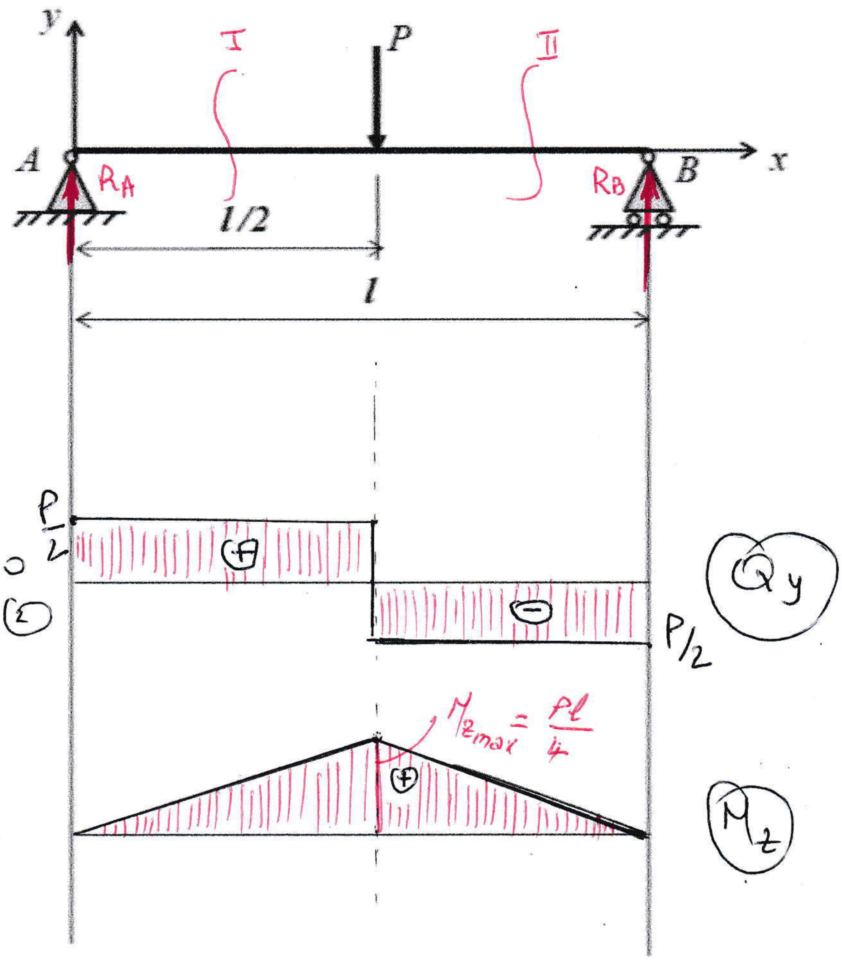
Exemple 1

Diagrammes Q_y et M_z



1/ calcul de réactions aux appuis R_A et R_B.

$$\sum F_y = 0 \rightarrow R_A + R_B - P = 0$$

$$R_A + R_B = P \quad \text{---} (1)$$

$$\sum M_A = 0 \rightarrow -P \cdot \frac{l}{2} + R_B \cdot l = 0 \quad (2)$$

$$(2) \Rightarrow R_B = \frac{P}{2}$$

$$(1) \Rightarrow R_A = \frac{P}{2}$$

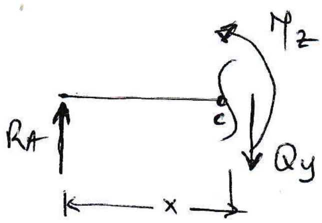
2°/ Equations de l'effort tranchant et du moment fléchissant

- Section I : $0 \leq x \leq \frac{l}{2}$

$\cdot \sum F_y = 0$

$\Rightarrow R_A - Q_y = 0$

$$Q_y = R_A = \frac{P}{2}$$



$$\cdot \sum M_c = 0 \rightarrow -R_A \cdot x + M_z = 0$$

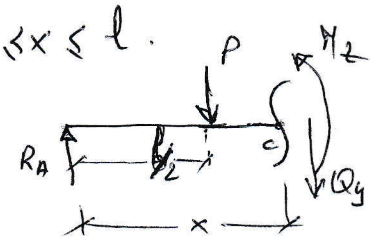
$$M_z = R_A \cdot x = \frac{P}{2} \cdot x$$

l'expression de M_z représente l'équ d'une droite, on a besoin de 2 pts.

$x = 0 \rightarrow M_z = 0$

$x = \frac{l}{2} \rightarrow M_z = \frac{Pl}{4}$

- Section II : $\frac{l}{2} \leq x \leq l$.



$\cdot R_A - P - Q_y = 0$

$$\Rightarrow Q_y = R_A - P = -\frac{P}{2}$$

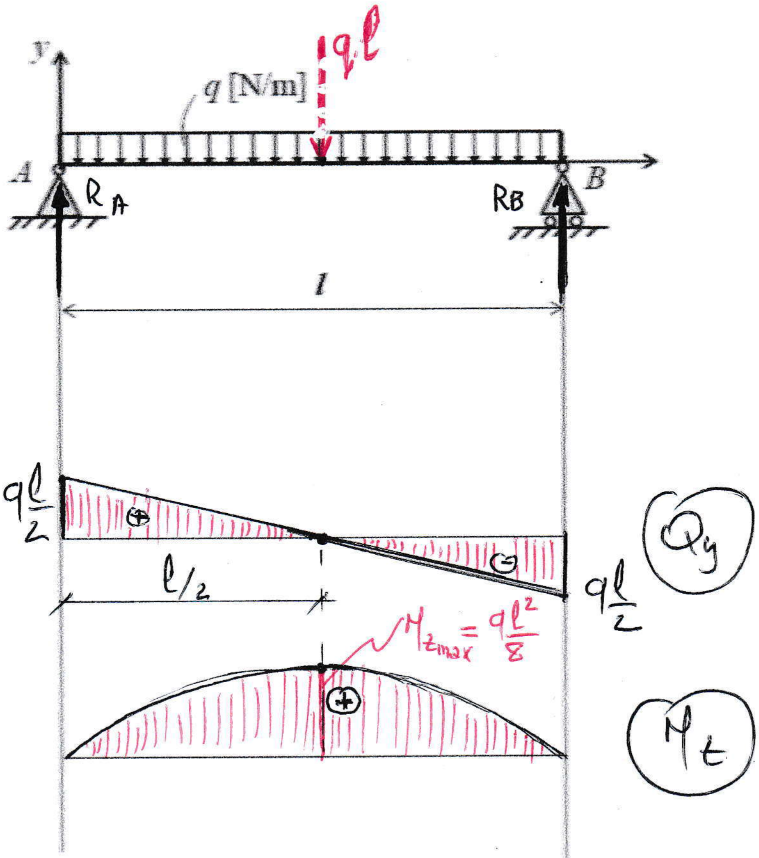
$$\cdot -R_A \cdot x + P \cdot \left(x - \frac{l}{2}\right) + M_z = 0 \Rightarrow$$

$$M_z = R_A \cdot x - P\left(x - \frac{l}{2}\right)$$

$x = \frac{l}{2} \Rightarrow M_z = \frac{Pl}{4}$

$x = l \Rightarrow M_z = 0$.

Exemple 2 :



1°/ Réaction aux appuis.

$\sum F_y = 0$

$R_A + R_B - ql = 0$ (1)

$\sum M_A = 0$

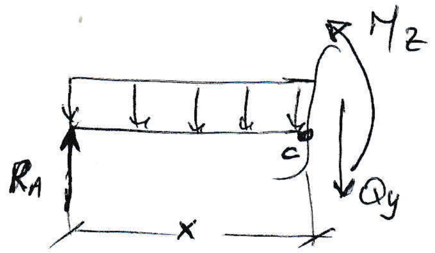
$-ql \cdot \frac{l}{2} + R_B \cdot l = 0$ (2)

(2) → $R_B = q\frac{l}{2}$

(1) → $R_A = q\frac{l}{2}$

2°/ Eqns de Q_y et M_z

• une seule section $0 \leq x \leq l$



• $\sum F_y = 0 \to R_A - q \cdot x - Q_y = 0$

$\to Q_y = R_A - q \cdot x$

$$\begin{cases} x = 0 \to Q_y = R_A = q\frac{l}{2} \\ x = l \to Q_y = -q\frac{l}{2} \end{cases}$$

• $\sum M_c = 0 \to$

$-R_A \cdot x + q \cdot x \cdot \frac{x}{2} + M_z = 0$

$\Rightarrow M_z = R_A \cdot x - q\frac{x^2}{2}$

$x = 0 \to M_z = 0$

$x = l \to M_z = 0.$

$\frac{dM_z}{dx} = Q_y = R_A - q \cdot x$

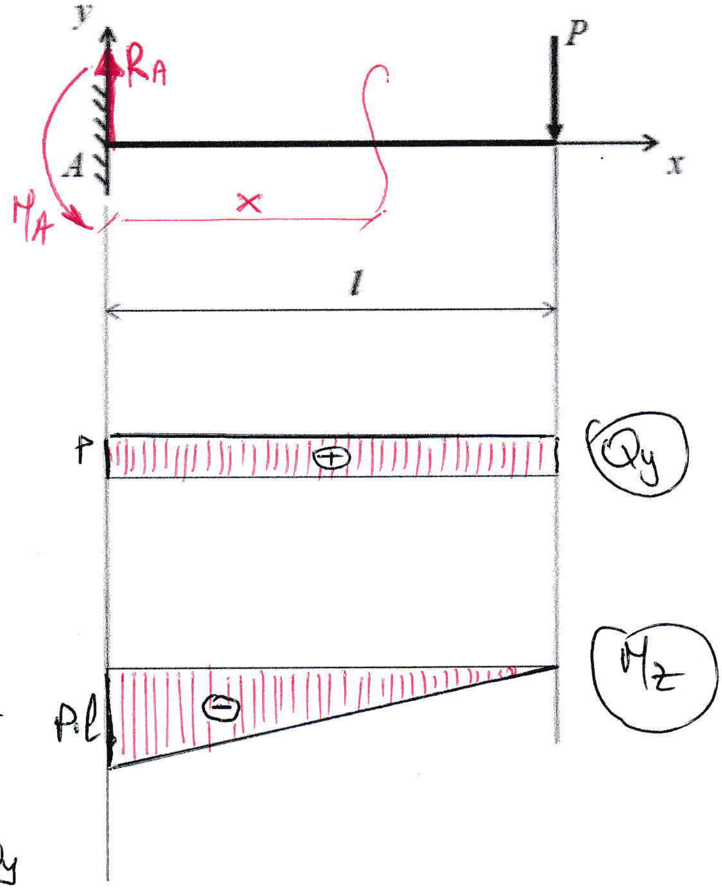
$Q_y = 0$ pour $x = \frac{l}{2}$

$\max(M_z) = M_z\left(x = \frac{l}{2}\right) = q\frac{l^2}{8}$

L'éqn de M_z est quadratique (parabole), elle admet comme tangente horizontale à $x = \frac{l}{2}$

Exemple 3 :

1°) Réactions à l'appui A



$\sum F_y = 0 \longrightarrow$

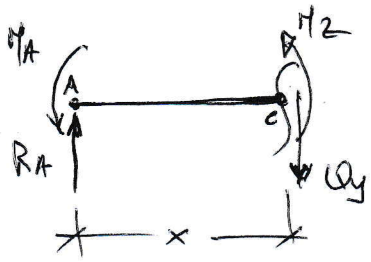
$R_A - P = 0$

$\Rightarrow R_A = P$

$\sum M_A = 0 \longrightarrow -P.l + M_A = 0$

$\Rightarrow M_A = P.l.$

2°) Eq^{ns} de Q_y et M_z



$\sum F_y = 0 \longrightarrow R_A - Q_y = 0$

$\Rightarrow R_A = Q_y = P \quad \forall x \in [0, l]$

$\sum M_c = 0 \longrightarrow -R_A \cdot x + M_A + M_z = 0$

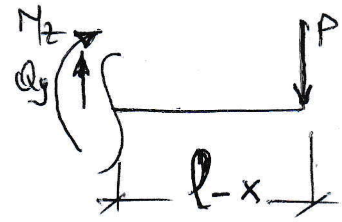
$M_z = -R_A \cdot x + M_A.$

$x = 0 \longrightarrow M_z = -M_A = -P.l.$

$x = l \longrightarrow M_z = 0.$

Rque

On pouvait bien prendre la partie droite



$Q_y = P$

$M_z = -P(l - x).$