FORZA

RELAZIONE TRA FORZA e VARIAZIONE del MOTO

IMPULSO di una forza applicata ad un corpo

$$\vec{J} = \vec{F} \cdot \Delta t \qquad \vec{F} \text{ costante durante } \Delta t$$

$$d\vec{J} = \vec{F} \cdot dt \longleftarrow \vec{F} \text{ non costante}$$

$$\vec{J} = \int_0^{\Delta t} \vec{F} \cdot dt$$

$$d\vec{J} = m_1 \, d\vec{v}_1$$

$$d\vec{J} = m_2 \, d\vec{v}_2$$

$$m_2 > m_1$$

$$dv_2 < dv_1$$

$$d\vec{J} = m \, d\vec{v}$$

m = MASSA INERZIALE

$$d\vec{J} = m\, d\vec{v}$$

$$\vec{J} = \int_{t_1}^{t_2} m\, d\vec{v} = m\,\Delta\vec{v} = m\left(\vec{v}_2 - \vec{v}_1\right)$$

$\int_{t_1}^{t_2}$ = SOMMA

$m\,\Delta\vec{v}$ = QUANTITA' di MOTO = $\vec{p}$

$$\boxed{\vec{J} = \Delta\vec{p}}$$

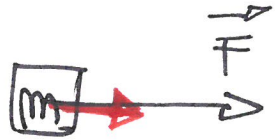
LEGGE dell'IMPULSO

1 PRINCIPIO DINAMICA $d\vec{J} = 0$ $m\,d\vec{v} = 0$ $\vec{v}_1 = \vec{v}_2$

NON CI SONO FORZE → PRINCIPIO d'INERZIA

2° PRINCIPIO

$$\vec{a} = \frac{\vec{F}}{m}$$



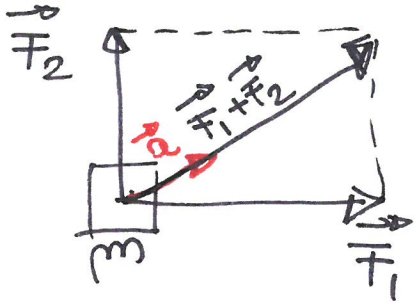
$$d\vec{J} = \frac{\vec{F} \cdot dt}{dt} = m\frac{d\vec{v}}{dt} \rightarrow \boxed{\vec{F} = m\vec{a}}$$

$$\left[kg \cdot \frac{m}{s^2}\right]$$

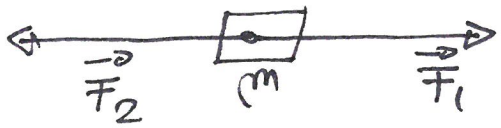
=

NEWTON

$[N]$



$$\vec{a} = \frac{\vec{F}_1 + \vec{F}_2}{m}$$



$$F_1 = F_2 \qquad |\vec{F}_1| = |\vec{F}_2|$$

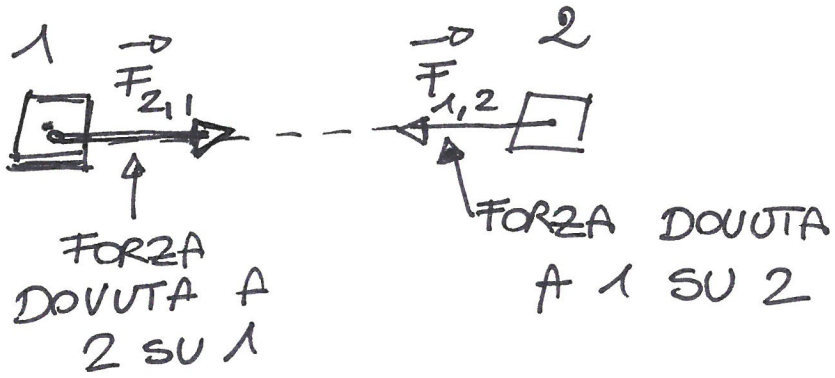
$$\vec{F}_1 + \vec{F}_2 = 0$$

$$\vec{a} = \frac{\vec{F}_1 + \vec{F}_2}{m} = 0$$

$$\vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \ldots \vec{F}_n \qquad \boxed{\sum_{i=1}^{N} \vec{F}_i = 0}$$

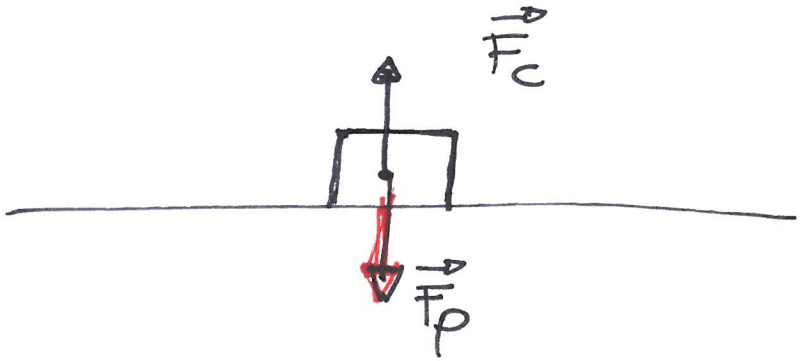
CONDIZIONE di EQUILIBRIO TRASLAZIONALE

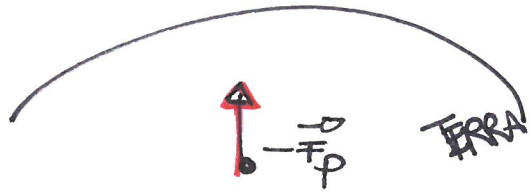
3° PRINCIPIO AZIONE / REAZIONE



$$\vec{F}_{1,2} = -\vec{F}_{2,1}$$

$$\vec{F}_{1,2} + \vec{F}_{2,1} = 0$$





LAVORO di UNA FORZA W L

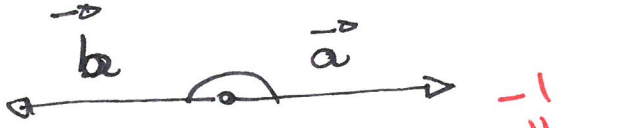
$$L = \vec{F} \cdot \vec{S}$$

se FORZA COSTANTE durante lo SPOSTAMENTO

$L > 0$ se $\theta < \frac{\pi}{2}$

$L = 0$ se $\theta = \frac{\pi}{2}$

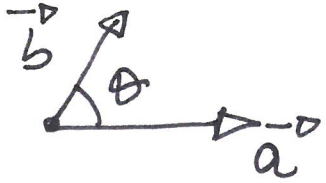
$L < 0$ se $\theta > \frac{\pi}{2}$

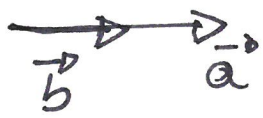


$$\vec{a} \cdot \vec{b} = a \cdot b \cdot \cos \pi = -ab$$

PRODOTTO SCALARE

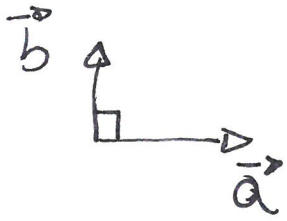
$$\vec{a} \cdot \vec{b} = a\, b \cos \theta$$





$$\vec{a} \cdot \vec{b} = a \cdot b \cdot \cos 0^\circ = ab$$

$\cos 0^\circ = 1$



$$\vec{a} \cdot \vec{b} = a \cdot b \cdot \cos \frac{\pi}{2} = 0$$

$\cos \frac{\pi}{2} = 0$

$$dL = \vec{F} \cdot d\vec{s} \longrightarrow L = \int_{s_1}^{s_2} \vec{F} \cdot d\vec{s}$$

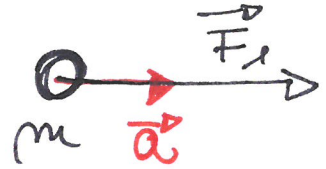
$$L = \vec{F} \cdot \vec{s} = [N \cdot m] = \text{JOULE } [J]$$

$$J$$

$$J = N \cdot m = kg \cdot \frac{m}{s^2} \cdot m = \boxed{kg \cdot \frac{m^2}{s^2}}$$

$m = 3\,kg \qquad F_1 = 20\,N \qquad a = ?$

a)



$$\vec{a} = \frac{\vec{F}}{m} \Rightarrow a = \frac{F}{m} = \frac{20\,N}{3\,kg} = 6{,}7\,\frac{m}{s^2}$$

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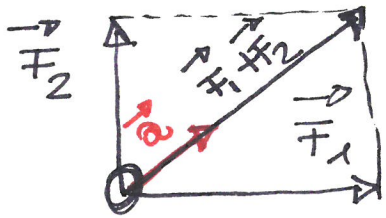
b) $F_2 = 15\,N \qquad F_1 = 20\,N$



$$\vec{a} = \frac{\vec{F}_1+\vec{F}_2}{m} \longrightarrow a = \frac{|\vec{F}_1+\vec{F}_2|}{m} = \frac{25\,N}{3\,kg} = 8{,}3\,\frac{m}{s^2}$$

$$|\vec{F}_1+\vec{F}_2| = \sqrt{F_1^2+F_2^2} = \sqrt{20^2+15^2} = 25\,N$$

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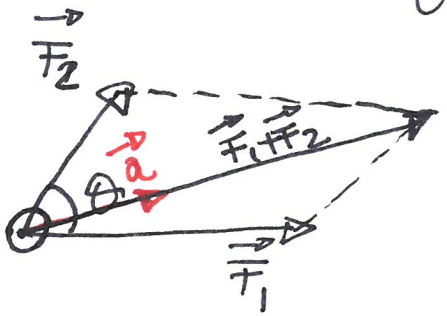
c) $\theta = 60°$



$$a = \frac{|\vec{F}_1+\vec{F}_2|}{m} = \frac{30{,}4\,N}{3\,kg} = 10{,}1\,m/s^2$$

$$|\vec{F}_1+\vec{F}_2| = \sqrt{F_1^2+F_2^2+2F_1F_2\cos\theta}$$

$$= \sqrt{20^2+15^2+(2\cdot 20\cdot 15\cdot \cos 60°)}$$

$$= 30{,}4\,N$$