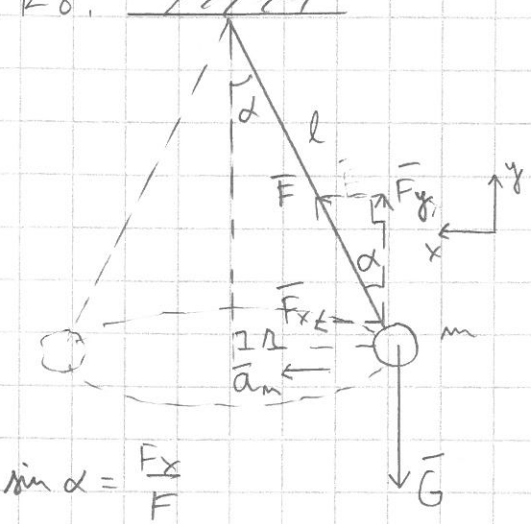
$$v = \pm\sqrt{\frac{gr\sin\alpha}{\cos\alpha}} = \sqrt{gr\tan\alpha} = \sqrt{9{,}81\frac{m}{s^2}\cdot 73\,m\,\tan 8^\circ}$$
$$\approx 10{,}0322\frac{m}{s} \approx 36\frac{km}{h}$$

Huom. $v > 36\frac{km}{h}$ → auto liukuu ylämäkeen (jäätävenmäkeä NI)
$v < 36\frac{km}{h}$ ⇒ — " — alamäkeen (α:n pitää pienentyä)

K8.



$l = 1{,}25\,m$, $m = 87\,g$, $\alpha = 41^\circ$

$\bar{G}$: paino
$\bar{F}$: langan jännitys

Jätetään ilmanvastus pienemä (v melko pieni, tiheä metallipallo) huomiotta

NII : $\sum \bar{F} = \bar{F} + \bar{G} = m\bar{a}$

$$\begin{cases} \sum F_x = F_x = F\sin\alpha = ma_m = m\frac{v^2}{r} & (1) \\ \sum F_y = F_y - G = F\cos\alpha - mg = 0 & (2) \end{cases}$$

$\sin\alpha = \frac{F_x}{F}$

$\cos\alpha = \frac{F_y}{F}$

c) (2): $F = \frac{mg}{\cos\alpha} = \frac{0{,}087\,kg\cdot 9{,}81\frac{m}{s^2}}{\cos 41^\circ} \approx 1{,}13086\,N \approx \underline{1{,}1\,N}$

$\sin\alpha = \frac{r}{l} \Leftrightarrow r = l\sin\alpha$

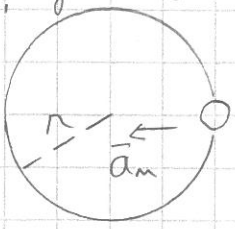
(1) $v = \pm\sqrt{\frac{Fr\sin\alpha}{m}} = \sqrt{\frac{Fl\sin\alpha\cdot\sin\alpha}{m}} = \sqrt{\frac{1{,}13086\,N\cdot 1{,}25\,m\cdot\sin^2 41^\circ}{0{,}087\,kg}}$

$\approx 2{,}6449\frac{m}{s}$

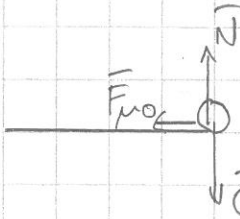
$$v = \frac{2\pi r}{T} = \frac{2\pi l\sin\alpha}{T} \quad | \cdot \frac{T}{v}$$

$$\Leftrightarrow T = \frac{2\pi l\sin\alpha}{v} = \frac{2\pi\cdot 1{,}25\,m\cdot\sin 41^\circ}{2{,}6449\frac{m}{s}} \approx 1{,}948\,s \approx \underline{1{,}9\,s}$$

K7. Ylhäältä



sivulta:



$r = 19\,m$, $\mu_0 = 0{,}82$

Tarkastellaan rajatilannetta, jossa lepokitkalla on maksimiarvo ja moottoripyörä on kaltevuuden suunnassa liukumaan

$F_{\mu 0} = F_{\mu 0 max} = \mu_0 N = \mu_0 G = \mu_0 mg$

NII $\sum \bar{F} = m\bar{a} \Rightarrow \underbrace{\bar{N} + \bar{G}}_{=0} + \bar{F}_{\mu 0} = m\bar{a}$

$$\Rightarrow \mu_0 mg = ma_m = m\frac{v^2}{r} \quad | \cdot \frac{r}{m}\sqrt{\ }$$

$\Leftrightarrow v = \pm\sqrt{\mu_0 gr} = \ldots \approx 12{,}363\frac{m}{s} \approx \underline{44\frac{km}{h}}$