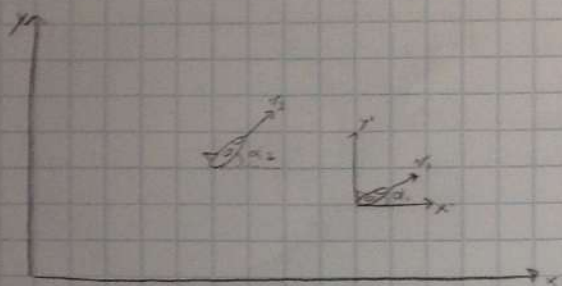


Questionario di fisica n° 6

Michela Di Luca

Esercizio n° 1



$$v_1 = 500 \text{ km/h}$$

$$v_2 = 300 \text{ km/h}$$

$$\alpha_1 = 30^\circ$$

$$\alpha_2 = 60^\circ$$

$$v_2' = v_2 - v_1$$

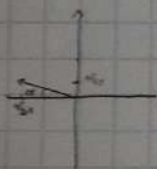
$$x') \quad v_{2x}' = v_2 \cos \alpha_2 - v_1 \cos \alpha_1$$

$$y') \quad v_{2y}' = v_2 \sin \alpha_2 - v_1 \sin \alpha_1$$

$$v_{2x}' = 300 \cos 60 - 500 \cos 30 = 300 \cdot \frac{1}{2} - 500 \frac{\sqrt{3}}{2} = -283 \frac{\text{km}}{\text{h}}$$

$$v_{2y}' = 300 \sin 60 - 500 \sin 30 = 300 \frac{\sqrt{3}}{2} - 500 \frac{1}{2} = 9 \frac{\text{km}}{\text{h}}$$

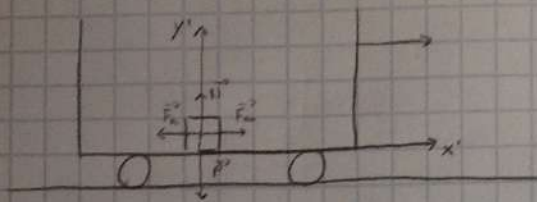
$$|\vec{v}_2'| = \sqrt{v_{2x}'^2 + v_{2y}'^2} = \sqrt{283^2 + 9^2} = 282 \frac{\text{km}}{\text{h}}$$



$$\sin \alpha = \frac{v_{2y}'}{v_2} = \frac{9}{282} = 0,0319$$

$$\alpha = \arcsin 0,0319 = 1,82^\circ$$

Exercício nº 2



$$m = 250g = 0,25kg$$

$$a_0 = 1m/s^2$$

$$\mu_c = 0,15$$

Eq. Força

$$\vec{N} + \vec{P} + \vec{F}_{es} + \vec{F} = m\vec{a}$$

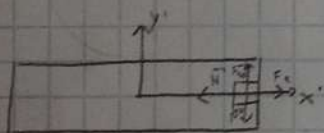
$$x') -ma_0 + F_{es} = ma \rightarrow -ma_0 + \mu_s N = ma$$

$$y') N - mg = 0 \rightarrow N = mg$$

$$-ma_0 + \mu_c mg = ma$$

$$a = \mu_c g - a_0 = 1,473 - 1 = 0,473$$

Exercício nº 3



$$R = 10cm$$

$$\omega = 10 \frac{g \cdot \pi}{min} = 1,05 \frac{rad}{s}$$

$$m = 40kg$$

Eq. Força

$$\vec{N} + \vec{P} + \vec{F}_e + \vec{F}_{es} = 0$$

$$x') -N + F_e = 0 \rightarrow F_e = N \Rightarrow N = m\omega^2 R$$

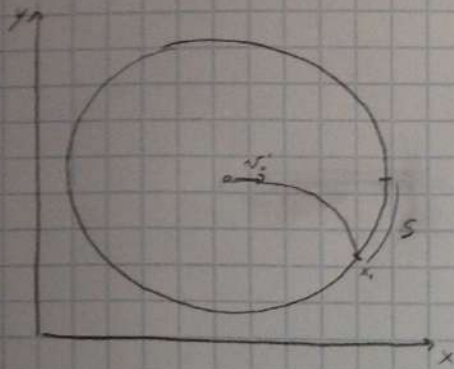
$$y') F_{es} - P = 0 \rightarrow F_{es} = mg$$

$$\mu_s N \geq mg \rightarrow \mu_s m\omega^2 R \geq mg$$

$$\mu_s \geq \frac{g}{\omega^2 R}, \quad \frac{9,82}{1,05^2 \cdot 10} = 0,89$$

$$\mu_s \geq 0,89$$

Esercizio n° 4



$$R = 1 \text{ m}$$

$$\omega = \frac{1 \text{ rad}}{3}$$

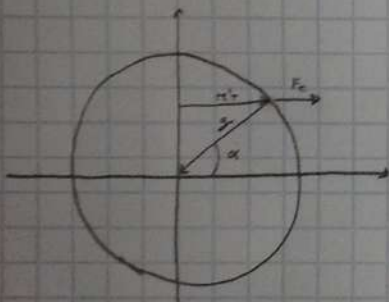
$$v_0 = \frac{3 \text{ m}}{3}$$

$$x = v_0 t \quad t = \frac{x}{v_0} = \frac{1}{3} = 0,33 \text{ s}$$

Punto di caduta

$$x = v_0 t = \omega R t = 1 \cdot 1 \cdot 0,33 = 0,33 \text{ m}$$

Esercizio n° 5



$$\alpha = 30^\circ$$

Eg. Formula

$$\vec{P} + \vec{F}_c + \vec{F}_{co} = m \vec{a}$$

↳ Forza peso apparente

$$m \vec{g} - m \vec{\omega} \times (\vec{\omega} \times \vec{r}) = m \vec{g}'$$

corpo fermo

$$\vec{g} - \vec{\omega} \times \vec{\omega} \times \vec{r} = \vec{g}'$$

$$R_E = 6400 \text{ km} = 6400000 \text{ m}$$

$$g = 9,82 \text{ m/s}^2$$

$$\omega = 7,27 \cdot 10^{-5} \text{ rad/s}$$

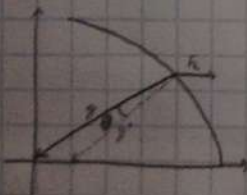
$$F_c = \omega^2 R \cos \alpha = 0,029$$

$$g' = \sqrt{g^2 + F_c^2 - 2 g F_c \cos \alpha} =$$

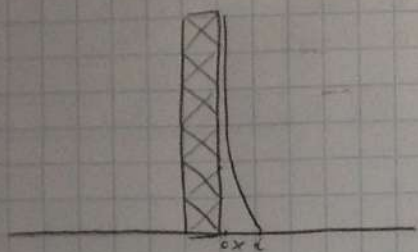
$$= \sqrt{9,82^2 + 0,029^2 - 2 \cdot 9,82 \cdot 0,029 \cdot \cos 30} = 9,79 \frac{\text{m}}{\text{s}^2}$$

$$\sin \theta = \frac{F_c}{g'} \sin 30 = \frac{0,029}{9,79} \sin 30 = 0,00148$$

$$\theta = \arcsin(0,00148) = 0,08^\circ$$



Exercício n° 6



$$h = 100 \text{ m}$$

$$\omega = 8,27 \cdot 10^{-3} \frac{\text{rad}}{\text{s}}$$

1) Força $\vec{P} + \vec{F}_{co} = m \vec{a}'$

$$x) \quad 2m \vec{\omega} \times \vec{v}' = m \cdot a_x \quad \longrightarrow \quad a_x = \omega \sqrt{\frac{g h}{2}} = 1,61 \cdot 10^{-3} \frac{\text{m}}{\text{s}^2}$$

$$y) \quad m \vec{g}' - 2m \vec{\omega} \times \vec{v}' = m \vec{g}'$$

↓

$$\vec{g}' = \vec{g} - 2 \vec{\omega} \times \vec{v}'$$

$$\vec{g}' \approx \vec{g}$$

$$v' = \sqrt{2gh}$$

$$\vec{v}' = \sqrt{\frac{gh}{2}} = 22,16 \frac{\text{m}}{\text{s}}$$

$$x(t) = \frac{1}{2} g t^2$$

$$v' = \frac{h}{t} \quad \Rightarrow \quad t = \frac{h}{v'} = 4,51 \text{ s}$$

$$x(4,51) = \frac{1}{2} 1,61 \cdot 10^{-3} \cdot 4,51^2 = 0,016 \text{ m} = 1,6 \text{ cm}$$