Pórticos

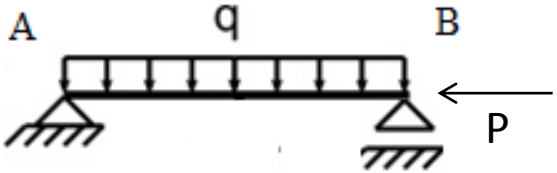
- Introducción
- Tensiones normales compuestas

Gere, 5ª Ed. (2002): 5.12

Ortiz Berrocal, 3ª Ed. (2007): 6.5

Beer, 3ª Ed. (2004): 4.12

Flexión compuesta



Tensión normal por directa :

$$\sigma_N = \frac{N}{A}$$

Fórmula de tensión por flexión :

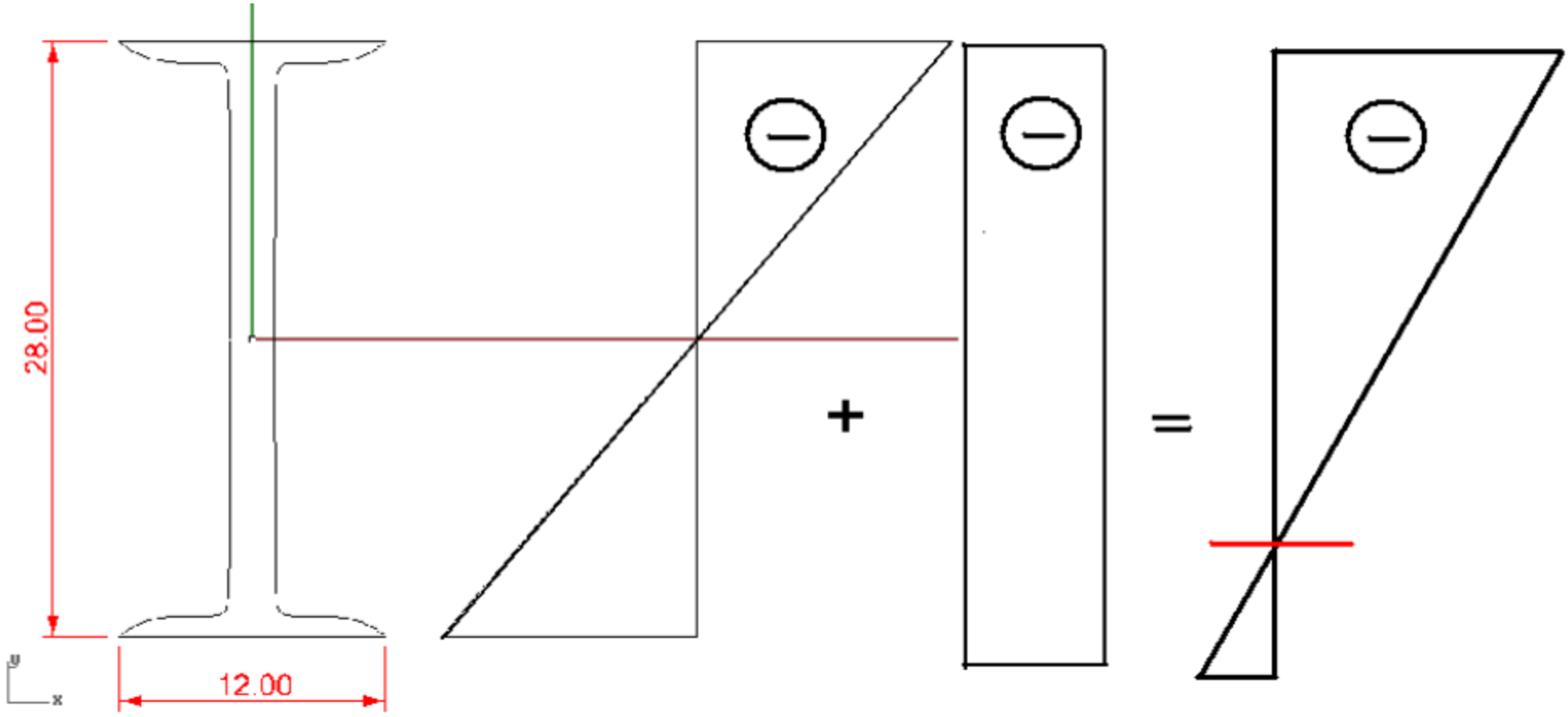
$$\sigma_M = -\frac{M.y}{I}$$

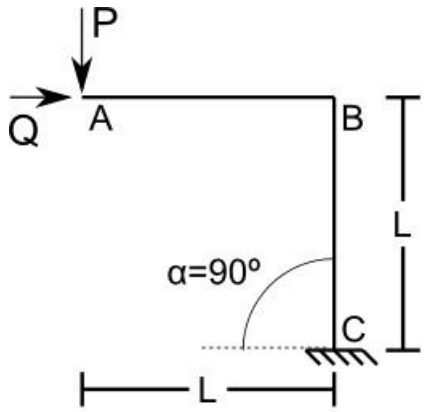
Tensiones normal en flexión compuesta:

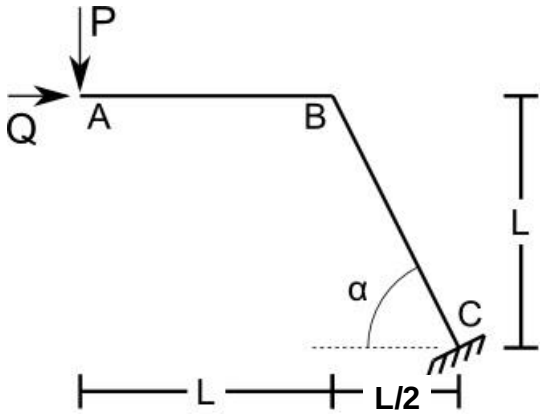
$$\sigma = \frac{N}{A} - \frac{M.y}{I}$$

Observación:
En flexión compuesta, el **eje neutro** ya **no pasa por el baricentro** de la sección.

Flexión Compuesta







Caso particular de barras en ángulo ortogonal.

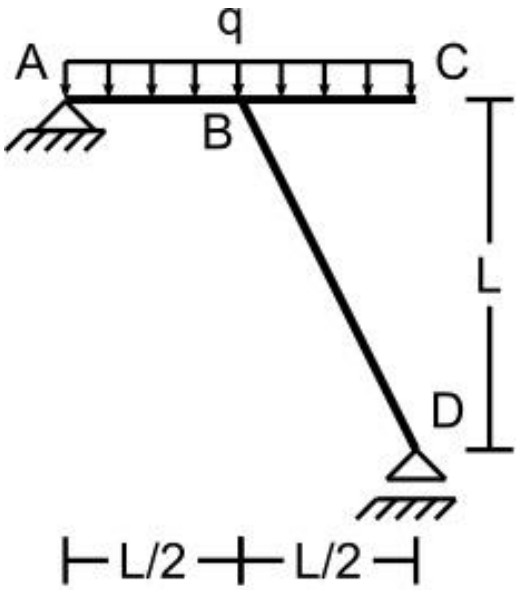
En B: $N^I=V^D$

$V^I=N^D$

$M^I=M^D$

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

Ejemplo



Sum(Fv)=0

$R_A+R_D=qL$

Sum(M_A)=0

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

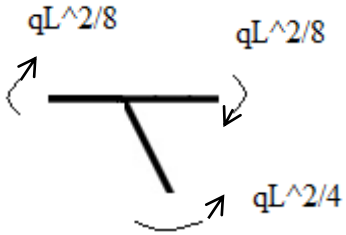
$R_D=qL/2$

$R_A=qL/2$

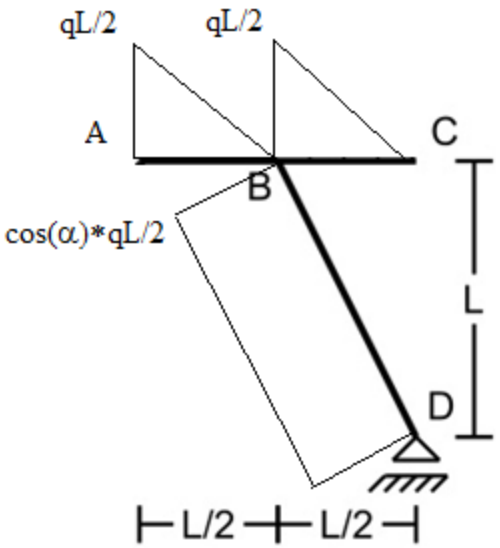
cos(α)=1/raíz(5)

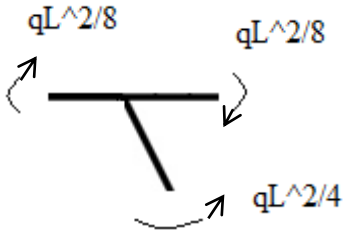
sen(α)= 2/raíz(5)

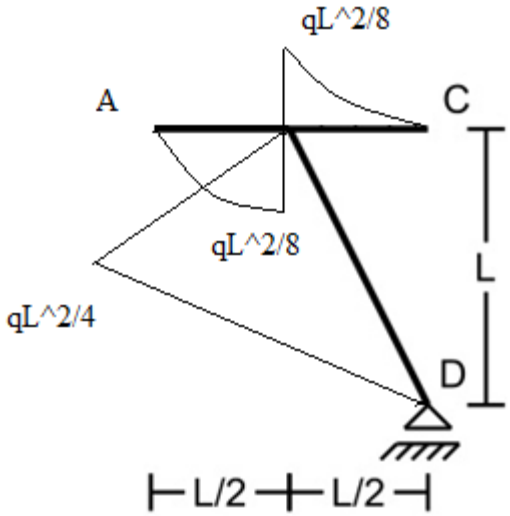
Fuerzas verticales en BD:



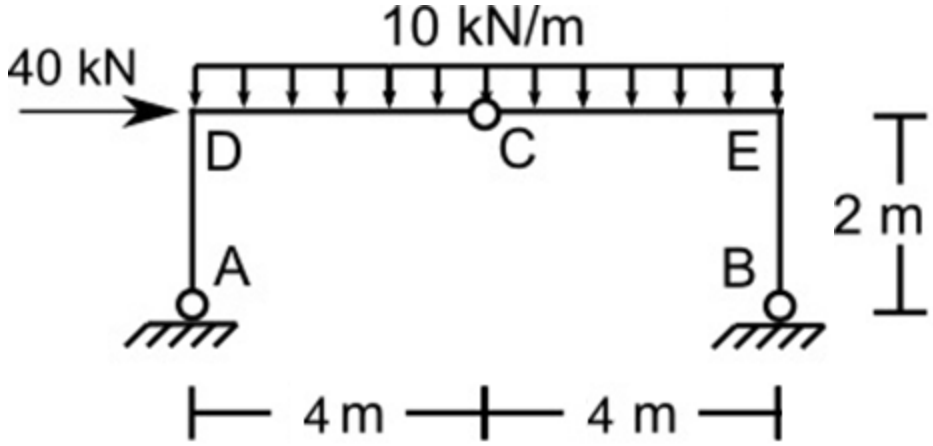
Diagramas


qL/2
qL/2
A
C
B
cos(α)*qL/2
L
D
L/2
L/2


qL^2/8
qL^2/8
qL^2/4


qL^2/8
A
C
qL^2/8
L
qL^2/4
D
L/2
L/2

Arco de tres articulaciones



Suma(M_A)=0

40.2+10.8.4=8.V_B→ V_B= 50 kN

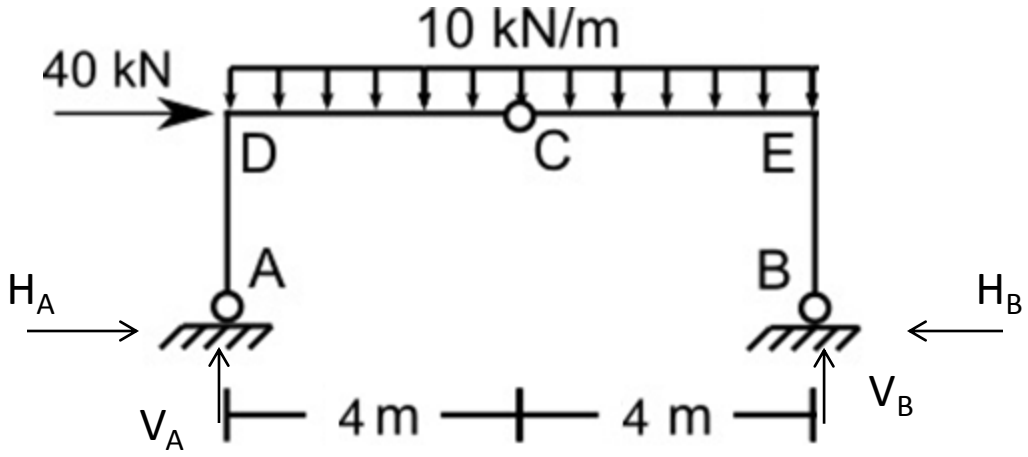
Suma(F_V)=V_A+50-10.8 =0

V_A=30 kN

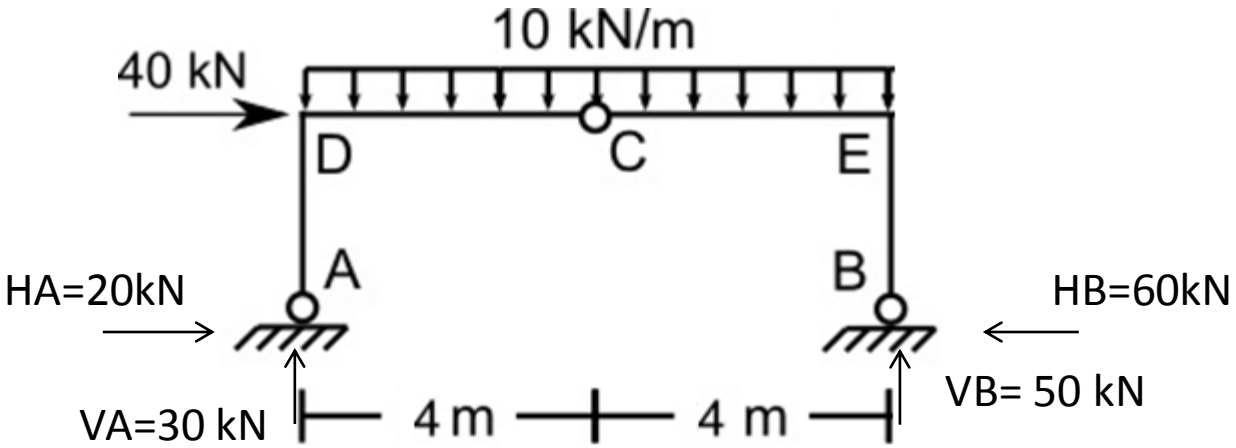
Suma (M_{derC}) = 4.10.2-50.4+H_B.2

H_B=60kN

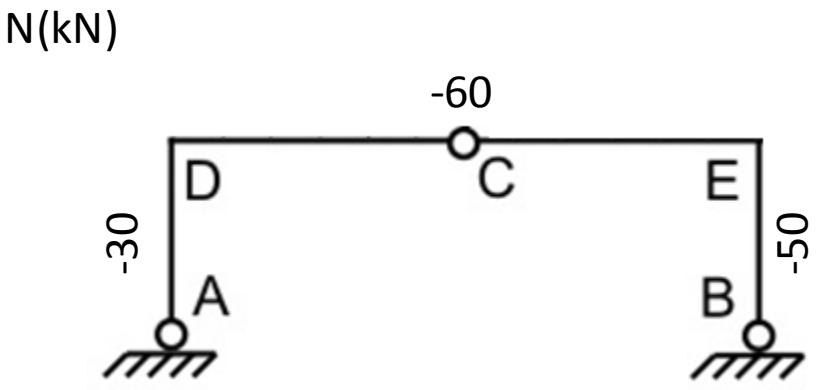
H_A=20kN

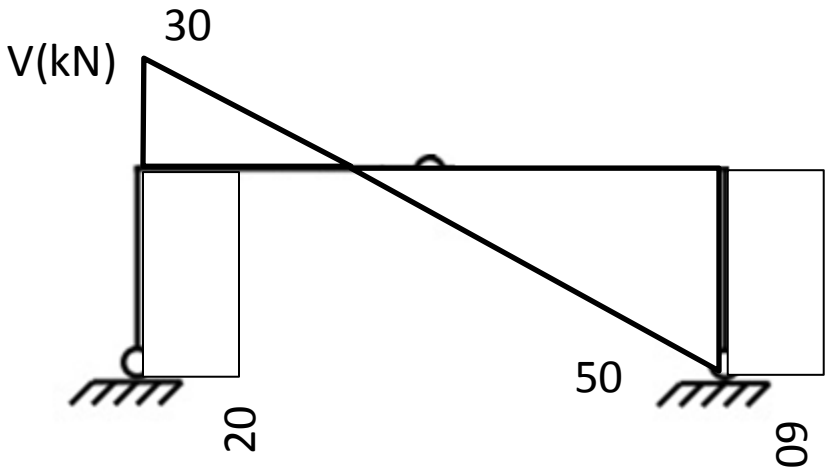


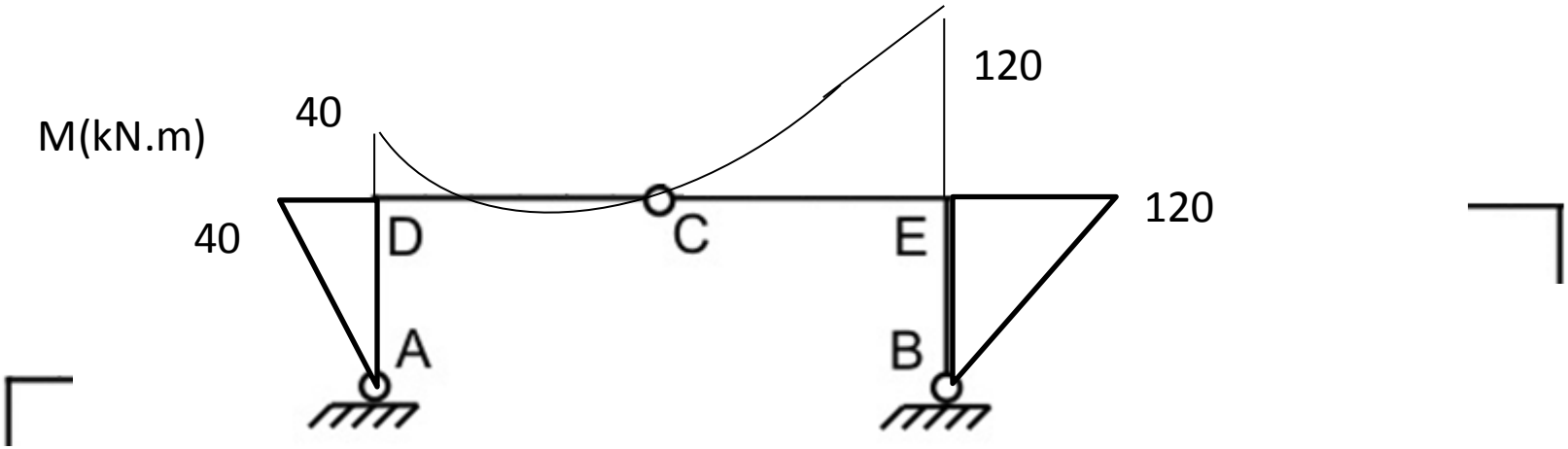
Reacciones



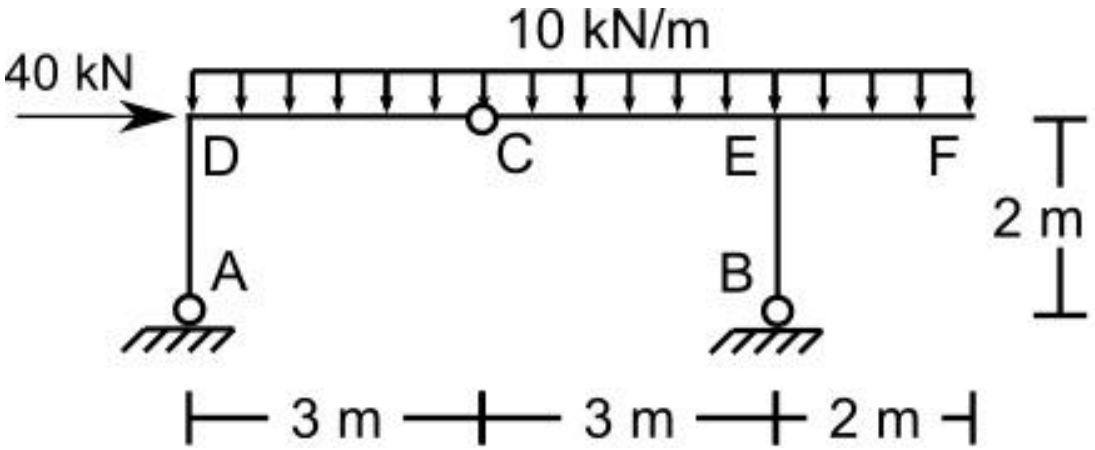
Diagramas







Arco de tres articulaciones



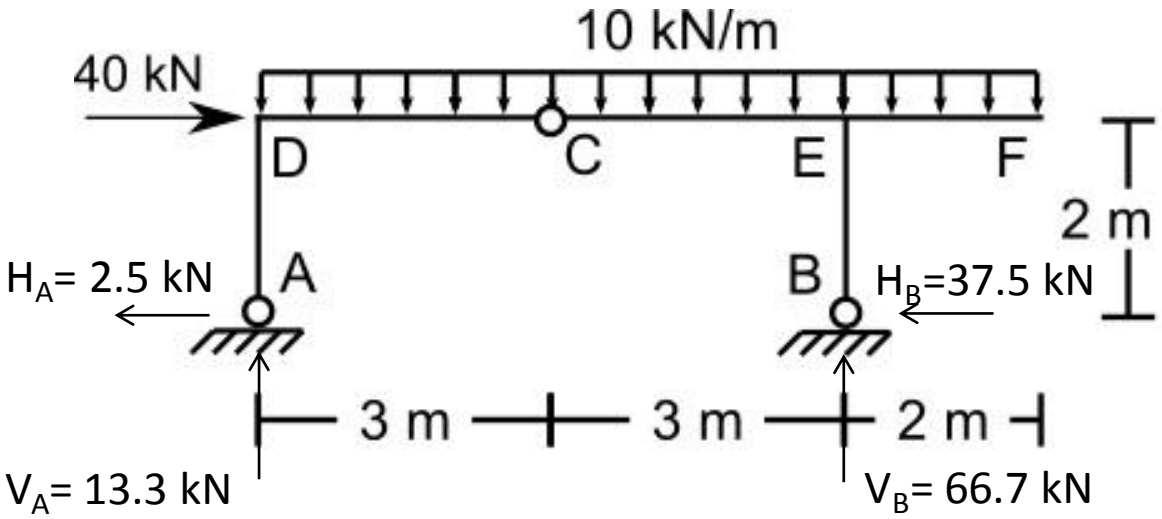
Suma(M_A)= 0 40.2+10.8. 4-V_B.6=0 → V_B= 66.7 kN

Suma(F_V)= 0 V_A+V_B=80 → V_A= 13.3 kN

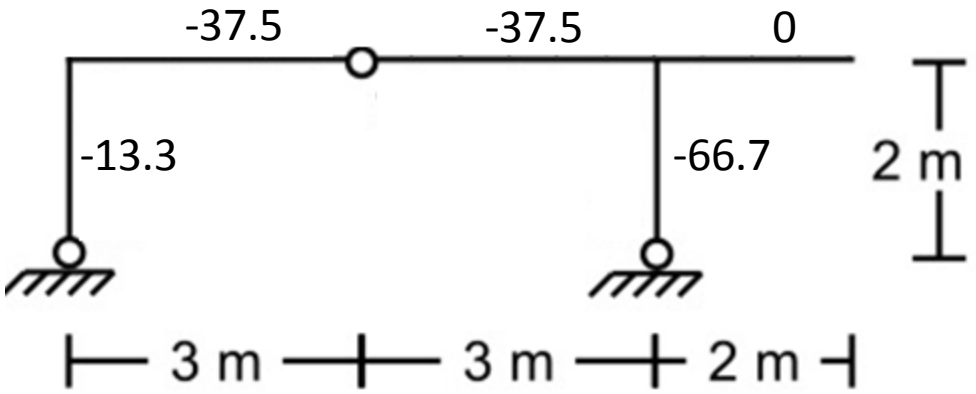
Suma(M_{derC})=0 10*5*2.5-66.7*3+H_B.2=0 → H_B=37.5 kN

H_A= 2.5 kN

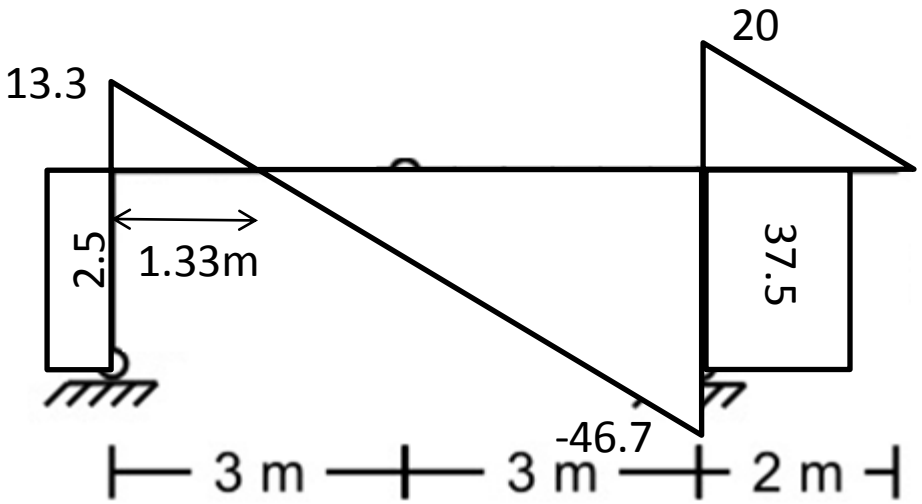
Reacciones

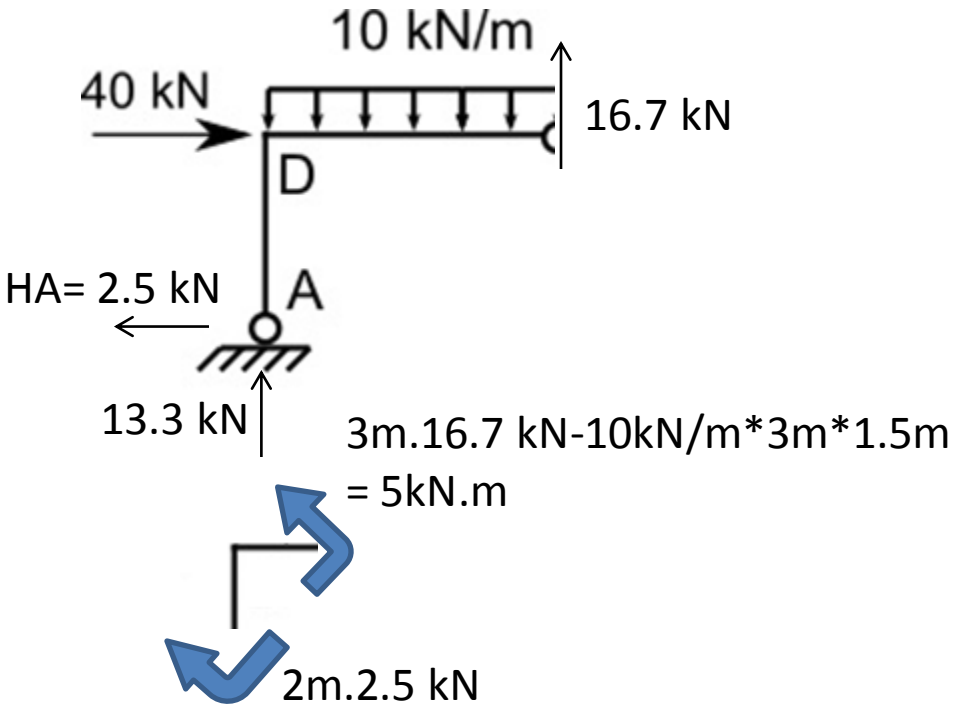

10 kN/m
40 kN
D
C
E
F
2 m
H_A= 2.5 kN
A
B
H_B=37.5 kN
3 m
3 m
2 m
V_A= 13.3 kN
V_B= 66.7 kN

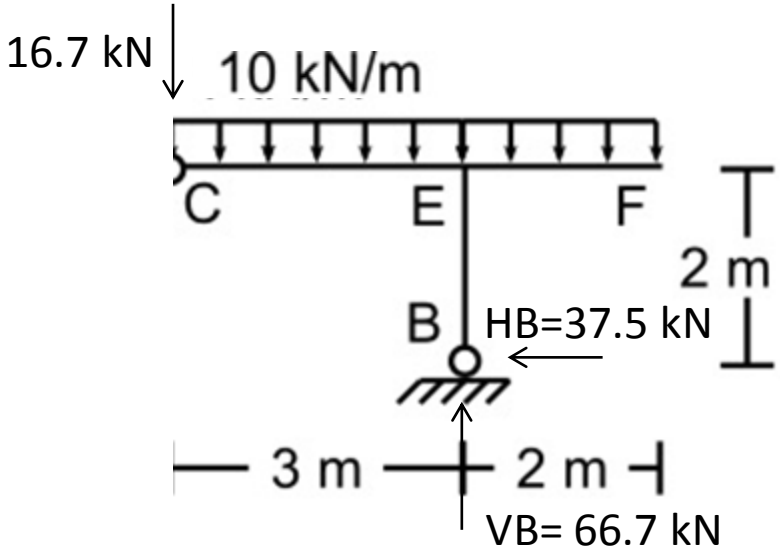
N(kN)

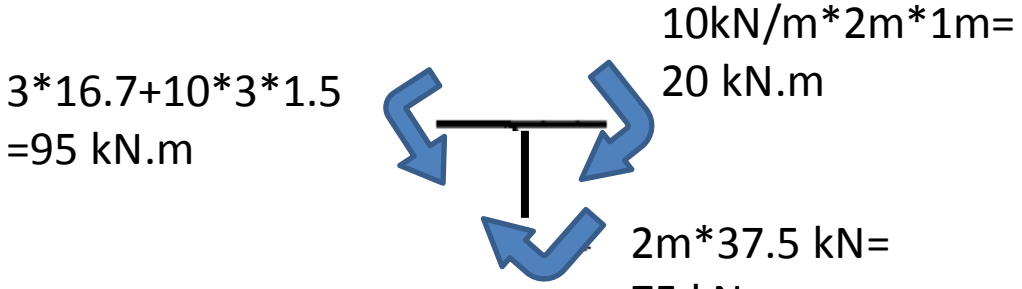


V(kN)

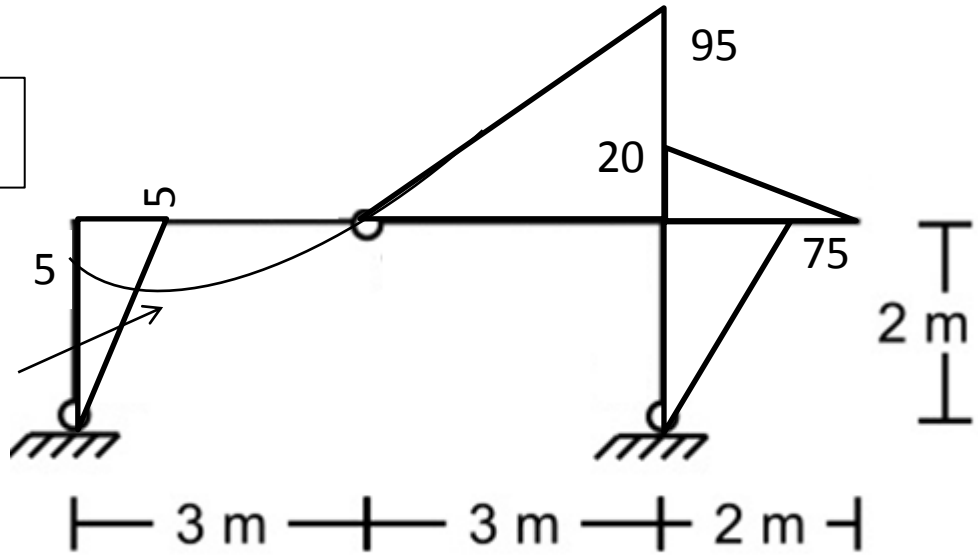



10 kN/m
40 kN
16.7 kN
D
HA= 2.5 kN
A
13.3 kN
3m.16.7 kN-10kN/m*3m*1.5m
= 5kN.m
2m.2.5 kN
= 5kN.m


16.7 kN
10 kN/m
C
E
F
2 m
B
HB=37.5 kN
3 m
2 m
VB= 66.7 kN

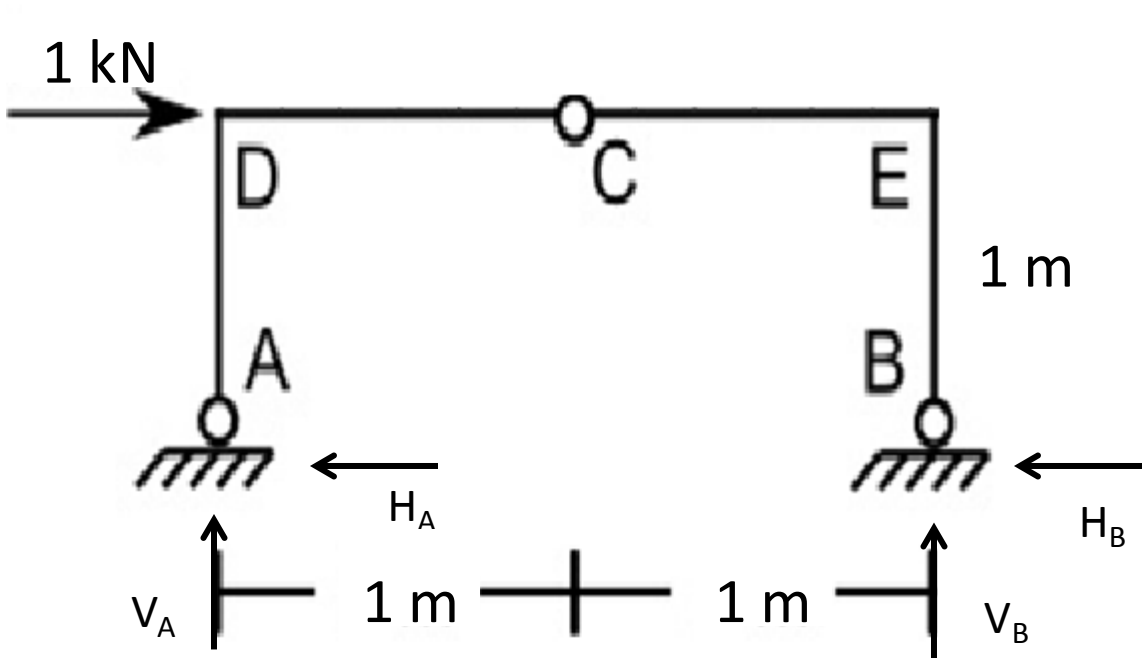

3*16.7+10*3*1.5
=95 kN.m
10kN/m*2m*1m=
20 kN.m
2m*37.5 kN=
75 kN.m

M(kN.m)



5+1.33*13.3/2=13.8 kNm

Ejemplo



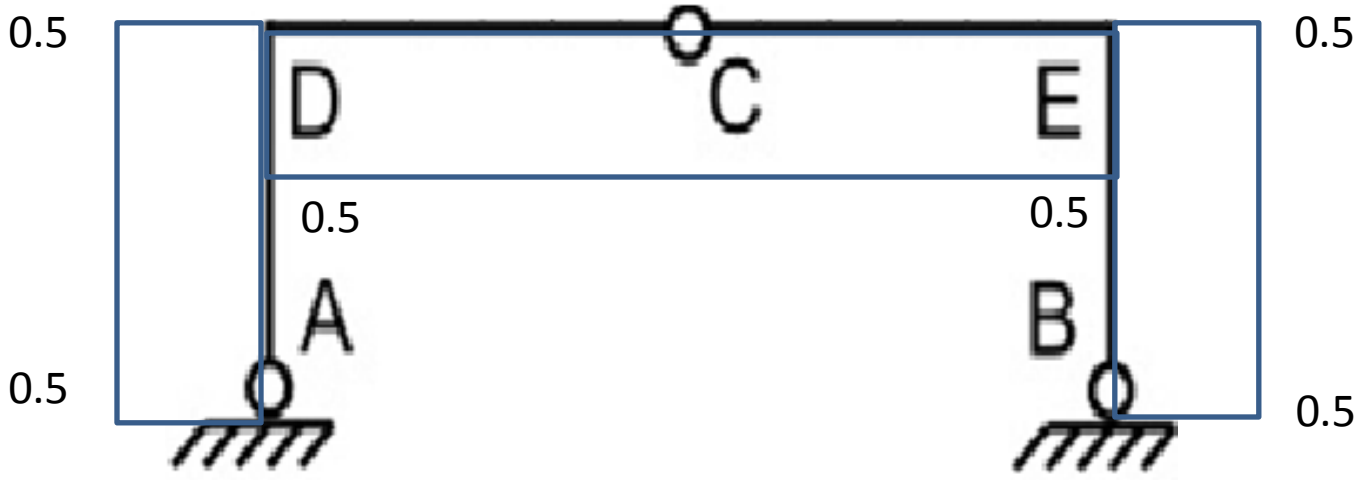
$V_A+V_B=0$

$H_A+H_B= 1$ kN

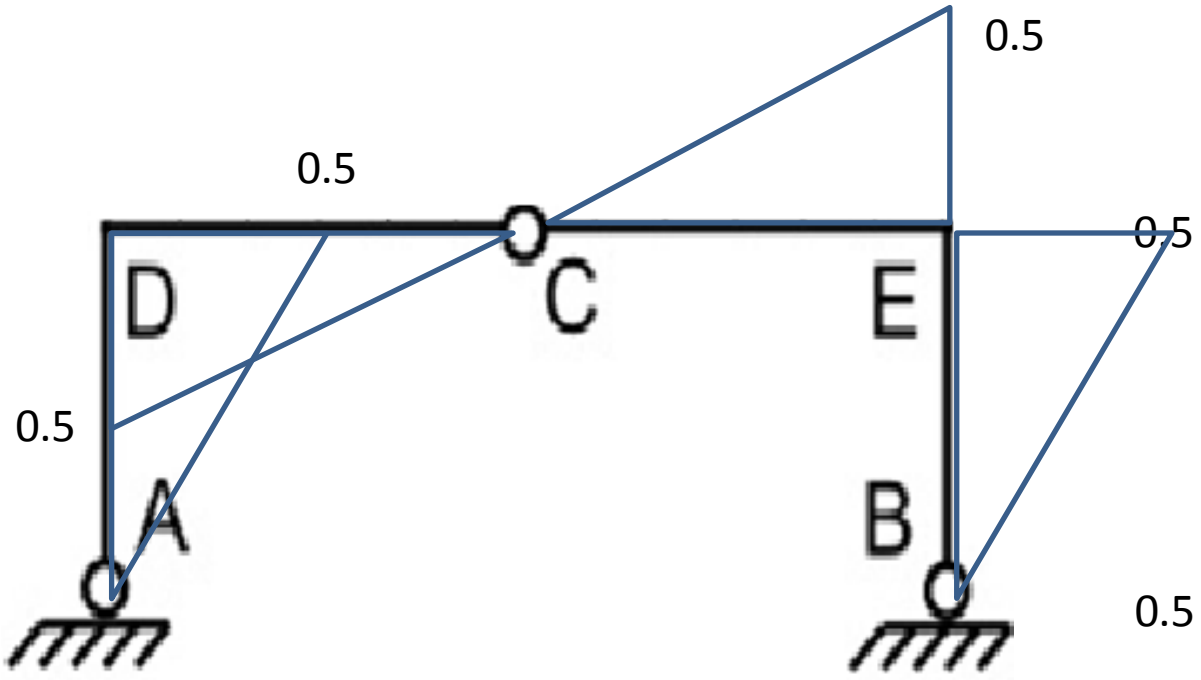
$Sum(M_A)=0$

$Sum(M_{izqC})=0$

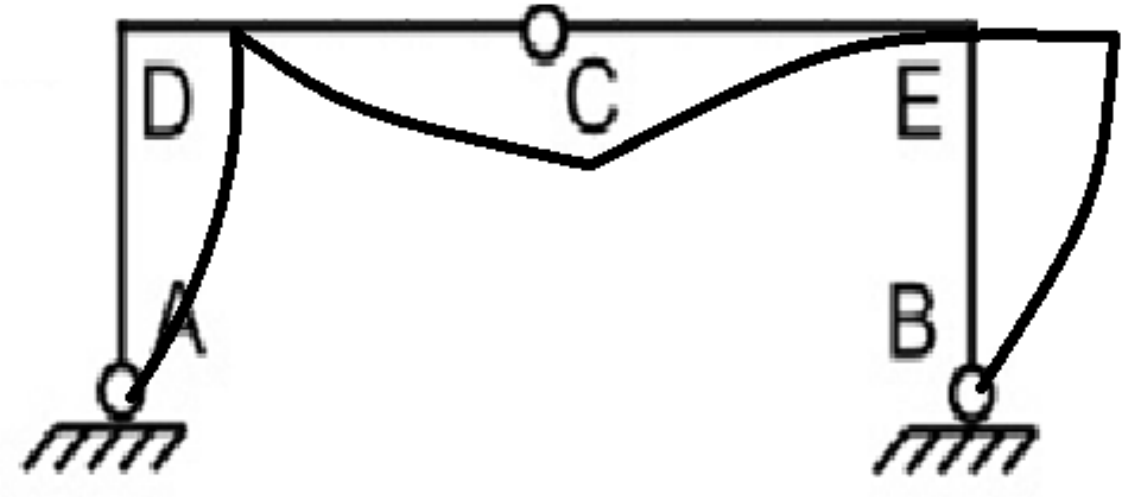
V(kN)



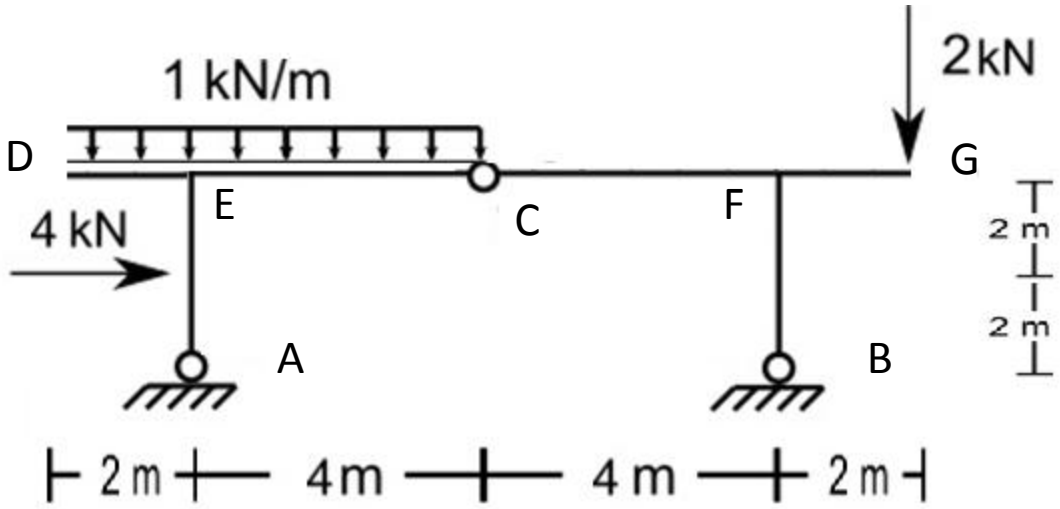
M(kN.m)



Ejemplo



Ejemplo



Suma(FV)=0
VA+VB=2+6

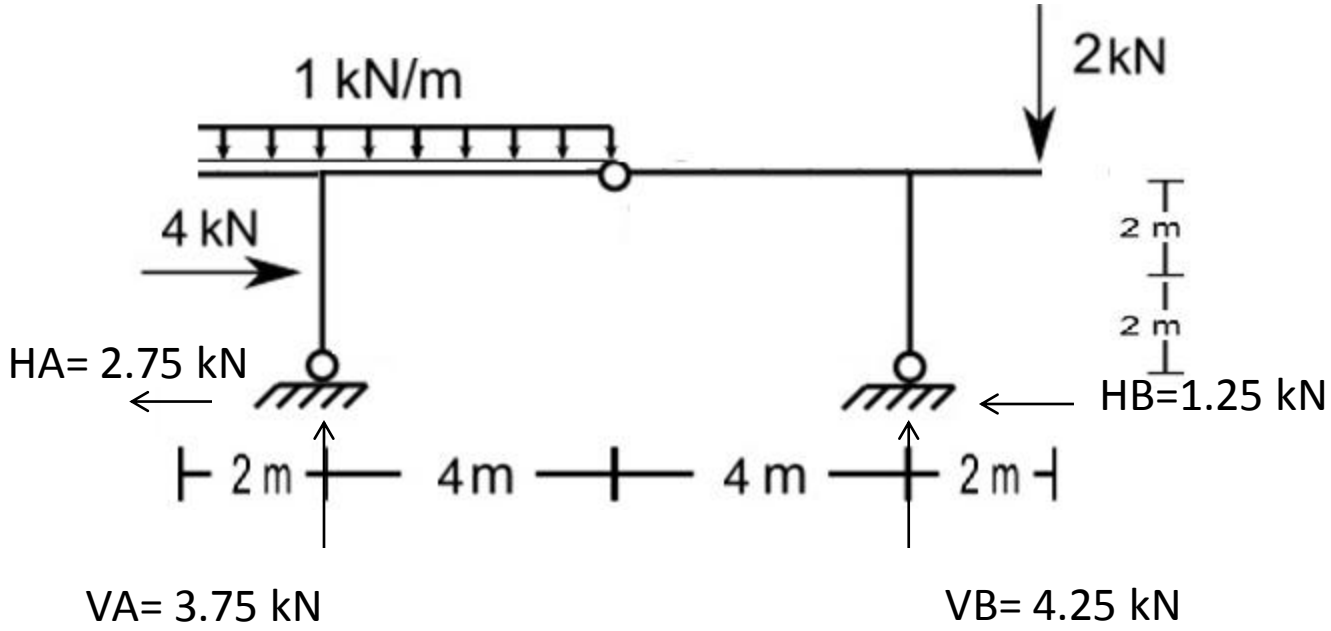
Suma(FH)=0
HA+HB=4

VA=3.75 kN

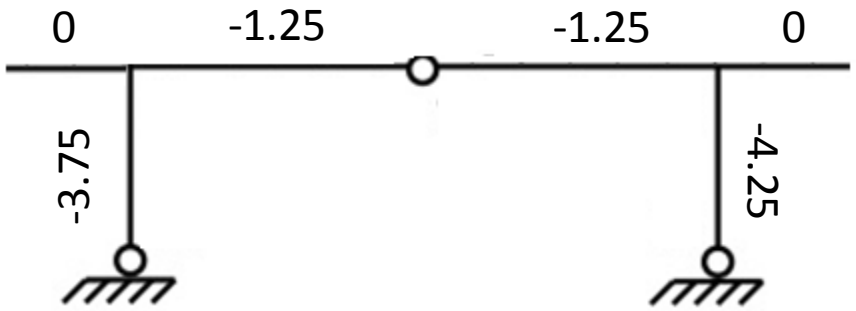
Suma(MA)=0
4*2+4*2-2*1+2*10-8*VB=0→VB=4.25 kN

Suma(MCderecha)=0
-VB*8+HB*4+2*6=0→HB=1.25 kN

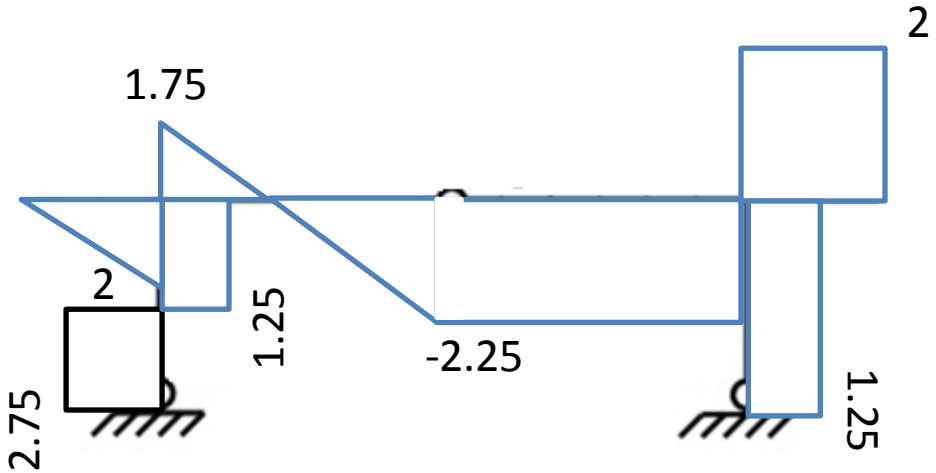
HA=2.75 kN

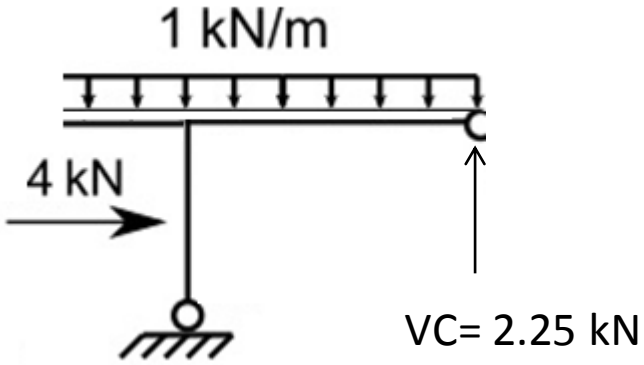

1 kN/m
2kN
4 kN
2 m
2 m
HA= 2.75 kN
HB=1.25 kN
2 m
4m
4 m
2 m
VA= 3.75 kN
VB= 4.25 kN

N(kN)

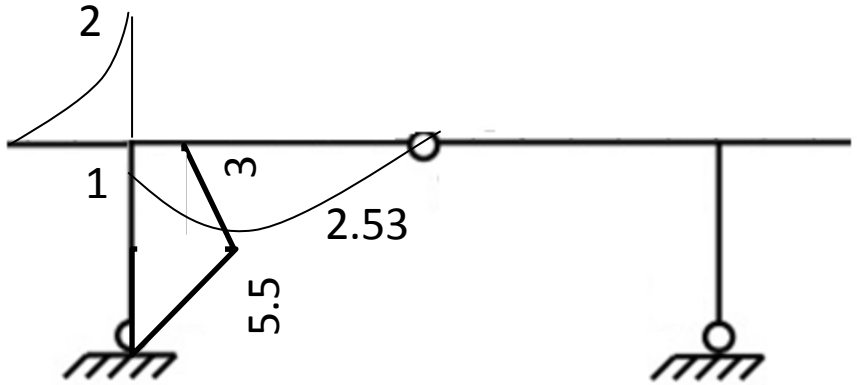

0
-1.25
-1.25
0
-3.75
-4.25

V(kN)

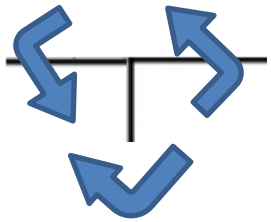




VC= 2.25 kN



2 kNm=2*1



1 kNm=2.25 kN.4m - 4kN.2m

3 kNm=-2.75kN.4m + 4kN.2m

M(kN.m)