Løsningsforslag
Midterm FYL008 Høsten 2019

Oppgave 1

Regner om hastigheten til enhet m/s:

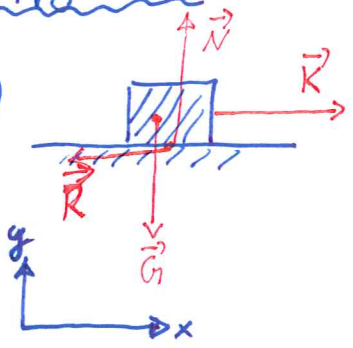
$75 \frac{km}{h} = 20,83 \ m/s$

For flytnig

$\Delta S = v \Delta t = 20,83 \frac{m}{s} \cdot 10s = \underline{208,3 \ m}$

Oppgave 2

a)



Ingen akselerasjon i vertikal retning gir at

$\vec{N} + \vec{G} = 0 \Rightarrow \vec{N} = -\vec{G} \Rightarrow |\vec{N}| = |\vec{G}| = mg$

Friksjonskrafta er

$|\vec{R}| = \mu |\vec{N}| = 0.28 \, mg = 0.28 \cdot 10 kg \cdot 9,81 \, m/s^2 = \underline{27,468 N}$

$|\vec{R}| \approx \underline{27,5 N}$

b) Summen av krefter i horisontal retning

$\sum F_x = |\vec{K}| - |\vec{R}| = 35N - 27,468N = \underline{7,53N}$

$a = \frac{\sum F_x}{m} = \frac{7,53N}{10 kg} = \underline{0,753 \ m/s^2}$

Tidløs vei formel

$2as = v^2 - \overset{0}{v_0^2} \Rightarrow v^2 = 2as$

$v = \sqrt{2as} = \sqrt{2 \cdot 0,753 \frac{m}{s^2} \cdot 10m}$

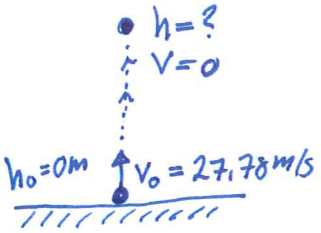
$v = 3.88 \ m/s = \underline{3,9 \ m/s}$

Oppgave 3

$$\frac{\Delta z}{z} = 2\frac{\Delta x}{x} + 3\frac{\Delta y}{y} = 2 \cdot 0{,}01 + 3 \cdot 0{,}02 = \underline{0{,}08} = \underline{\underline{8\,\%}}$$

Oppgave 4

a) $100\,\frac{km}{h} = \frac{100}{3.6}\,\frac{m}{s} = \underline{27{,}78\ m/s} = v_0$



Energibevaring gir

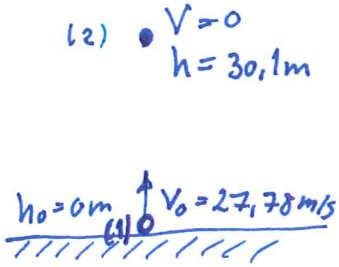
$$\frac{1}{2}mv^{2\,(0)} + mgh = \frac{1}{2}mv_0^2 + mgh_0^{\,(0)}$$

$$mgh = \frac{1}{2}mv_0^2$$

$$h = \frac{v_0^2}{2g} = \frac{(27{,}78\ m/s)^2}{2 \cdot 9{,}81\ m/s^2} = \underline{39{,}33\ m}$$

$$h = \underline{\underline{39{,}3\ m}}$$

b)



Mekanisk energi i punktet (1)

$$E_1 = \frac{1}{2}mv_0^2 = \frac{1}{2}\,0.080\,kg\,(27{,}78\,\tfrac{m}{s})^2 = \underline{30{,}86\ J}$$

Mekanisk energi i punktet (2)

$$E_2 = mgh = 0{,}080\,kg \cdot 9{,}81\,\tfrac{m}{s^2} \cdot 30{,}1\,m = \underline{23{,}62\ J}$$

Energitap grunnet luftmotstanden

$$\Delta E = 30{,}86\ J - 23{,}62\ J = 7{,}24\ J = \underline{7{,}2\ J}$$

Oppgave 5

Har at: $m = 10^2 cm$

$60s = 1 min \Rightarrow s = \frac{1}{60} min$

$\Rightarrow$

$$\frac{m}{s} = \frac{10^2 cm}{\frac{1}{60} min} = 60 \cdot 10^2 \frac{cm}{min} = 6 \cdot 10^3 \frac{cm}{min}$$

$\Rightarrow$

$$1 \frac{m}{s} = 1 \cdot 6 \cdot 10^3 \frac{cm}{min} = \underline{\underline{6000 \frac{cm}{min}}}$$

Oppgave 6

a) Hookes lov gir

$$F = kx = 250 \frac{N}{m} \cdot (0,1m) = \underline{\underline{25N}}$$

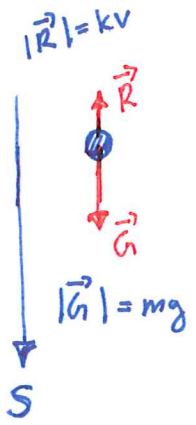
b) Bevaring av mekanisk energi gir

$$\frac{1}{2} m v^2 = \frac{1}{2} k x^2$$

$$v^2 = \frac{k}{m} x^2$$

$$v = x\sqrt{\frac{k}{m}} = 0.1m \sqrt{\frac{250 N/m}{0,3 kg}} = 2,88 m/s \simeq \underline{\underline{2,9 m/s}}$$

Oppgave 7



Summen av krefter som virker på steinen i vertikal retning er

$$\Sigma F = mg - kv$$

Newtons 2. lov

$$\Sigma F = ma$$

$$mg - kv = ma$$

Ved konstant hastighet er $a = 0$.

Da vil kraften fra luftmotstanden akkurat balansere tyngde kraften

$$mg - kv = 0$$

Hastigheten hvor dette skjer er

$$v = \frac{mg}{k} = \frac{2\,kg \cdot 9{,}81\,m/s^2}{0{,}05\,\frac{N \cdot s}{m}} = \underline{\underline{392{,}4\,m/s}}$$