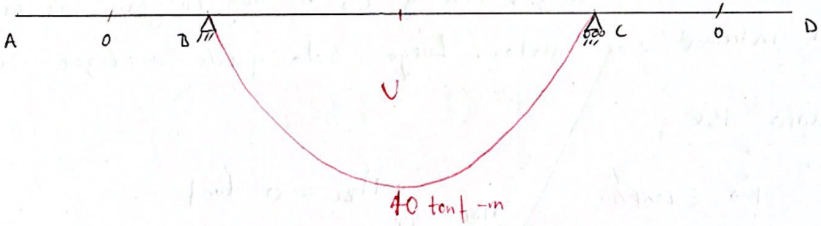
N(x):



Q(x):



M(x):



∴ El/la compañero/a estaba en lo correcto.

40 tonf-m > 35 tonf/m ✓