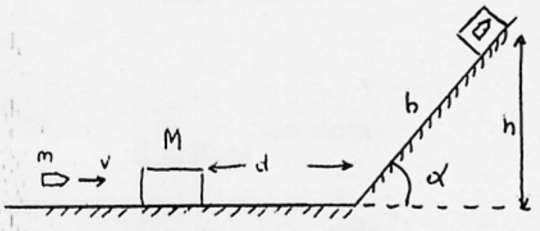


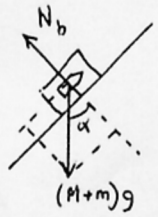
$\text{sen}\,\alpha = h/b \quad , \quad b = h/\text{sen}\,\alpha$

$$mv + 0 = (M+m)v' \Rightarrow v' = \frac{m}{M+m}v \qquad (1)$$

$$\frac{1}{2}(M+m)v'^2 = (M+m)gh + W_{roz} \qquad (2)$$

$$W_{roz} = W_{roz_d} + W_{roz_b} = \mu_c N_d \cdot d + \mu_c N_b \cdot b =$$

$$= \mu_c (M+m)gd + \mu_c (M+m)g\cos\alpha \cdot \underbrace{b}_{h/\text{sen}\,\alpha} \qquad (3)$$

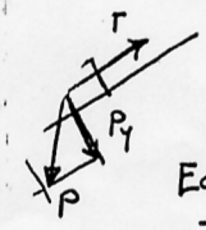


(1) y (3) en (2):

$$\frac{1}{2}\cancel{(M+m)}\left(\frac{m}{M+m}\right)^2 v^2 = \cancel{(M+m)}gh + \mu_c \cancel{(M+m)}g\left(d + \frac{h}{tg\alpha}\right)$$

$$\boxed{h = \frac{\frac{1}{2}\left(\frac{m}{M+m}\right)^2 v^2 - \mu_c g d}{g\left(1 + \frac{\mu_c}{tg\alpha}\right)}}$$

Aplicación: $\boxed{h = 3{,}11\ m}$



Para W_{MAX} y W_{min} $\quad T = W$

Para W_{min} $f_r = \mu P_y$ y sentido hacia arriba

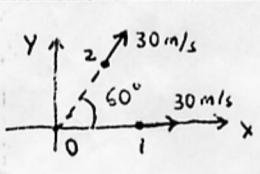
Para W_{MAX} $f_r = \mu P_y$ y sentido hacia abajo

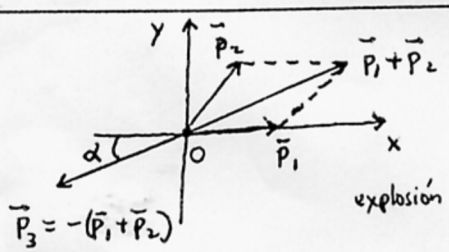
Ecuación:

$$T \pm f_r = P_x \Rightarrow W^{min}_{MAX} \pm \mu P\cos 45 = P\,\text{sen}\,45 \Rightarrow$$

$$W^{min}_{MAX} = P(\text{sen}\,45 \mp \mu\cos 45) = 100 \cdot 9'8 \cdot \left(\frac{\sqrt{2}}{2} \mp 0'4\,\frac{\sqrt{2}}{2}\right)$$

$$= 980\,\frac{\sqrt{2}}{2}(1 \mp 0'4) \Rightarrow \begin{cases} W_{min} = 415{,}8\ Nw \\ W_{MAX} = 970{,}2\ Nw \end{cases}$$





conserv. masa $\quad m = m_1 + m_2 + m_3 = m_1 + m_1 + 3m_1 \Rightarrow$

$\Rightarrow m = 5m_1 \Rightarrow m_1 = \frac{m}{5} = m_2 \ , \ m_3 = \frac{3}{5}m$

explosión: $\vec{F}$ interna $\Rightarrow \vec{P}_{inic} = \vec{P}_{fin} \Rightarrow \vec{0} = \vec{P}_1 + \vec{P}_2 + \vec{P}_3$

$$\vec{0} = m_1\vec{v}_1 + m_2\vec{v}_2 + m_3\vec{v}_3 = \frac{m}{5}30\,\vec{i} + \frac{m}{5}(30\cos 60\,\vec{i} + 30\,\text{sen}\,60\,\vec{j}) + \frac{3}{5}m(-v_3\cos\alpha\,\vec{i} - v_3\,\text{sen}\,\alpha\,\vec{j}) \Rightarrow$$

$$\Rightarrow \begin{cases} x: \ 0 = \frac{m}{5}30 + \frac{m}{5}30\cos 60 - \frac{3}{5}m v_3\cos\alpha \Rightarrow v_3\cos\alpha = 15 \\ y: \ 0 = \frac{m}{5}30\,\text{sen}\,60\,\vec{j} - \frac{3}{5}m v_3\,\text{sen}\,\alpha \Rightarrow v_3\,\text{sen}\,\alpha = 5\sqrt{3} \end{cases} \Rightarrow tg\,\alpha = \frac{\sqrt{3}}{3} \Rightarrow \boxed{\alpha = 30°}$$

$$\boxed{v_3 = 15/\cos\alpha = 17{,}32\ m/s} \ ; \ \vec{v}_3 = -v_3\cos\alpha\,\vec{i} - v_3\,\text{sen}\,\alpha\,\vec{j} = -15\,\vec{i} - 5\sqrt{3}\,\vec{j}$$

$$\boxed{\vec{v}_3 = -15\,\vec{i} - 8{,}66\,\vec{j}\ (m/s)}$$

$$\left.\begin{array}{l} m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2' \\ \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 = \frac{1}{2}m_1v_1'^2 + \frac{1}{2}m_2v_2'^2 \quad \text{o} \quad e = \frac{v_2' - v_1'}{v_1 - v_2} = 1 \end{array}\right\} \Rightarrow \boxed{\begin{array}{l} v_1' = \frac{2m_2}{m_1+m_2}v_2 + \frac{m_1-m_2}{m_1+m_2}v_1 \\ v_2' = \frac{2m_1}{m_1+m_2}v_1 + \frac{m_2-m_1}{m_1+m_2}v_2 \end{array}}$$

a) $m_1 = m_2 \Rightarrow v_1' = v_2 \ , \ v_2' = v_1$: intercambio de velocidades

b) $v_2 = 0 \ , \ m_2 >> m_1 \Rightarrow v_1' \simeq -v_1 \ , \ v_2' \simeq 0$: la incidente y poco masiva m_1 rebota, y m_2 apenas se altera