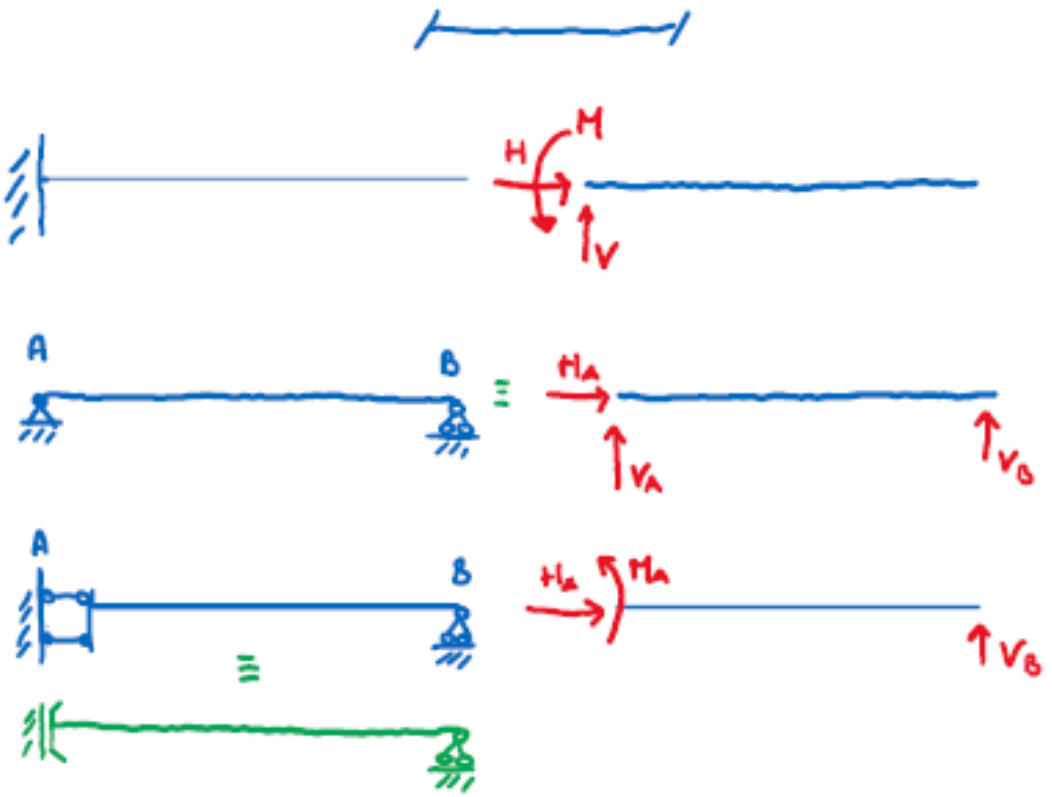
isostatiche $g = s = m$

ipestatiche $g = s < m$

Labili:

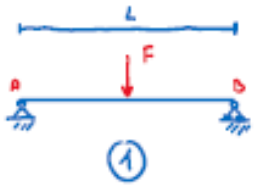


Eq. cardinali della statica

1) $\Sigma (R_x^{\rightarrow} + R_x^{\uparrow}) = 0$

2) $\Sigma (R_y^{\rightarrow} + R_y^{\uparrow}) = 0$

3) $\Sigma\ M_o^{\circlearrowright} + M_o^{\circlearrowleft} = 0$



(1)

(2)

Ris. sistema

$\xrightarrow{+}$ 1) $H_A = 0$ $\quad H_A = 0$

$\uparrow +$ 2) $V_A + V_B - F = 0$ $\Rightarrow$ $V_A = \frac{F}{2}$

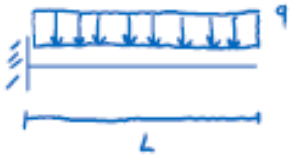
$\circlearrowleft +$ 3) $+ F\frac{L}{2} + V_B L = 0$ $\quad V_B = -\frac{F}{2}$

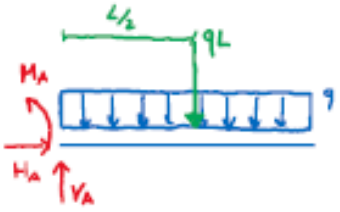
1) $H_A = 0$ $\quad H_A = 0$

2) $V_A - V_B - F = 0$ $\Rightarrow$ $V_A = \frac{F}{2}$

3) $-F\frac{L}{2} - V_B L = 0$ $\quad V_B = -\frac{F}{2}$ inverso nello schema

Esempio



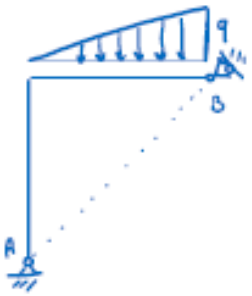


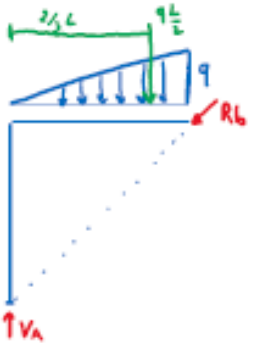
$\xrightarrow{+}$ 1) $H_A = 0$ $\quad H_A = 0$

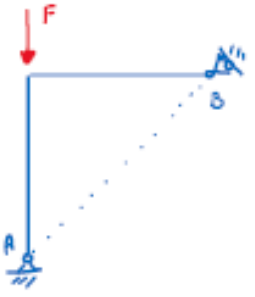
$\uparrow +$ 2) $-qL + V_A = 0$ $=$ $V_A = qL$

$\circlearrowleft +$ 3) $M_A - qL\left(\frac{L}{2}\right) = 0$ $\quad M_A = q\frac{L^2}{2}$

Es





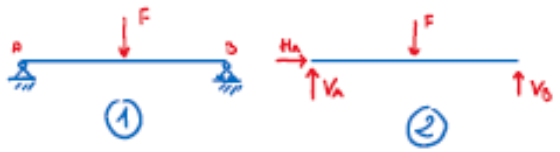


1) $H_A - R_b\frac{\sqrt{2}}{2} = 0$

2) $V_A - R_b\frac{\sqrt{2}}{2} - q\frac{L}{2} = 0$

3) $-q\frac{L}{2}\cdot\frac{2L}{3} = 0 = -q\frac{L^2}{3}$

Non è soddisfatta



Ris. sistema

$\rightarrow$+ 1) $H_A = 0$ $\quad H_A = 0$

↑+ 2) $V_A + V_B - F = 0$ $\quad \Rightarrow \quad V_A = \frac{F}{2}$

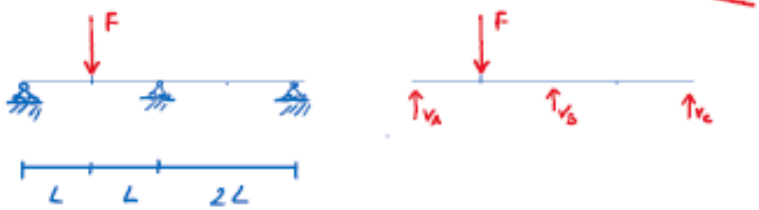
3) in A $\quad -F\frac{L}{2} + V_B L = 0$ $\quad V_B = \frac{F}{2}$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & L \end{bmatrix} \begin{bmatrix} H_A \\ V_A \\ V_B \end{bmatrix} = \begin{bmatrix} 0 \\ F \\ F/2 \end{bmatrix} \quad \text{A} \quad x \quad b$$

$= x = A^{-1} b$

$\det(A) \neq 0$

Es.



$g = 3$

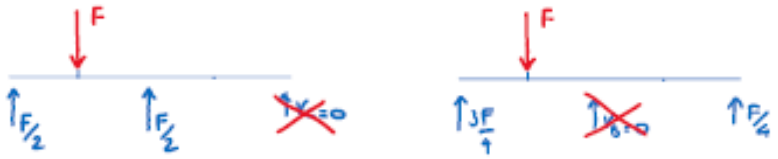
$m = 3$

$s = 2$

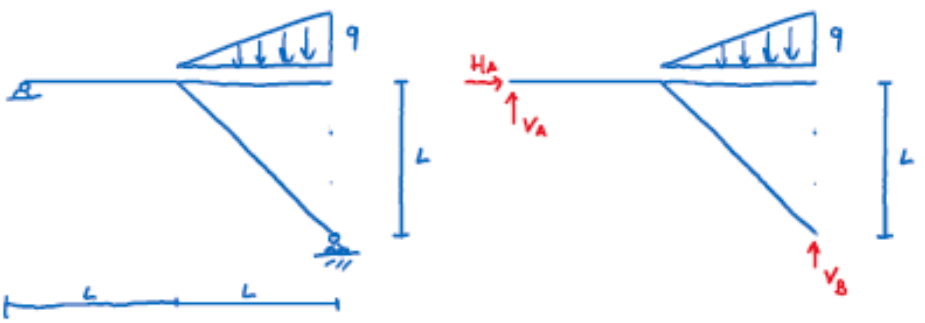
1) $0 = 0$ $\quad 3-2$ soluzioni

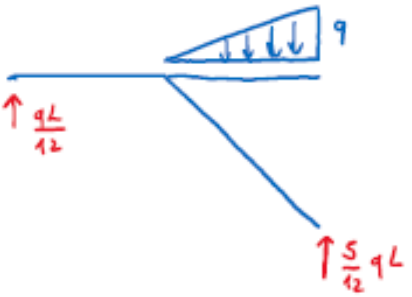
2) $V_A + V_B + V_C - F = 0$

3) $-FL + V_B 2L + V_C 4L = 0$



Es





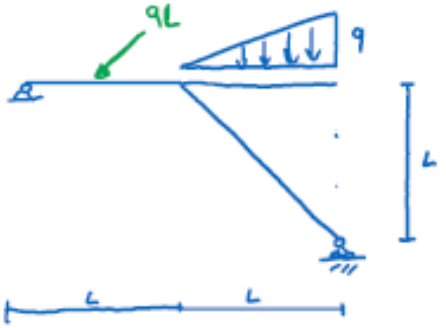
1) $H_A = 0$

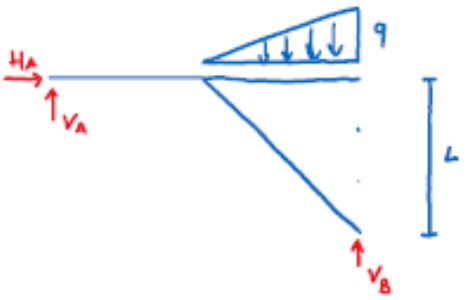
2) $V_A + V_B - qL/2 = 0$

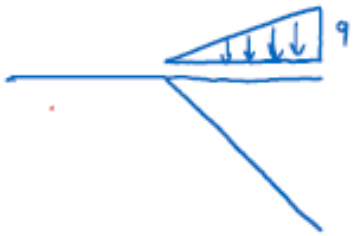
3) in A $\quad V_B 2L - \frac{qL}{2}\left(L + \frac{2}{3}L\right) = 0 = 2V_B L - \frac{5}{6}qL^2 = 0$

$V_B = \frac{5}{12}qL \qquad V_A = \frac{1}{12}qL$

Es





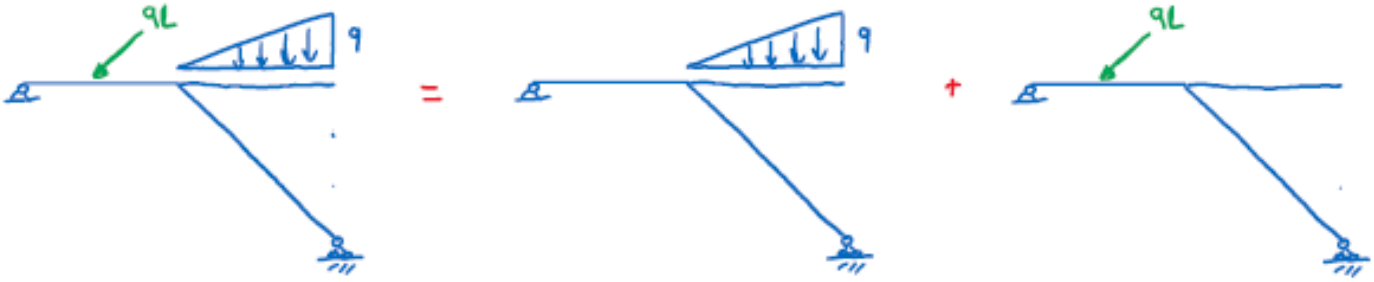


1) $H_A - qL\frac{\sqrt{2}}{2} = 0$

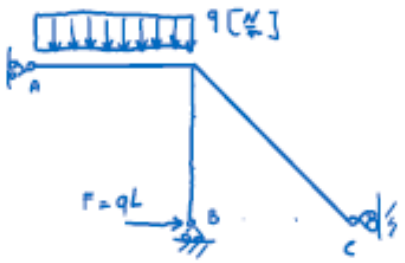
2) $V_A + V_B - qL/2 - qL\frac{\sqrt{2}}{2} = 0$

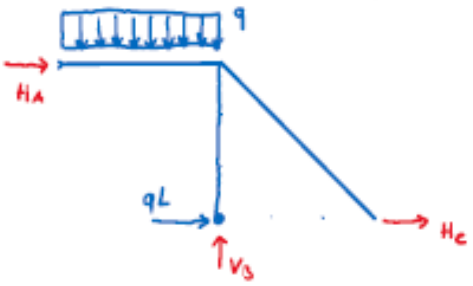
in A $\quad V_B 2L - \frac{qL}{2}\left(L + \frac{2}{3}L\right) - qL\frac{\sqrt{2}}{2}\frac{L}{2} = 0$

$V_B = \frac{5}{12}qL + qL\frac{\sqrt{2}}{8} \qquad V_A = \frac{1}{12}qL + \frac{3}{8}L\sqrt{2} \qquad H_A = 0 + qL\frac{\sqrt{2}}{2}$



Sovrapposizione degli effetti

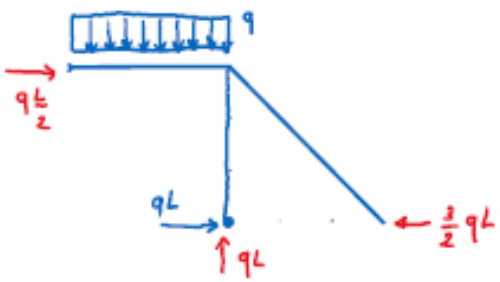


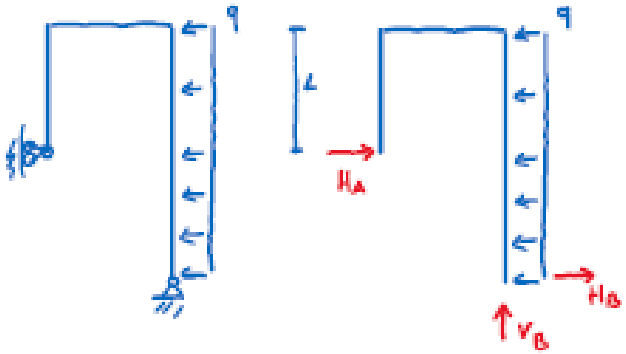


1) $H_A + H_C + qL = 0 \longrightarrow H_C = -\frac{3}{2}qL$

2) $V_B - qL = 0 \longrightarrow V_B = qL$

+↺ 3) in B $\quad -H_A L + qL\cdot\frac{L}{2} = 0 \longrightarrow H_A = \frac{qL}{2}$





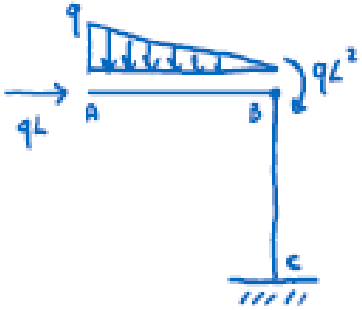
1) $H_A + H_B - 2qL = 0$

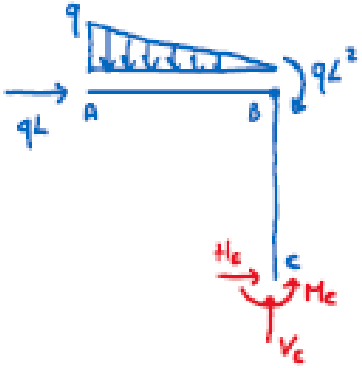
2) $V_B = 0$

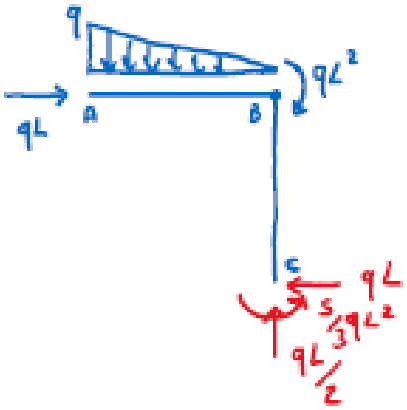
3) $H_B L = 0$

$\Downarrow$

$H_B = 0 \quad V_B = 0 \quad H_A = 2qL$





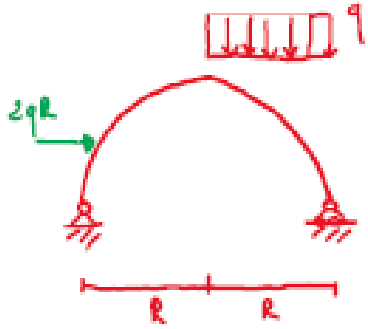


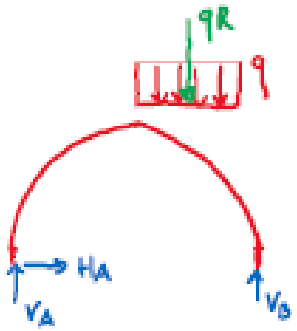
1) $H_C + qL = 0$ $\quad H_C = -qL$

2) $V_C - q\frac{L}{2} = 0$ $\quad \Rightarrow \quad V_C = qL/2$

3) in C $\quad -qL^2 - qL^2 + q\frac{L}{2}\frac{2}{3}L + M_C = 0$ $\quad M_C = \frac{5}{3}qL^2$

Es



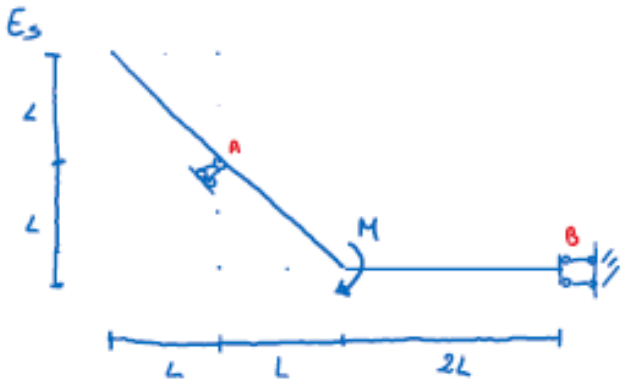


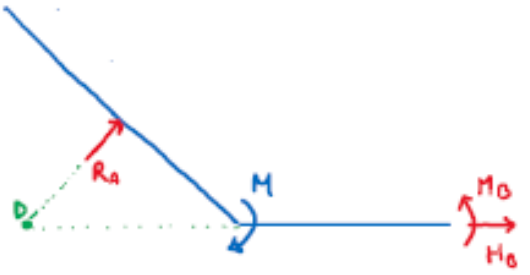
1) $H_A = 0$ $\quad H_A = 0$

2) $V_A + V_B - qR = 0$ $\quad V_A = \frac{1}{4}qR$

3) $2R V_B - \frac{3}{2}qR^2 = 0$ $\quad V_B = \frac{3}{4}qR$

?

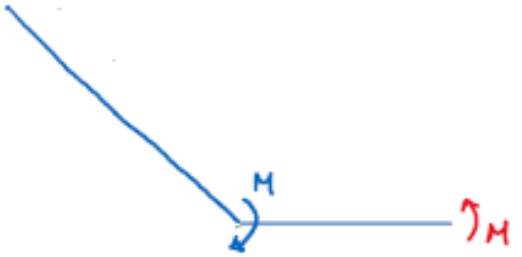


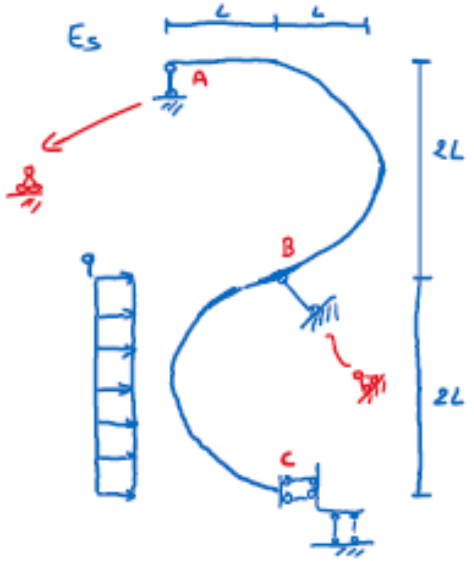


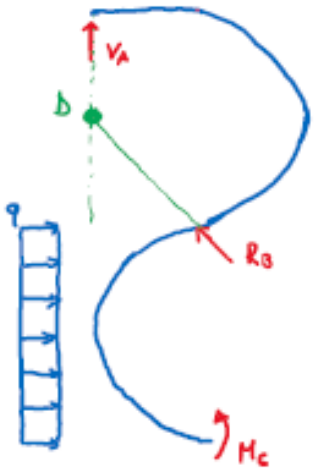
1) $H_D + R_A \frac{\sqrt{2}}{2} = 0$ $\qquad H_B = 0$

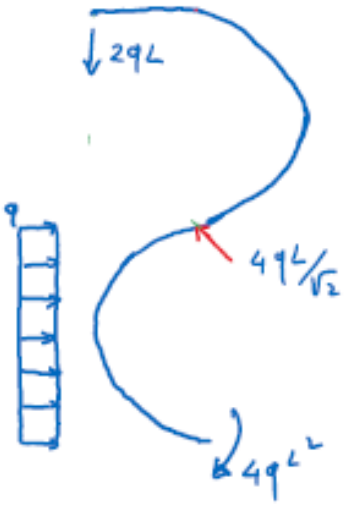
2) $R_A \frac{\sqrt{2}}{2} = 0$ $\qquad \Rightarrow \quad R_A = 0$

3) im B $\quad -M + M_B = 0$ $\qquad M_B = M$









1) $-R_B \frac{\sqrt{2}}{2} + 2qL = 0$ $\qquad R_b = \frac{2qL}{\sqrt{2}} = 2qL\sqrt{2}$

2) $V_A + R_b \frac{\sqrt{2}}{2} = 0$ $\qquad \Rightarrow \quad V_A = -2qL$

+↻ im B $\quad 3) \quad 4qL^2 + M_C = 0$ $\qquad M_C = -4qL^2$