

$$q = 4 \text{ kN/m}; Q = 15 \text{ kN}$$

$$a = 3,5 \text{ m}; b = 3 \text{ m}$$

Réactions d'appui

$$\sum F_x = 0 : A_x = 0$$

$$\sum F_y = 0 : A_y - Q + C_y - q \cdot b = 0 \Rightarrow A_y = Q + q \cdot b - C_y$$

$$\sum M_A = 0 : -Q \cdot a + C_y \cdot 2a - q \cdot b \cdot \left(2a + \frac{b}{2}\right) = 0 \Rightarrow C_y = \frac{Q}{2} + q \cdot b \cdot \frac{(2a + \frac{b}{2})}{2a} = \frac{Q}{2} + q \cdot b \cdot \left(1 + \frac{b}{4a}\right)$$

$$= 22,1 \text{ kN}$$

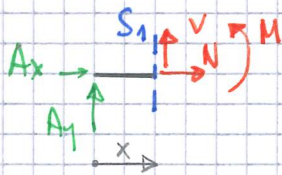
$$A_y = Q + q \cdot b - \frac{Q}{2} - q \cdot b \cdot \left(1 + \frac{b}{4a}\right) = \frac{Q}{2} - q \cdot \frac{b^2}{4a}$$

$$= 4,9 \text{ kN}$$

Diagrammes des efforts intérieurs

Trois zones à considérer : AB, BC et CD $\Rightarrow$ 3 coupes (S_1, S_2, S_3)

Partie AB:



$$\sum F_x = 0 : A_x + N(x) = 0 \Rightarrow N(x) = 0$$

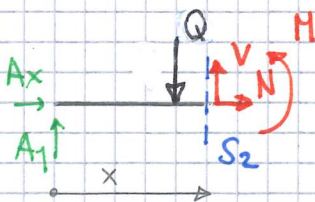
$$\sum F_y = 0 : A_y + V(x) = 0 \Rightarrow V(x) = -A_y = -4,9 \text{ kN}$$

$$\sum M = 0 : -A_y \cdot x + M(x) = 0 \Rightarrow M(x) = A_y \cdot x$$

$$\text{en } x = 0 : M = 0$$

$$\text{en } x = a : M = A_y \cdot a = 17,15 \text{ kNm}$$

Partie BC:



$$\sum F_x = 0 : A_x + N(x) = 0 \Rightarrow N(x) = 0$$

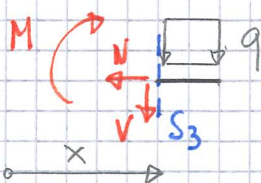
$$\sum F_y = 0 : A_y - Q + V(x) = 0 \Rightarrow V(x) = Q - A_y = 10,1 \text{ kN}$$

$$\sum M = 0 : -A_y \cdot x + Q \cdot (x - a) + M(x) = 0 \Rightarrow M(x) = A_y \cdot x - Q \cdot (x - a)$$

$$\text{en } x = a : M = A_y \cdot a = 17,15 \text{ kNm}$$

$$\text{en } x = 2a : M = A_y \cdot 2a - Q \cdot a = -18,2 \text{ kNm}$$

Partie CD:



$$\sum F_x = 0 : N(x) = 0$$

$$\sum F_y = 0 : -V(x) - q(2a + b - x) = 0 \Rightarrow V(x) = -q(2a + b - x)$$

$$\text{en } x = 2a : V = -q \cdot b = -12 \text{ kN}$$

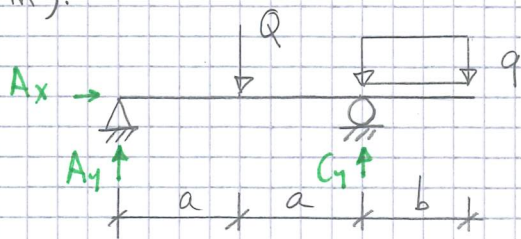
$$\text{en } x = 2a + b : V = 0$$

$$\sum M = 0 : -M(x) - q \cdot \frac{(2a + b - x)^2}{2} = 0 \Rightarrow M(x) = -q \cdot \frac{(2a + b - x)^2}{2}$$

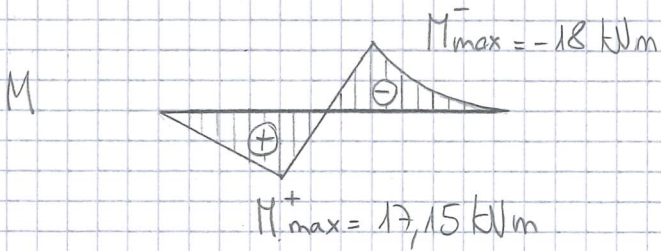
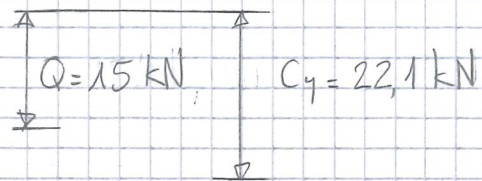
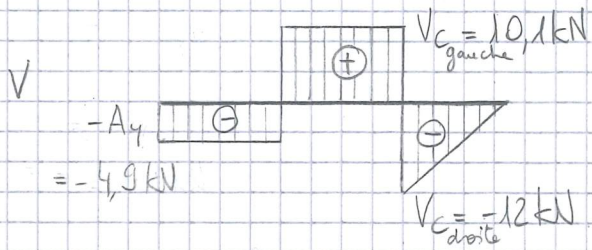
$$\text{en } x = 2a : M = -q \cdot \frac{b^2}{2} = -18 \text{ kNm}$$

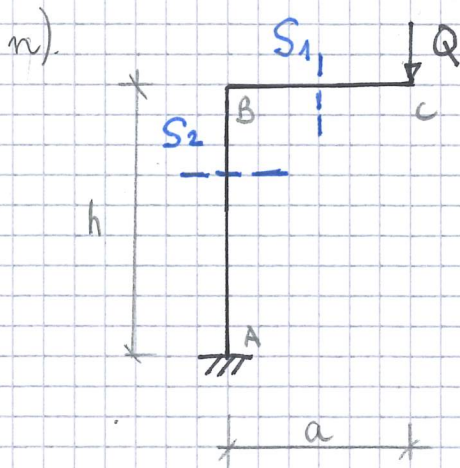
$$\text{en } x = 2a + b : M = 0$$

suite m).



N _____ 0





$$Q = 10 \text{ kN}$$

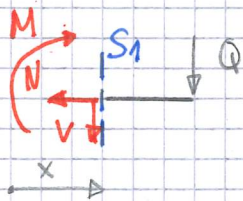
$$a = 3 \text{ m}, h = 4 \text{ m}$$

Poutre encastrée en A

Deux zones d'étude $\rightarrow$ 2 coupes (S_1, S_2)

En travaillant sur la partie de droite (S_1) et du haut (S_2), il n'est pas nécessaire de déterminer les réactions d'appui A_x, A_y et M_A en A.

Partie BC



$$\sum F_x = 0 : -N(x) = 0$$

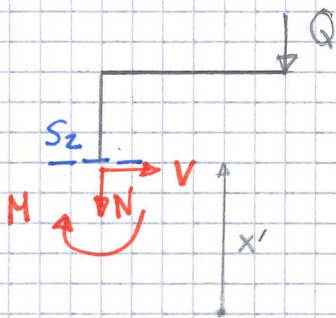
$$\sum F_y = 0 : -V(x) - Q = 0 \Rightarrow V(x) = -Q = -10 \text{ kN}$$

$$\sum M = 0 : -M(x) - Q(a-x) = 0 \Rightarrow M(x) = -Q(a-x)$$

$$\text{en } x=0 : M = -Q \cdot a = -10 \cdot 3 = -30 \text{ kNm}$$

$$\text{en } x=a : M = 0$$

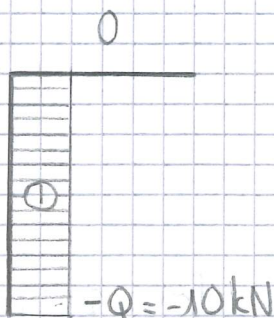
Partie AB



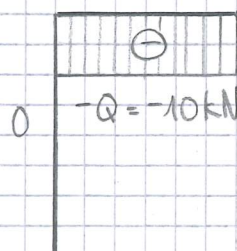
$$\sum F_x = 0 : V(x') = 0$$

$$\sum F_y = 0 : -N(x') - Q = 0 \Rightarrow N(x') = -Q = -10 \text{ kN}$$

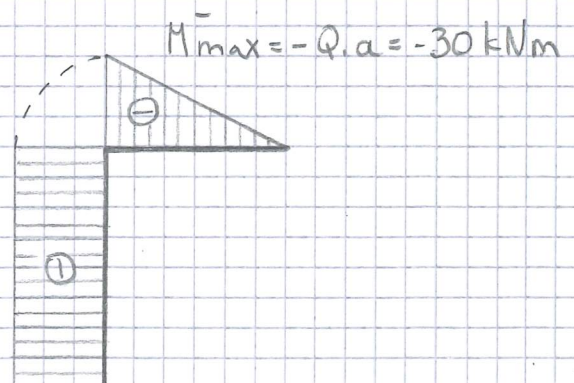
$$\sum M = 0 : -M(x') - Q \cdot a = 0 \Rightarrow M(x') = -Q \cdot a = -10 \cdot 3 = -30 \text{ kNm}$$



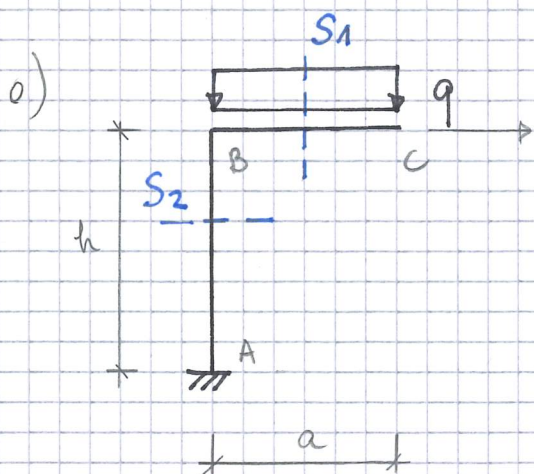
N



V



M



$$q = 2 \text{ kN/m}$$

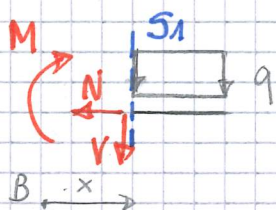
$$a = 3 \text{ m}; h = 4 \text{ m}$$

Poutre encastrée en A.

Deux zones d'étude $\rightarrow$ 2 coupes (S_1, S_2)

En travaillant sur la partie de droite (S_1) et du haut (S_2), il n'est pas nécessaire de déterminer les réactions d'appui A_x, A_y et M_A en A.

Partie BC



$$\sum F_x = 0 : -N(x) = 0$$

$$\sum F_y = 0 : -V(x) - q(a-x) = 0 \Rightarrow V(x) = -q(a-x)$$

$$\text{en } x=0 : V = -qa = -2 \cdot 3 = -6 \text{ kN}$$

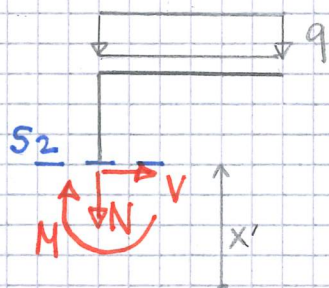
$$\text{en } x=a : V = 0$$

$$\sum M = 0 : -M(x) - q(a-x) \frac{(a-x)}{2} = 0 \Rightarrow M(x) = -q \frac{(a-x)^2}{2}$$

$$\text{en } x=0 : M = -q \frac{a^2}{2} = -2 \cdot \frac{3^2}{2} = -9 \text{ kNm}$$

$$\text{en } x=a : M = 0$$

Partie AB



$$\sum F_x = 0 : V(x') = 0$$

$$\sum F_y = 0 : -N(x') - q \cdot a = 0 \Rightarrow N(x') = -q \cdot a = -2 \cdot 3 = -6 \text{ kN}$$

$$\sum M = 0 : -M(x') - q \cdot a \cdot \frac{a}{2} = 0 \Rightarrow M(x') = -q \frac{a^2}{2} = -2 \cdot \frac{3^2}{2} = -9 \text{ kNm}$$

