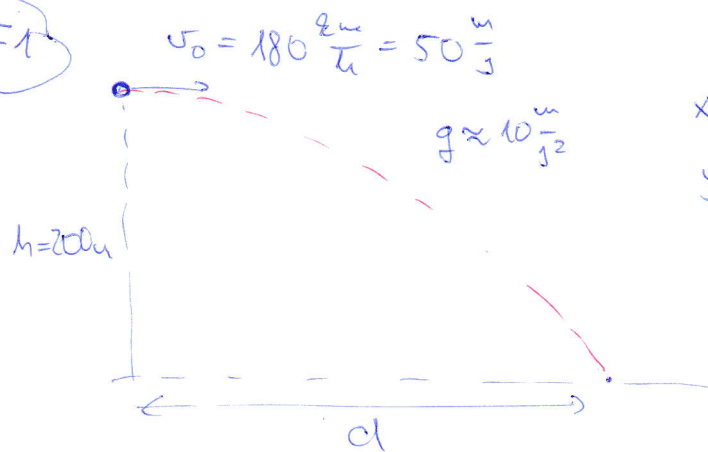


4. feladatok megoldása

F1



$$x(t) = v_0 \cdot t$$

$$y(t) = h - \frac{g}{2} \cdot t^2$$

$$t_{be}: y = 0$$

$$h - \frac{g}{2} t_{be}^2 = 0$$

$$t_{be} = \sqrt{\frac{2h}{g}} = 6.32s$$

dobás távolsága x irányban:

$$d = x(t_{be}) = v_0 \cdot t_{be} = v_0 \cdot \sqrt{\frac{2h}{g}} = \underline{\underline{316,2m}}$$

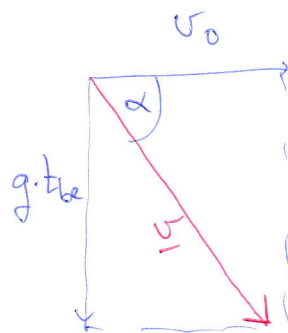
Selességvektor:

$$v_x = v_0$$

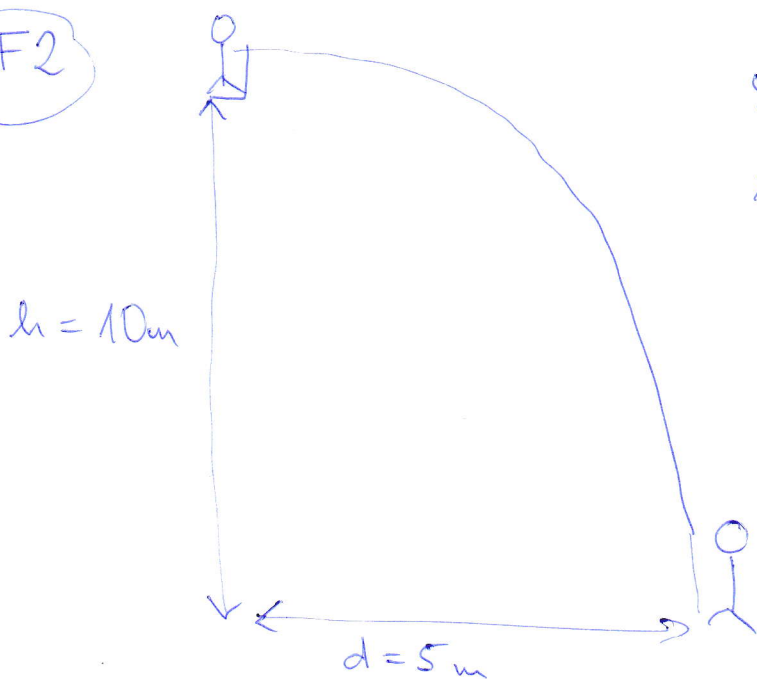
$$v_y = -g \cdot t_{be}$$

$$\tan \alpha = \frac{g \cdot t_{be}}{v_0} = 1.26$$

$$\alpha = 0.90 \text{ (rad)} = \underline{\underline{51,7^\circ}}$$



F2



$$y = h - \frac{g}{2} \cdot t^2 = 0 \Rightarrow t_{be} = \sqrt{\frac{2h}{g}} = \underline{\underline{1.41s}}$$

$$x = v_0 \cdot t$$

$$v_0 \cdot t_{be} = d \Rightarrow v_0 = \frac{d}{t_{be}} = d \sqrt{\frac{g}{2h}}$$

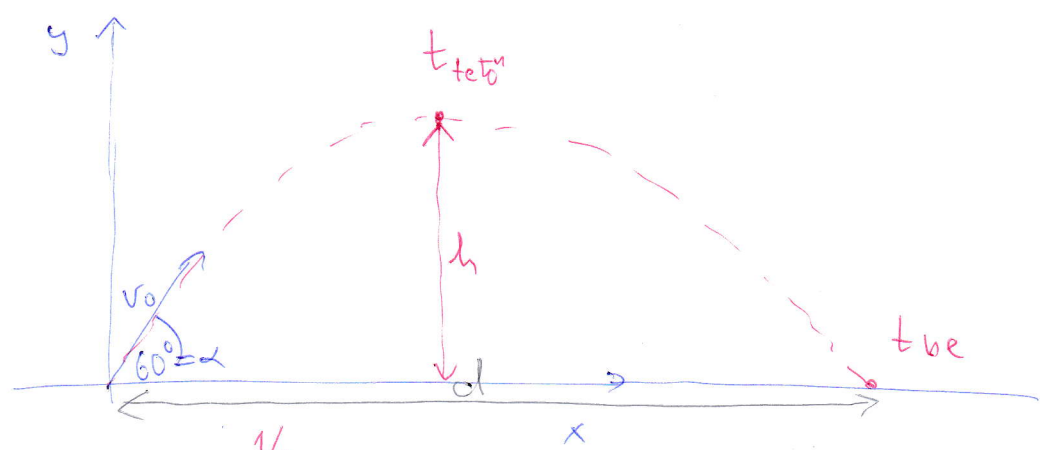
$$\underline{\underline{v_0 = 3.54 \frac{m}{s}}}$$

$$v_x = v_0 = 3.54 \frac{m}{s}$$

$$v_y = -g \cdot t_{be} = 14,1 \frac{m}{s}$$

$$|v| = \sqrt{v_x^2 + v_y^2} = 14,5 \frac{m}{s}$$

F3



$$v_x = v_0 \cdot \overbrace{\cos \alpha}^{1/2} = \frac{v_0}{2} = 12,5 \frac{m}{s}$$

$$v_y = v_0 \cdot \sin \alpha - g \cdot t$$

$$v_0^y = 21,6 \frac{m}{s}$$

a.) tetőponton: $v_y = 0$

$$v_0 \cdot \sin \alpha - g \cdot t_{tető} = 0$$

$$t_{tető} = \frac{v_0 \cdot \sin \alpha}{g} =$$

$$= \underline{\underline{2,165 s}}$$

$$x(t) = v_0 \cdot \cos \alpha \cdot t$$

$$y(t) = v_0 \sin \alpha \cdot t - \frac{g}{2} \cdot t^2$$

b.) $h = y(t_{tető}) = v_0 \cdot \sin \alpha \cdot t_{tető} - \frac{g}{2} \cdot t_{tető}^2 = 23,4 m$

c.) $t_{be}: y = 0 \quad v_0 \cdot \sin \alpha \cdot t_{be} - \frac{g}{2} \cdot t_{be}^2 = 0$

$$\left\{ \begin{array}{l} t_{be} = 0 \quad (\text{kezdet}) \end{array} \right.$$

$$t_{be} = \frac{2 \cdot v_0 \sin \alpha}{g} = \underline{\underline{4,33 s}}$$

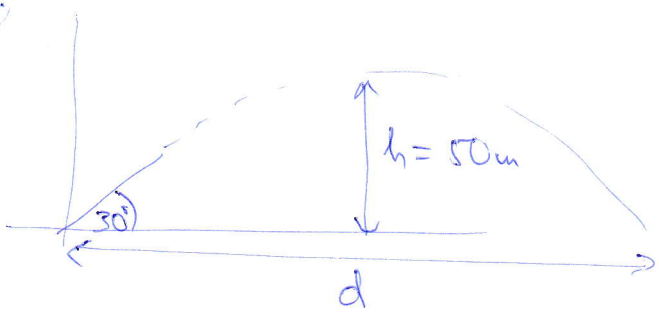
ésreveztetel: $t_{be} = 2 \cdot t_{tető}$
(szimmetria)

$$d = x(t_{be}) = \underline{\underline{54,1 m}}$$

d.) ötlet: $x = v_0 \cdot \cos \alpha \cdot t \rightsquigarrow t = \frac{x}{v_0 \cdot \cos \alpha}$

$$y = v_0 \sin \alpha \frac{x}{v_0 \cos \alpha} - \frac{g}{2} \frac{x^2}{v_0^2 \cos^2 \alpha} = x \cdot \tan \alpha - \frac{g}{2 v_0^2 \cos^2 \alpha} \cdot x^2$$

F4.



$$t_{\text{leto}} = \frac{v_0^y}{g} = \frac{v_0 \cdot \sin \alpha}{g}$$

$$\begin{aligned}
 h &= v_0 \cdot \sin \alpha \cdot t_{\text{leto}} - \frac{g}{2} \cdot t_{\text{leto}}^2 = \\
 &= \frac{v_0^2 \sin^2 \alpha}{g} - \frac{g}{2} \frac{v_0^2 \sin^2 \alpha}{g^2} = \\
 &= \frac{v_0^2 \sin^2 \alpha}{2g}
 \end{aligned}$$

$$\Downarrow \left[v_0 = \sqrt{\frac{2gh}{\sin^2 \alpha}} = \underline{63.25 \frac{\text{m}}{\text{s}}} \right]$$

$$d = v_0 \cdot \cos \alpha \cdot \underbrace{2 t_{\text{leto}}}_{t_{\text{be}}} = 2 v_0 \cos \alpha \cdot \frac{v_0 \sin \alpha}{g} = \frac{2 v_0^2 \sin \alpha \cdot \cos \alpha}{g} = \underline{346.5 \text{m}}$$

F5.



$$R = 10 \text{ km}$$

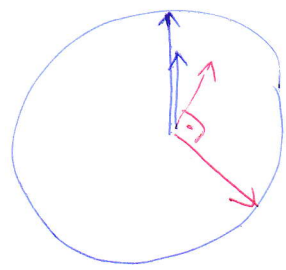
$$v = 810 \frac{\text{km}}{\text{h}} = 225 \frac{\text{m}}{\text{s}}$$

$$a.) \left[\omega = \frac{v}{R} = \frac{225 \frac{1}{\text{s}}}{10000 \text{ s}} = \underline{0.0225 \frac{1}{\text{s}}} \right]$$

$$\begin{aligned}
 b.) \left[t_{\text{pelson}} : \omega \cdot t_{\text{pelson}} &= \pi \\
 t_{\text{pelson}} &= \frac{\pi}{\omega} = \underline{140 \text{ s}}
 \end{aligned}$$

$$\begin{aligned}
 c.) \quad a : \text{egyetlen k\u00f6rmozg\u00e1s} \\
 \left\{ \begin{aligned}
 a_{cp} &= \frac{v^2}{R} = R \cdot \omega^2 = 5.06 \frac{\text{m}}{\text{s}^2}
 \end{aligned} \right.
 \end{aligned}$$

F6



$$\omega_k = \frac{2\pi}{12h} = 0.524 \frac{1}{h}$$

$$\omega_n = \frac{2\pi}{1h} = 6.28 \frac{1}{h}$$



$$p_k = \omega_k \cdot t$$

$$p_n = \omega_n \cdot t$$

$$(p_n - p_k) = (\omega_n - \omega_k) \cdot t =$$

$$= 2\pi \cdot \left(1 - \frac{1}{12}\right) \frac{1}{h} \cdot t$$

$$= \frac{11}{12} \cdot 2\pi \frac{1}{h} \cdot t$$

leider: $p_n - p_k = \frac{\pi}{2}$

$$\frac{\pi}{2} = \frac{11}{6} \pi \cdot t$$

$$t = \frac{3}{11} h$$

F7

$$v = \frac{5m}{2s} = 2.5 \frac{m}{s}$$

R = ? 5m : füllv

$$R \cdot \pi = 5m$$

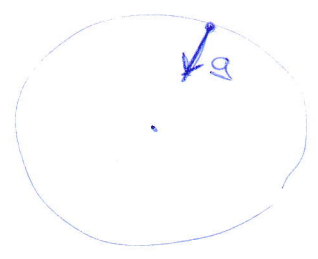
$$L_0 \quad R = 1.59m$$

$$\omega = \frac{v}{R} = 1.57 \frac{1}{s}$$

Ergenleter Körgröße

b.) $a_{cp} = R \cdot \omega^2 = 3.92 \frac{m}{s^2}$

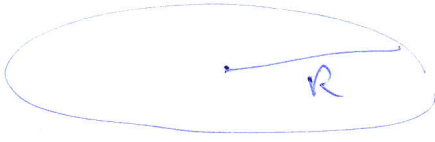
supär iudyi



c.) $t_{100kr} = \frac{100 \cdot 2\pi}{\omega} = 400s$

(4s : 1kr)

F8



$$R = 50\text{cm} = 0.5\text{m}$$

$$a_t = 0.2 \frac{\text{m}}{\text{s}^2}$$

↳ tangensialis (arahnya radial)

$$v = a_t \cdot t$$

$$a_{cp} = \frac{v^2}{R} = \frac{a_t^2 \cdot t^2}{R}$$

? $a_{cp} = a_t$ misal?

$$a_t = \frac{a_t^2 \cdot t^2}{R} \rightarrow t = \sqrt{\frac{R}{a_t}} = \underline{\underline{1.58\text{s}}}$$

$$s = \frac{a_t}{2} \cdot t^2 = \frac{a_t}{2} \cdot \frac{R}{a_t} = \underline{\underline{\frac{R}{2}}}$$

F9

$$1400\text{RPM} \sim \left[\omega = \frac{1400 \cdot 2\pi}{60\text{s}} = 146.6 \frac{1}{\text{s}} \right]$$

$$d = 50\text{cm}$$

$$R = 25\text{cm} = 0.25\text{m}$$

$$\rightarrow \left[a_{cp} = R \cdot \omega^2 = 5373 \frac{\text{m}}{\text{s}^2} \right] \sim \underline{\underline{540g}}$$