Condizione di equilibrio

$$\sum_i F_i = 0$$

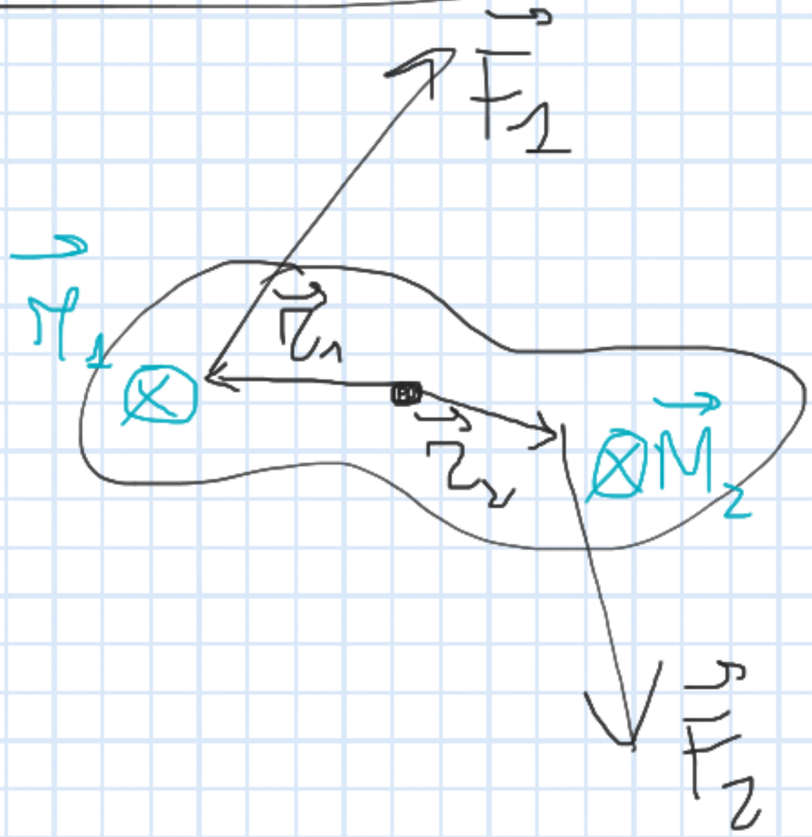
Momento di una Forza

$$\vec{M} = \vec{r} \times \vec{F}$$

$$M = r \cdot F_{tang}$$

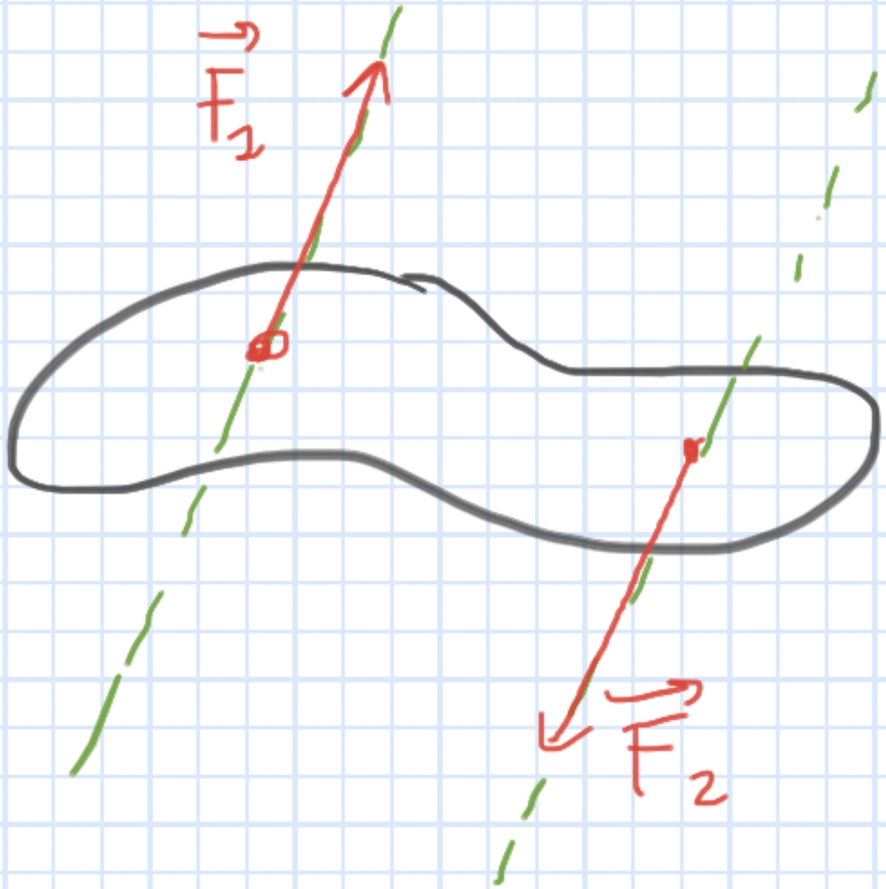
$$M = b \cdot F$$

Con 2 Forze



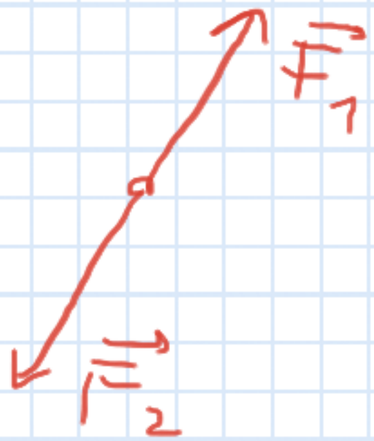
COPPIA DI FORZE

↳ 2 forze parallele e discordi di uguale intensità, che agiscono su due punti diversi di un corpo rigido



$$\vec{F}_1 = -\vec{F}_2$$

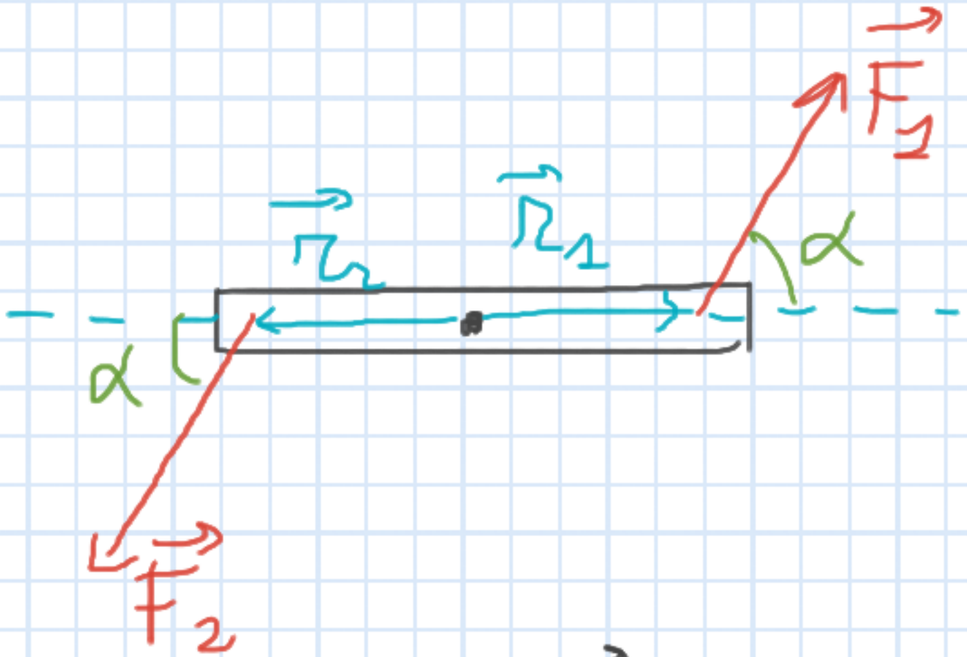
$$(F_1 = F_2)$$



$$\vec{F}_1 + \vec{F}_2 = \vec{0}$$

$$\vec{F}_{TOT} = \vec{0}$$

Calcoliamo il momento di una coppia di forze



$$\vec{F}_1 = -\vec{F}_2$$

$$\vec{r}_1 = -\vec{r}_2$$

$$\vec{M}_1 = \vec{r}_1 \times \vec{F}_1$$

$$\vec{M}_2 = \vec{r}_2 \times \vec{F}_2$$

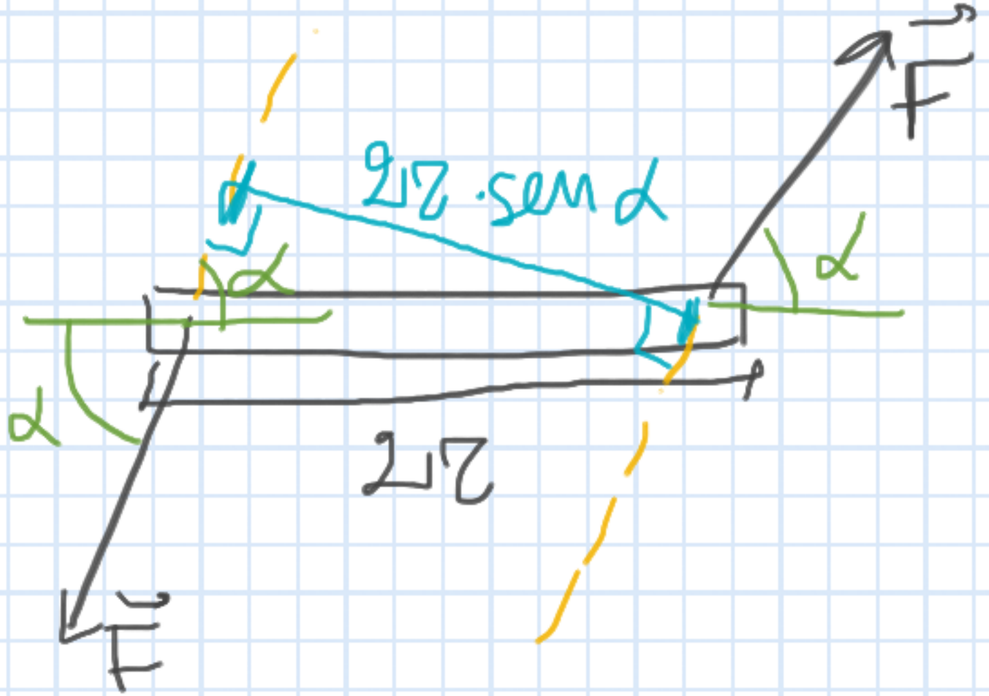
$$\vec{M}_{TOT} = \sum_i \vec{M}_i = \sum_i \vec{r}_i \times \vec{F}_i$$ Momento risultante

$$\vec{M}_{TOT} = \vec{r}_1 \times \vec{F}_1 + \vec{r}_2 \times \vec{F}_2 = \vec{r}_1 \times \vec{F}_1 + (-\vec{r}_1) \times (-\vec{F}_1) =$$

$$= \vec{r}_1 \times \vec{F}_1 + \vec{r}_1 \times \vec{F}_1 = 2\,\vec{r}_1 \times \vec{F}_1$$

$$M_{(coppia)} = 2 \cdot r \cdot F \cdot \operatorname{sen}\alpha$$

$$= \underbrace{2r \cdot \operatorname{sen}\alpha} \cdot F = d \cdot F$$



distanza tra forze = segmento perpendicolare tra le rette di azione delle 2 forze

Condizioni di equilibrio di un corpo esteso

1) $\vec{R} = \vec{0}$
$(\vec{F}_{TOT} = 0)$
$(\Sigma \vec{F}_i = 0)$

→ la risultante delle forze che agiscono sul corpo deve essere uguale a $\vec{0}$

(→ NON CI SONA TRASLAZIONI)

2) $\vec{M}_{TOT} = \vec{0}$

→ il momento torcente totale rispetto a un punto qualsiasi deve essere nullo

(→ NON CI SONO ROTAZIONI)

ESERCIZI

N36

$P_L = 99\,N$ $\quad P_T = ?$

$g_L = 1{,}62\,\frac{m}{s^2}$ $\quad g_T = 9{,}81\,\frac{m}{s^2}$

$$P = m \cdot g$$

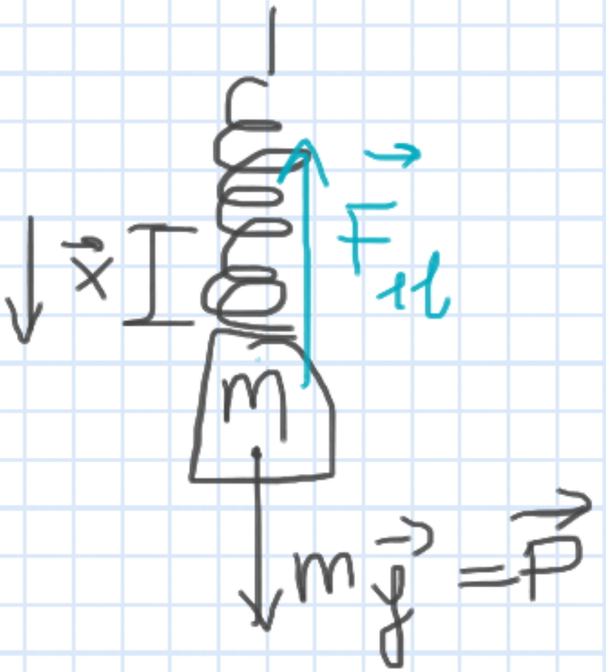
$$P_L = m \cdot g_L \rightarrow m = \frac{P_L}{g_L}$$

$$P_T = m \cdot g_T = \frac{P_L}{g_L} \cdot g_T = \frac{99\,N}{1{,}62\,\frac{m}{s^2}} \cdot 9{,}81\,\frac{m}{s^2}$$

N40

$m = 25\,g = 0{,}025\,Kg$

$\Delta L = x = 2\,cm = 0{,}02\,m$



$\vec{F}_{ee} = -\vec{P}$

$L = -k\vec{x}$

$F_{el} = P = mg$

$L = Kx$

$Kx = mg \rightarrow K = \frac{mg}{x}$

$$K = \frac{0{,}025\,Kg \cdot 9{,}81\,m/s^2}{0{,}02\,m}$$

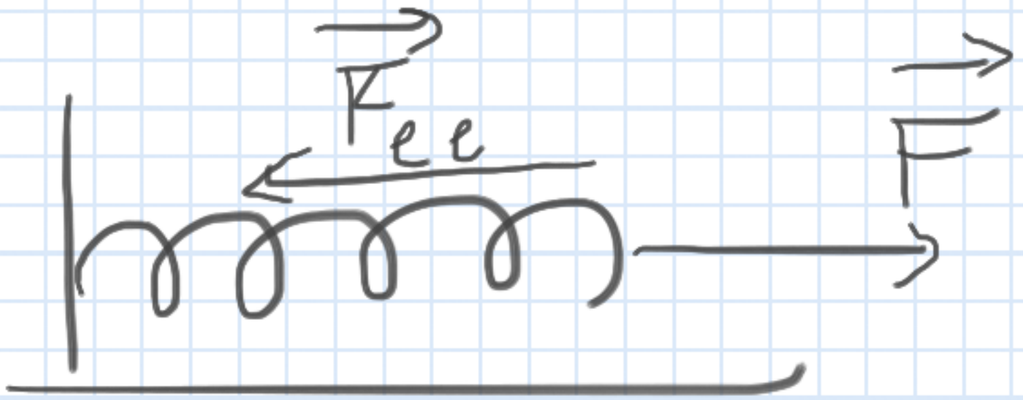
N

N42

$L = 20\,cm = 0{,}2\,m$

$K = 250\ \frac{N}{m}$

$F = 5\,N$



$F_{ee} = F = 5\,N$

$L = K \cdot x$

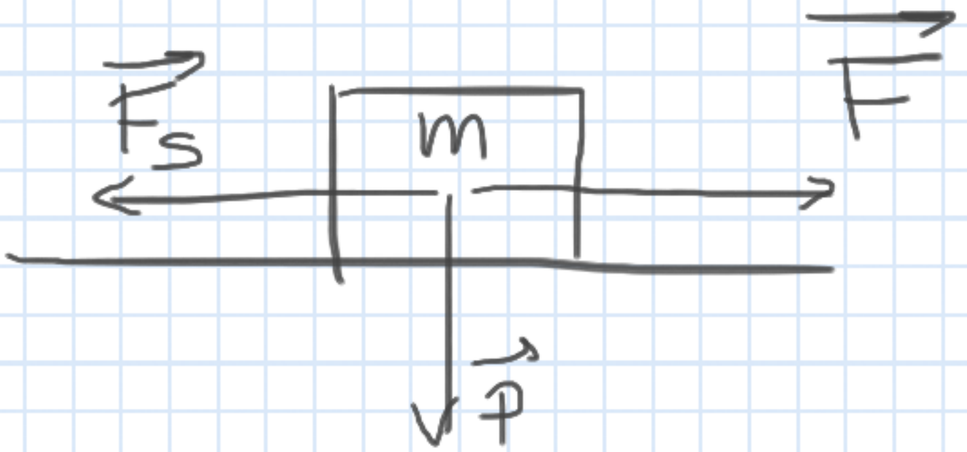
$\rightarrow x = \frac{F}{K}$

$L_{final} = L + x$

N53

$m = 14\,kg$

$\mu_s = 0{,}64$



$\vec{P} = \vec{F_\perp}$

$F_s = \mu_s F_\perp$

$\| $

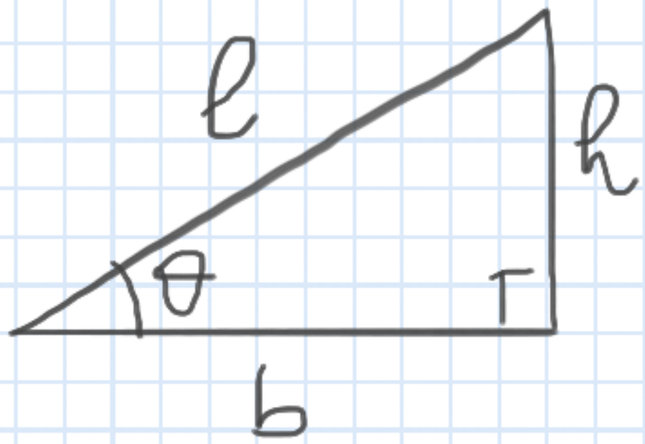
F

$\Big\}$ $F = \mu_s \cdot P = \mu_s \cdot m \cdot g$

N61

$\ell = 10\,m$

$h = 3\,m$



$$h = \ell \cdot \operatorname{sen}\theta$$

$$\operatorname{sen}\theta = \frac{h}{\ell} \Rightarrow \quad \theta = \underbrace{\text{arcsen}}_{\sin^{-1}}\left(\frac{h}{\ell}\right)$$

$\text{arccos} \rightarrow \cos^{-1}$

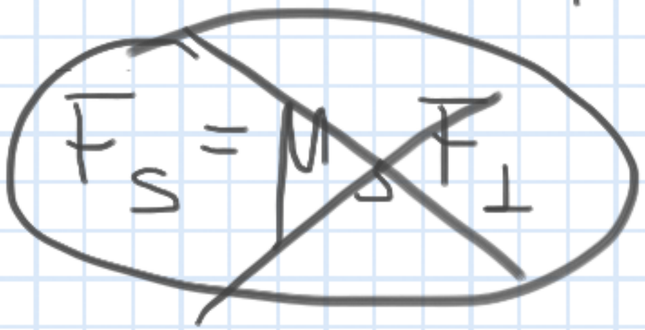
$\text{arctg} \rightarrow \tan^{-1}$

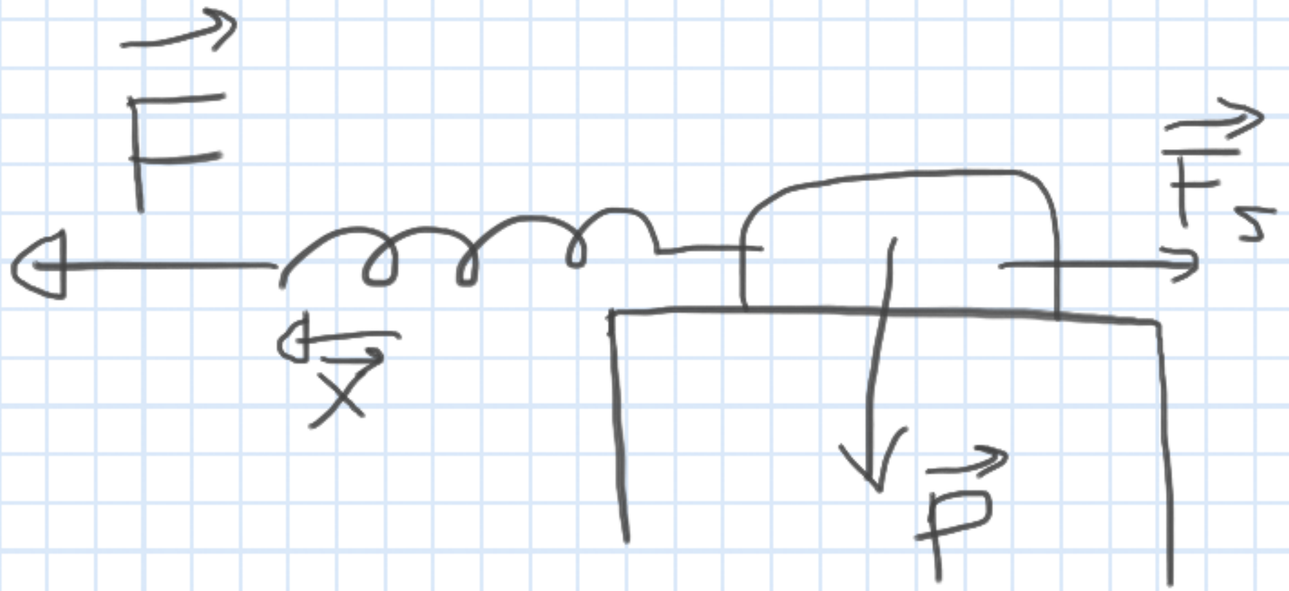
N64

$P = 52\,N$

$K = 150\,\frac{N}{m}$

$X = 2cm = 0{,}02\,m$





$$F = K \cdot X$$

$$\| $$

$$F_s$$