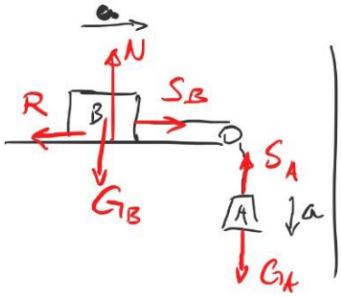
Oppgaver - Repetisjon - Løsningsforslag

FYS009-G 22V - Fysikk realfagskurs

Oppgave 1

a)



b) Newton's 2. $S_A = S_B = S$, $a_A = a_B = a$

A: $G_A - S_A = m_A a$

B: $S_B - R = m_B a$ $\quad R = \mu \cdot N = \mu m_B g$

$m_A g - S = m_A a$

$+ \quad S - \mu m_B g = m_B a$

$m_A g - S + S - \mu m_B g = m_A a + m_B a$

$a(m_A + m_B)$

$$\Rightarrow a = \frac{m_A g - \mu m_B g}{m_A + m_B}$$

$$= \frac{9{,}81 - 0{,}4 \cdot 4 \cdot 9{,}81}{2+4} = \underline{0{,}65 \text{ m/s}^2}$$

c) $m_A g - S = m_A a$

$$\Rightarrow S = m_A g - m_A a = 2 \cdot 9{,}81 - 2 \cdot 0{,}65 = \underline{\mathbf{18\ N}}$$

d) $s = \frac{1}{2} a t^2 + v_0 t + x_0$ $\quad (v_0 = 0,\ x_0 = 0)$

$$\Rightarrow a = \frac{2s}{t^2} = \frac{2 \cdot 2}{1{,}5^2} = 1{,}78 \text{ m/s}^2$$

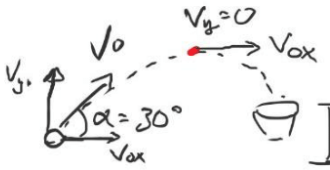
$m_A g - \mu m_B g = (m_A + m_B) a$

$$\Rightarrow \mu = \frac{m_A g - (m_A + m_B) a}{m_B g}$$

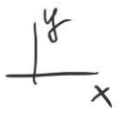
$$= \frac{2 \cdot 9{,}81 - (2+4) \cdot 1{,}78}{4 \cdot 9{,}81} = \underline{0{,}23}$$

Oppgave 2

2a)

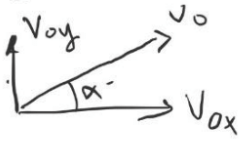


$a_y = -g$, $a_x = 0$



$v_y = a_y t + v_{oy} \Rightarrow v_{oy} = -a_y t = g \cdot t = 9{,}81 \cdot 0{,}48 = \underline{4{,}7 \text{ m/s}}$

b) I toppunkt er $v = v_{ox}$



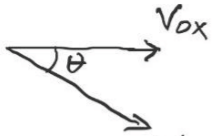
$\tan\alpha = \frac{v_{oy}}{v_{ox}}$

$\Rightarrow v_{ox} = \frac{v_{oy}}{\tan\alpha} = \underline{8{,}16 \text{ m/s}}$

c) $\frac{1}{2}mv_0^2 = \frac{1}{2}mv^2 + mgh$

$\Rightarrow v = \sqrt{v_0^2 - 2gh} = \sqrt{v_{ox}^2 + v_{oy}^2 - 2gh} = \underline{8{,}3 \text{ m/s}}$

d)

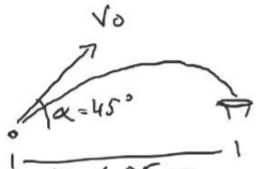


$\cos\theta = \frac{v_{ox}}{v}$

$\theta = \cos^{-1}\left(\frac{v_{ox}}{v}\right) = \underline{109°}$

$= \underline{-10{,}9°}$

e)



$v_{ox} = v_0 \cos\alpha$, $v_{oy} = v_0 \sin\alpha$

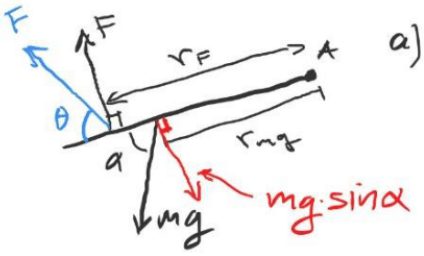
x: $x = \frac{1}{2}a_x t^2 + v_{ox} t + x_0 \Rightarrow t = \frac{x}{v_{ox}} = \frac{x}{v_0 \cos\alpha}$

y: $y = \frac{1}{2}a_y t^2 + v_{oy} t + y_0 = -\frac{1}{2}g\frac{x^2}{v_0^2\cos^2\alpha} + \underbrace{v_0 \sin\alpha}_{v_{oy}} \cdot \frac{x}{v_0 \cos\alpha}$

$y = -\frac{g \cdot x^2}{2v_0^2\cos^2\alpha} + x \cdot \tan\alpha \quad \frac{1}{v_0^2} \cdot \frac{gx^2}{2\cos^2\alpha} = (x \cdot \tan\alpha - y)v_0^2$

$v_0 = \sqrt{\frac{gx^2}{2\cos^2\alpha(x \cdot \tan\alpha - y)}} = \underline{8{,}43 \text{ m/s}}$

Oppgave 3



a) $M_{mg} = r_{mg} \cdot mg \cdot \sin\alpha$

$= 0{,}7 \cdot 10 \cdot \sin 60 = \underline{6{,}06\ \text{Nm}}$

b) Likevekt $\rightarrow \sum M = 0 \qquad M_F = M_{mg}$

$M_F = r_F \cdot F \Rightarrow F = \frac{M_{mg}}{r_F} = \frac{6{,}06}{1{,}05} = \underline{5{,}77\ \text{N}}$

c) $\sum M = 0 \qquad M_{mg} = M_F = r_F \cdot \underset{\uparrow}{F} \cdot \sin\theta$

10 N

$\Rightarrow \sin\theta = \frac{M_{mg}}{r_F \cdot F}$

$\Rightarrow \theta = \sin^{-1}\left(\frac{6{,}06}{1{,}05 \cdot 10}\right) = \underline{35{,}2^\circ}$