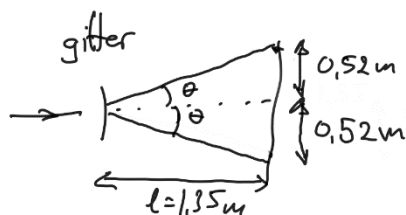<u>Midtsemesterprøve</u> vår 2021

1. Bølge $v = f \cdot \lambda \Rightarrow \lambda = \frac{v}{f} = \frac{340}{1046} = \underline{\underline{0,325\ m}}$

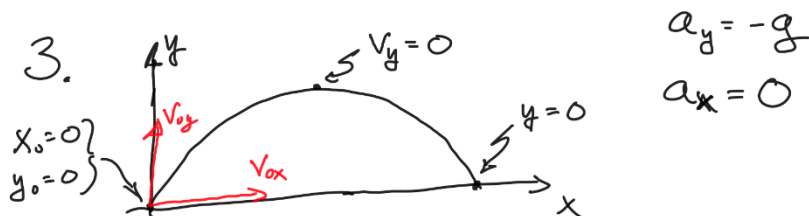2. Gitter: $d \cdot \sin\theta = n\lambda$

$d = \frac{1\ mm}{300} = \frac{10^{-3}}{300} = 3,333 \cdot 10^{-6}\ m$, 2. ordens $\Rightarrow n = 2$

Ur figuret: $\tan\theta = \frac{0,52}{1,35}$
$\Rightarrow \theta = 21,07°$

gitter

0,52 m
0,52 m
$l = 1,35\ m$

$\lambda = \frac{d}{n} \sin\theta = \frac{3,333 \cdot 10^{-6}}{2} \sin 21,07$

$= 599 \cdot 10^{-9}\ m$

$= \underline{\underline{599\ nm}}$

3.

$X_0 = 0$
$y_0 = 0$

$V_y = 0$
$y = 0$

$a_y = -g$
$a_x = 0$

a) $V_y = a_y \cdot t + V_{oy} \Rightarrow 0 = -g \cdot t + V_{oy} \Rightarrow t = \frac{V_{oy}}{g} = 7,65\ s$

$y = \frac{1}{2} a_y t^2 + V_{oy} t + y_0^{\ 0} = -\frac{1}{2} g \cdot t^2 + V_{oy} t = 287\ m = \underline{\underline{290\ m}}$

b) $y = \frac{1}{2} a_y t^2 + V_{oy} t + y_0^{\ 0} \Rightarrow 0 = -\frac{1}{2} g t^2 + V_{oy} t$

$\Rightarrow (t = 0),\ t = \frac{2 \cdot V_{oy}}{g} = 15,3\ s$

$X = \frac{1}{2} a_x t^2 + V_{ox} t + X_0^{\ 0} = 160 \cdot 15,3 = 2448\ m$

$= \underline{\underline{2500\ m}}$

4. a) $v = \dfrac{2\pi r}{T} = \dfrac{2\pi \cdot 1{,}8}{2{,}5} = 4{,}52 \; m/s = \underline{\underline{4{,}5 \; m/s}}$

   b) $a = \dfrac{v^2}{r} = \dfrac{(4{,}52)^2}{1{,}8} = 11{,}4 \; m/s^2 = \underline{\underline{11 \; m/s^2}}$
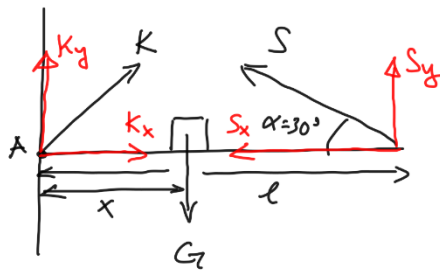
5. Sentripetalkraft

   $F = m\dfrac{v^2}{r}$

   F må vare gitt av friksjonskraften

   $F = R = \mu N, \quad N = mg \;\Rightarrow\; F = \mu mg$

   $\Rightarrow \mu \cancel{m} g = \cancel{m}\dfrac{v^2}{r} \;\Rightarrow\; v = \sqrt{\mu g r}$

   $v = \sqrt{0{,}65 \cdot 9{,}81 \cdot 40} = 15{,}97 \; m/s = \underline{\underline{57 \; km/t}}$

6.

a) Kraftmomentet om
akse A. $S = 200$ N

$$M_G = M_S$$

$$G \cdot X = S \cdot \ell \sin \alpha$$

$$\Rightarrow X = \frac{S \cdot \ell \cdot \sin \alpha}{G} = \underline{\underline{1,7 \text{ m}}}$$
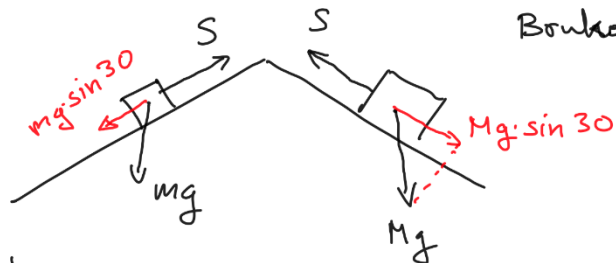
b) $\sum F_x = 0 \Rightarrow K_x = S_x = S \cdot \cos \alpha = 173$ N

$\sum F_y = 0 \Rightarrow K_y + S_y = G \Rightarrow K_y = G - S_y = G - S \cdot \sin \alpha$

$K_y = 150 - 200 \cdot \sin 30 = 50$ N

$$\underline{K_x = 170 \text{ N}} \quad , \quad \underline{K_y = 50 \text{ N}}$$

7.

Bruker Newtons 2. lov

$$S - mg \cdot \sin 30 = ma \quad ①$$

$$Mg \cdot \sin 30 - S = Ma \quad ②$$

$① + ② \Rightarrow \cancel{S} - mg \sin 30 + Mg \cdot \sin 30 - \cancel{S} = ma + Ma = a(m+M)$

$$\Rightarrow a = \frac{(M-m) g \sin 30}{m+M} = \frac{(3-2) \cdot 9,81 \cdot \sin 30}{2+3} =$$

$$= 0,981 \text{ m/s}^2$$