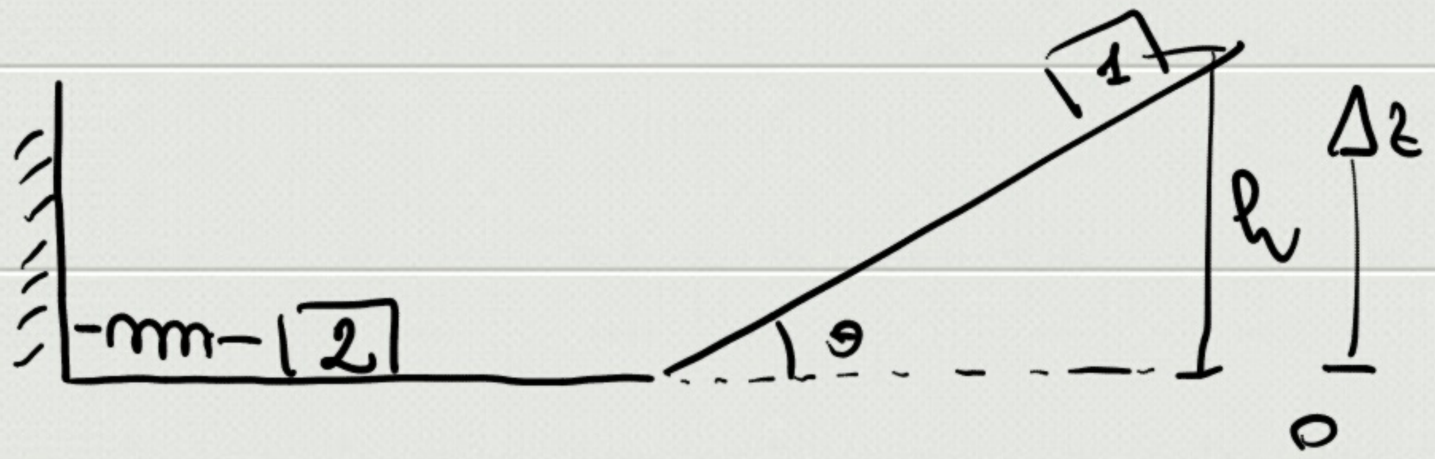


$m_1 = 0.23\ kg$

$v_{01} = v_{02} = 0$

urto compl. anel.

$m_2 = 0.51\ kg$

$h = ?$

$k = 150\ N/m$

$\Delta x_{max} = 0.068\ m$

$v_1 = \sqrt{2ah/\sin\theta}$ $\quad a = g\sin\theta$ $\quad *$ $\quad v_f^2 = v_i^2 + 2a\Delta l$

$m_1 g h = m_1 v_1$

$m_1 g h = \frac{1}{2} m_1 v_1^2$ $\quad *$ $\quad \Rightarrow v_1 = \sqrt{2gh}$

$m_1 g h = \frac{1}{2}(m_1 + m_2) v_1^2$

$\vec{P} = cost \Rightarrow m_1 v_1 = (m_1 + m_2) v$

$\Rightarrow v = \frac{m_1}{m_1 + m_2} \sqrt{2gh}$

$$\frac{1}{2} k \Delta x^2 = \frac{1}{2} m_2 v^2$$

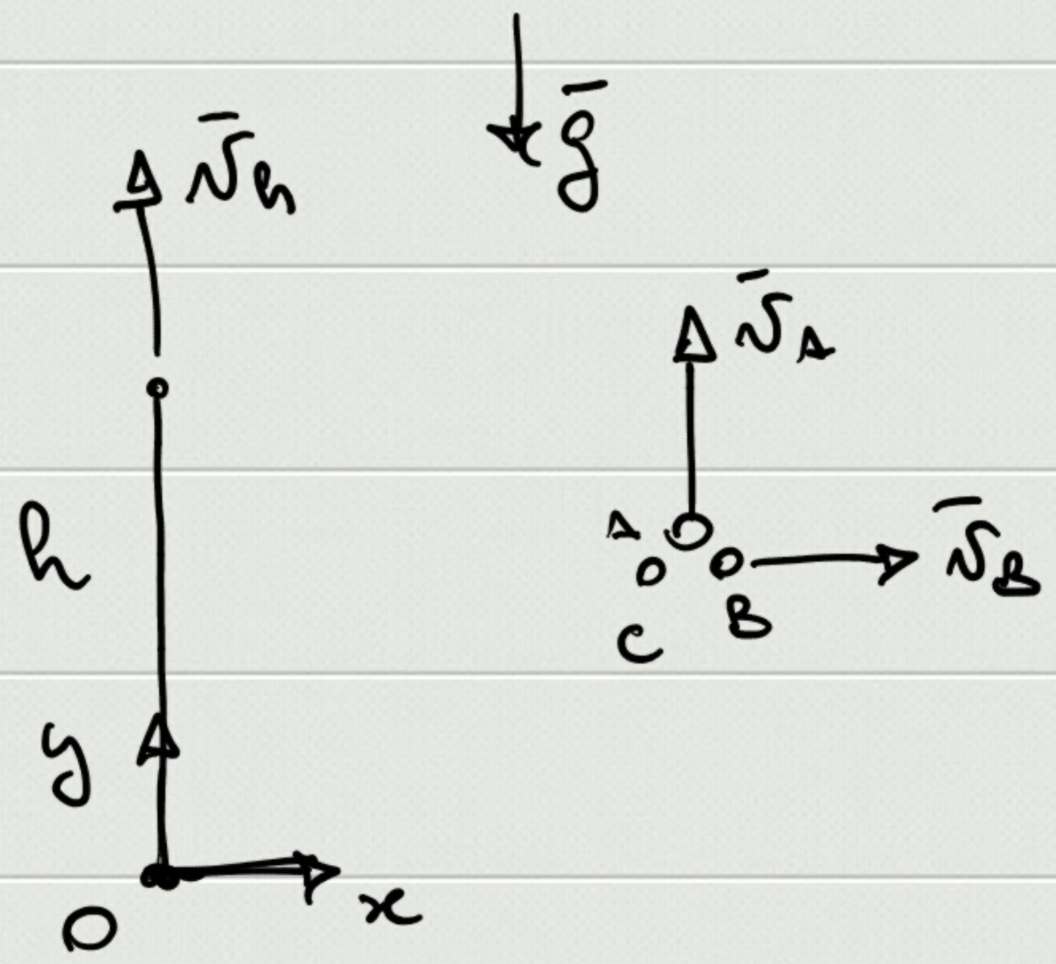
$$0 = v^2 + 2a\Delta x \qquad a = -\frac{k\Delta x}{m_1 + m_2}$$

$$\frac{1}{2} k \Delta x^2 = m_1 g h$$

$$\frac{1}{2} k \Delta x^2 = \frac{1}{2}(m_1 + m_2) v^2 \qquad *$$

$$k \Delta x^2 = (m_1 + m_2) \frac{m_1^2}{(m_1 + m_2)^2} 2gh$$

$$\Rightarrow h = \frac{m_1 + m_2}{m_1^2} \frac{k \Delta x^2}{2g} = 0.495 \text{ m}$$



$h = 1000\ m$

$v_h = 250\ m/s$

$m_A = m_C = m$

$m_B = 2m$

$v_A = 450\ m/s$

$v_B = 240\ m/s$

$\bar{v}_C = ?$ $\quad \bar{r}_{CM}(t_1 = 2s) = ?$

$\bar{P} = const$

$$\bar{v}_C = \bar{v}_h - \bar{v}_A - \bar{v}_B$$

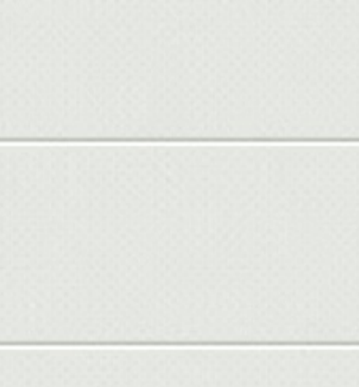
$$\frac{1}{2}(4m)v_h^2 = \frac{1}{2}m_A v_A^2 + \frac{1}{2}m_B v_B^2 + \frac{1}{2}m_C v_C^2$$

$$4m\bar{v}_h = m\bar{v}_A + 2m\bar{v}_B + m\bar{v}_C \qquad *$$

$$4mv_h = mv_A + 2mv_B + mv_C$$

$$x: \int 0 = 2v_B + v_{Cx} \Rightarrow v_{Cx} = -2v_B = -480\ m/s$$

$$y: \begin{cases} 4v_h = v_A + v_{Cy} \Rightarrow v_{Cy} = 4v_h - v_A = 550\ m/s \end{cases}$$



$$v_C = \sqrt{v_{Cx}^2 + v_{Cy}^2} = 730\ m/s$$

$$tg\,\phi = \frac{v_{Cy}}{v_{Cx}} \Rightarrow \phi = 131^\circ$$

$$\bar{r}_{cm} = \frac{\sum_1^3 i \left(\bar{r}_{0i} + \frac{1}{2}\bar{g} t_1^2 \right) m_i}{\sum_i m_i}$$

$$\bar{r}_{cm} = \frac{\sum_i \left(\bar{r}_{0i} + \bar{v}_{0i} t_1 + \frac{1}{2}\bar{g} t_1^2 \right) m_i}{\sum_i m_i} \quad *$$

$$y_{cm} = h \qquad x_{cm} = 0$$

$$y_{cm} = h + v_h t_1 - \frac{1}{2} g t_1^2 \qquad x_{cm} = 0 \quad *$$

$$\bar{r}_{cm} = \frac{\sum_i m_i \bar{r}_i}{\sum_i m_i} \qquad \bar{R}^{ext} = m_{tot} \bar{a}_{cm}$$

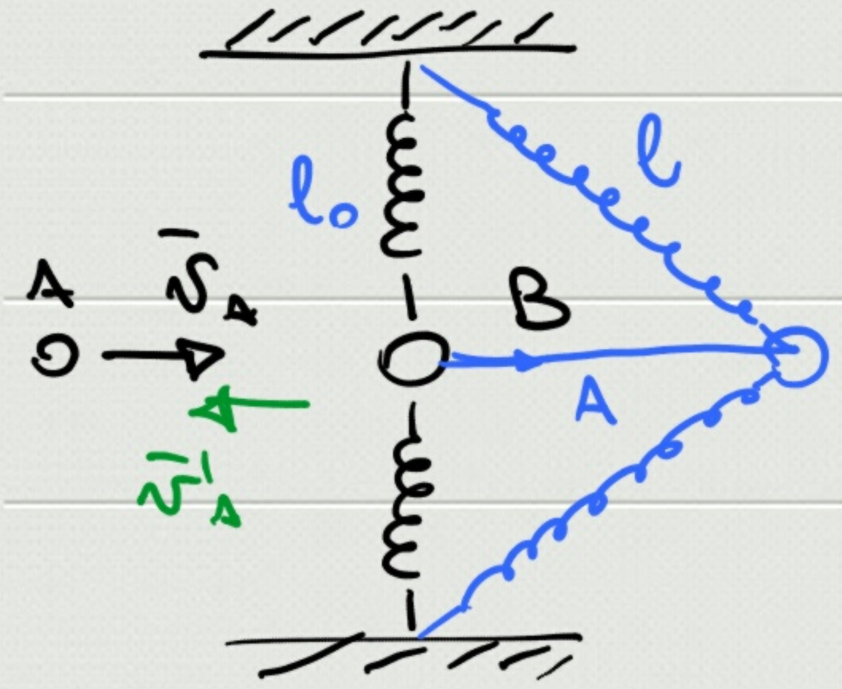
$$4 m\bar{g} = m_{tot} \bar{a}_{cm} \Rightarrow \boxed{\bar{a}_{cm} = \bar{g}}$$

$$\bar{r}_{cm} = \bar{r}_0 + \bar{v}_0 t + \frac{1}{2}\bar{a}_{cm} t^2$$

$$(0, h) \quad (0, v_h) \quad (0, -g)$$

$$x_{cm} = 0 \qquad y_{cm} = h + v_h t - \frac{1}{2} g t^2$$

$$\Rightarrow y_{cm}(t_1) = 1480 \text{ m}$$



$m_A = 0.1$ kg

$v_A = 1.5$ m/s

$m_B = 1$ kg $\quad v_{0B} = 0$

$l_0 = 1$ m $\quad K = 0.5$ N/m

$|v'_A| = 0.5$ m/s

$v'_B = ?$

$\vec{v}_A = \vec{v}'_A + \vec{v}'_B$

$m_A \vec{v}_A = -m_A \vec{v}'_A + m_B \vec{v}'_B$

$\frac{1}{2} m_A v_A^2 = \frac{1}{2} m_A v_A'^2 + \frac{1}{2} m_B v_B'^2$

$m_A v_A = m_A v'_A + m_B v'_B \qquad * \quad v'_A = -|v'_A|$

$\Rightarrow v'_B = \frac{m_A}{m_B}(v_A - v'_A) = 0.2$ m/s

$E_{diss} = |\Delta E_m| = |\Delta E_k| = |E_{k,fin} - E_{k,in}| =$

$= \left| \left(\frac{1}{2} m_A v_A'^2 + \frac{1}{2} m_B v_B'^2 \right) - \frac{1}{2} m_A v_A^2 \right| = 0.08$ J

$$E_p = \frac{1}{2} k \Delta x^2$$

$$\frac{1}{2} m_B v_B'^2 = 2 \cdot \frac{1}{2} k \ell^2$$

$$0 = v_B'^2 + 2aA \qquad a = \frac{kA}{m_B}$$

$$\frac{1}{2} m_B v_B'^2 = 2 \cdot \frac{1}{2} k (\ell - \ell_0)^2 \qquad *$$

$$\frac{1}{2} m_B v_B'^2 + \frac{1}{2} m_B v_B'^2 = 2 \cdot \frac{1}{2} k (\ell - \ell_0)^2$$

$$\ell = \ell_0 + v_B' \sqrt{\frac{m_B}{2k}}$$

$$A = \sqrt{\ell^2 - \ell_0^2} = 0.66 \text{ m}$$