

Risoluzione di strutture isostatiche

Risolvere una struttura isostatica significa calcolare le reazioni vincolari mediante la scrittura e la risoluzione delle equazioni cardinali della statica (o equazioni di equilibrio):

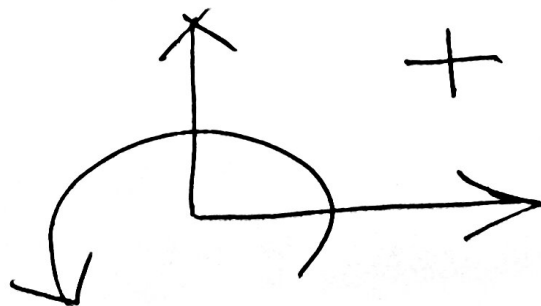
$$\sum F_h = 0 \quad \text{equilibrio traslazione orizzontale}$$

$$\sum F_v = 0 \quad \text{eq. traslazione verticale}$$

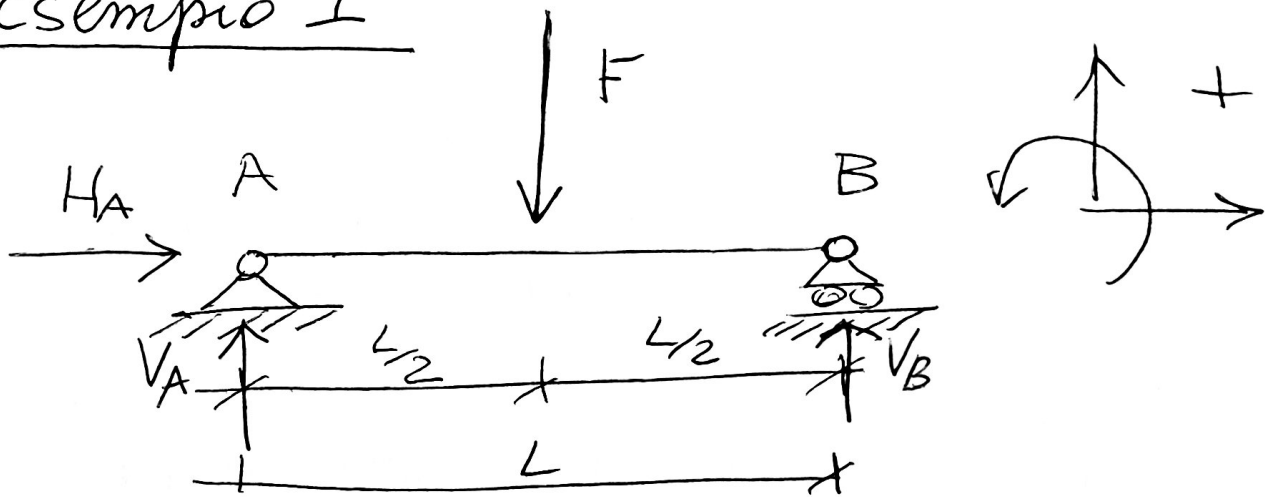
$$\sum M_P = 0 \quad \text{equilibrio alla rotazione intorno al polo P}$$

Per scrivere dette equazioni si utilizza la seguente convenzione:

- forze orizzontali positive se rivolte verso destra
- forze verticali positive se rivolte verso l'alto
- momenti positivi se ruotano antiorari



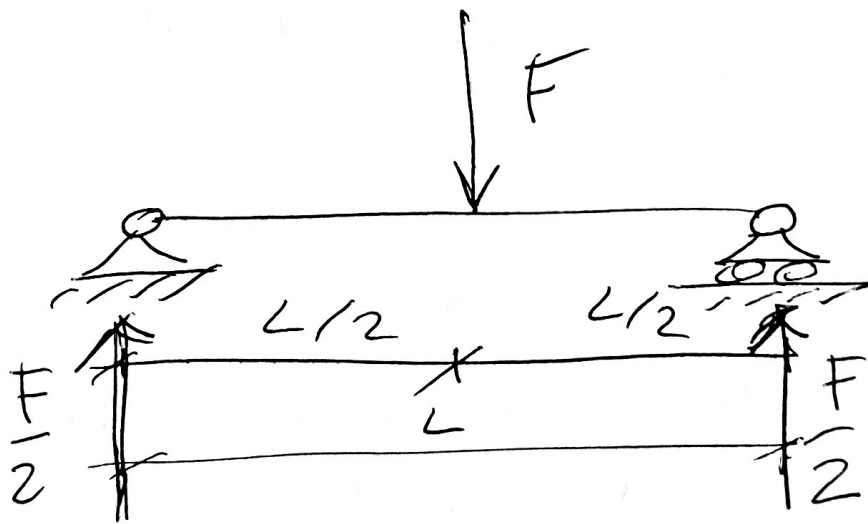
Esempio 1



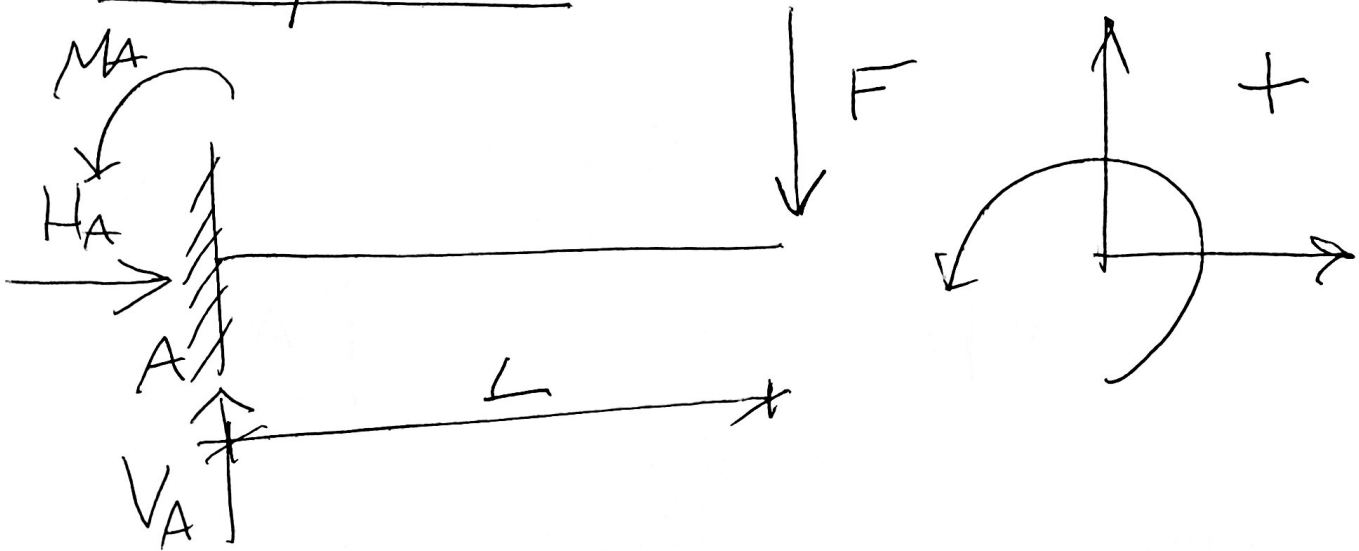
$$\sum F_H = 0 \rightarrow H_A = 0 \quad \rightarrow H_A = 0$$

$$\sum F_V = 0 \rightarrow V_A - F + V_B = 0 \quad \rightarrow V_A = \frac{F}{2}$$

$$\sum M_{(A)} = 0 \rightarrow -F \frac{L}{2} + V_B L = 0 \quad \rightarrow V_B = \frac{F}{2}$$



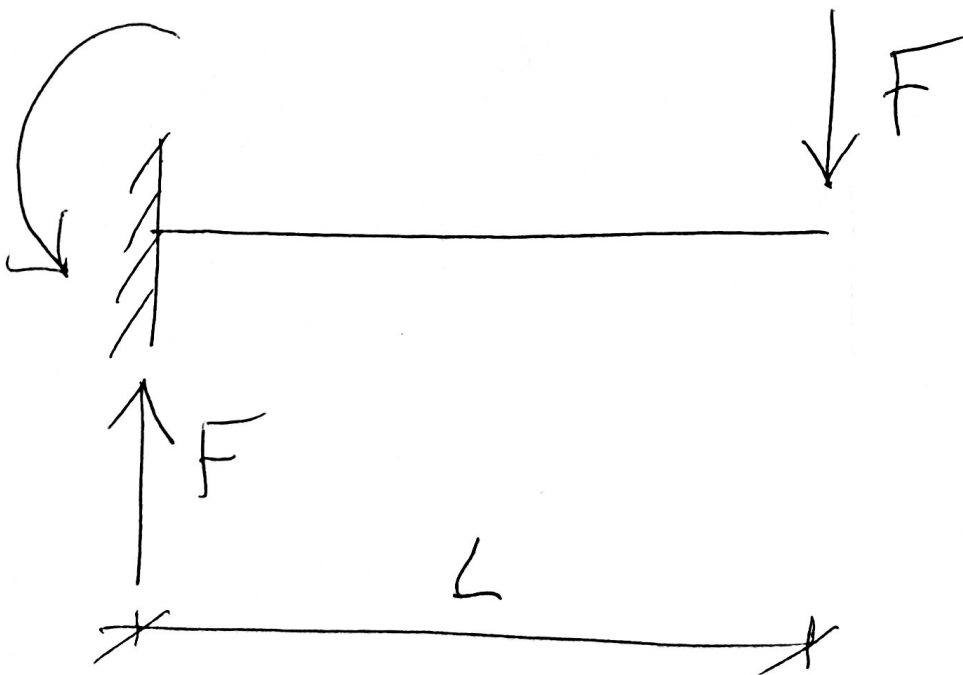
Esempio 2



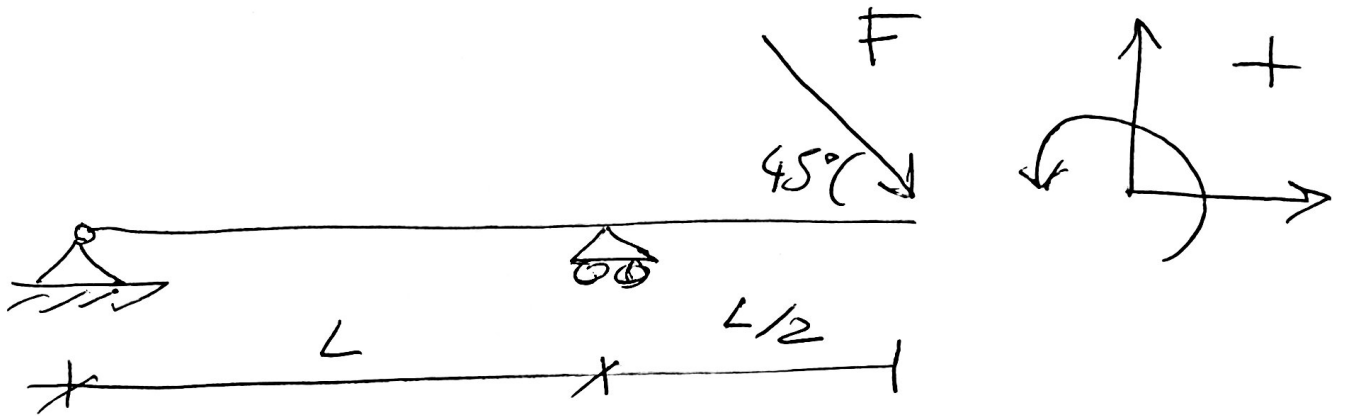
$$\sum F_H = 0 \rightarrow H_A = 0 \quad \rightarrow H_A = 0$$

$$\sum F_V = 0 \rightarrow V_A - F = 0 \quad \rightarrow V_A = F$$

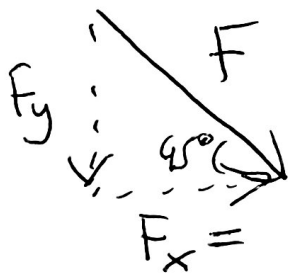
$$\sum M_{(A)} = 0 \rightarrow M_A - FL = 0 \rightarrow M_A = FL$$



Esempio 3



La forza inclinata si può scomporre:

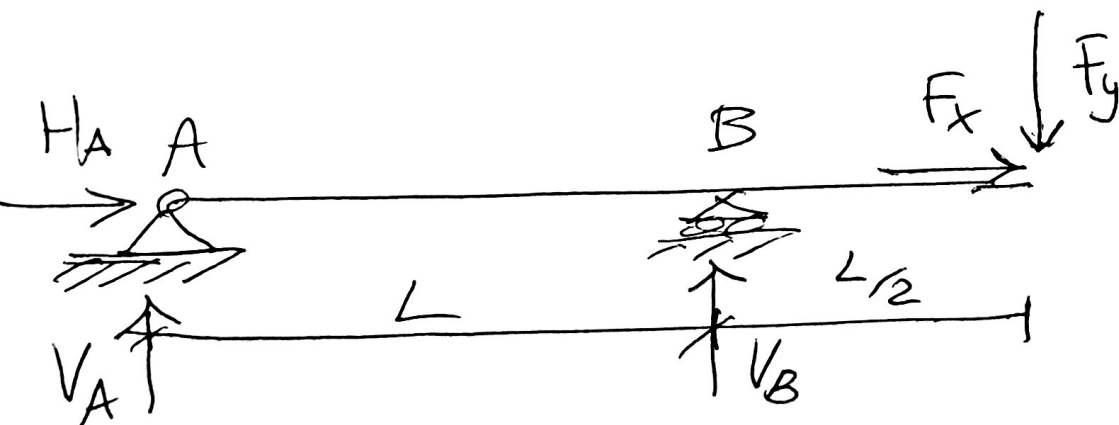


$$F_x = F \cdot \cos 45^\circ = \frac{F\sqrt{2}}{2}$$

$$F_y = F \cdot \sin 45^\circ = \frac{F\sqrt{2}}{2}$$

Si considerano le due componenti

F_x e F_y al posto delle forze inclinate



$$\sum F_H = 0 \rightarrow H_A + F_x = 0 \rightarrow \textcircled{1}$$

$$\sum F_V = 0 \rightarrow V_A + V_B - F_y = 0 \rightarrow \textcircled{2}$$

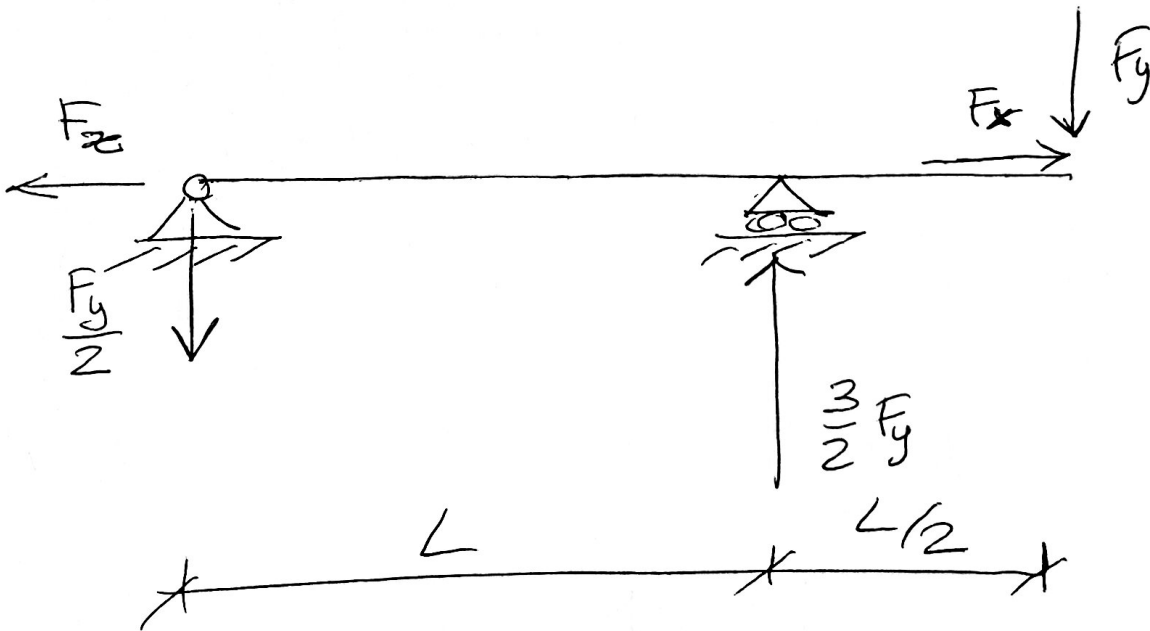
$$\sum M_{(A)} = 0 \rightarrow V_B L - F_y \left(L + \frac{L}{2} \right) = 0 \rightarrow \textcircled{3}$$

$$\textcircled{1} \rightarrow H_A = -F_x \rightarrow H_A = -\frac{F\sqrt{2}}{2}$$

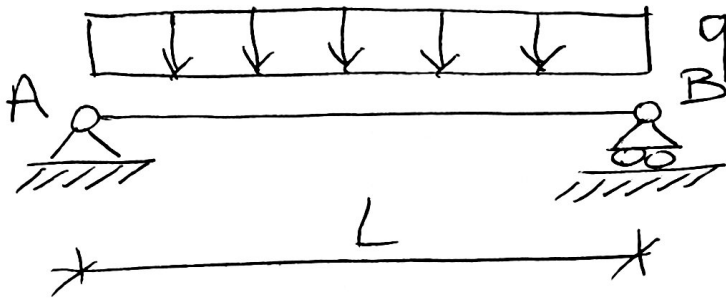
$$\textcircled{2} \rightarrow V_A = -\frac{F_y}{2} \rightarrow V_A = -\frac{F\sqrt{2}}{4}$$

$$\textcircled{3} \rightarrow V_B = \frac{3}{2} F_y \rightarrow V_B = +\frac{3}{4} F\sqrt{2}$$

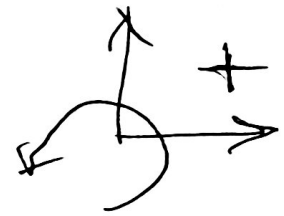
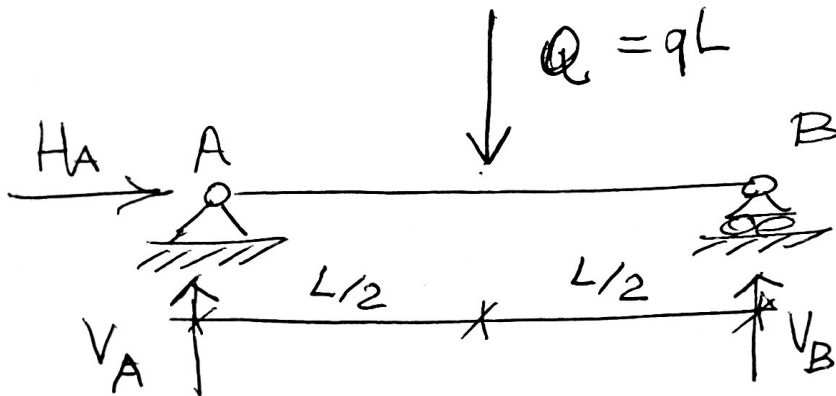
Alle reazioni con segno negativo deve essere cambiato il verso.



Esempio 4



Si calcola la risultante del carico distribuito e la si applica in mezz'era.



$$\sum F_H = 0 \rightarrow H_A = 0$$

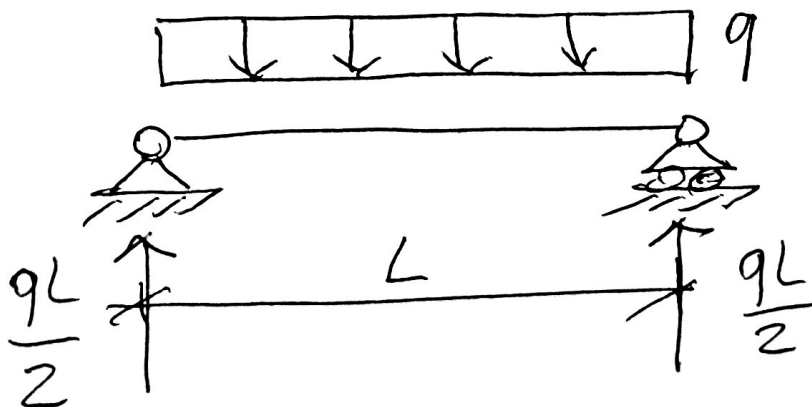
$$\rightarrow H_A = 0$$

$$\sum F_V = 0 \rightarrow V_A - Q + V_B = 0$$

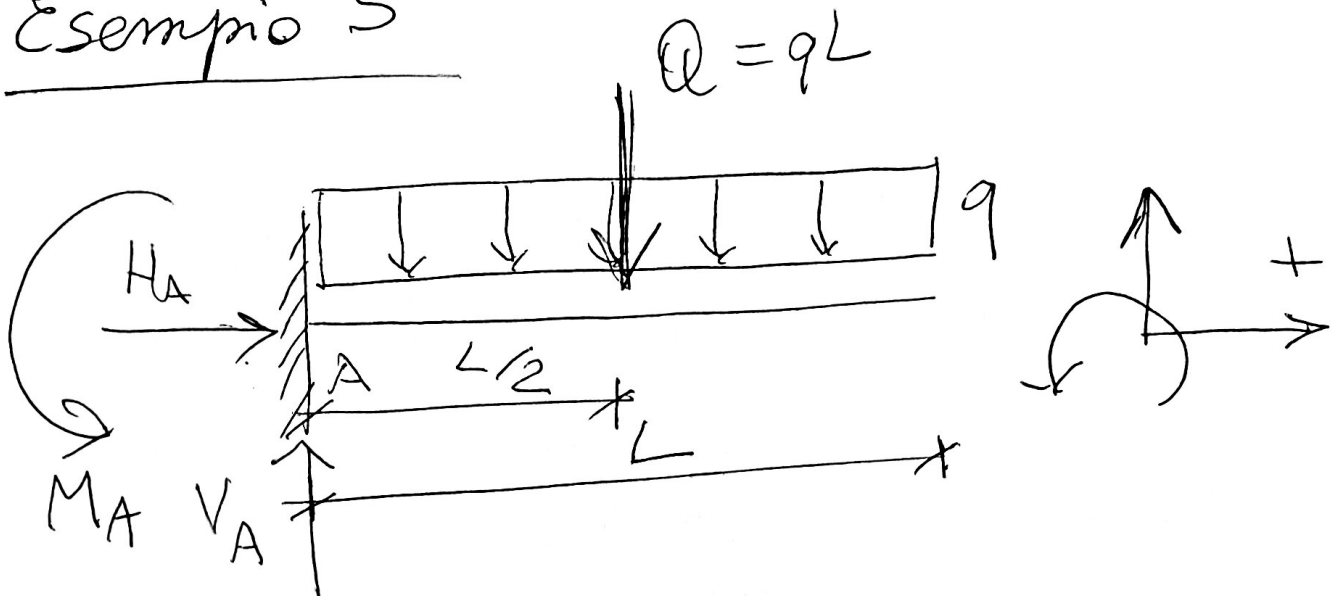
$$\rightarrow V_A = \frac{qL}{2}$$

$$\sum M_{(A)} = 0 \rightarrow -Q \frac{L}{2} + V_B L = 0$$

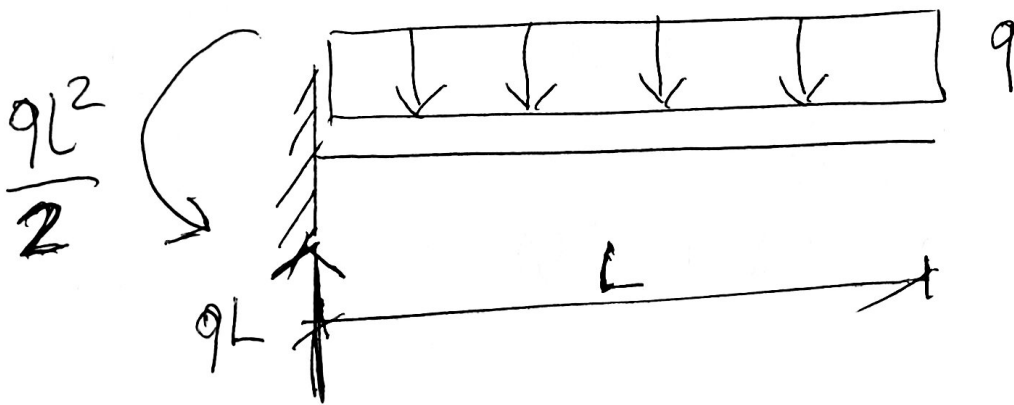
$$\rightarrow V_B = \frac{qL}{2}$$



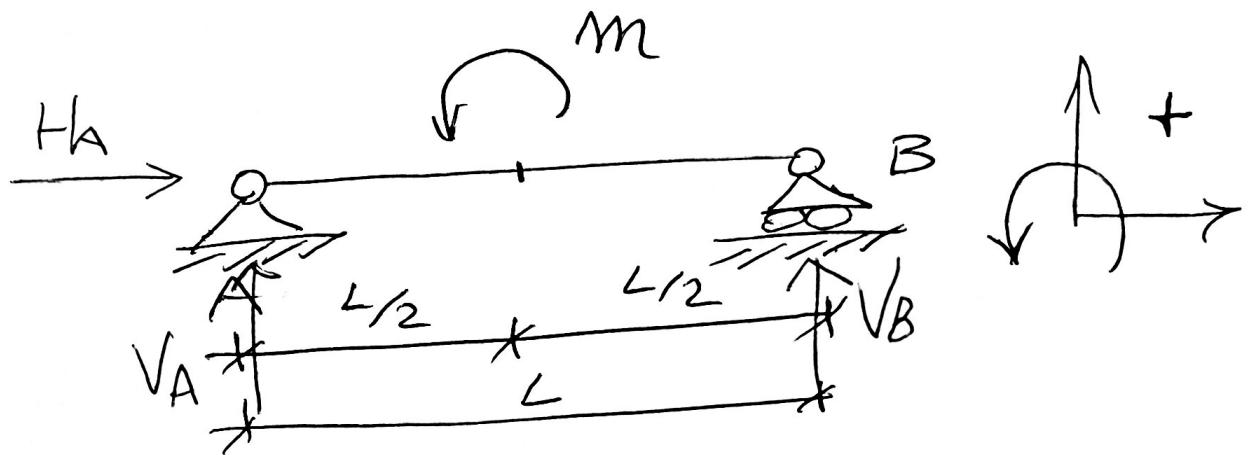
Esempio 5



$$\begin{aligned}\sum F_H = 0 &\rightarrow H_A = 0 &&\rightarrow H_A = 0 \\ \sum F_V = 0 &\rightarrow V_A - Q = 0 &&\rightarrow V_A = qL \\ \sum M_{(A)} = 0 &\rightarrow M_A - Q \frac{L}{2} = 0 &&\rightarrow M_A = \frac{qL^2}{2}\end{aligned}$$



Esempio 6



$$\begin{aligned}\sum F_H = 0 &\rightarrow H_A = 0 &&\rightarrow H_A = 0 \\ \sum F_V = 0 &\rightarrow V_A + V_B = 0 &&\rightarrow V_A = \frac{M}{L} \\ \sum M_{(A)} = 0 &\rightarrow M + V_B \cdot L = 0 &&\rightarrow V_B = -\frac{M}{L}\end{aligned}$$

