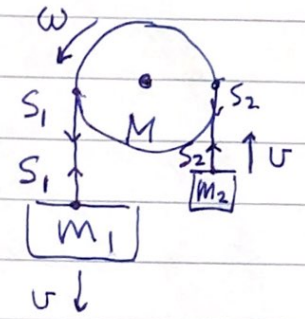
FY6013 Eksamen 8/8 - 2018

(7)



$m_1 g > m_2 g$

$S_1 > S_2$

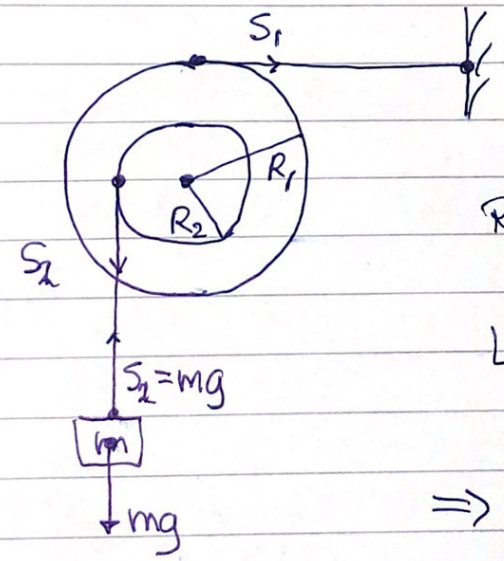
$m_1 g > S_1$

$S_2 > m_2 g$

$\Rightarrow \underline{m_1 g > S_1 > S_2 > m_2 g}$ (C)

(8) Ved $t = 1.0\,s$ er $dx/dt > 0 \Rightarrow \underline{v > 0}$ (B)

(10)



Rotasjonslikevekt for trinsa:

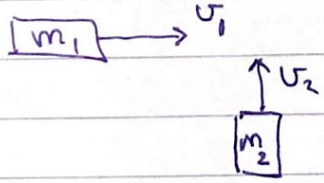
$S_1 R_1 = S_2 R_2$

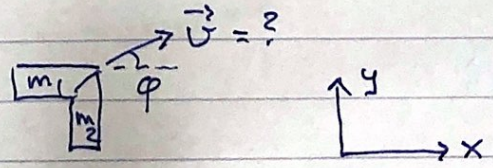
Likevekt for massen m:

$S_2 = mg$

$\Rightarrow \underline{S_1 = mg\,R_2/R_1}$ (B)

(12)





Impulsbevarelse $\Rightarrow$

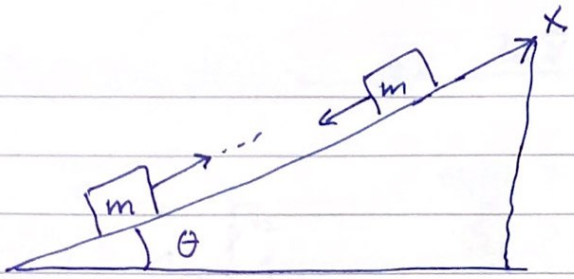
$m_1 v_1 = (m_1 + m_2) v_x$

$m_2 v_2 = (m_1 + m_2) v_y$

$\Rightarrow v = |\vec{v}| = \sqrt{v_x^2 + v_y^2} = (m_1+m_2)^{-1} \cdot \sqrt{m_1^2 v_1^2 + m_2^2 v_2^2} = \underline{43\ km/h}$

$\varphi = \arctan(v_y/v_x) = \arctan(m_2 v_2 / m_1 v_1) = \arctan(2.5) = \underline{68^\circ}$

(13)



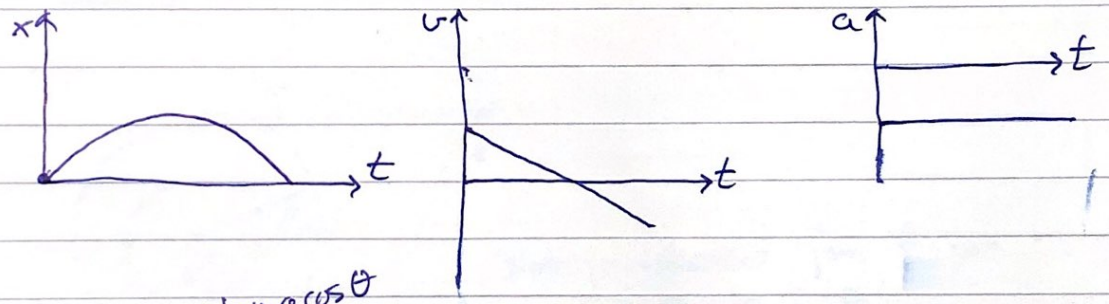
a) N2 langs skråplanet: $-mg\sin\theta = ma = m\ddot{x}$

$a = (-5\,m/s)/4s = \underline{-1.25\ m/s^2}$ = konstant

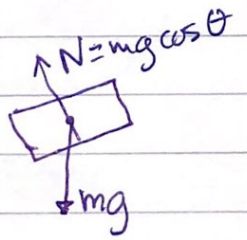
$v(t) = v_0 + at = \underline{5\ m/s - t\cdot 1.25\ m/s^2}$

$x(t) = x_0 + v_0 t + \frac{1}{2}at^2 = \underline{t\cdot 5\ m/s - t^2\cdot 0.625\ m/s^2}$ $(x_0 = 0)$

b)



c)



d) $a = g\sin\theta \Rightarrow \theta = \arcsin(a/g) = \arcsin(1.25/9.81) = \underline{7.3°}$

(11) a) $a = a_\perp = v^2/R = \omega^2 R = \frac{4\pi^2 R}{T^2}$

$= 4\pi^2 \cdot 0.40\,\text{m}/(0.505)^2 = \underline{63\ \text{m/s}^2}$

b) Skrått kast med $v_0 = \omega R = 2\pi R/T = 2\pi \cdot 0.40\,\text{m}/0.505 = 5.03\ \text{m/s}$

og utg.høyde $y_0 = R - R\sin 45° = 0.40\,\text{m}\,(1 - 1/\sqrt{2}) = 0.117\,\text{m}$

og utg.vinkel $\theta = 45°$

$x(t) = v_0 t \cos\theta = v_0 t/\sqrt{2}$

$y(t) = y_0 + v_0 t \sin\theta + \frac{1}{2}at^2 = y_0 + \frac{v_0 t}{\sqrt{2}} - \frac{1}{2}gt^2$

Bakken: $y = 0 \Rightarrow gt^2/2 - v_0 t/\sqrt{2} - y_0 = 0$

$\Rightarrow t = \frac{v_0/\sqrt{2} \pm \sqrt{v_0^2/2 + 2gy_0}}{g} = \underline{0.765}$

c) $v_x = v_0/\sqrt{2} = \text{konst.} = 3.56\ \text{m/s}$

$v_y = v_0 \sin\theta - gt = v_0/\sqrt{2} - gt = (3.56 - 7.46)\frac{\text{m}}{\text{s}} = -3.90\ \text{m/s}$

$\Rightarrow v = \sqrt{v_x^2 + v_y^2} = \underline{5.28\ \text{m/s}}$

Eller med energibevarelse: $\frac{1}{2}mv^2 - \frac{1}{2}mv_0^2 = mgy_0 = mgR(1 - 1/\sqrt{2})$

$\Rightarrow v = \{v_0^2 + 2gR(1 - 1/\sqrt{2})\}^{1/2} \simeq \underline{5.25\ \text{m/s}}$

d)