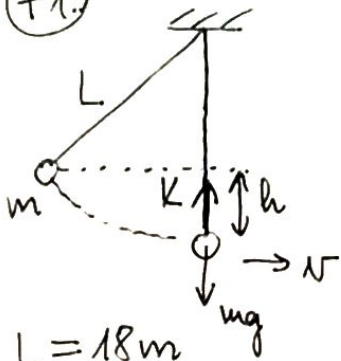


5. Gyakorlat

Ⓕ1.



$$L = 18 \text{ m}$$

$$h = 3 \text{ m}$$

$$m = 90 \text{ kg}$$

Energiamegmaradás:

$$mgh = \frac{1}{2} mv^2 \rightarrow v^2 = 2gh$$

Körpálya közepén:

$$K - mg = m \frac{v^2}{L}$$

$$K = mg + \frac{mv^2}{L} = mg + 2mg \frac{h}{L} =$$

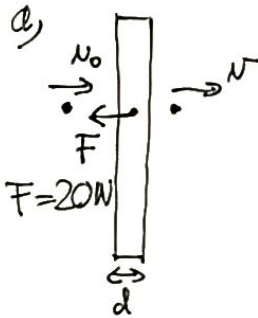
$$= mg \left(1 + 2 \frac{h}{L} \right) = 1200 \text{ N}$$

Ⓕ2.

$$d = 0,1 \text{ m}$$

$$m = 2 \cdot 10^{-2} \text{ kg}$$

$$v_0 = 20 \text{ m/s}$$



Munkatétel:

$$-F \cdot d = \frac{1}{2} mv^2 - \frac{1}{2} mv_0^2$$

$$v = \sqrt{v_0^2 - \frac{2Fd}{m}} = 14 \text{ m/s}$$

b) $F(x) = D \cdot x$; $D = 2 \frac{\text{N}}{\text{cm}} = 200 \frac{\text{N}}{\text{m}}$

ha $x = 0$: $F = 0$

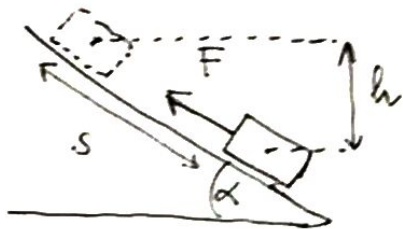
ha $x = d$: $F = D \cdot d$

} lineárisan növekszik: átlagos erő: $\bar{F} = \frac{Dd}{2}$

Munkatétel: $-\frac{Dd}{2} \cdot d = \frac{1}{2} mv^2 - \frac{1}{2} mv_0^2$

$$v = \sqrt{v_0^2 - \frac{Dd^2}{m}} = 17 \text{ m/s}$$

F3.



a) $W_F = F \cdot s = 200 \text{ J}$

b) $W_{\text{mekh}} = -mgh = -mgs \cdot \sin \alpha = -150 \text{ J}$

$\alpha = 30^\circ$
 $F = 20 \text{ N}$
 $m = 3 \text{ kg}$
 $s = 10 \text{ m}$

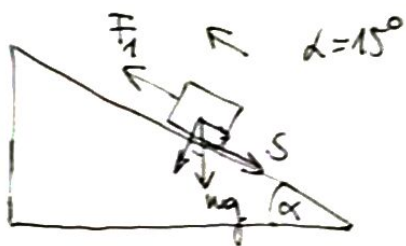


c) munkatétel: $W_F + W_{\text{mekh}} = \Delta E_{\text{kin}}$

$$200 \text{ J} - 150 \text{ J} = \frac{1}{2} m v^2$$

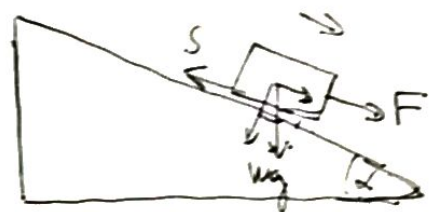
$$v \approx 6 \text{ m/s}$$

F4.



$F_1 = mgs \sin \alpha + \mu mgs \cos \alpha$ (feljeli)

$F_2 = \mu mgs \cos \alpha - mgs \sin \alpha$ (lefelé)

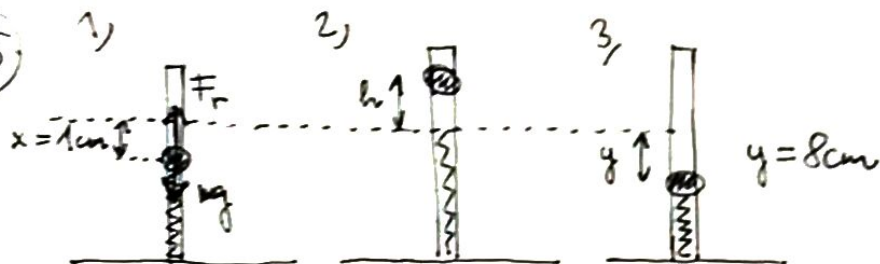


$$\left. \begin{aligned} W_1 &= F_1 \cdot s \\ W_2 &= F_2 \cdot s \end{aligned} \right\} \frac{W_1}{W_2} = 2 = \frac{F_1}{F_2}$$

tehát: $\sin \alpha + \mu \cdot \cos \alpha = 2 \cdot \mu \cos \alpha - 2 \cdot \sin \alpha$

$$3 \cdot \sin \alpha = \mu \cdot \cos \alpha \rightarrow \mu = 3 \cdot \tan \alpha = 0,8$$

F5.



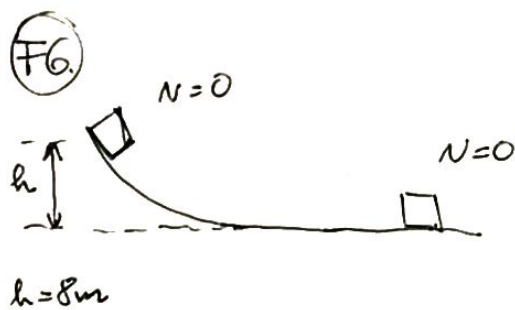
$$1): mg = F_r$$

$$mg = D \cdot x \rightarrow D = \frac{mg}{x}$$

2, -3, között energiamegmaradás:

$$mg(h+y) = \frac{1}{2} D y^2$$

$$mg(h+y) = \frac{1}{2} \cdot \frac{mg}{x} \cdot y^2 \rightarrow h = \frac{y^2}{2x} - y = y \left(\frac{y}{2x} - 1 \right) = 24 \text{ cm}$$



munkatétel: $mgh + W_{\text{súrl}} = 0$ (lefelé)

felfelé: $W + W_{\text{súrl}} - mgh = 0$

$$W = mgh - W_{\text{súrl}} = mgh - (-mgh) = 2mgh = 2400 \text{ J}$$