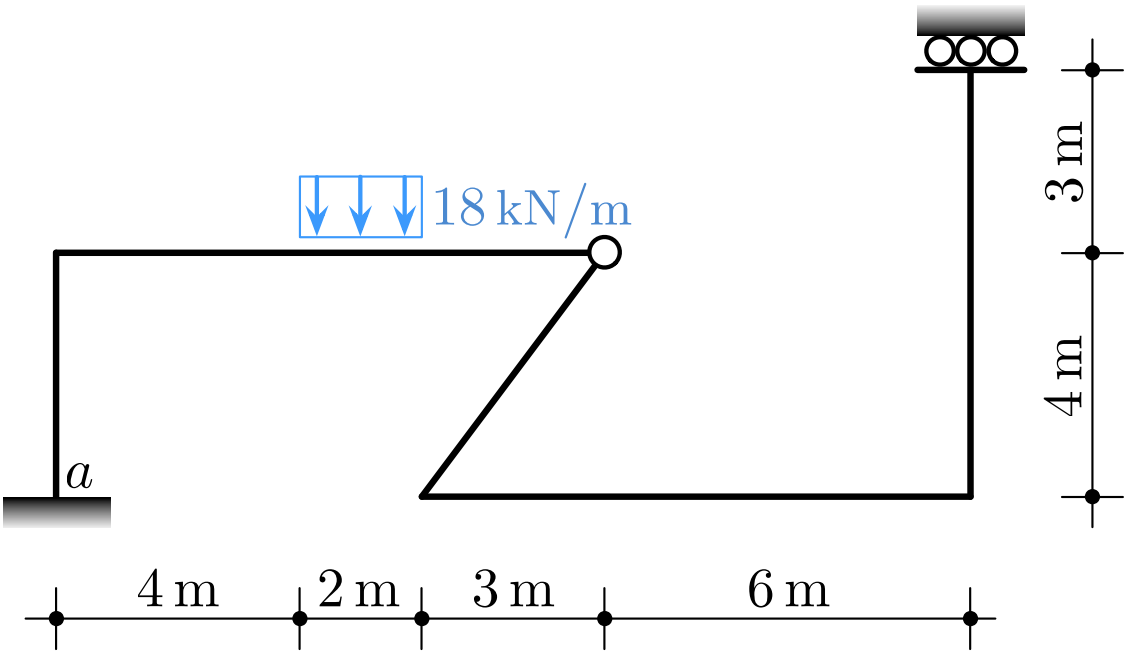
FONDAMENTI DI MECCANICA DELLE STRUTTURE

(docente: G. FORMICA)

PROVA DI VERIFICA – 17 gennaio 2019

STUDENTE: traccia **B**



Parte 2

Del sistema iperstatico rappresentato in figura, composto di elementi in acciaio caratterizzati da un momento ultimo $\boldsymbol{M}_{\mathrm{u}} = \mathbf{350\,kN\,m}$, si stimi il carico di collasso secondo i teoremi dell'analisi limite. Scelta come incognita X la **reazione a momento dell'incastro** in a, si consegnino

2.1. i risultati ottenuti all'interno dell'approccio statico:

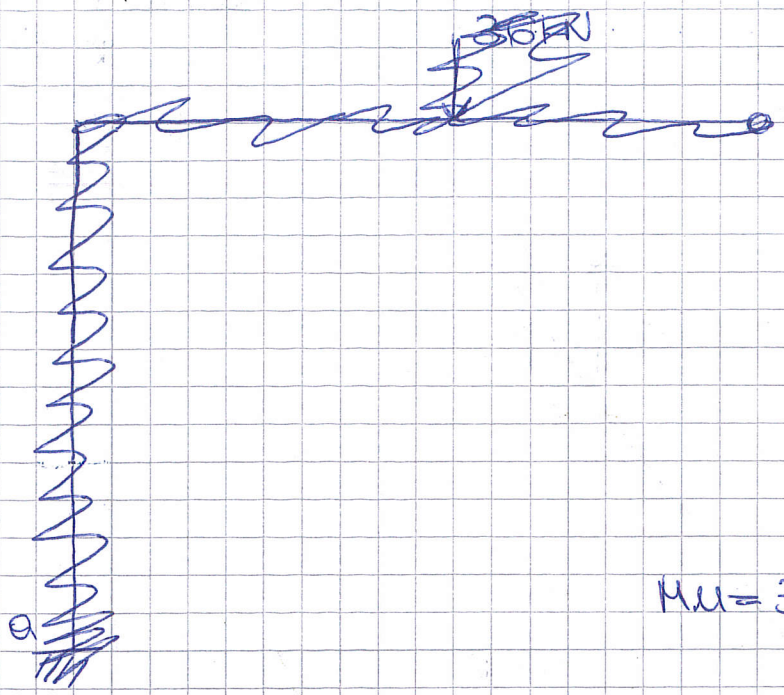
- i diagrammi di $(N_0,\, T_0,\, M_0)$ e $(N_X,\, T_X,\, M_X)$ distribuiti sullo schema isostatico,
- il valore del fattore di amplificazione del carico λ_s,
- il relativo diagramma $M = M_0 + M_X$ *staticamente ammissibile* ($\left|M\right| \leq M_{\mathrm{u}}$);

2.2. i risultati ottenuti all'interno dell'approccio cinematico:

- il (grafico del) meccanismo di collasso *cinematicamente ammissibile*,
- il relativo valore del fattore di amplificazione del carico λ_p.

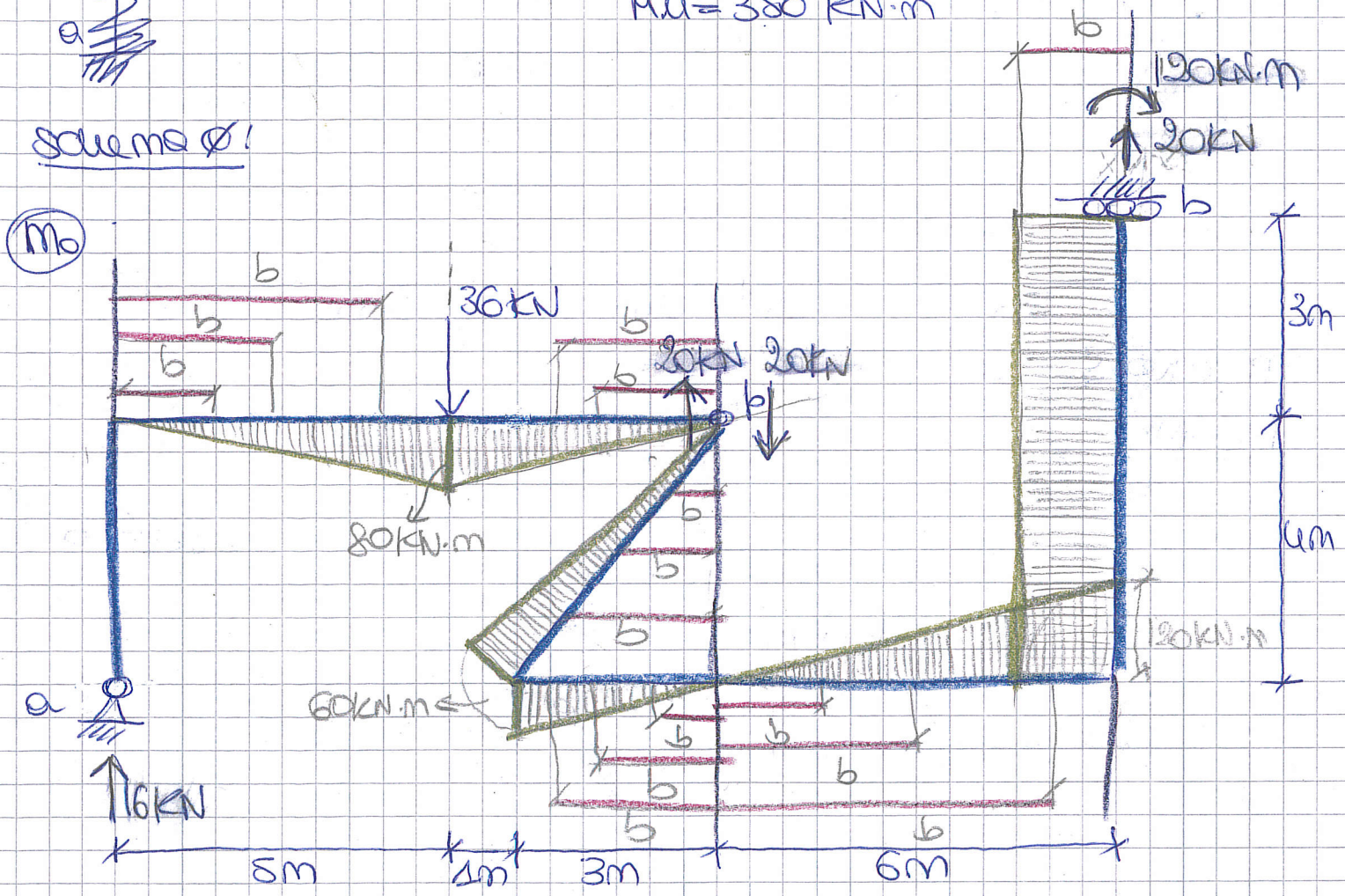
ELISA GENOVESI

17/01/2019



$M_u = 350\ KN \cdot m$

Schema Ø!



EQL. SX

Legge di Archimede

$C = a \quad \Sigma H = 0$

$36 \cdot 5 - R_v(b) \cdot 9 = 0$

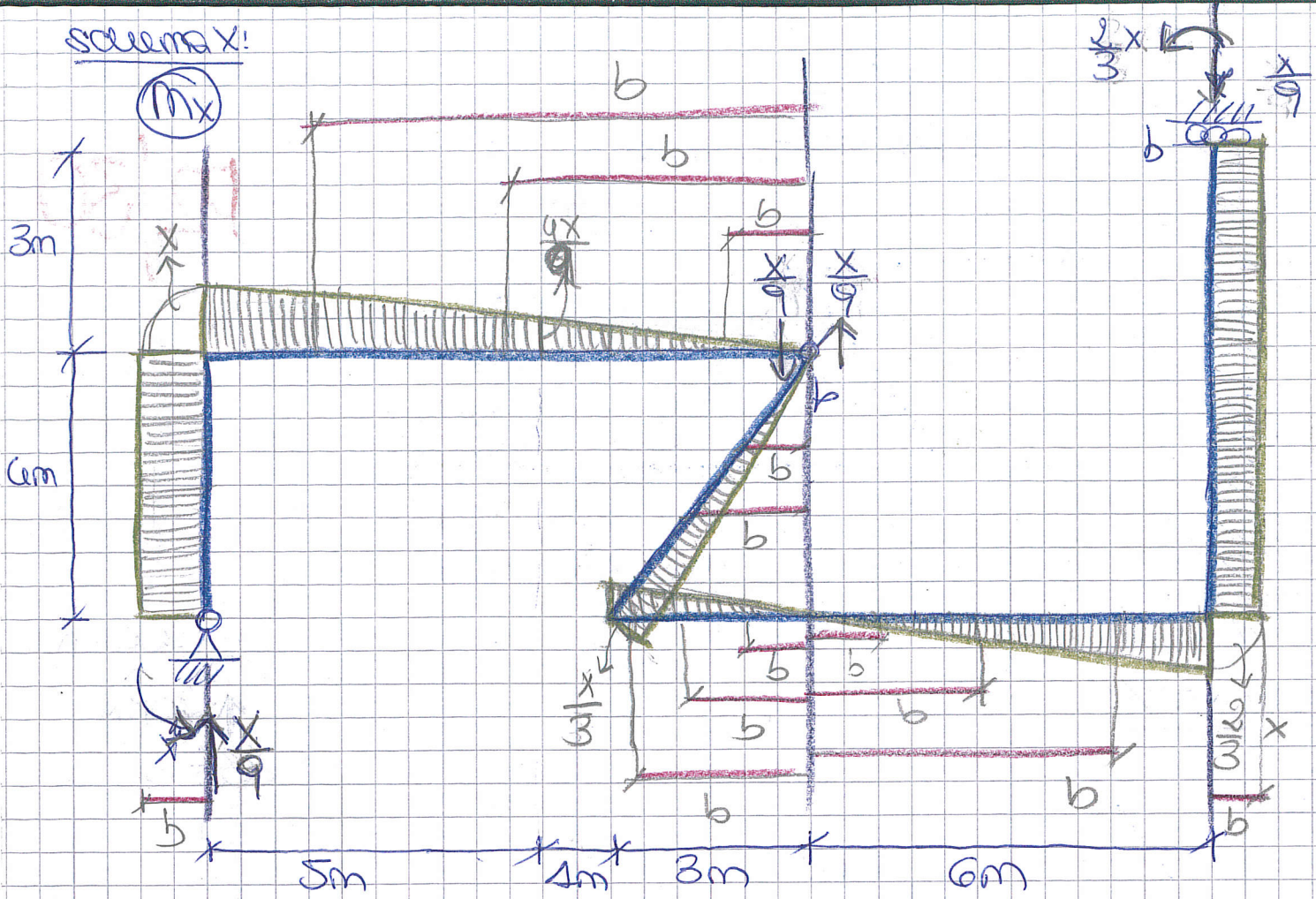
$R_v(b) = \frac{36 \cdot 5}{9} = 20KN$

$R_v(a) = 36 - 20 = 16\ KN$

EQUL. DX

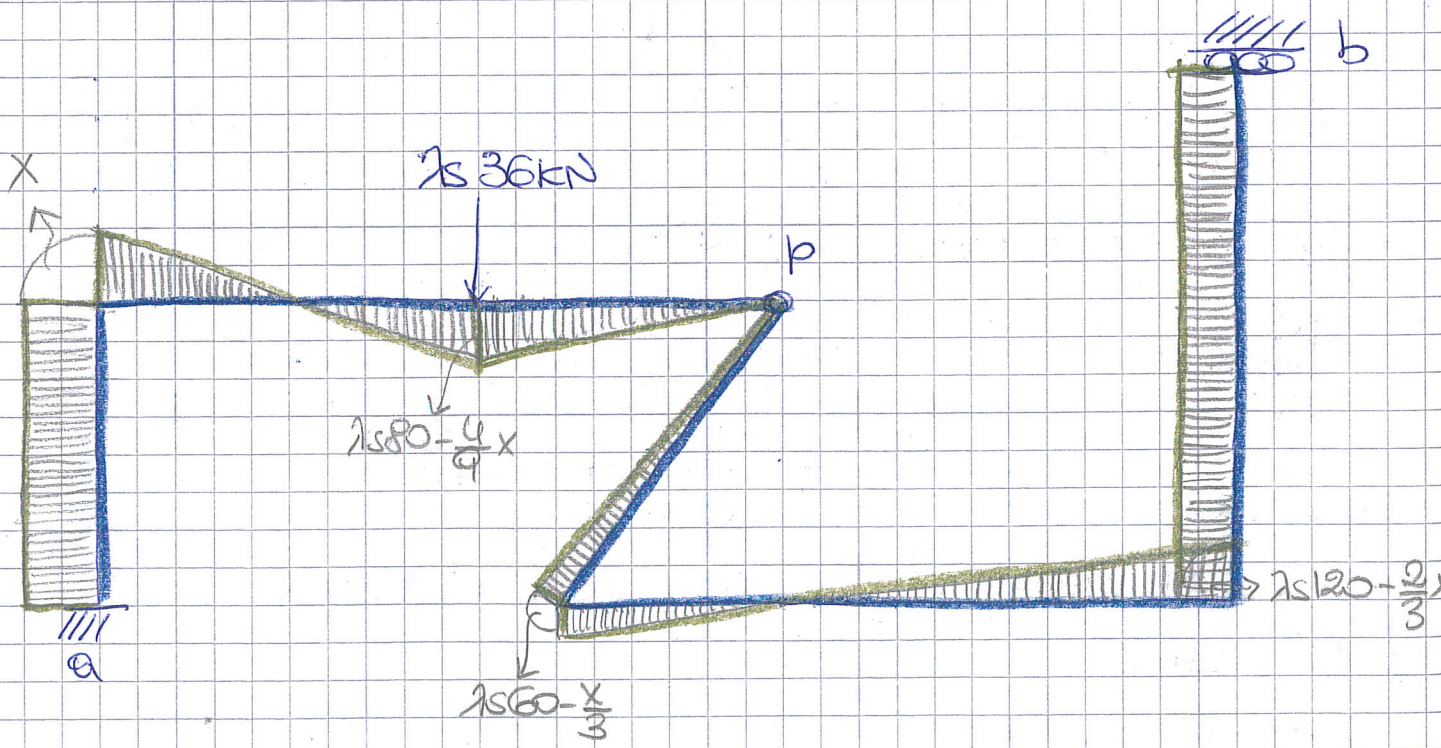
$R_m = 20 \cdot 6 = 120KN \cdot m$

schema X:



APPROCCIO STATICO

M0+MX



$$\begin{cases} \lambda s\,80 - \frac{4}{9}x \le M_M \\ \lambda s\,60 - \frac{x}{3} \le M_M \\ \lambda s\,120 - \frac{2}{3}x \le M_M \leftarrow M_{max} \\ x \le M_M \end{cases}$$

$X = M_M$

$$\begin{cases} \lambda s\,120 - \frac{2}{3}X = M_M \\ X = M_M \end{cases}$$

$$\lambda s\,120 = +\frac{2}{3}M_M + M_M$$

$$\lambda s\,120 = \frac{5}{3}\cdot 350$$

$$\lambda s = \frac{8}{3}\cdot\frac{\overset{175}{\cancel{350}}}{\underset{12}{\cancel{120}}} = \boxed{\frac{175}{36}}$$

$$\boxed{\lambda s \doteq 4{,}86}$$

$$\frac{15}{13}\cdot\lambda s\,80 \le \frac{\cancel{13}}{9}x\cdot\frac{15}{\cancel{13}} \rightarrow \sim \lambda s\,93$$

$$\frac{15}{12}\cdot\lambda s\,60 \le \frac{\cancel{12}}{9}x\cdot\frac{15}{\cancel{12}} \rightarrow \sim \lambda s\,75$$

$$\lambda s\,120 \le \frac{15}{9}x \Leftarrow M_{max}$$

[redacted] $* \quad \frac{175}{\cancel{36}_9}\cdot\overset{20}{\cancel{80}} - \frac{4}{9}350 \le 350$

$$\frac{3500 - 1400}{9} \le 350$$

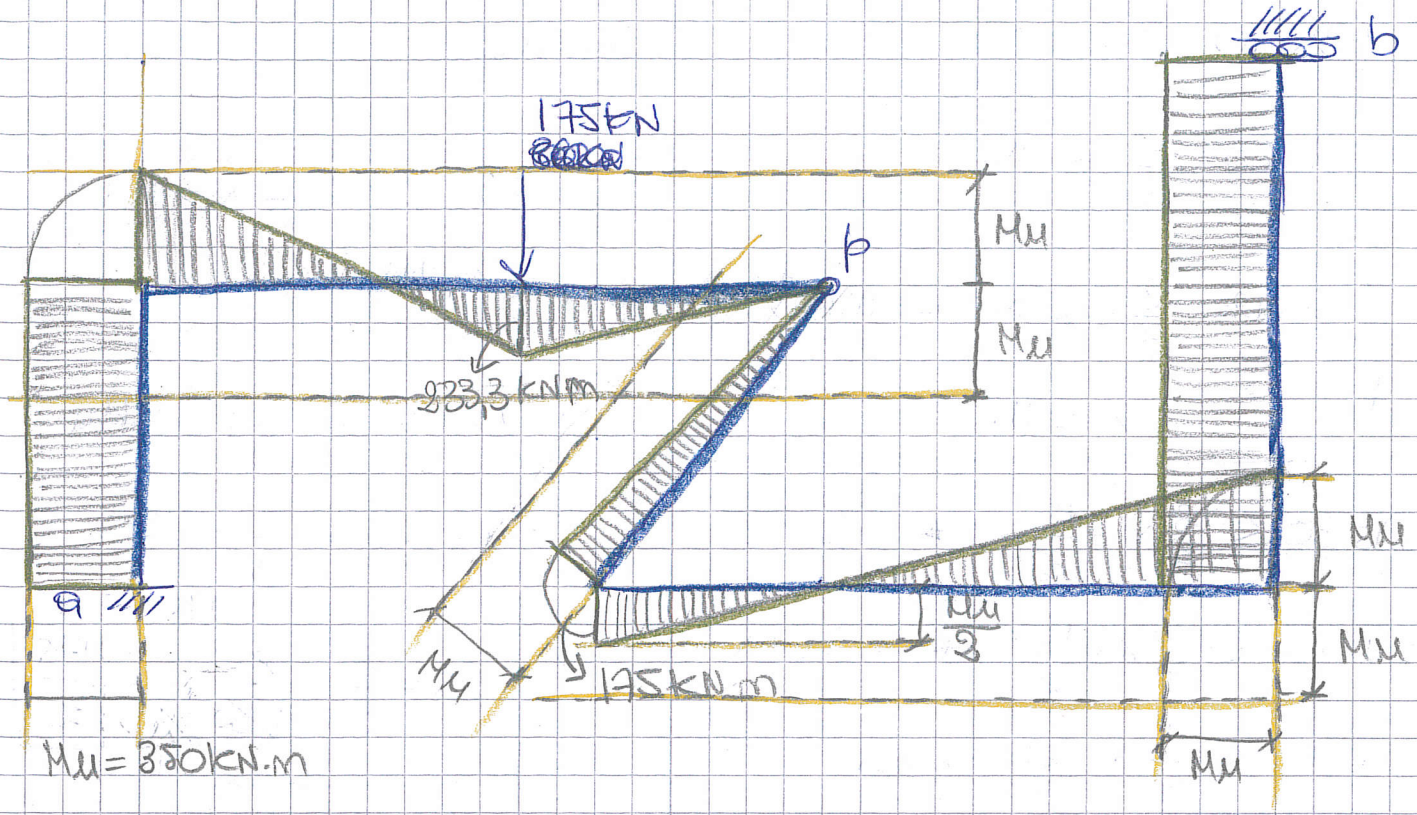
$$233{,}3 \le 350 \checkmark$$

[redacted]

$$* \quad \frac{175}{\cancel{36}_3}\cdot\overset{5}{\cancel{65}} - \frac{350}{3} \le 350$$

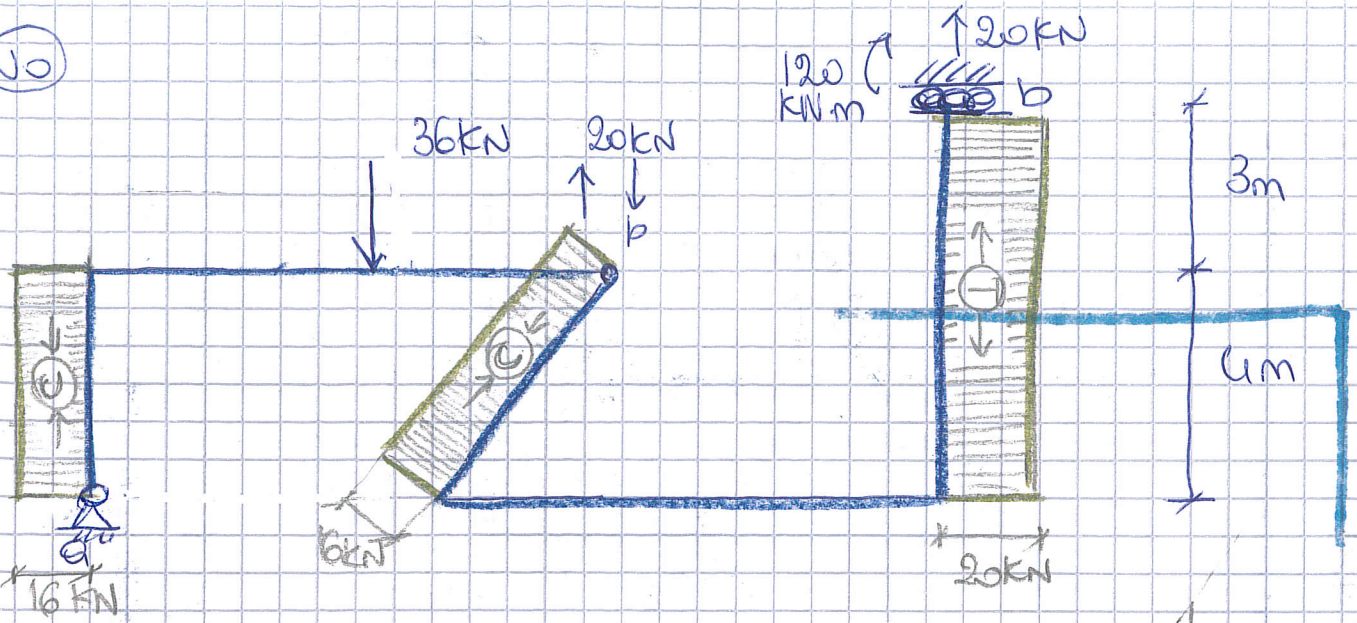
$$\frac{\overset{175}{\cancel{525}} - 350}{3} \le 350$$

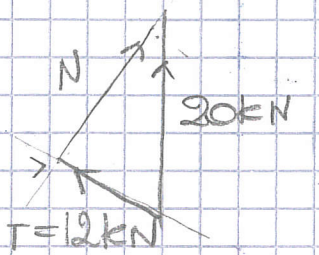
$$175 \le 350 \checkmark$$

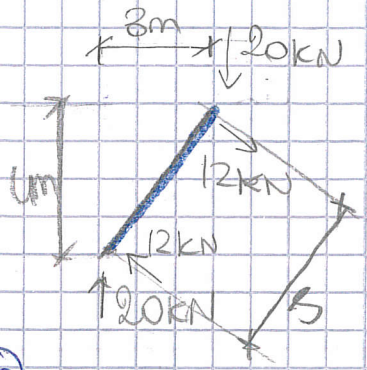


$M_H = 350 kN.m$

(No)



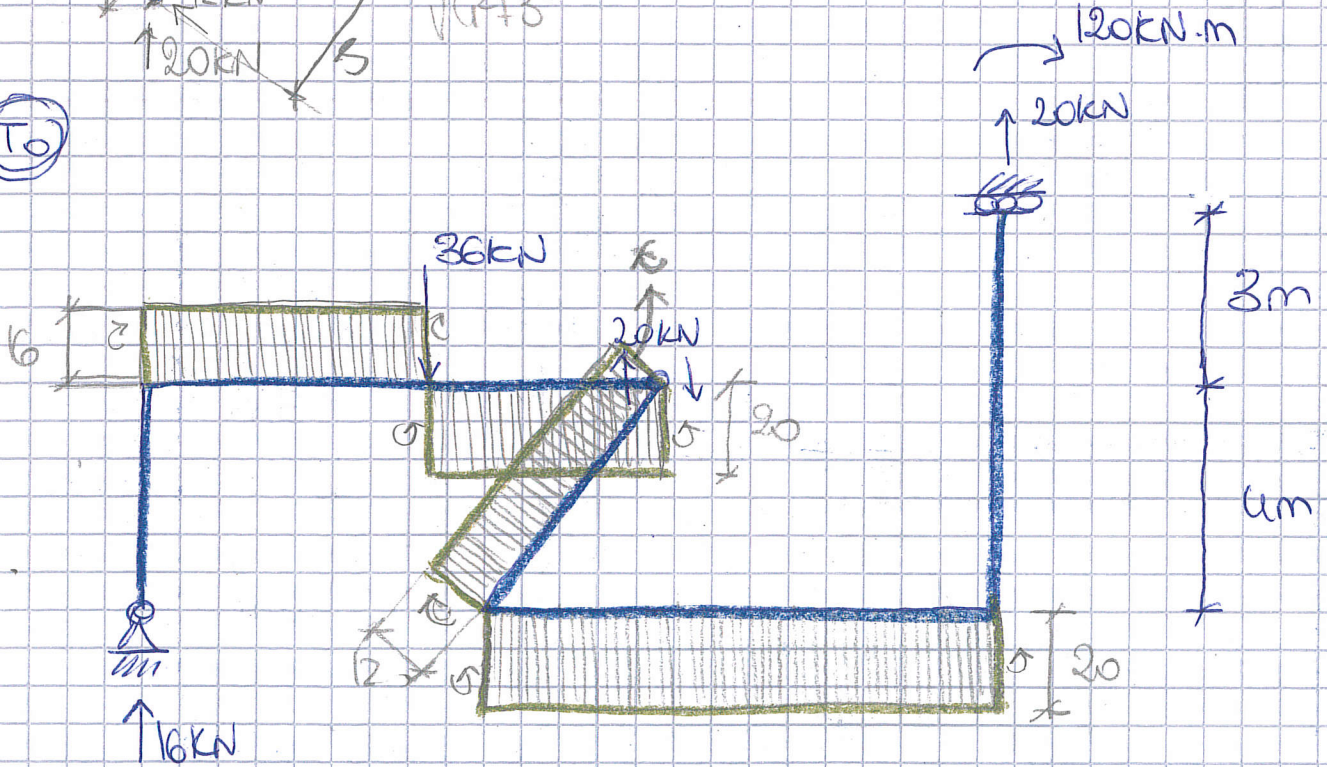




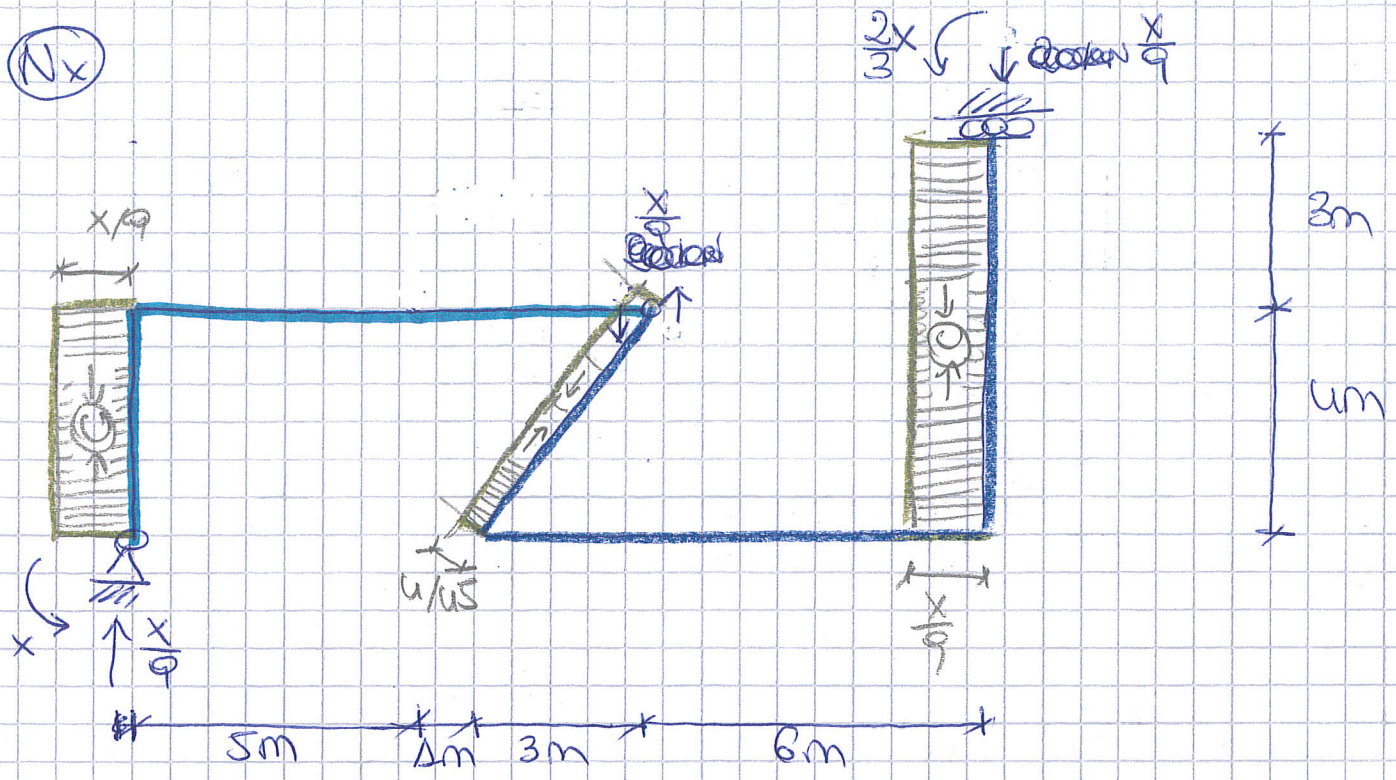
$T = \frac{60}{5} = 12KN$

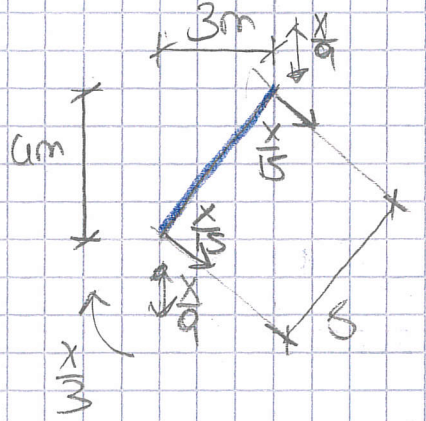
$N = \sqrt{20^2 - 12^2} = 16KN$

(To)

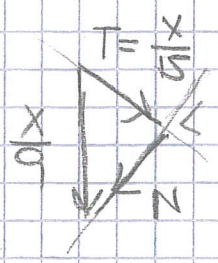


(Nx)



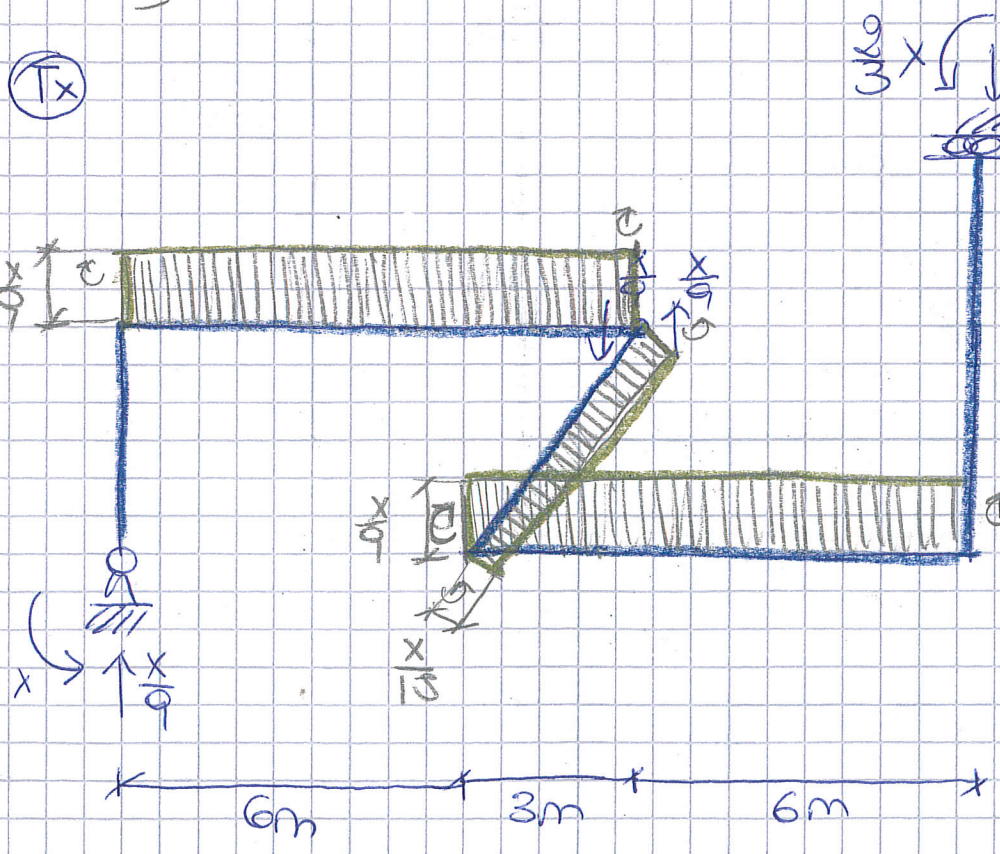


$$T = \frac{X}{3} \cdot \frac{1}{5} = \frac{X}{15}$$

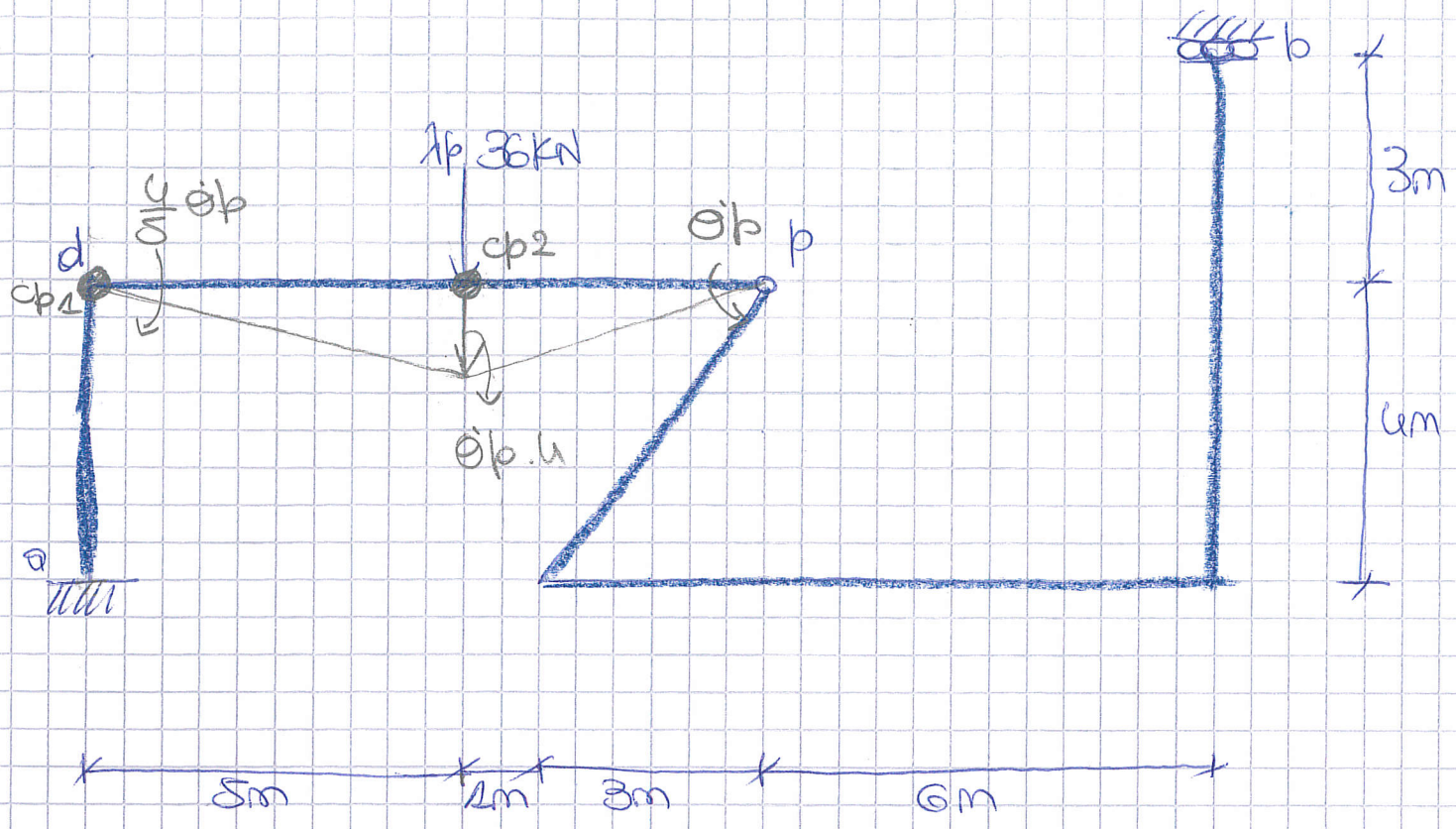


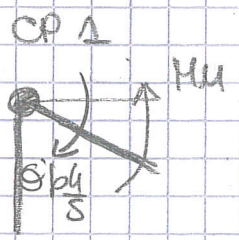
$$N = \sqrt{\left(\frac{X}{9}\right)^2 - \left(\frac{X}{15}\right)^2} = \frac{4}{\sqrt{15}} X$$

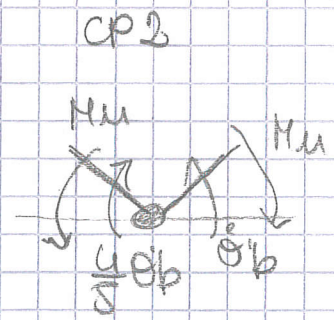
(Tx)



APPROCCIO CINEMATICO







$$\lambda p = \frac{Mu \cdot \frac{4}{5}\theta p + Mu\,\theta p + Mu\,\frac{4}{5}\theta p}{36 \cdot \theta p \cdot 4} = \frac{\frac{350}{70} \cdot \frac{13}{5}}{8 \cdot 36 \cdot 4/2} = \frac{455}{72}$$

$$\boxed{\lambda p \cong 6{,}31}$$

PER MINIMIZZARE λp SI POTREBBE PENSARE DI SPOSTARE LA CP. DAL PUNTO "d" AL PUNTO "a".

$$\boxed{\lambda s \le \lambda c \le \lambda p} \rightarrow \boxed{4{,}86 \le \lambda c \le 6{,}31}$$

$$\boxed{\frac{175}{36} \le \lambda c \le \frac{455}{72}}$$