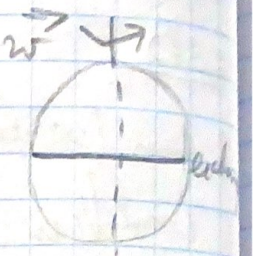
blogs lend to user fewer graphics, they make use of embedded video.

Домашнє завдання 3



① Дано:
$T = 24$ год
$h = 500$ м
$S - ?$

$\vec{F}_к = 2m[\vec{v} \times \vec{w}]$

Після падіння на екваторі з висоти 500 м сила буде направлена на схід

Буде прискорення $a_к = 2vw = 2gtw$

$v_r = \int_0^t a_к dt = \int_0^t 2gtw = gwt^2$

Тіло відхилиться на відстань:

$S = \int_0^t v dt = \int_0^t gwt^2 dt = \frac{1}{3}gwt^3$

$h = \frac{gt^2}{2} \Rightarrow t = \sqrt{\frac{2h}{g}}$; $S = \frac{1}{3}gw\left(\frac{2h}{g}\right)^{\frac{3}{2}} = \frac{2}{3}hw\sqrt{\frac{2h}{g}} =$

$= \frac{2}{3}h \cdot \frac{2\pi}{\pi}\sqrt{\frac{2h}{g}}$; $S = \frac{2}{3} \cdot 500 \cdot \frac{2 \cdot 3,14}{24 \cdot 3600} \cdot \sqrt{\frac{2 \cdot 500}{9,8}} = 0,24$

$= 24$ см

② Дано:

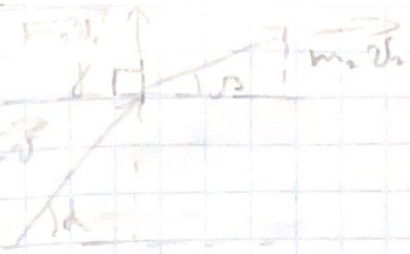
$\alpha = 60°$

$v = 10$ м/с

$\beta = 45°$

$\alpha - \beta = 90°$

$v_1 - ?$ $v_2 - ?$



$m\vec{v} = m_1\vec{v}_1 + m_2\vec{v}_2$

$mv_x = m_1v_{1x} + m_2v_{2x}$

$mv^2\cos\alpha = 0 + m_2v_2\cos\beta$

$mv\cos\alpha = \frac{1}{2}mv_2\cos\beta$

$v_2 = \frac{2v\cos\alpha}{\cos\beta} = \frac{2 \cdot 10\ м/с \cdot \cos 60°}{\cos 45°} =$

$= \frac{20 \cdot \frac{1}{2}}{\frac{\sqrt{2}}{2}} = \frac{20}{\sqrt{2}} = 14\ м/с$

$mv_y = m_1v_{1y} + m_2v_{2y}$

$mv\sin\alpha = \frac{1}{2}mv_1 + \frac{1}{2}mv_2 \cdot \sin\beta$

$2v\sin\alpha = v_1 + v_2\sin\beta =$ ~~$\frac{\sqrt{3}}{2}$~~

$v_1 = 2v\sin\alpha - v_2\sin\beta =$

$= 2 \cdot 10 \cdot \frac{\sqrt{3}}{2} - 14 \cdot \frac{\sqrt{2}}{2} = 17 - 9,9 = 7,3\ м/с$

③ Дано:

M

m

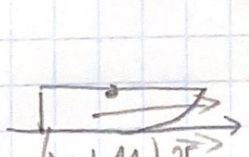
v_0

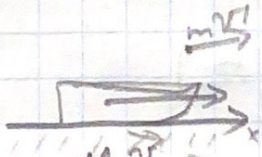
u

а) v_a ↑ - ?

б) v_a ↓ - ?

а)



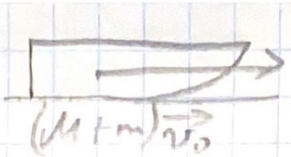


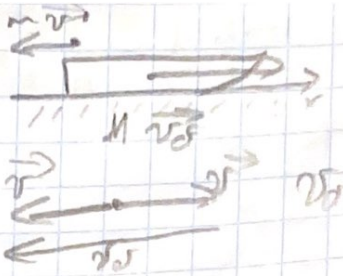
$\vec{v}_{отн} = \vec{v}_2 - \vec{v}_1$

$u_a = v' - v \Rightarrow v' = u + v$

$(m+M)v_0 = Mv + m(u+v)$, $(m+M)v_0 = Mv + mu + mv$

$v_a = \frac{(m+M)v_0 - mu}{m+M}$

б) 



$\vec{v}_0 = \vec{v} + \vec{v}' \Rightarrow v' = u - v$

$(m+M)v_0 = Mv_0 = m(u-v)$; $(m+M)v_0 = Mv - mu + mv$

$v_0 = \frac{(m+M)v_0 + mu}{M+m}$

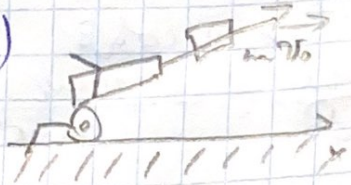
⑨ Дано:

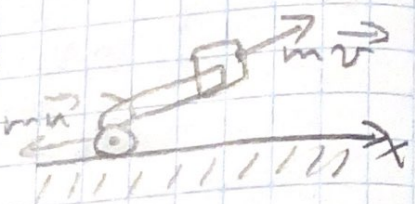
$\alpha = 60°$

$v_0 = 180$ м/с

$\eta = \frac{M}{m} = 50$

$u - ?$

а) 

б) 

$\sum \vec{p} = const \Rightarrow 0 = mv\cos\alpha - Mu \;|\cdot\frac{1}{m} \Rightarrow$

$\Rightarrow v\cos\alpha = \frac{M}{m}u$

$W_к = \frac{mv_0^2}{2} = W_{снаряда} + W_{тормоза}$; $\frac{mv_0^2}{2} = \frac{mv^2}{2} + \frac{Mu^2}{2} \;|\cdot\frac{1}{m}$

$\Rightarrow v_0^2 = v^2 + \frac{M}{m}u^2$

$\begin{cases} v\cos\alpha = \eta u \\ v_0^2 = v^2 + \eta u^2 \end{cases} \Rightarrow$ $v = \frac{\eta u}{\cos\alpha}$

$v_0^2 = u^2\left(\frac{\eta^2}{\cos^2\alpha} + \eta\right) = u^2\eta\left(\frac{\eta}{\cos^2\alpha} + 1\right) =$

$= u^2\eta\left(\frac{\eta + \cos^2\alpha}{\cos^2\alpha}\right)$

$u = \frac{v_0\cos\alpha}{\sqrt{\eta(\eta+\cos^2\alpha)}} \simeq \frac{v_0\cos\alpha}{\eta} = \frac{180\cdot\cos 60°}{50} = 1{,}8$ м/с

Дано:

m

v_1

M

v_2

$Q - ?$

Швидкість куль після пробиття

$v_2 = \left(\frac{m}{M}\right)(v_1 - v_2)$

$\frac{M(v_2)^2}{2} + \frac{m_2^2}{2}$

$Q = \frac{m v_1^3}{2} = \left(\frac{M v^2}{2} + m\right)$

$Q = \frac{m}{2M}\left(M(v_1^2 - v_2^2) - m(v_1 - v_2)^2\right)$