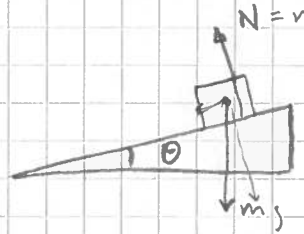
LF V2018 - 1

A1



C

BEGYNNER Å GLI NÅR

$$mg\cdot\sin\theta = F_f = \mu_s N = \mu_s\cdot mg\cos\theta$$

$$\Rightarrow \frac{\sin\theta}{\cos\theta} = \tan\theta = \mu_s = 0.23 \Rightarrow \underline{\theta = 12.952 \sim 13}$$

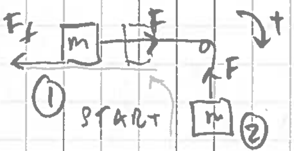
A2. $m = 6.0\,kg \times 6$; $R = 2.0\,m$ $\quad I = mR^2$ FOR PUNKTMASSE

C

$$I_{tot} = \sum I_{punkt} = 6\cdot mR^2 = 6\cdot 6\cdot 2^2 = 144\,kg\,m^2$$

$$\sim \underline{145}\,kg\,m^2$$

A3.



$m = 0.5\,kg$; $\mu_s = 0.25$; $\mu_k = 0.20$; $F_f = \mu_k\cdot N$

D

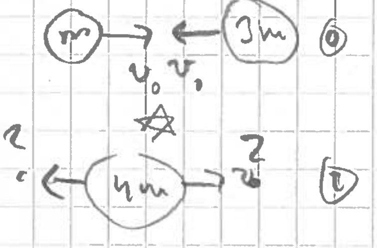
$(1)\quad -F_f + F = m\cdot a \qquad (1)+(2) \Rightarrow \qquad ; N = mg$

$(2)\quad mg - F = m\cdot a \qquad mg - F_f = 2ma$

$$\Rightarrow mg - \mu_k N = 2ma \Rightarrow \cancel{m}g - \mu_k\cancel{m}g = 2\cancel{m}a \Rightarrow a = \frac{1}{2}g(1-\mu_k)$$

VERDIER: $a = \frac{1}{2}\cdot 9.81\cdot(1-0.20) = 0.4\cdot 9.81 = \underline{0.4\cdot g}$

A4.



BEVARINGSLOV: $mv_0 - 3mv_0 = 4mv_1$

$$-2mv_0 = 4mv_1 \Rightarrow v_1 = \frac{-v_0}{2}$$

B

$$K_{før} = \frac{1}{2}(mv_0^2) + \frac{1}{2}3mv_0^2 = \frac{4}{2}mv_0^2 = 2mv_0^2$$

$$K_{etter} = \frac{1}{2}(4m)v^2 = \frac{1}{2}(4m)\left(\frac{v_0}{2}\right)^2 = \frac{1}{2}mv_0^2$$

$$TAP = K_{før} - K_{etter} = 2mv_0^2 - \frac{1}{2}mv_0^2 = \underline{\frac{3mv_0^2}{2}}$$

A5. $m_1 = 3m$, $v_1 = v$; $m_2 = 4m$

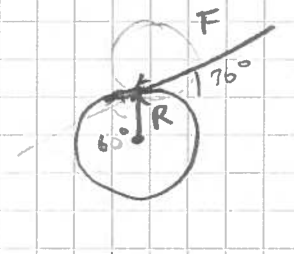
ENERGIEN ER BEVART FØR = ETTER

C

$$K_{før} = \frac{1}{2}(3m)v^2 = \underline{\frac{3mv^2}{2}}$$

LF V2018-2

A6.



B

$\tau = F \cdot r \cdot \sin\theta$ θ ER MER $60°$

$= F\, r \sin 60°$

MEN $\sin 60° = \cos 30° \Rightarrow F \cdot r \cdot \cos 30°$

A7.

E

A) $R_{tot} = R_1 + R_2 + R_3 = 13\ \Omega$

B) $R_{tot} = R_1 + R_2 // R_3 = R_1 + \frac{R_2 R_3}{R_2 + R_3} = 1 + \frac{20}{12} \approx 2\frac{2}{3}\ \Omega$

C) $\frac{1}{R_{tot}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \Rightarrow R_{tot} = \frac{10}{16}\ \Omega$

D) $R_{tot} = R_2 + R_1 // R_3$ $R_{tot} = 2.91\ \Omega$

E) $R_{tot} = R_3 + R_1 // R_2 = 10 + \frac{R_1 R_2}{R_1 + R_2} = 10 + \frac{2}{3} = 10\frac{2}{3} \approx 10.7\ \Omega$

A8

$n = 1.33$ $n = 1.5$

A   (C)

$n_1 \sin\theta_1 = n_2 \sin\theta_2$

$1.33 \cdot \sin 17° = 1.0 \cdot \sin\theta_2 \Rightarrow 22.9°$

A9.

B

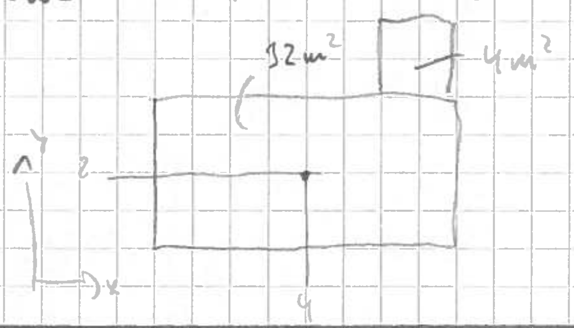
DEN SVARADE GAV $(x, y) = (4, 2)$

VI SER BITTE-LITE EXTRA PÅ x OCH y => D

BERÄKNING: AREA $= 36\ m^2$

$x = \frac{1}{36}(4 \cdot 7 + 32 \cdot 4) = 4.33$

$y = \frac{1}{36}(4 \cdot 5 + 32 \cdot 2) = 2.33$



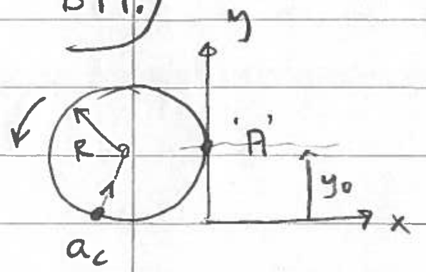
A10. $x = 0$; $\frac{dx}{dt} < 0$; $\frac{d^2x}{dt^2}$ = KONST

C

UTESLUTNINGSPRINCIP GER C

LF FORTS.

B11.)



$R = 0.75\,m$

a) NÅR KULEN GÅR I SIRKULÆR BANE MED KONSTANT FART ER DET KUN SENTRIPETAL AKSELERASJON SOM VIRKER PÅ KULEN.

$$a_c = \frac{v_t^2}{R} = \frac{(\omega R)^2}{R} = \omega^2 R \qquad \text{DER } \omega = \frac{2\pi}{T}$$

$$\Rightarrow a_c = \left(\frac{2\pi}{T}\right)^2 \cdot R = (2\pi)^2 \cdot \frac{0.75}{0.50^2} \simeq 118.44 \simeq \underline{120 \frac{m}{s^2}}$$

b) NÅR SNOREN RYKER ER DEN PÅ VEI OPPOVER VED $y_0 = 0.75\,m$

$$v_t = v_{oy} = \omega \cdot R = \frac{2\pi}{T} \cdot R = 2\pi \cdot \frac{0.75}{0.5} = 9.42 \frac{m}{s}$$

VI KAN BRUKE DE VANLIGE KINEMATIKKLIGNINGENE

$$\Rightarrow y = y_0 + v_{oy} \cdot t + a_y \cdot \frac{1}{2} t^2 \Rightarrow y = R + \frac{2\pi R}{T} \cdot t - g\frac{1}{2} \cdot t^2 \quad ; \quad g = 9.8 \frac{m}{s^2}$$

$$v_y = v_{oy} + a_y t \Rightarrow v_y = \frac{2\pi R}{T} - gt$$

KULEN TREFFER BAKKEN NÅR $y = 0 \Rightarrow 0 = R + \frac{2\pi R}{T} \cdot t - g\frac{1}{2}t^2$

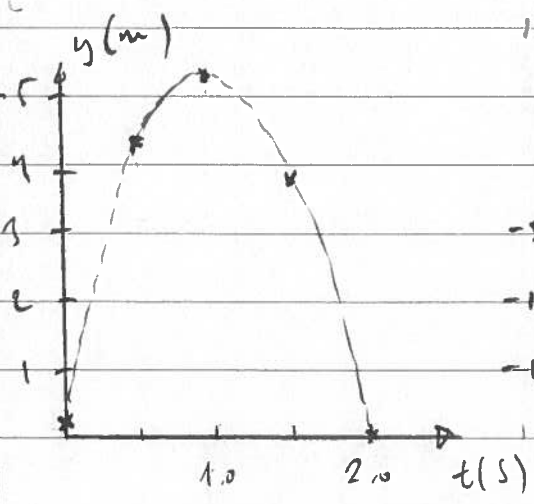
$$\Rightarrow t^2 - \frac{2 \cdot 2\pi R}{gT} - \frac{2R}{g} = 0 \Rightarrow t = \underbrace{\frac{2\pi R}{gT}}_{0.96171} \pm \sqrt{\underbrace{\left(\frac{2\pi R}{gT}\right)^2}_{0.92489} + \underbrace{\frac{2R}{g}}_{0.15306}} = \begin{cases} +1.99995 \\ -0.07651 \end{cases}$$

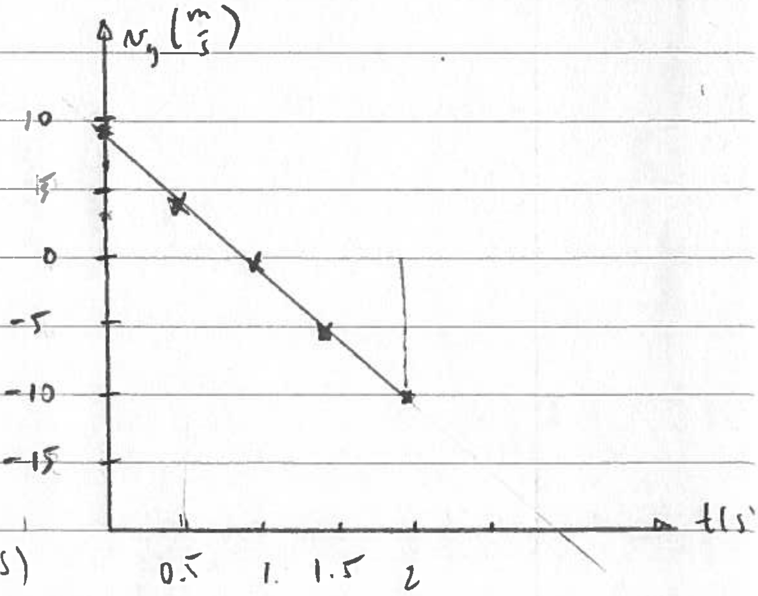
DEN POSITIVE ROTEN ER FYSIKALSK RETT $\Rightarrow$ $\underline{\text{Ans. } t = 2.0\,s}$

c) $v_y = \frac{2\pi R}{T} - g \cdot t = 9.42 - 9.8 \cdot 1.99995 = -10.18 \frac{m}{s}$ $\quad \underline{\text{Ans. } -10 \frac{m}{s}}$

d)

t	y	v_y
0	0.75	9.42
0.5	4.24	4.52
1.0	5.27	-0.38
1.5	3.86	-5.28
2.0	0	-10.2





B 12. $f = 7\ cm$, $s = 14\ cm$

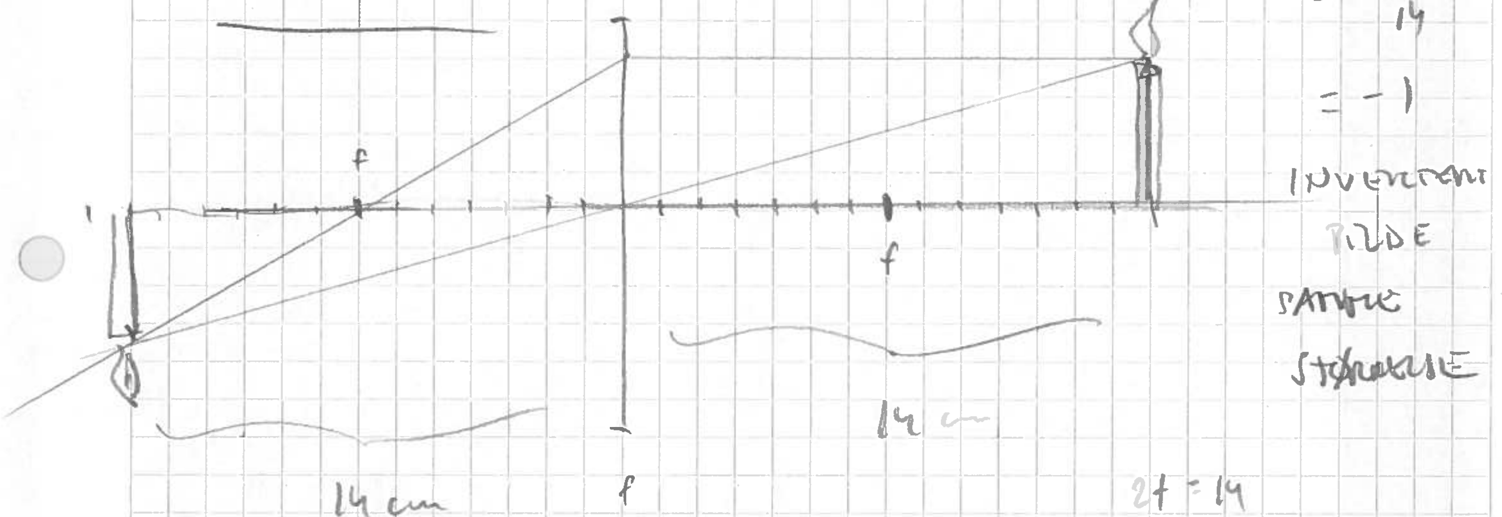
TYNNE LINS LIGNING

A) $\frac{1}{s} + \frac{1}{s'} = \frac{1}{f} \Rightarrow \frac{1}{14} + \frac{1}{s'} = \frac{1}{7} \Rightarrow \frac{1}{s'} = \frac{2\cdot 1}{2\cdot 7} - \frac{1}{14} = \frac{1}{14}$

$M_T = -\frac{s'}{s} = -\frac{14}{14} = -1$

BILDET BLIR 14 cm TIL VENSTRE.

STRÅLE GANG



INVERTERT BILDE

SAMME STØRRELSE

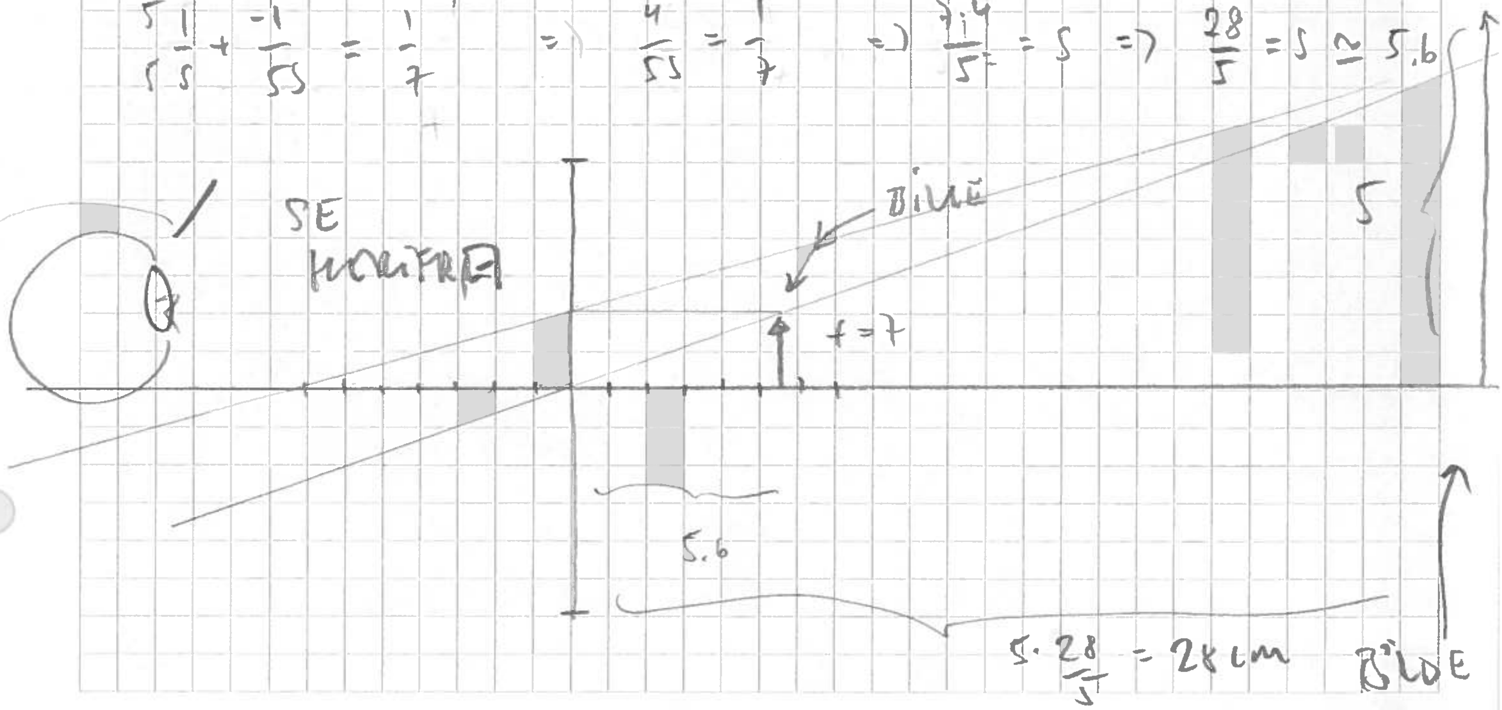
B) FORSTØRRELSESGLASS GIR RETTVENDT, VIRTUELT BILDE

$\Rightarrow s' < 0$ $M_T = 5 = -\frac{s'}{s} \Rightarrow 5 = -\frac{s'}{s}$

$\Rightarrow s' = -5s$

TYNNE LINSELIGNING

$\frac{5}{5}\frac{1}{s} + \frac{-1}{5s} = \frac{1}{7} \Rightarrow \frac{4}{5s} = \frac{1}{7} \Rightarrow \frac{7\cdot 4}{5} = s \Rightarrow \frac{28}{5} = s \simeq 5.6$

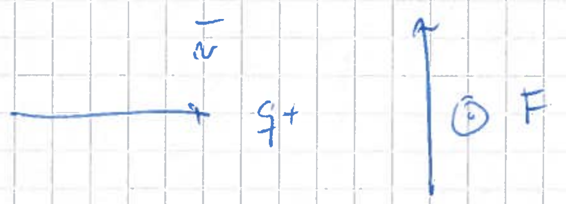


$5 \cdot \frac{28}{5} = 28\ cm$

B11)

$\bar{F} = q(\bar{v} \times \bar{B})$

a)



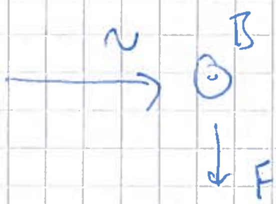
ut ur pappret

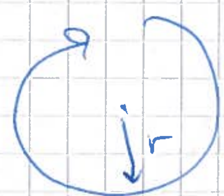
$$|F| = 1.60\cdot10^{-19}\,C \cdot 600\,000\,\frac{m}{s} \cdot 0.05\cdot10^{-3}\,T$$

$$= 4.8\cdot10^{-18}\,N$$

SETT OVANIFRÅN

b)



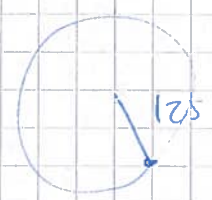


Beveger sig i sirkel

$F = m\cdot a_c$

$$F = m\frac{v^2}{r} \Rightarrow r = \frac{mv^2}{F}$$

$$= \frac{1.673\cdot10^{-27}\cdot 600\,000^2}{4.8\cdot10^{-18}}$$



$t = \frac{s}{v}$ $\quad T = \frac{2\pi\cdot125}{600\,000}$ omloppstid $\quad$ ~~T.3.1397~~ $= 125$ m

$1.314\cdot10^{-3}$ s $\Rightarrow f = 761$ Hz