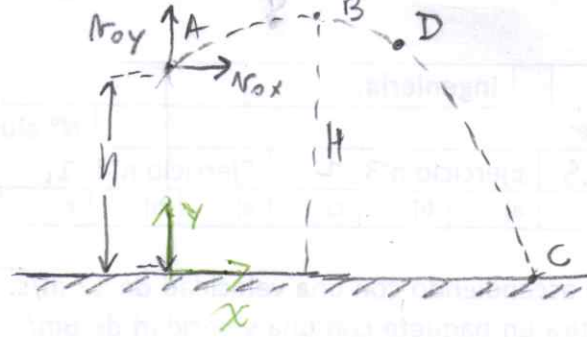


1

$h = 80 \text{ m}$   
 $v_{0y} = 12 \text{ m/s}$   
 $v_{0x} = 6 \text{ m/s}$

a)  $t_c$ ?



$$\begin{cases} x(t) = x_0 + v_{0x}t + \frac{1}{2}a_x t^2 = v_{0x}t \\ y(t) = y_0 + v_{0y}t + \frac{1}{2}a_y t^2 = h + v_{0y}t - \frac{1}{2}gt^2 \end{cases}$$

$$y(t_c) = 0 = h + v_{0y}t_c - \frac{1}{2}gt_c^2 \Rightarrow 4,9t_c^2 - 12t_c - 80 = 0 \quad \begin{cases} t_1 \approx 5,45 \text{ s} \\ t_2 \approx -3 \text{ (No)} \end{cases}$$

$$\Rightarrow t_c = \frac{60 + 20\sqrt{107}}{49} \approx 5,45 \text{ s}$$

b)  $H$ ?

$$v_y(t) = v_{0y} + a_y t = v_{0y} - gt \Rightarrow v_y(t_B) = 0 = v_{0y} - gt_B \Rightarrow t_B = \frac{v_{0y}}{g}$$

$$\Rightarrow y(t_B) = H = h + v_{0y}\left(\frac{v_{0y}}{g}\right) - \frac{1}{2}g\left(\frac{v_{0y}}{g}\right)^2 = h + \frac{v_{0y}^2}{2g} = \frac{4280}{49} \text{ m}$$

$$\Rightarrow H \approx 87,35 \text{ m}$$

c)  $t_D = 2 \text{ s}$

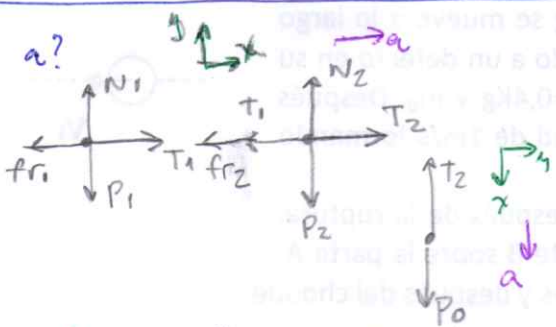
$$\begin{cases} x(t_D) = v_{0x}t_D = 12 \text{ m} \\ y(t_D) = h + v_{0y}t_D - \frac{1}{2}gt_D^2 = 84,4 \text{ m} \end{cases} \Rightarrow \vec{r}(t_D) = \langle 12; 84,4 \rangle \text{ (m)}$$

$$\begin{cases} v_x(t_D) = v_{0x} = 6 \text{ m/s} \\ v_y(t_D) = v_{0y} - gt_D = -7,6 \text{ m/s} \end{cases} \Rightarrow \vec{v}_y(t_D) = \langle 6; -7,6 \rangle \text{ (m/s)}$$

2

$m_1 = 1 \text{ kg}$   
 $m_2 = 2 \text{ kg}$   
 $\mu_e = 0,3$   
 $\mu_d = 0,2$   
 $m_0 = 3 \text{ kg}$

a)  $a$ ?



$$\begin{aligned} m_1 & \begin{cases} \sum F_x: T_1 - fr_1 = m_1 a \\ \sum F_y: N_1 - P_1 = 0 \Rightarrow N_1 = m_1 g \end{cases} \\ m_2 & \begin{cases} \sum F_x: T_2 - T_1 - fr_2 = m_2 a \\ \sum F_y: N_2 - P_2 = 0 \Rightarrow N_2 = m_2 g \end{cases} \\ m_0 & \begin{cases} \sum F_x: P_0 - T_2 = m_0 a \end{cases} \end{aligned}$$

$$\begin{cases} T_1 - \mu_d m_1 g = m_1 a & (1) \Rightarrow T_1 = \mu_d m_1 g + m_1 a & (1)' \\ T_2 - T_1 - \mu_d m_2 g = m_2 a & (2) \\ m_0 g - T_2 = m_0 a & (3) \Rightarrow T_2 = m_0 g - m_0 a & (3)' \end{cases} \quad \text{reemplazando (1)' y (3)' en (2):}$$

$$m_0 g - m_0 a - \mu_d m_1 g - m_1 a - \mu_d m_2 g = m_2 a \Rightarrow a = \frac{m_0 g - \mu_d m_1 g - \mu_d m_2 g}{m_0 + m_1 + m_2} = 3,92 \text{ m/s}^2$$

b)  $T_1 = \mu_d m_1 g + m_1 a = m_1 (\mu_d g + a) = 5,88 \text{ N}$

c)  $a = 0$ ;  $f_r = f_{r\text{max}} = \mu_e N \rightarrow$  se usaron los  $m_1, m_2, m_0$ , etc.

$$\begin{cases} T_1 - \mu_e m_1 g = 0 \\ T_2 - T_1 - \mu_e m_2 g = 0 \\ m_0 g - T_2 = 0 \end{cases} \quad \text{resolviendo: } m_0 = \mu_e (m_1 + m_2) = 0,9 \text{ kg}$$