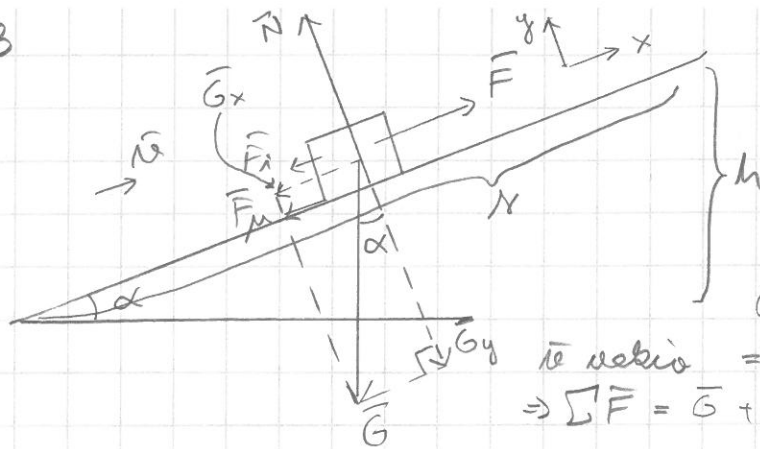


11.13



$\alpha = 17^\circ$

$m = 72 \text{ kg}$

$\mu = 0,38$

$h = 1,5 \text{ m}$

$g = 9,81 \frac{\text{m}}{\text{s}^2}$

Oleli. ilmanvastus $F_A = 0$

$$\vec{a} = \vec{0} \Rightarrow \Sigma \vec{F} = \vec{G} + \vec{N} + \vec{F} + \vec{F}_\mu = \vec{0}$$

$$\begin{cases} \Sigma F_x = F - F_\mu - G_x = F - \mu N - G \sin \alpha = F - \mu N - mg \sin \alpha = 0 & (1) \\ \Sigma F_y = N - G_y = N - G \cos \alpha = N - mg \cos \alpha = 0 & (2) \end{cases}$$

(2) : $N = mg \cos \alpha$ sijo. (1) : sen

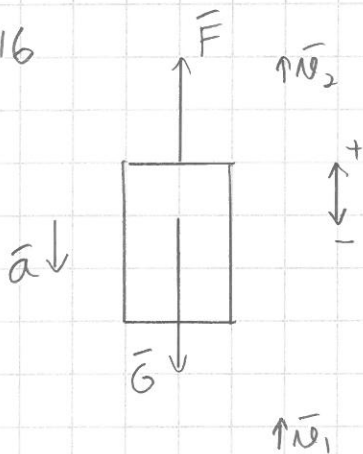
$\Rightarrow F = \mu mg \cos \alpha + mg \sin \alpha$

$\sin \alpha = \frac{h}{l} \Rightarrow l = \frac{h}{\sin \alpha}$

Tehtävän työ:

$$W = F \cdot l = (\mu mg \cos \alpha + mg \sin \alpha) \cdot \frac{h}{\sin \alpha} = 2376,33 \text{ J} = \underline{2,4 \text{ kJ}}$$

11.16



$$v_1 = 2,9 \frac{\text{m}}{\text{s}} ; v_2 = 0,85 \frac{\text{m}}{\text{s}} ; t = 1,2 \text{ s}$$

$$m = 940 \text{ kg} ; \eta = 89\%$$

$$\text{NII: } \Sigma \vec{F} = \vec{F} + \vec{G} = m\vec{a}$$

$$\Rightarrow F - G = F - mg = ma = m \frac{\Delta v}{\Delta t}$$

$$\Rightarrow F = mg + m \frac{\Delta v}{\Delta t} = mg + m \frac{v_2 - v_1}{t}$$

$$= 940 \text{ kg} \cdot \left(9,81 \frac{\text{m}}{\text{s}^2} + \frac{0,85 \frac{\text{m}}{\text{s}} - 2,9 \frac{\text{m}}{\text{s}}}{1,2 \text{ s}} \right)$$

$$= 7615,57 \text{ N}$$

$$\text{Hyötysuhde: } \eta = \frac{P_{\text{out}}}{P_{\text{in}}} = \frac{F v_2}{P_{\text{in}}} \quad | \cdot \frac{P_{\text{in}}}{\eta}$$

$\Rightarrow P_{\text{in}} = \frac{F v_2}{\eta}$

$$\text{alussa } P_{\text{in}1} = \frac{F v_1}{\eta} = \frac{7615,57 \text{ N} \cdot 2,9 \frac{\text{m}}{\text{s}}}{0,89} = 24914,8 \text{ W}$$

$$\text{lopuksa } P_{\text{in}2} = \frac{F v_2}{\eta} = \dots = 7273,29 \text{ W}$$

$$\Rightarrow \text{säilyneen teho pienenee: } P_{\text{in}1} - P_{\text{in}2} = 17541,5 \text{ W}$$

$$= \underline{18 \text{ kW}}$$