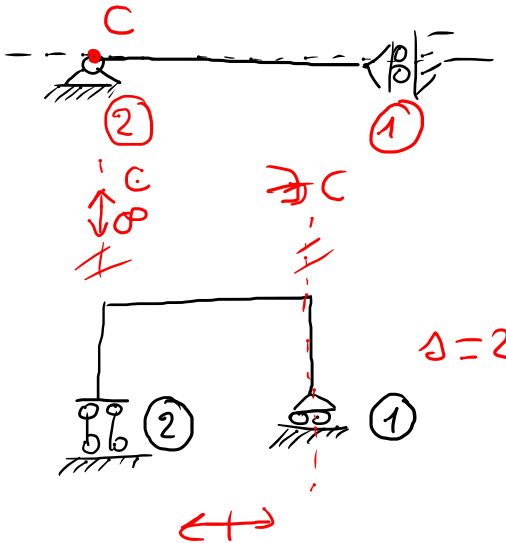
31/3/22

g: n° di gdl del SISTEMA (... DI C.R.) = $3N$

v: molteplicità di VINCOLO

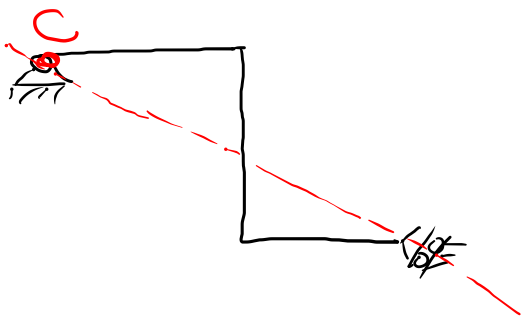
s: n° di gdl EFFETTIVAMENTE soltanto dal sist. ($s \leq g$)



ESISTE C, STR. LABILE

$g=3,\ v=3,\ s=2$

VINCOLI NON EFFICACI



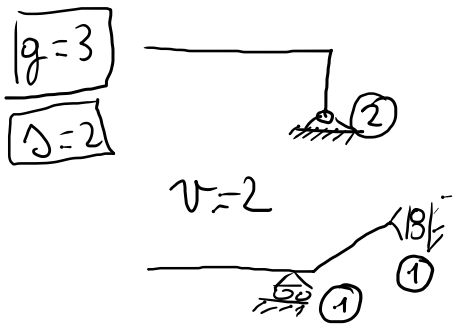
$g=3,\ v=3,\ s=3$

STR. BLOCCATA

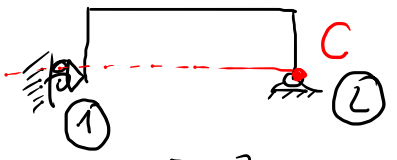
CLASSIFICAZIONE DELLE STRUTTURE

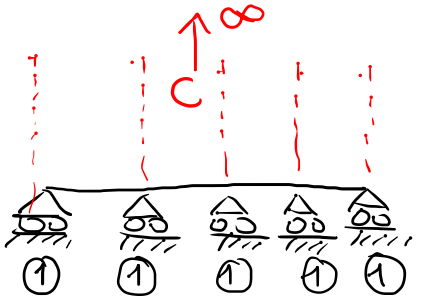
- STR. LABILI ($s < g$) (DOTATA DI G.D.L.)
- STR. ISOSTATICHE ($g = v = s$) (ISO – VINCOLATA)
- STR. IPERSTATICHE ($g = s < v$) (IPER – VINCOLATA)

STR. LABILE



LABILITA' PER IPO STATICITA'





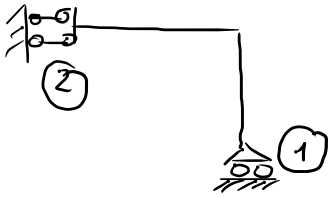
VINCOLI NON EFFICACI

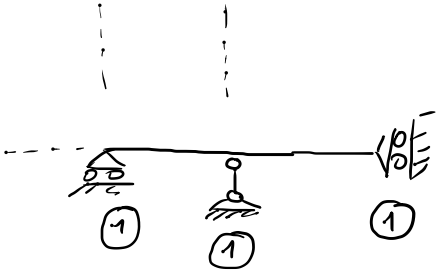
STR. ISOSTATICHE

$g=3,\ v=3,\ s=3$ (✗ C)

TRAVE APPOGGIATA

MENSOLA





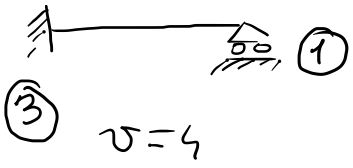
INCASTRO

TRAVE INCASTRO

$v=6 \quad s=3$

STR. IPERSTATICHE

$g=3$
$s=3$



$v=4$

grado di IPERSTATICITÀ

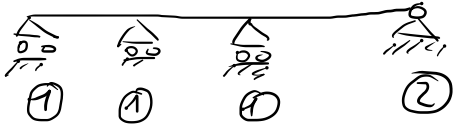
$i = v - g$

TRAVE CONTINUA

$v=4$

$i=1$

1 VOLTA IPER

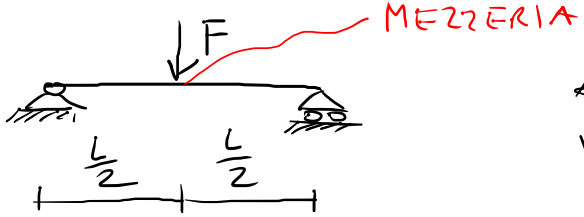


$v=5$

$i=2$

2 VOLTE IPER

ANALISI STATICA DELLE STRUTTURE PIANE (1 C.R.)



$g=3$, $v=3$, $s=3$
ISOSTATICA

ANALISI STATICA: COME LA FORZA F VIENE TRASFERITA AI VINCOLI?

oppure: COME LA TRAVE STA IN EQUILIBRIO?

⇒ STUDIO ATTRAVERSO LE EQUAZ. CARDINALI DELLA STATICA

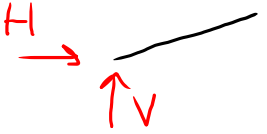
PER RISOLVERE IL PROBLEMA STATICO DEVO CONOSCERE COME I VINCOLI RISPONDONO STATICAMENTE (QUALI SONO LE REAZIONI VINCOLARI ESPLICATE DAI VINCOLI STESSI)

PRESTAZ. STATICHE DEI VINCOLI

$v=3$ INCASTRO

LE REAZ. VINCOLARI NASCONO DUALMENTE ALLE COMPONENTI DI MOVIMENTO IMPEDITE DAL VINCOLO

$v = 2$ CERNIERA

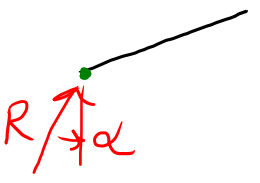


$u_A = 0$ PRESTAZ. CINEMATICA

$u_{Ax} = 0$

$u_{Ay} = 0$

σ



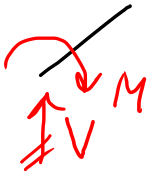
$tg\alpha = \frac{H}{V}$

DOPPIO PENDOLO

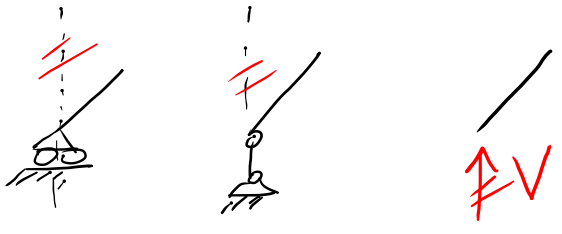
$\vartheta = 0$

$u_A \cdot M = 0$

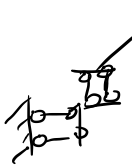
PREST. CINEM.



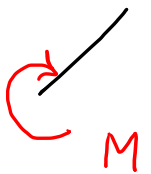
$v = 1$ CARRELLO / PENDOLO / BIELLA



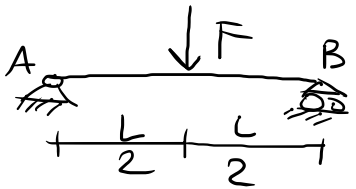
DOPPIO - DOPPIO PENDOLO



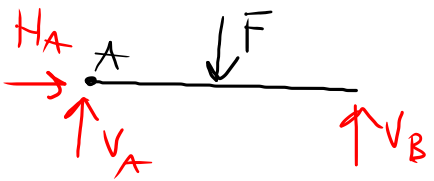
$\vartheta = 0$



COME IMPOSTARE E RISOLVERE UN PROBLEMA STATICO



PROBL. STATICO: CERCA E TROVA (SE PUOI) L'INSIEME DELLE REAZ VINCOLARI CHE MANTIENE IN EQUILIBRIO LA STRUTTURA ASSEGNATA.



SCHEMA DI CORPO LIBERO

1) SOST. AI VINCOLI LE REAZ. VINC. "POTENZIALI" (IL "VERSO" È ARBITRARIO) $\Rightarrow$ H_A, V_A, V_B SONO LE INCOGNITE DEL PROBLEMA.

2) IMPOSTIAMO LE EQ. CARDIN. DELLA STATICA E SCRIVIAMO UN SIST. DI EQUAZIONI LINEARI:

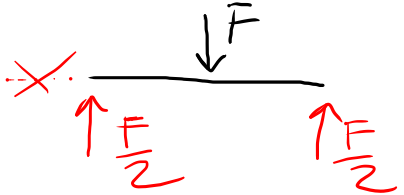
$$\left.\begin{aligned} \pm\rightarrow:\ & H_A = 0 \\ +\uparrow:\ & V_A - F + V_B = 0 \\ +\circlearrowleft_A:\ & -FL/2 + V_B L = 0 \end{aligned}\right\}$$

3 EQ. IN 3 INCOGNITE

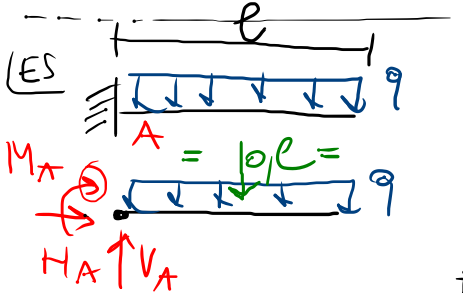
3) CERCO LA SOLUZ. AL SISTEMA

$$\begin{cases} H_A = 0 \\ V_A - F + V_B = 0 \\ -F\frac{\ell}{2} + V_B \ell = 0 \end{cases} \qquad \begin{cases} H_A = 0 \\ V_A = +F/2 \\ V_B = +\frac{F}{2} \end{cases}$$

LA SOLUZ. ESISTE ED È UNICA



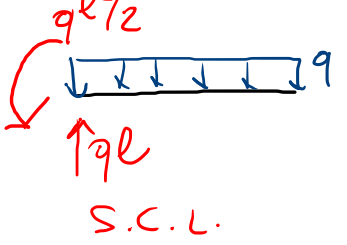
4) DISEGNO UN NUOVO S.C.L. CON LE REAZ. VINCOLARI OTTENUTE RISOLVENDO IL SIST.



$$\begin{cases} \rightarrow : +H_A = 0 \\ \uparrow + : +V_A - q\ell = 0 \\ +_A : -M_A - q\ell \cdot \frac{\ell}{2} = 0 \end{cases}$$

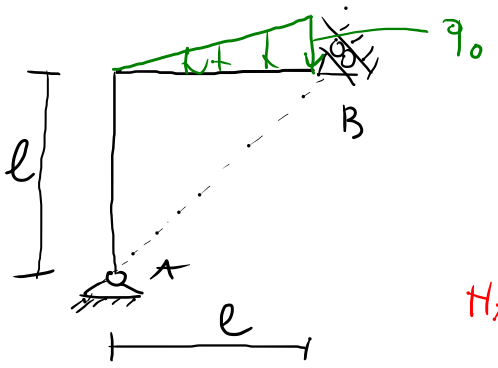
$$\begin{cases} H_A = 0 \\ V_A = +q\ell \\ M_A = -q\frac{\ell^2}{2} \end{cases}$$

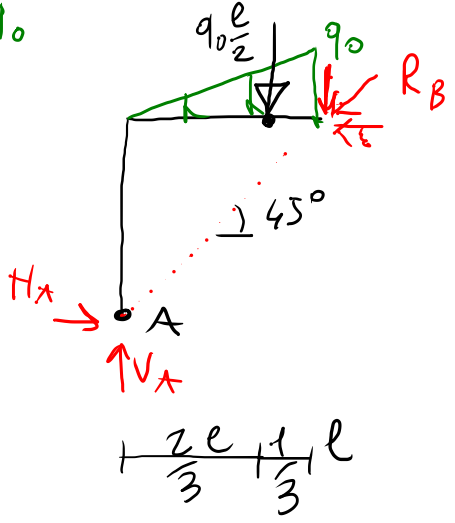
SOLUZ. UNICA



S.C.L.

LES





$$\rightarrow: H_A - \frac{R_B}{\sqrt{2}} = 0$$

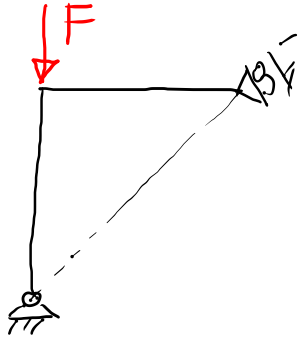
$$+\uparrow: +V_A - q_0\frac{\ell}{2} - \frac{R_B}{\sqrt{2}} = 0$$

$$+\circlearrowleft_A: -q_0\frac{\ell}{2}\cdot\frac{2}{3}\ell = 0$$

NON PUÒ ESSER SODDISF. CON $q_0 \neq 0$

⇒ SIST. NON HA SOLUZ. !!!

LES



∃ LA SOLUZ. ? SE SÌ È UNICA ?