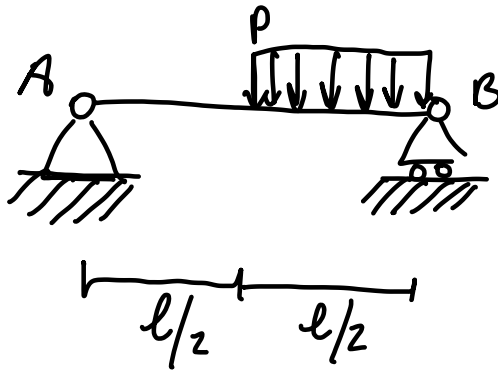


Reazioni Vincolari e azioni interne in 2D

Esercizio 1



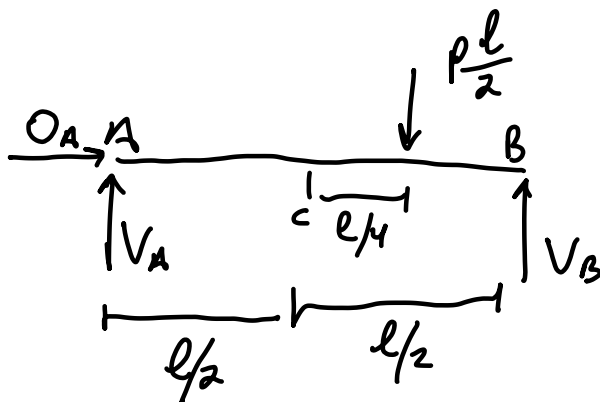
Analisi Cinematica

$$\left. \begin{array}{l} gdl = 3 \\ gdh = 2 + 1 \end{array} \right\} 3 = 3$$

Candidato
isostatico

Analizzando
velocistiche
è isostatico

Reazioni Vincolari



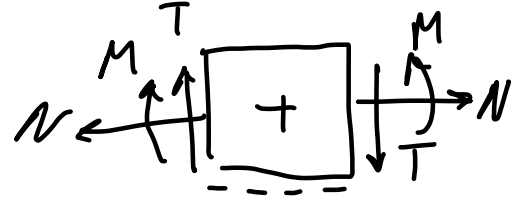
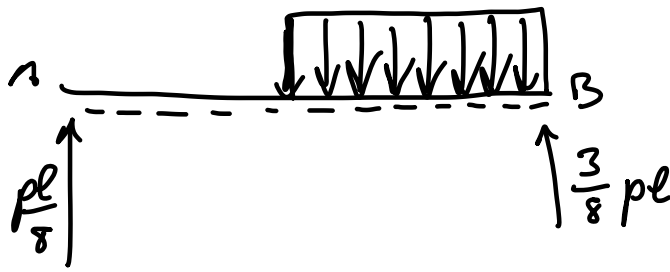
$$O_A = 0$$

$$\begin{aligned} A) \quad & V_B \cdot l - p \frac{l}{2} \cdot \frac{3}{4} l = 0 \\ & \Rightarrow V_B = \frac{3}{8} p l \end{aligned}$$

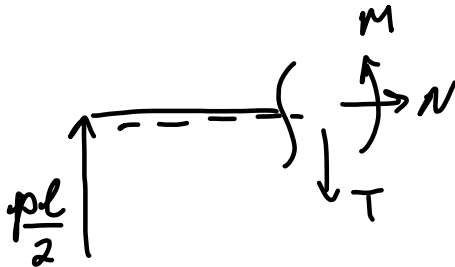
$$\uparrow) \quad V_A + V_B - p \frac{l}{2} = 0 \Rightarrow$$

$$\Rightarrow V_A = \frac{p l}{8}$$

Asioni Interne → Nelle asioni interne non si può prendere il carico distribuito come carico puntuale, deve rimanere distribuito



Sezione S_1) $0 \leq x \leq \frac{l}{2}$



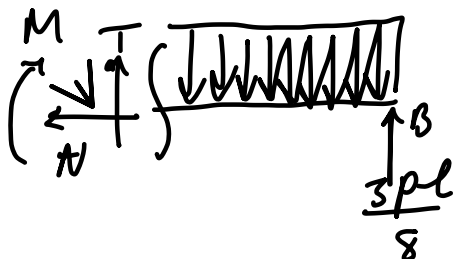
$$\rightarrow) N = 0$$

$$\uparrow)^+ T = \frac{pl}{8}$$

$$\curvearrowright)^+ M - \frac{pl}{8} x = 0$$

$$M = \frac{plx}{8} \quad \left(\begin{array}{l} x=0 \\ M_A = 0 \end{array} \right) \quad \int_{x=0}^{x=\frac{l}{2}} \quad 2M_C = \frac{pl^2}{16}$$

Sezione S_2 $0 \leq x \leq \frac{l}{2}$



$$\leftarrow)^+ N = 0$$

$$\uparrow)^+ T - px + \frac{3}{8}pl = 0$$

$$T = px + \frac{3}{8}pl \quad \left\{ \begin{array}{l} x=0 \\ T_B = \frac{3}{8}pl \end{array} \right. \quad \left\{ \begin{array}{l} x=l/2 \\ T_B = \frac{3}{8}pl \end{array} \right.$$

$$M + \frac{px^2}{2} - \frac{3}{8} plx = 0$$

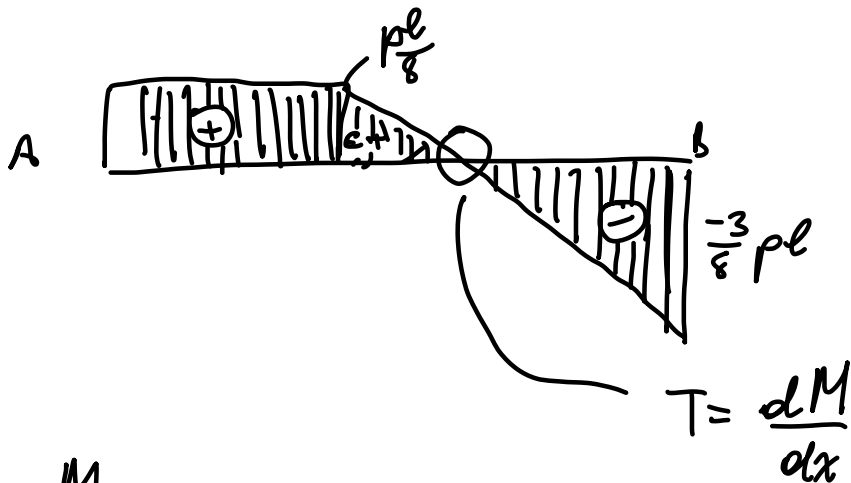
$$M = \frac{3}{8} plx - \frac{px^2}{2}$$

$$\begin{cases} x=0 \\ M_B=0 \end{cases} \quad \begin{cases} x=l/2 \\ M_C = \frac{pl^2}{18} \end{cases}$$

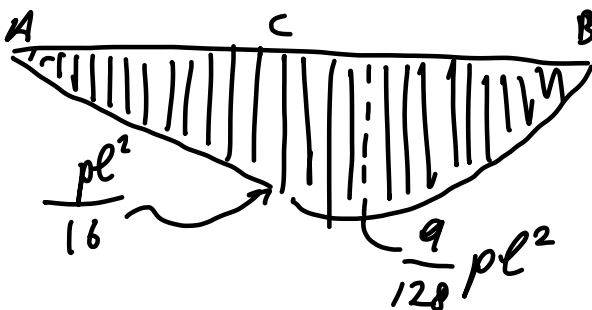
N



T



M



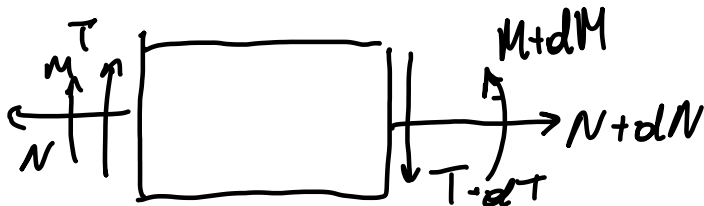
$$T = 0$$

$$T = px - \frac{3}{8} pl \rightarrow 0 = px - \frac{3}{8} pl$$

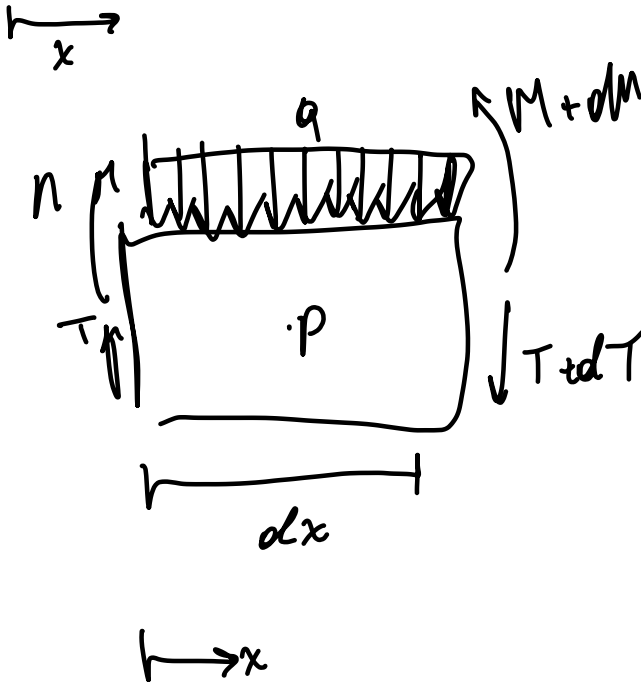
$x = \frac{3}{8} l$

$$M = \frac{3}{8} p l s - \frac{p s^2}{2}$$

$$M|_{T=0} = M(x=x^*) = \frac{3}{8} p l \left(\frac{3}{8} l\right) - \frac{p}{2} \left(\frac{3}{8} l\right)^2 = \frac{9}{128} p l^2$$



$$T = \frac{dM}{dx}$$



$$\uparrow^+ T - q dx - (T + \frac{dT}{dx} dx) = 0$$

$$T - q dx - T - \frac{dT}{dx} dx = 0$$

$$q = -\frac{dT}{dx}$$

$$\uparrow^+ M + \frac{dM}{dx} dx - M - \frac{T dx}{2} - \left(T + \frac{dT}{dx} dx\right) \frac{dx}{2} = 0$$

$$\frac{dx}{2} = 0$$

$$\frac{dM}{dx} dx - T \frac{dx}{2} - T \frac{dx}{2}$$

$$- \frac{dT}{dx} \frac{dx^2}{2} = 0$$

$$\frac{dM}{dx} = T dx$$

$$T = \frac{dM}{dx}$$

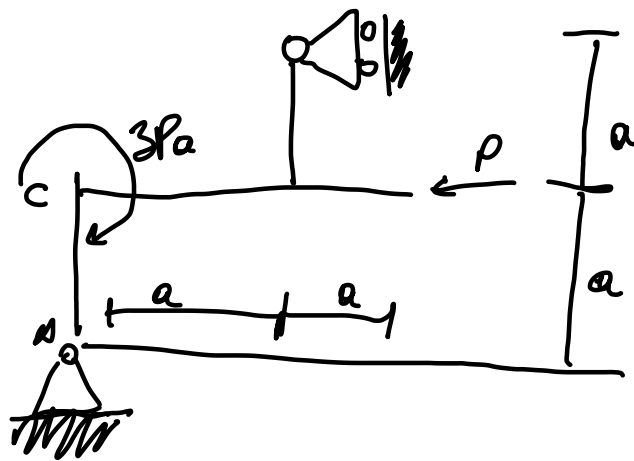
Prendendo:



$$q = \frac{dT}{dx}$$

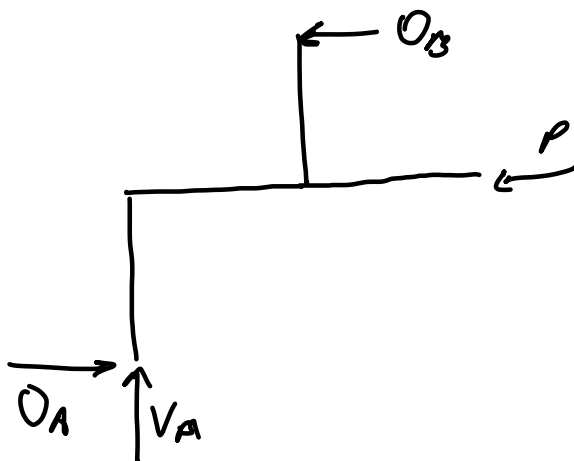
$$e \quad T = -\frac{dM}{dx}$$

Esercizio 2



Analisi
Cinematica
 $g_{\text{rot}} = 3 \cdot 1 = 3$
 $g_{\text{tr}} = 2 + 1 = 3$ | Iso
↓
Bandmutter

Reazioni Vincolari

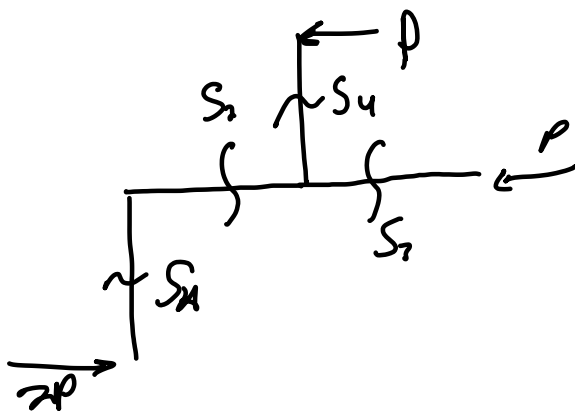


$$\uparrow)^+ V_A = 0$$

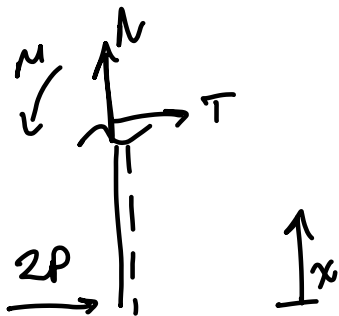
$$\curvearrowright)^+ -3Pa + Pa + O_B \cdot 2a = 0$$

$$O_B = P$$

$$\rightarrow)^+ O_A - O_B - P = 0 \rightarrow O_A = 2P$$



Section S_1



$$0 \leq x \leq a$$

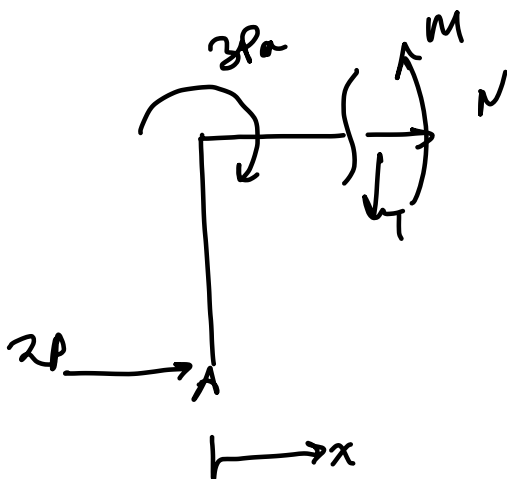
$$\uparrow \uparrow^+ \quad N = 0$$

$$\rightarrow \uparrow^+ \quad 2P + T = 0 \rightarrow T = -2P$$

$$S_1)^+ \quad M + 2Px = 0 \rightarrow M = -2P$$

$$\begin{cases} x=0 \\ M_A = 0 \end{cases} \quad \begin{cases} x=a \\ M_C = -2Pa \end{cases}$$

Section S_2) $0 \leq x \leq a$



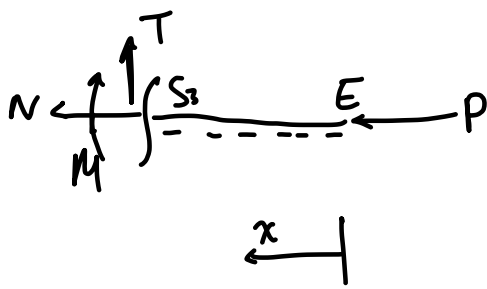
$$\rightarrow \uparrow^+ \quad 2P + N = 0 \rightarrow N = -2P$$

$$\downarrow \uparrow^+ \quad T = 0$$

$$S_2)^+ \quad M - 3Pa + 2Pa = 0$$

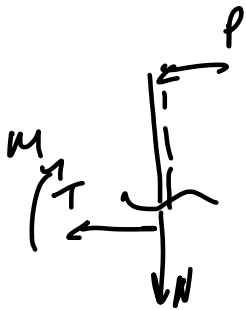
$$M = Pa$$

S_3) $0 \leq x \leq a$



$$\begin{aligned} \uparrow)^+ T &= 0 \\ \leftarrow)^+ N + P &= 0 \rightarrow N = -P \\ S_3)^+ M &= 0 \end{aligned}$$

$S_1) \quad 0 \leq x < a$



$$\leftarrow)^+ P + T = 0 \rightarrow T = -P$$

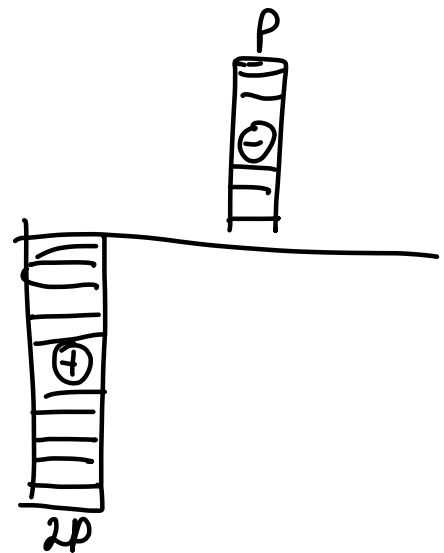
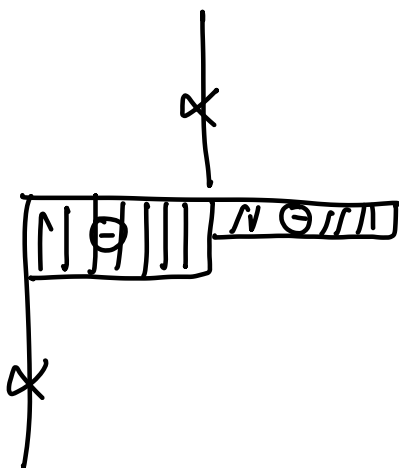
$$\downarrow)^+ N = 0$$

$$S_1)^+ M - Px = 0 \rightarrow M = Px$$

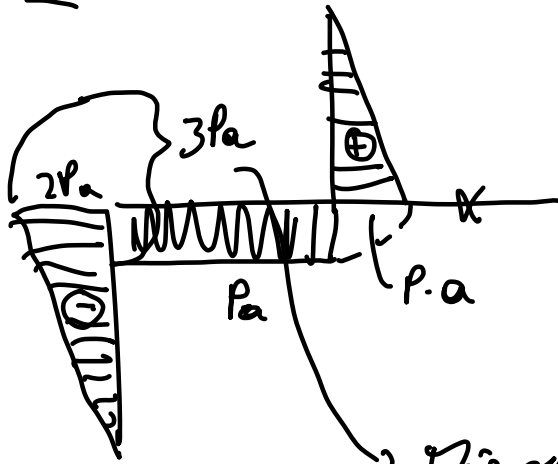
$$\begin{cases} x=0 \\ M_B = 0 \end{cases} \quad \begin{cases} x=a \\ M_D = Pa \end{cases}$$

N

T



M



Discontinuità del momento puntuale