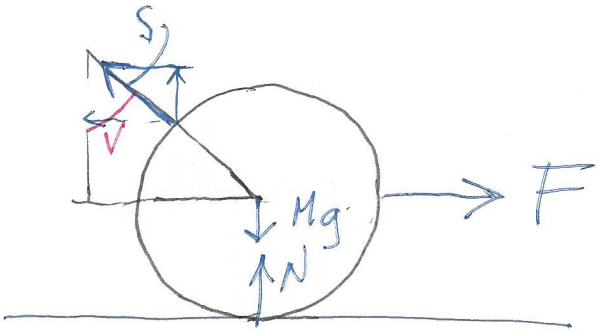
Fysik del A LMA538 & SEE095 220105

OBS! Indatavärden kan variera

1)



$M = 5.3 \cdot 10^2 kg$

$V = 56°$

$F = 6.5 \cdot 10^2 N$

Kraftjämvikt för klotet

$\rightarrow \quad F - S \sin V = 0 \quad 1)$

$\uparrow \quad S \cos V + N - Mg = 0 \quad 2$

$1) \Rightarrow S = \frac{F}{\sin V} = \frac{6.5 \cdot 10^2}{\sin 56°} = \underline{7.8 \cdot 10^2 N}$

$2) \Rightarrow N = Mg - S \cos V = 5.3 \cdot 10^2 \cdot 9.82 - 7.8 \cdot 10^2 \cos 56°$

$N = \underline{4.8 \cdot 10^3 N}$

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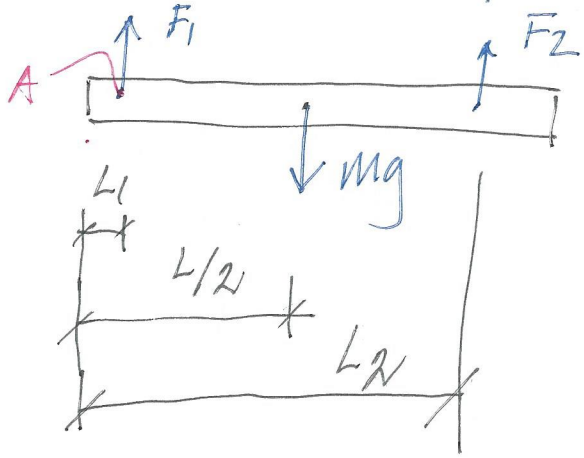
2) Rita krafter på stången



Givet: $L = 14 cm$

$m = 750 g$

$L_1 = 3{,}1 cm$

$L_2 = 12 cm$

$F_1 = 2.1 N$

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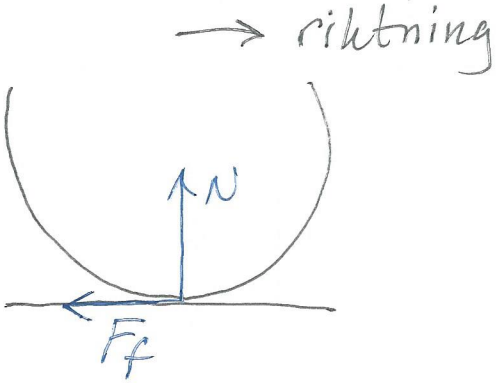
2/ forts Kraftmoment jämvikt kring axel genom A

$$F_2(L_2 - L_1) - mg\left(\frac{L}{2} - L_1\right) = 0 \Rightarrow$$

$$F_2 = mg\,\frac{\frac{L}{2} - L_1}{L_2 - L_1} = 0.750 \cdot 9.82\,\frac{7.0 - 2.1}{12 - 2.1} = \underline{3.6\ N}$$

3/

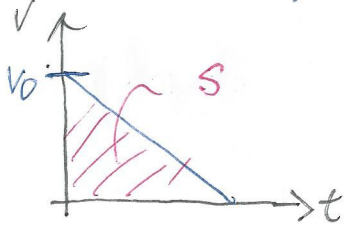


Givet: $m = 1.3 \cdot 10^3\ kg$
$\mu = 0.68$
$v_0 = 86\ km/h$

Bilen glider med låsta hjul, dvs fullt utbildad friktion $\Rightarrow F_f = \mu N = \mu mg$

Newtons rörelselag $\rightarrow -F_f = ma \Rightarrow$

$$-\mu mg = ma \Rightarrow a = -\mu g = -0.68 \cdot 9.82 = -6.7\ m/s^2$$



Bromssträckan $s = \frac{v_0 t}{2}$ med

$$a = \frac{v - v_0}{t} = -\frac{v_0}{t} \Rightarrow$$

$$s = \frac{v_0 t}{2} = \frac{v_0}{2}\left(-\frac{v_0}{a}\right) = \frac{-v_0^2}{2a}$$

$$= \frac{\left(\frac{86}{3.6}\right)^2}{2 \cdot 6.7} = \underline{43\ m}$$

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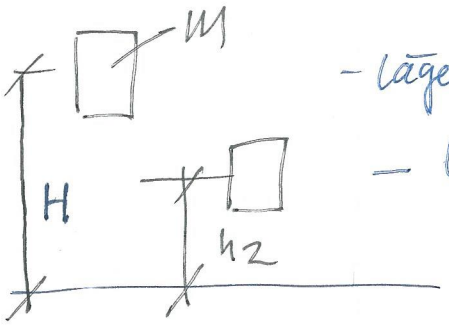
4)



Givet: $m = 120\,kg$
$H = 6.8\,m$
$h_2 = 2.4\,m$

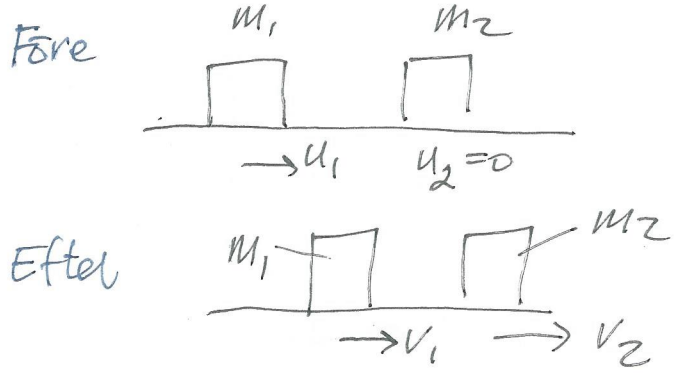
Energiprincipen:

$$mgh_1 + 0 = mgh_2 + \frac{1}{2}mv_2^2 \Rightarrow$$

$$v_2^2 = 2g(H - h_2) \rightarrow v_2 = \sqrt{2g(h_1 - h_2)}$$

$$v_2 = \sqrt{2 \cdot 9.82 \cdot (6.8 - 2.4)} = 9.3\,m/s$$

5)



Givet: $m_1 = 250\,g$
$u_1 = 70\,m/s$
$m_2 = 45.8\,g$
$v_2 = 89\,m/s$

Rörelsemängdens bevarande:

$$m_1u_1 + \underbrace{m_2u_2}_{=0} = m_1v_1 + m_2v_2 \Rightarrow$$

$$v_1 = \frac{1}{m_1}(m_1u_1 - m_2v_2) =$$

$$= \frac{1}{0.250}(0.250 \cdot 70 - 0.0458 \cdot 89) = 54\,m/s$$

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5 forts: Rörelsenergi:

$$E_{k\,före} = \frac{1}{2} m_1 v_1^2 \qquad E_{k\,efter} = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$$

$$\frac{E_{k\,efter}}{E_{k\,före}} = \frac{\frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2}{\frac{1}{2} m_1 v_1^2} = \frac{0.250 \cdot 54^2 + 0.0458 \cdot 89^2}{0.250 \cdot 70^2}$$

$$= 0.89$$

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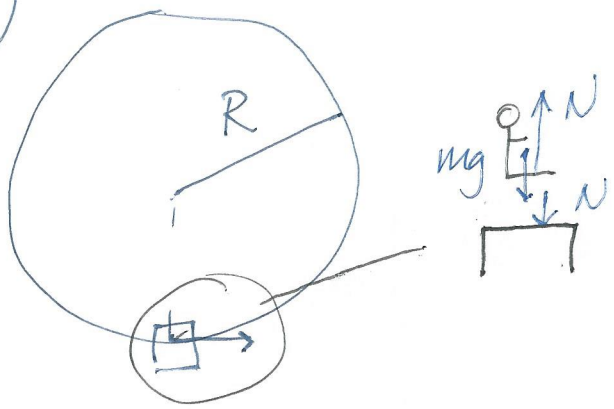
6)



Rörelseekv Pilot

$$\uparrow \quad N - mg = m\frac{v^2}{R}$$

$$N = mg + m\frac{v^2}{R}$$

$$N = 69 \cdot 9.82 + 69 \cdot \frac{\left(\frac{200}{3.6}\right)^2}{130} =$$

$$= 2.3 \text{ kN}$$

Givet $m = 69$ kg
$V = 200$ km/h
$R = 130$ m

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7) Energin som behövs

$$E = m \cdot c_h = \dot{P} \cdot t \Rightarrow$$

$$m = \frac{P \cdot t}{c_h} = \frac{0.51 \cdot 10^3 \cdot 60}{2.26 \cdot 10^6} = 0.0135\,kg = 13.5\,g$$

Givet $T = 100\,^\circ C$

$P = 0.51\,kW$

$t = 1$ minut

$c_h = 2.2 \cdot 10^6\,J/kg$

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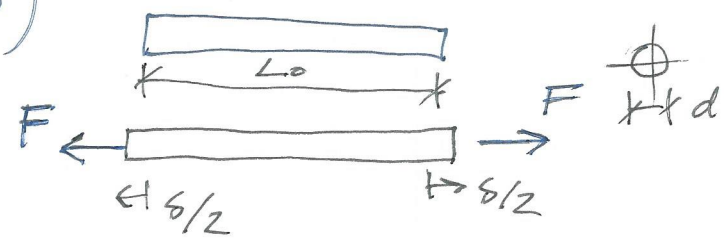
8)



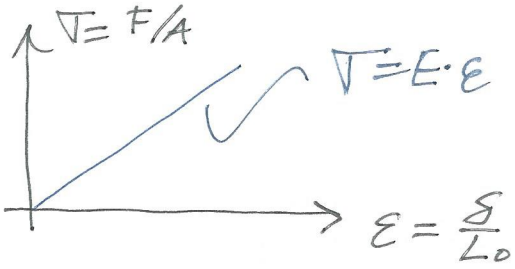
Givet:

$F = 8.7 \cdot 10^3\,N$

$L_o = 85\,mm$

$d = 8.7\,mm$

$\delta = 0.079\,mm$



Töjningen $\varepsilon = \frac{\delta}{L_o}$ spänningen $\sigma = \frac{F}{A} = \frac{F \cdot 4}{\pi d^2}$

$$\Rightarrow E = \frac{\sigma}{\varepsilon} = \frac{F \cdot 4}{\pi d^2} \cdot \frac{L_o}{\delta} = \frac{4 F L_o}{\pi \cdot d^2 \cdot \delta} =$$

$$= \frac{4 \cdot 8.7 \cdot 10^3 \cdot 85}{\pi \cdot 8.7^2 \cdot 0.079} = 1.6 \cdot 10^5\,N/mm^2$$

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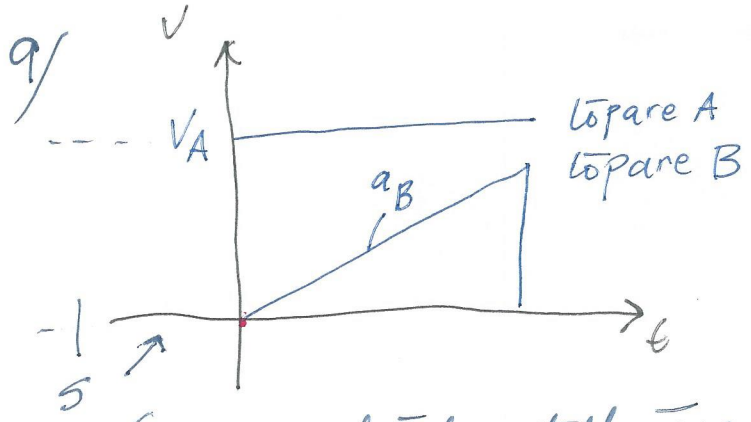
9/



Givet $v_A = 3.1\ m/s$

$s = 20\ m$

$a_B = 0.14\ m/s^2$

Samma sträcka till överkamrande

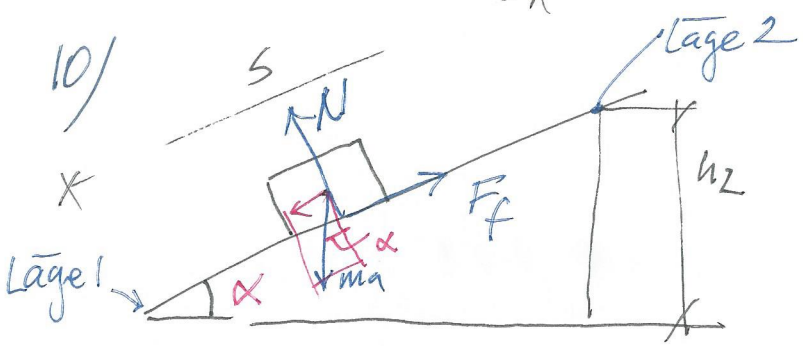
$$v_A \cdot t = s + \frac{1}{2} a_B t^2 \quad \text{(sträckan s bakom vid } t=0\text{)}$$

$$\frac{1}{2} a_B t^2 - v_A t + s = 0$$

$$t^2 - \frac{2v_A}{a_B} t + \frac{2s}{a_B} = 0;\ t = \frac{v_A}{a_B} \pm \sqrt{\left(\frac{v_A}{a_B}\right)^2 - \frac{2s}{a_B}}$$

$$t = 22{,}1 \pm \sqrt{(22{,}1)^2 - 286} = 22.1 (\pm) 14.3 = \underline{7.8\ s}$$

10/



Givet $\alpha = 19°$

$v_1 = 11\ m/s$

$m = 3.7\ kg$

$\mu = 0.17$

Läge 2 stannar och vänder $\rightarrow v_2 = 0$

Energiprincipen

$$E_{p1} + E_{k1} = E_{p2} + E_{k2} + W_f$$

$$0 + \frac{1}{2} m v_1^2 = mgh_2 + 0 + F_f \cdot s \quad 1)$$

Jämvikt ↑ $\quad N - mg\cos\alpha = 0 \quad 2)$

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10) Corts Fullt utbildad friktion $\Rightarrow$

$F_f = \mu N$ med 2/ $F_f = \mu mg\cos\alpha$ in i 1)

$$\frac{1}{2}mv_1^2 = mgh_2 + \mu mg\cos\alpha \cdot \frac{h_2}{\sin\alpha}$$

$$h_2 = \frac{v_1^2}{2g\left(1+\mu\frac{\cos\alpha}{\sin\alpha}\right)} = \frac{11^2}{2\cdot 9.82\left(1+0.17\cdot\frac{\cos 19^\circ}{\sin 19^\circ}\right)}$$

$h_2 = \underline{4.1\ m}$

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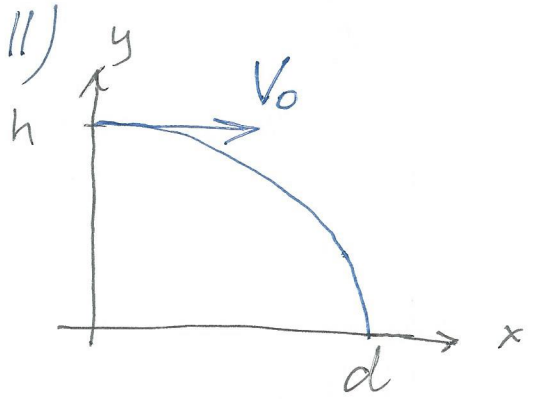
11)



Givet:
$h = 110\ m$
$d = 120\ m$

Paketets rörelse x-led $\rightarrow$ $s_x = v_{0x}t = v_0 t$ 1)

y-led $\rightarrow$ $s_y = v_{0y}t + \frac{1}{2}a_y t^2$ 2)

Med $a_y = -g$, $v_{0y} = 0$ $\Rightarrow$ $s_y = -h = -\frac{1}{2}gt^2$

$\Rightarrow t = \sqrt{\frac{2h}{g}}$ i 1) $\Rightarrow$ $v_0 = \frac{s_x}{t} = d\sqrt{\frac{g}{2h}}$

$$v_0 = 120\sqrt{\frac{9.82}{2\cdot 110}} = \underline{25\ m/s}$$