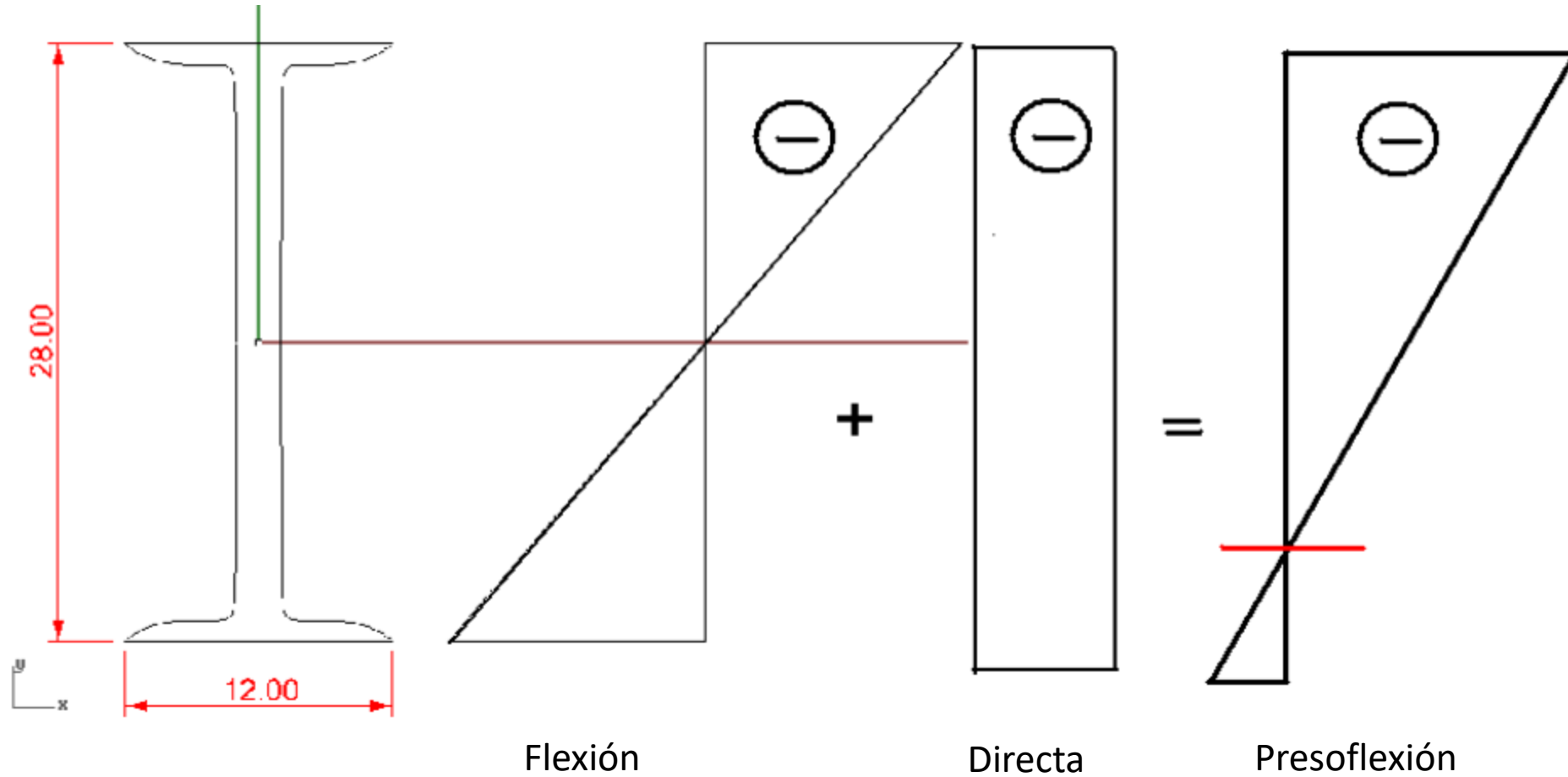
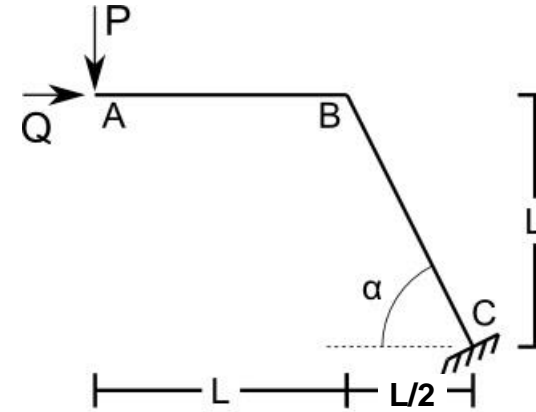
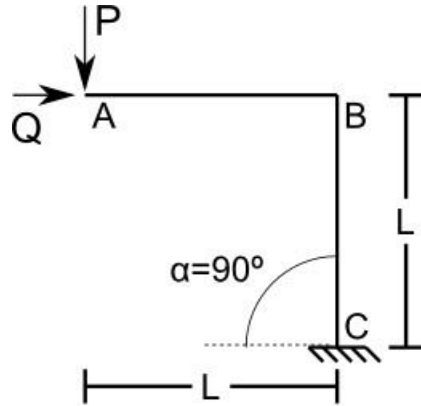


# Pórticos

# Flexión Compuesta







Caso particular de barras  
en ángulo ortogonal.

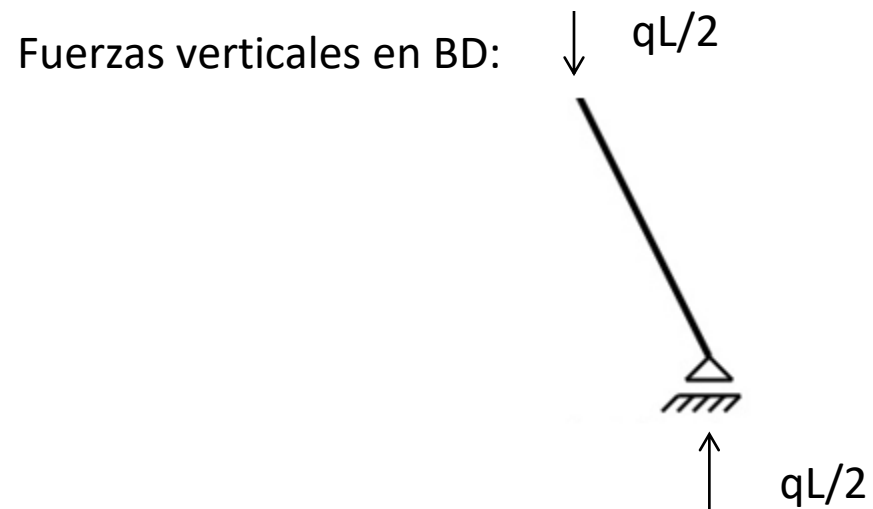
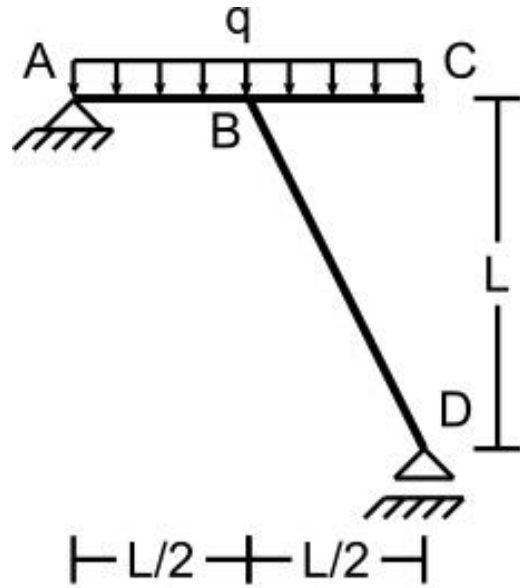
En B:  $N^I = V^D$

$V^I = N^D$

$M^I = M^D$

Es decir, el cortante y la  
directa se invierten, y el  
momento se transmite.

# Ejemplo



$$\text{Sum}(F_v)=0$$

$$R_A + R_D = qL$$

$$\text{Sum}(M_A)=0$$

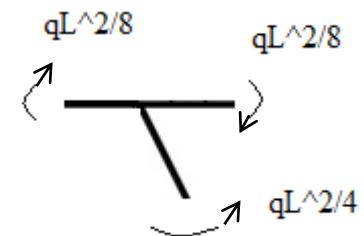
$$q * L * L/2 - R_D * L = 0$$

$$R_D = qL/2$$

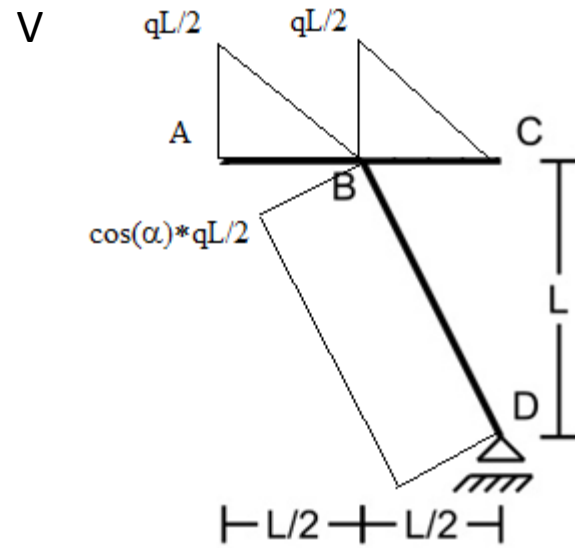
$$R_A = qL/2$$

$$\cos(\alpha) = 1/\text{raíz}(5)$$

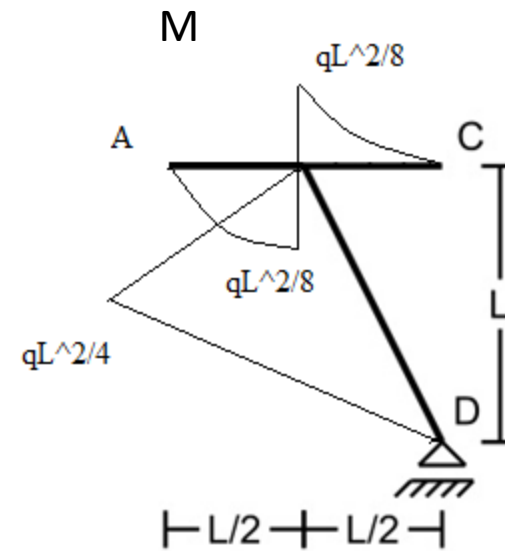
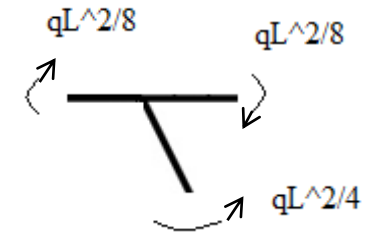
$$\text{sen}(\alpha) = 2/\text{raíz}(5)$$



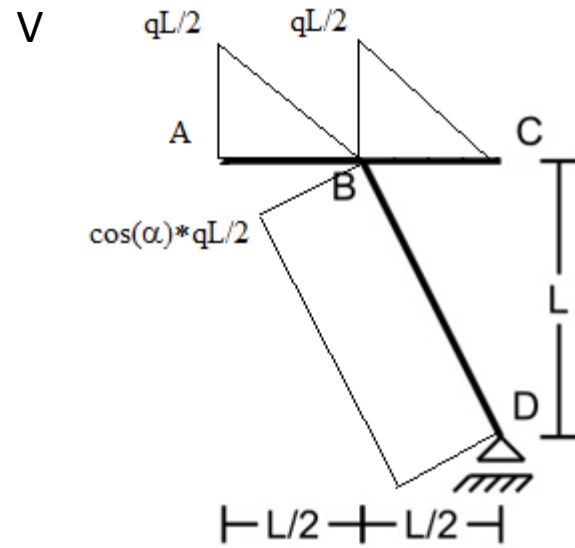
# Diagramas



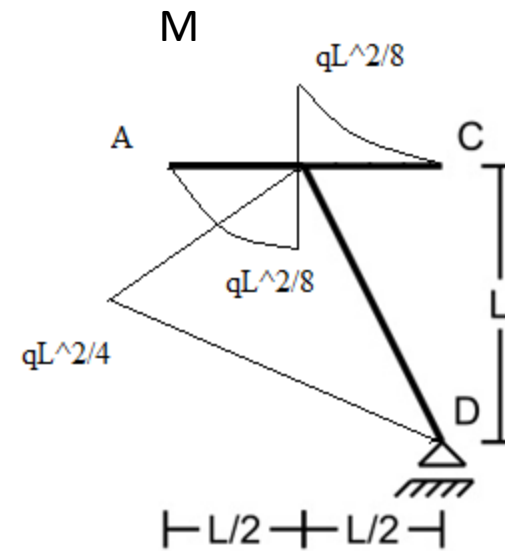
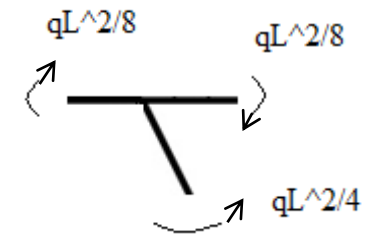
Momentos en  
el nudo=0



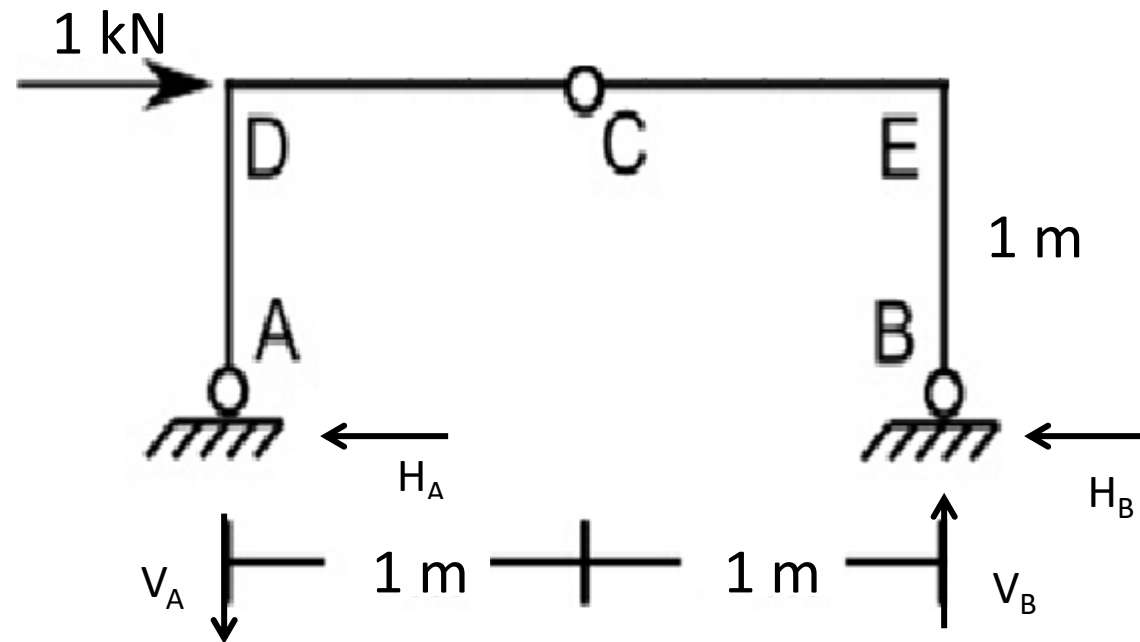
# Diagramas



Momentos en  
el nudo=0



# Ejemplo

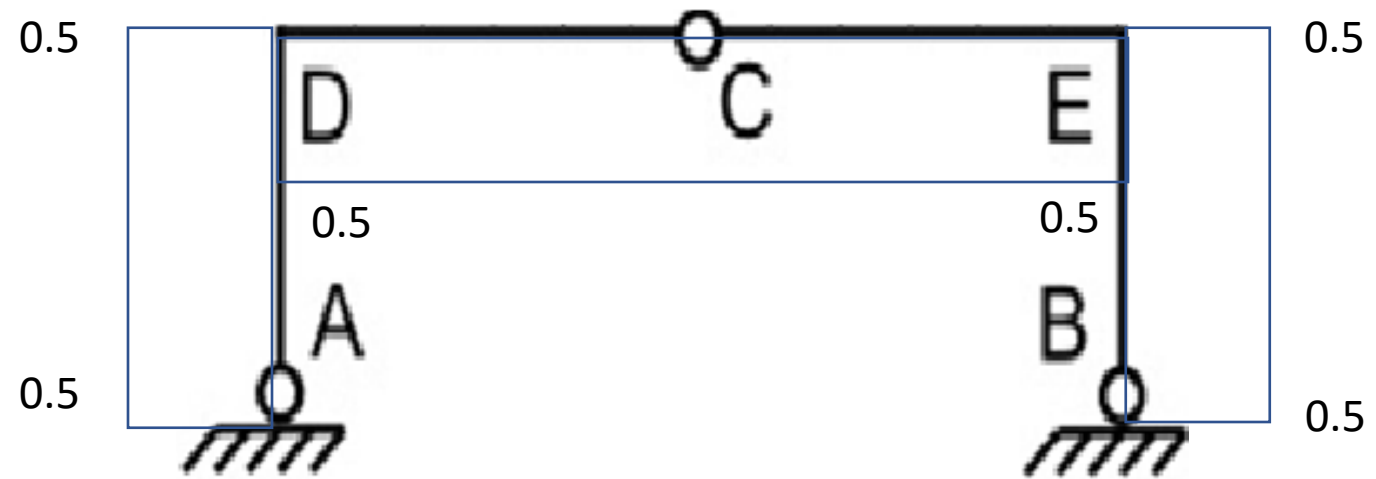


$$\begin{aligned} -V_A + V_B &= 0 \\ H_A + H_B &= 1 \text{ kN} \end{aligned}$$

$$\begin{aligned} \text{Sum}(M_A) &= 0 \\ \text{Sum}(M_{izqC}) &= 0 \end{aligned}$$

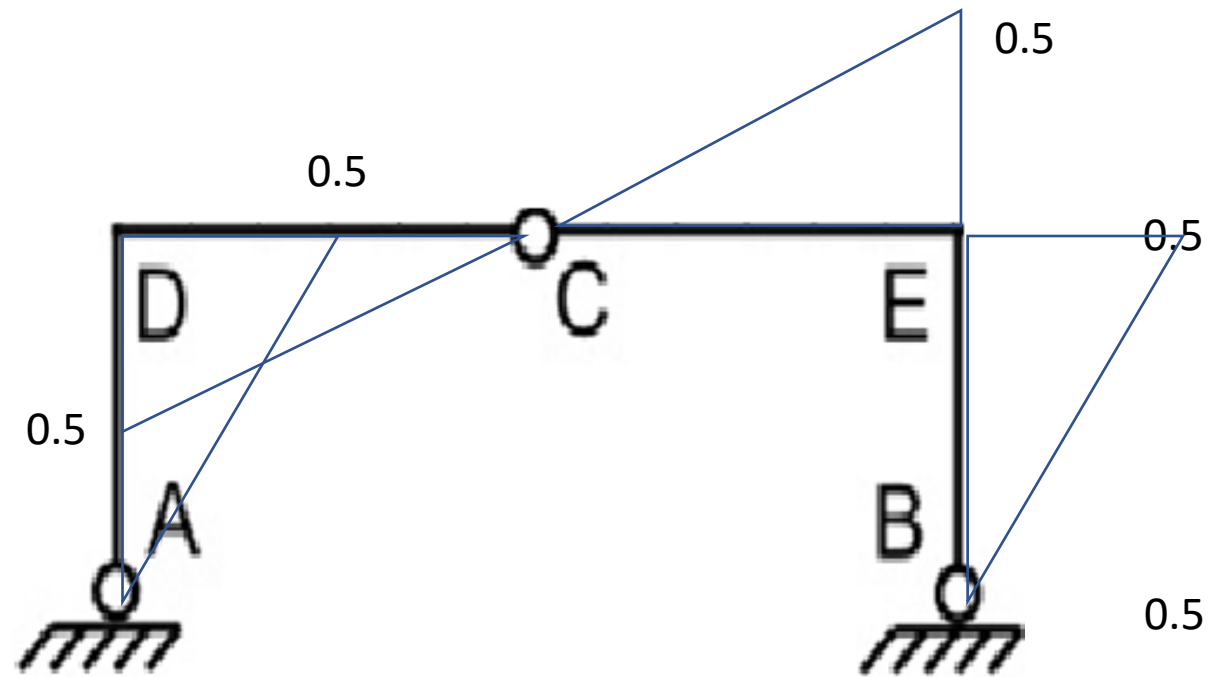


V(kN)



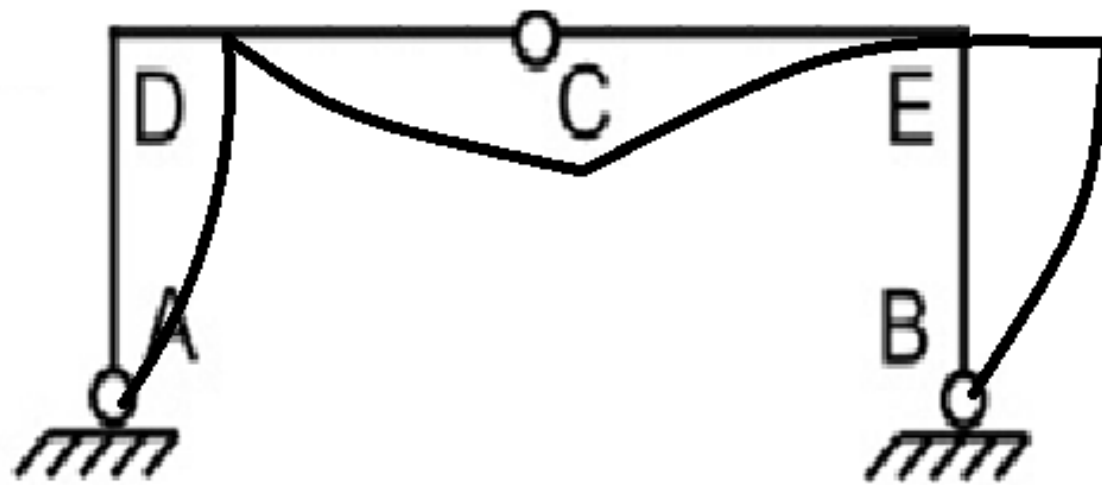
Tensiones Rasantes maximas

M(kN.m)

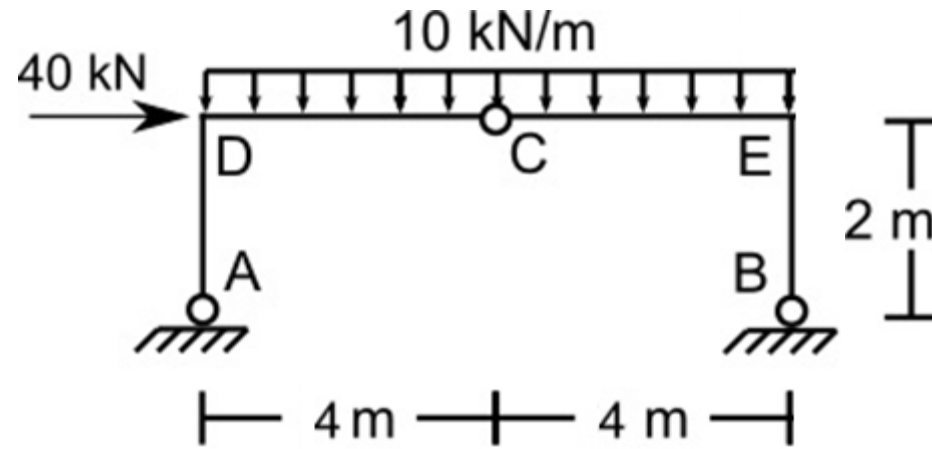


Tensiones Normales máximas (tensiones por M + tensiones por N)

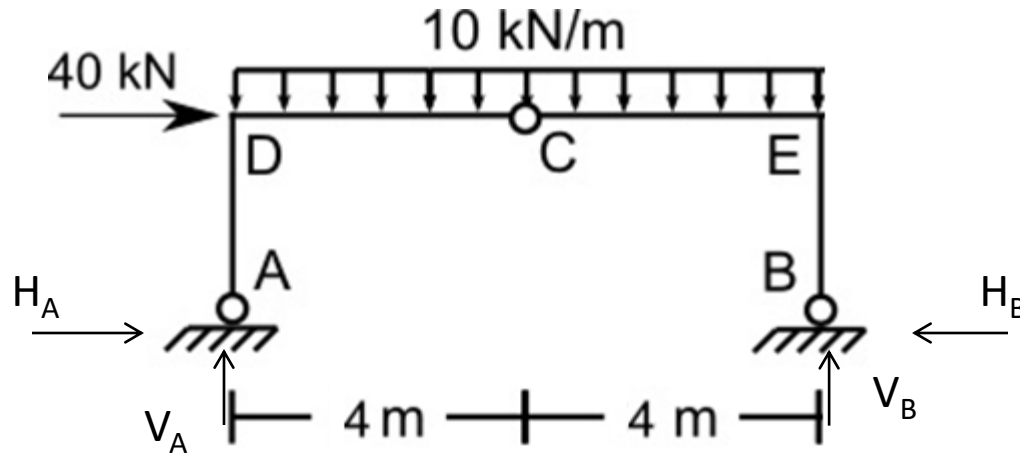
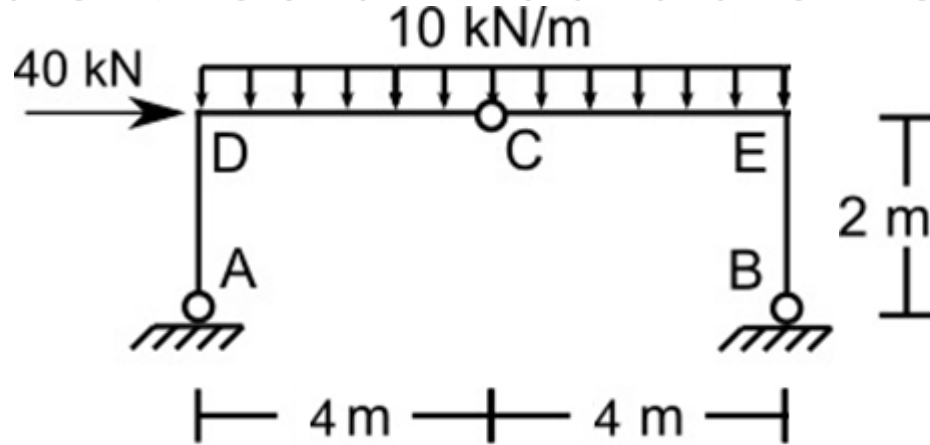
# Ejemplo



# Arco de tres Articulaciones



# Arco de tres articulaciones



$$\text{Suma}(M_A)=0$$

$$40 \cdot 2 + 10 \cdot 8 \cdot 4 = 8 \cdot V_B \rightarrow V_B = 50 \text{ kN}$$

$$\text{Suma}(F_V) = V_A + 50 - 10 \cdot 8 = 0$$

$$V_A = 30 \text{ kN}$$

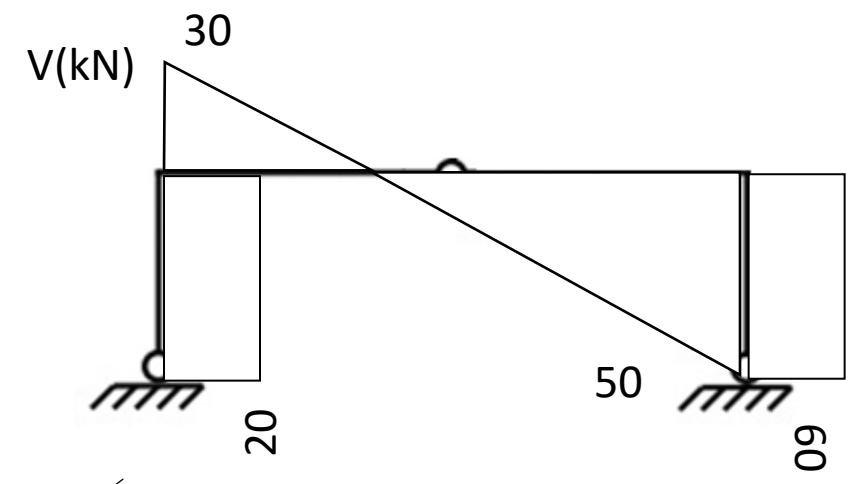
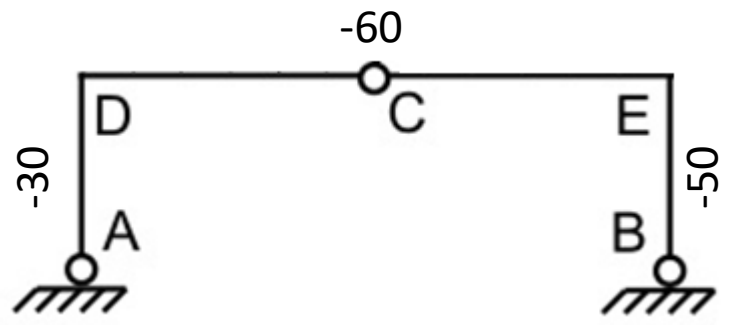
$$\text{Suma}(M_{\text{derC}}) = 4 \cdot 10 \cdot 2 - 50 \cdot 4 + H_B \cdot 2$$

$$H_B = 60 \text{ kN}$$

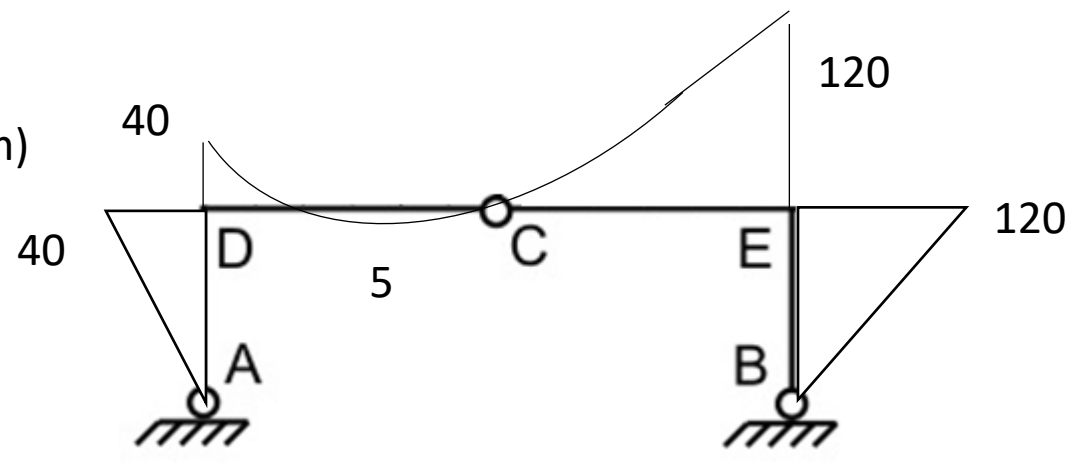
$$H_A = 20 \text{ kN}$$

# Diagramas

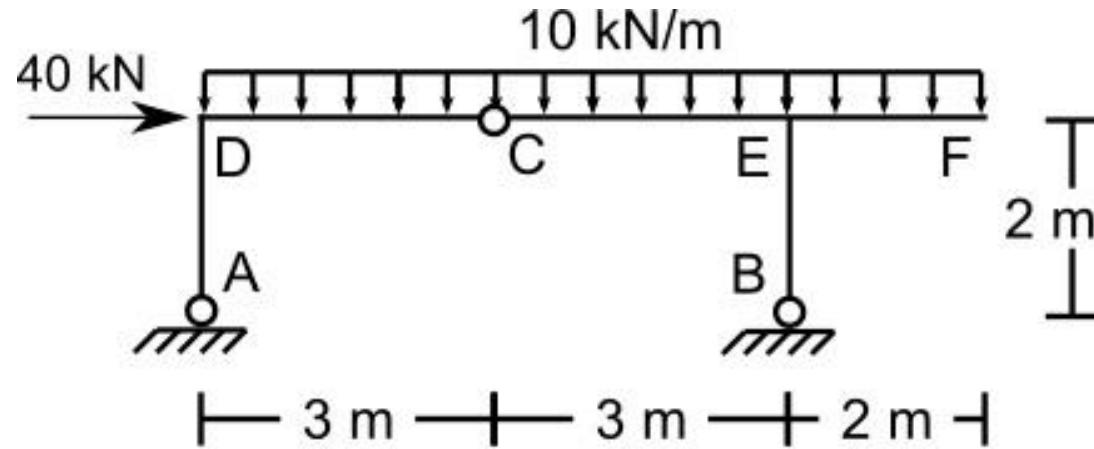
N(kN)



M(kN.m)



# Arco de tres articulaciones



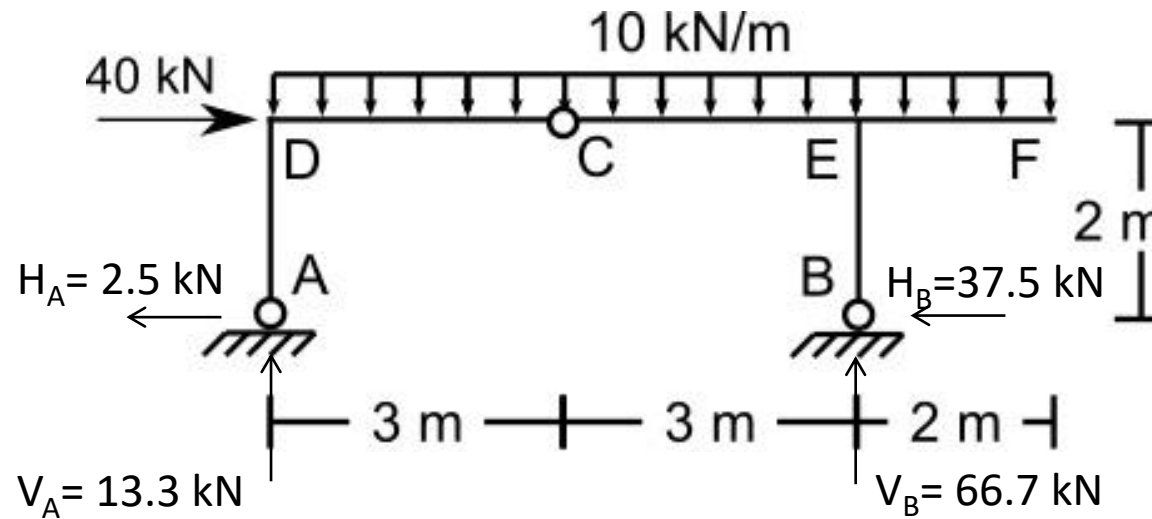
$$\text{Suma}(M_A)=0 \quad 40 \cdot 2 + 10 \cdot 8 \cdot 4 - V_B \cdot 6 = 0 \quad \rightarrow V_B = 66.7 \text{ kN}$$

$$\text{Suma}(F_V)=0 \quad V_A + V_B = 80 \quad \rightarrow V_A = 13.3 \text{ kN}$$

$$\text{Suma}(M_{\text{derC}})=0 \quad 10 \cdot 5 \cdot 2.5 - 66.7 \cdot 3 + H_B \cdot 2 = 0 \quad \rightarrow H_B = 37.5 \text{ kN}$$

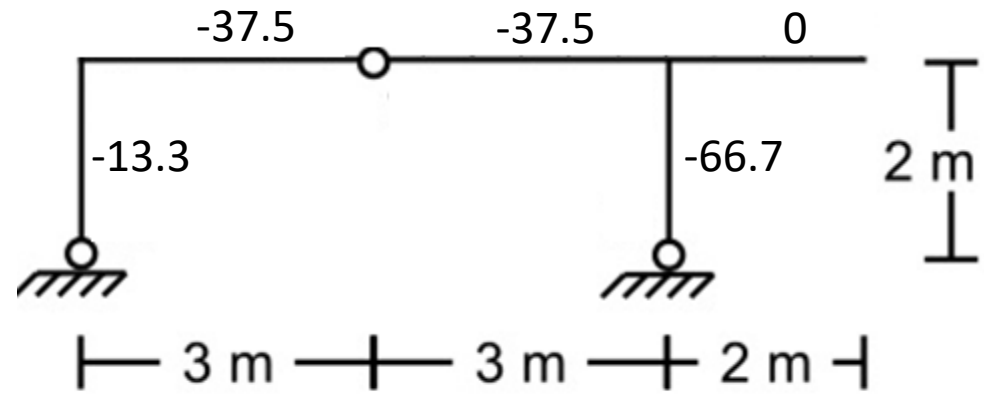
$$H_A = 2.5 \text{ kN}$$

# Reacciones

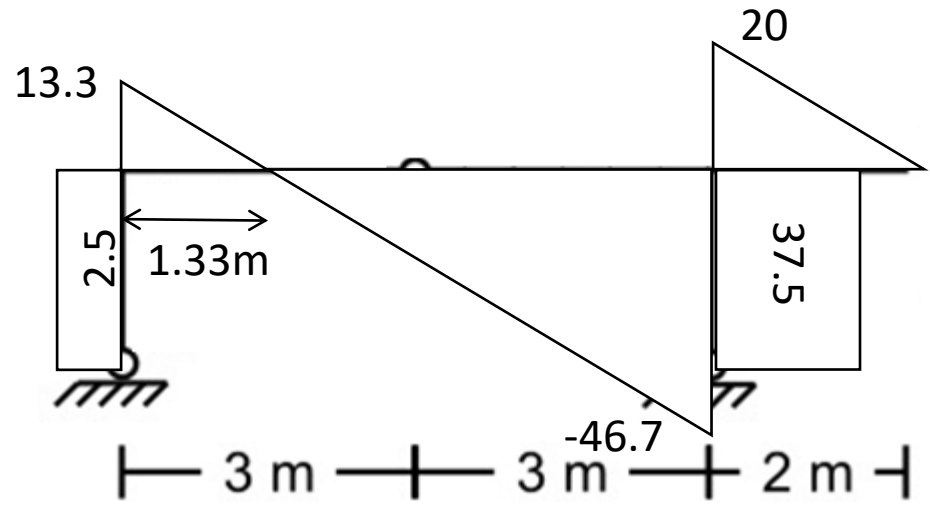


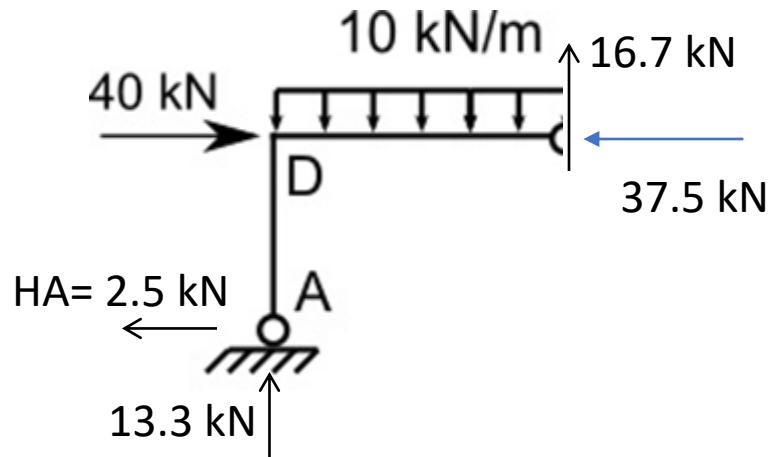


N(kN)

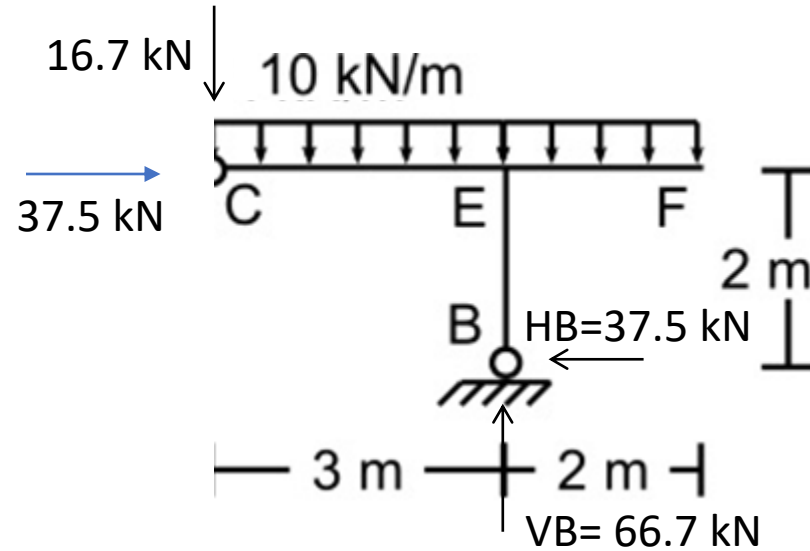
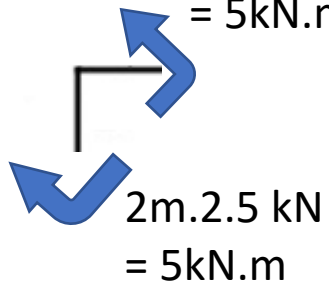


V(kN)





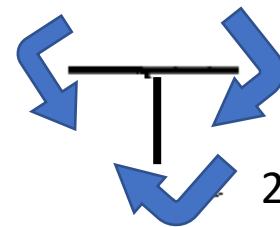
$$3 \text{m} \cdot 16.7 \text{ kN} - 10 \text{ kN/m} \cdot 3 \text{m} \cdot 1.5 \text{m} = 5 \text{ kN}\cdot\text{m}$$



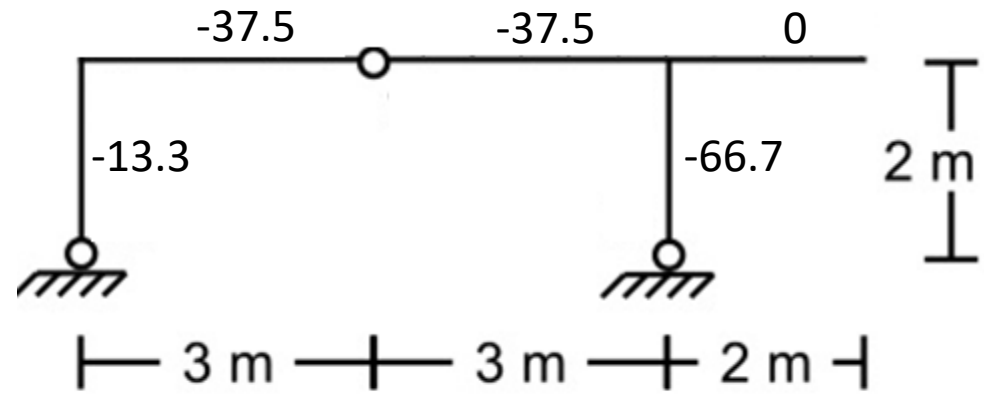
$$3 \cdot 16.7 + 10 \cdot 3 \cdot 1.5 = 95 \text{ kN}\cdot\text{m}$$

$$10 \text{ kN/m} \cdot 2 \text{m} \cdot 1 \text{m} = 20 \text{ kN}\cdot\text{m}$$

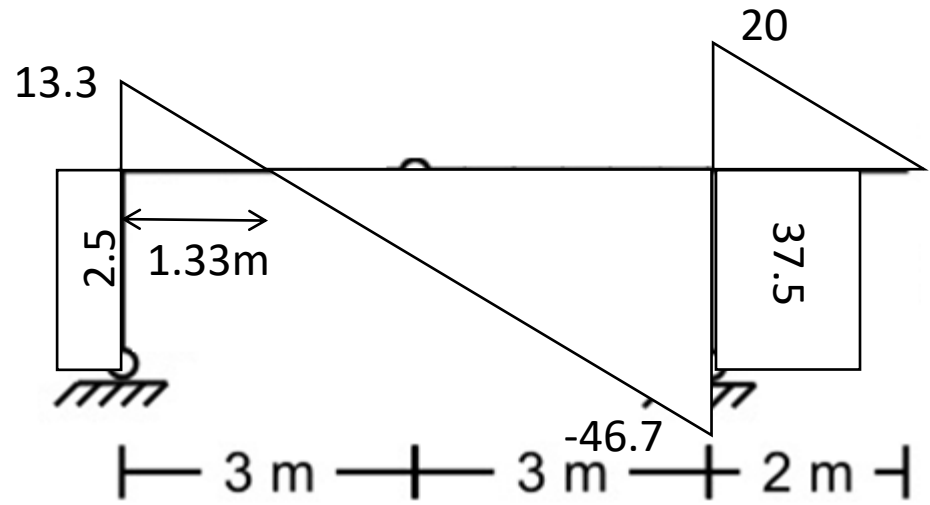
$$2 \text{m} \cdot 37.5 \text{ kN} = 75 \text{ kN}\cdot\text{m}$$

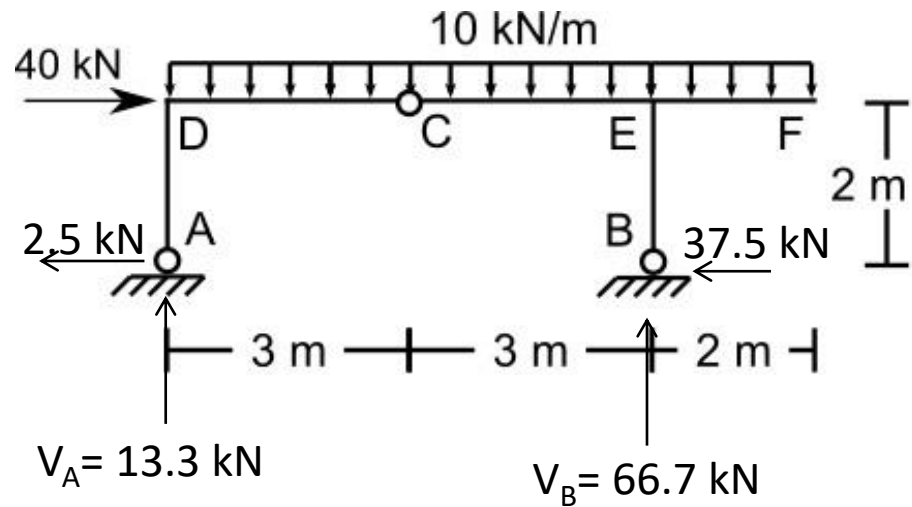


N(kN)

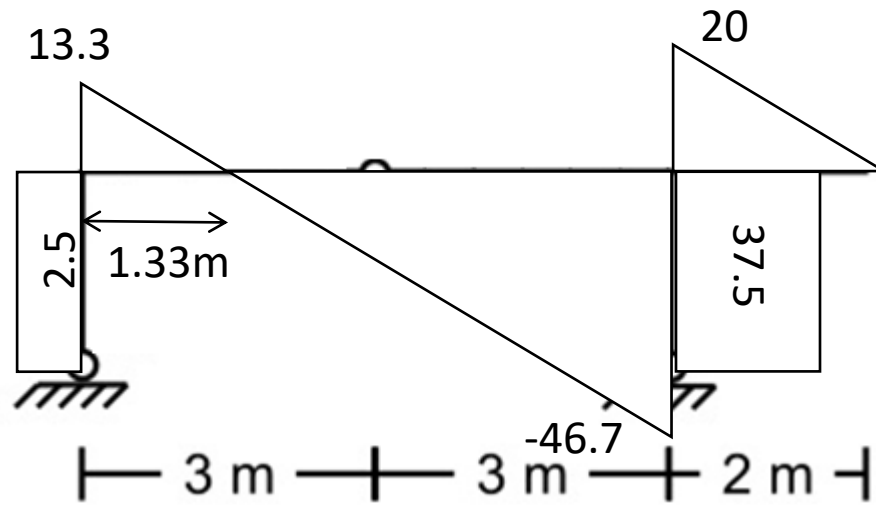


V(kN)

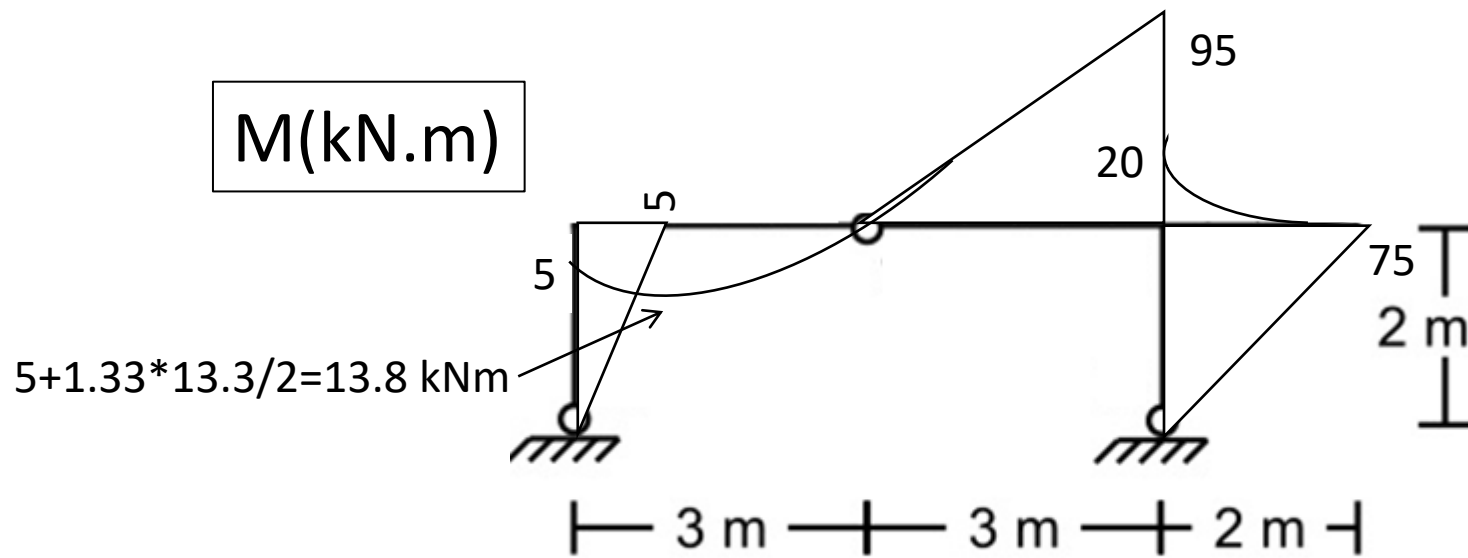




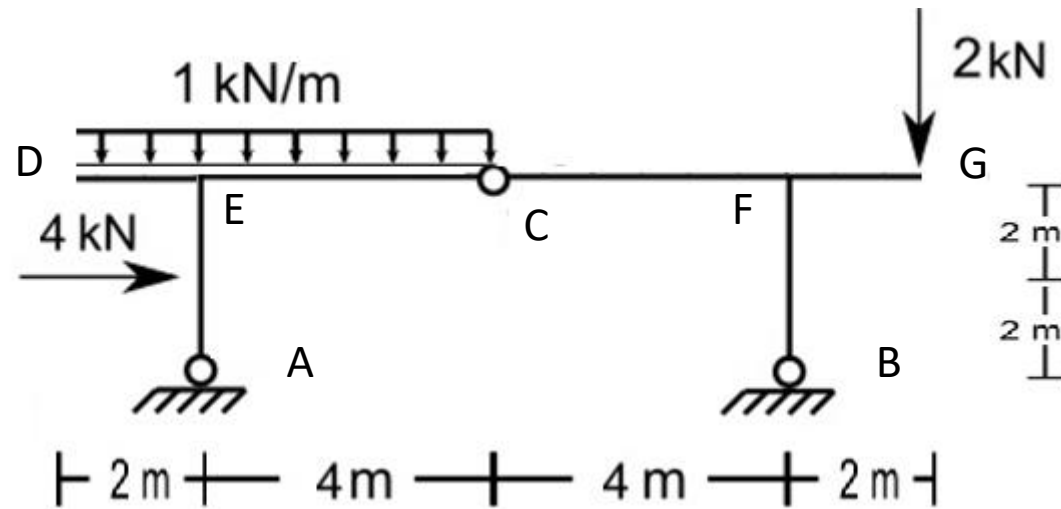
V(kN)



M(kN.m)



# Ejemplo



$$\text{Suma}(FV)=0$$

$$V_A+V_B=2+6$$

$$\text{Suma}(FH)=0$$

$$H_A+H_B=4$$

$$V_A=3.75 \text{ kN}$$

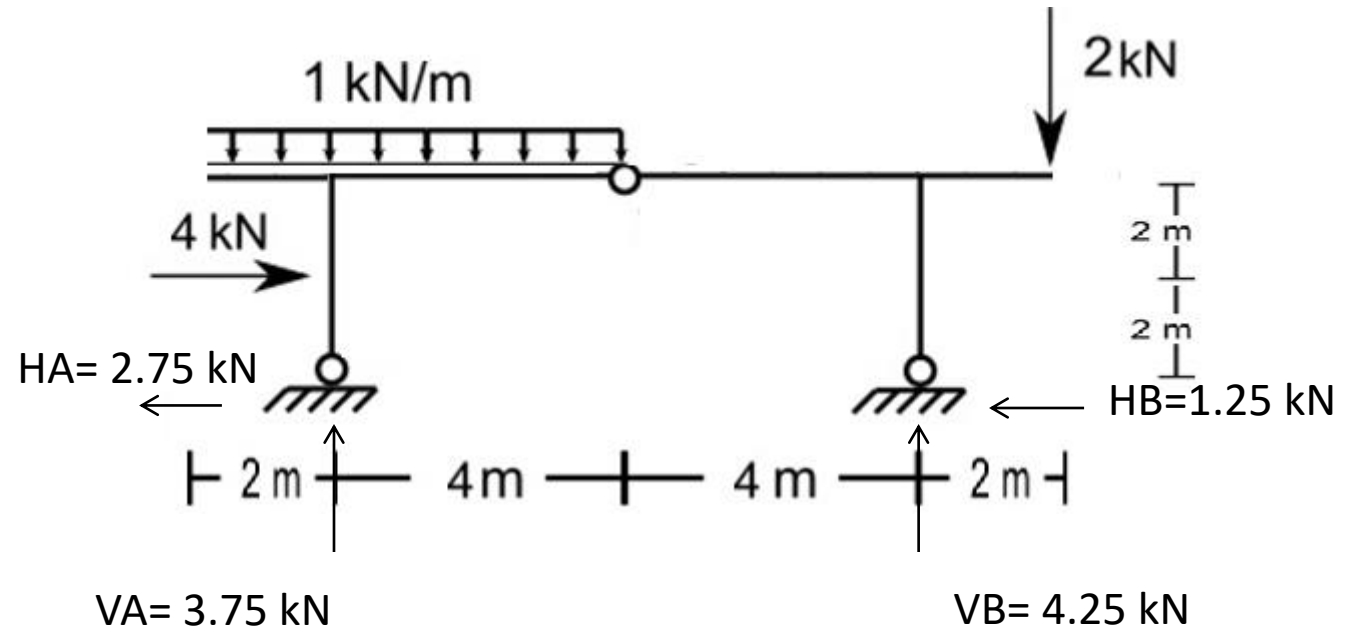
$$\text{Suma}(MA)=0$$

$$4 \cdot 2 + 4 \cdot 2 - 2 \cdot 1 + 2 \cdot 10 - 8 \cdot V_B = 0 \rightarrow V_B = 4.25 \text{ kN}$$

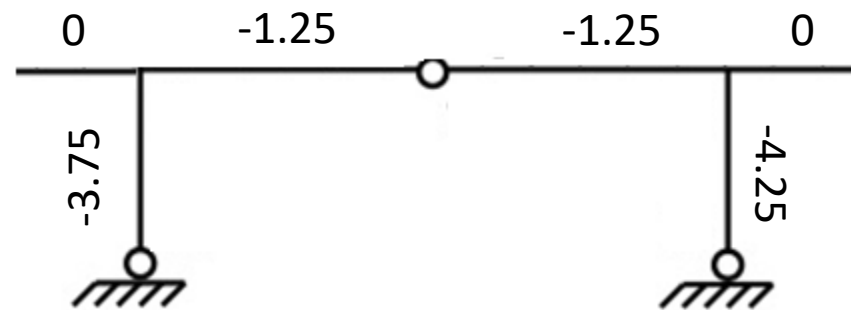
$$\text{Suma}(MC_{\text{derecha}})=0$$

$$-V_B \cdot 8 + H_B \cdot 4 + 2 \cdot 6 = 0 \rightarrow H_B = 1.25 \text{ kN}$$

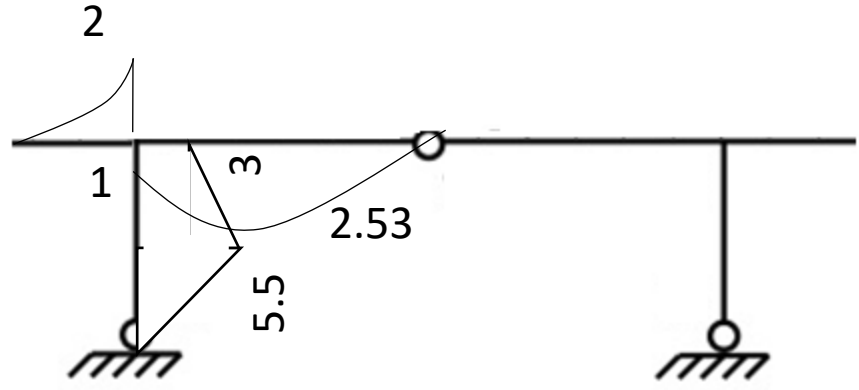
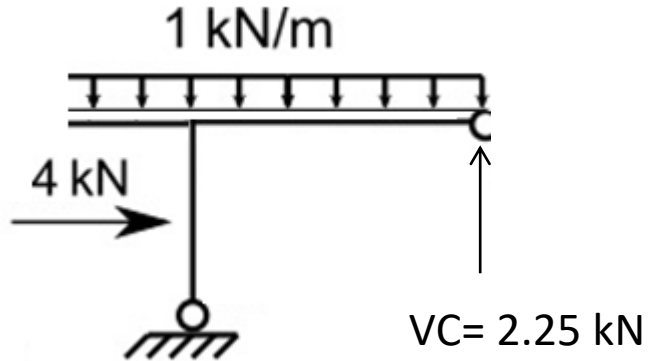
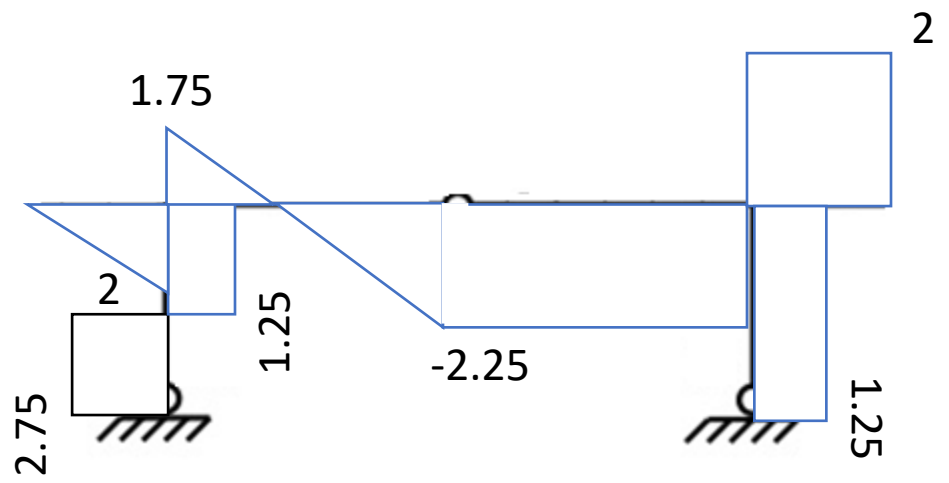
$$H_A = 2.75 \text{ kN}$$



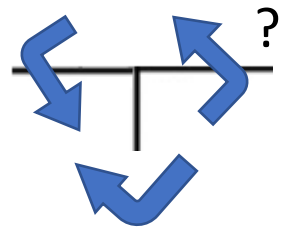
**N(kN)**



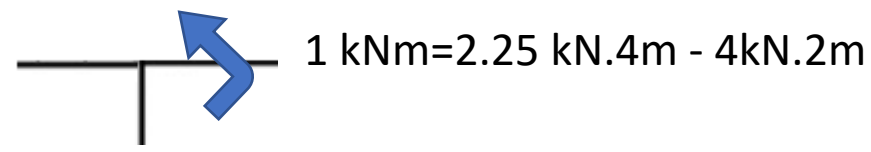
V(kN)



$2 \text{ kNm} = 2 \cdot 1$



$3 \text{ kNm} = -2.75 \text{ kN} \cdot 4 \text{ m} + 4 \text{ kN} \cdot 2 \text{ m}$



M(kN.m)

