oppgave 1

$m = 60kg$

$D = 0,16\ kg/m$

$\vec{F} = D|\vec{v}|\vec{v}$

Her kan vi bruke newtons 2. lov

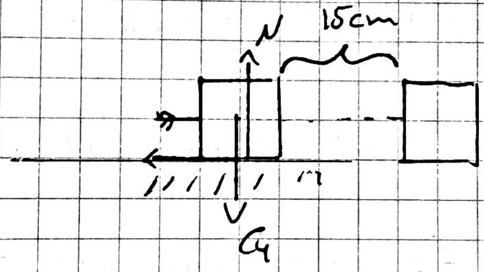
$\vec{F} = m\vec{a}$, $\vec{a} = g$

$m\vec{a} = D|\vec{v}|\vec{v}$

$\frac{m\vec{a}}{D} = \vec{v}^2$

$\vec{v} = \sqrt{\frac{m\vec{a}}{D}} = \sqrt{\frac{60kg \cdot 9{,}81m/s^2}{0{,}16\ kg/s}} = \underline{\underline{60{,}65\ m/s}}$

oppgave 2



$M = 3{,}0kg$

$m = 100g = 0{,}1kg$

$\mu = 0{,}5$

$L = 15cm = 0{,}15m$

Vi lar farten til pila før kollisjon være V_p

$m \cdot V_p = (m + M)\, V_f$

$V_f = \frac{m \cdot V_p}{(m + M)} = \frac{0{,}1kg}{(0{,}1\ kg + 3{,}0kg)} \cdot V_p = \underline{0{,}032 V_p}$

Så setter vi inn

$W = \underbrace{W_G}_{=0} + W_f + \underbrace{W_N}_{=0} = \Delta E_k$

$W_f = \Delta E_k$

$-\mu \cdot mg\cos\alpha \cdot l = -\frac{1}{2} m v_f^2 \quad \Big| \cdot -\frac{2}{m}$

$2 \cdot \mu \cdot g\cos\alpha \cdot l = v_f^2$

$v_f = \sqrt{2 \cdot \mu g \cos\alpha l} = \sqrt{2 \cdot 0{,}5 \cdot 9{,}81\,m/s^2 \cdot \cos 0 \cdot 0{,}16\,m}$

$= \underline{3{,}15\,m/s}$

forten på pilla er da

$v_p = \frac{v_f}{0{,}032} = \frac{3{,}15\,m/s}{0{,}032} = \underline{\underline{98{,}43\,m/s}}$

$E_{k_i} = \frac{1}{2} m \cdot v_p^2 = \frac{1}{2} \cdot 0{,}1\,kg \cdot 98{,}43\,m/s = 4{,}9\,kg\,m/s$

$E_{kf} = \frac{1}{2} M v_f^2 = \frac{1}{2} \cdot 3{,}0\,kg \cdot 3{,}15\,m/s = 4{,}7\,kg\,m/s$

Tappet av energi er da

$E_{k_i} - E_{kf} = 4{,}9\,kg\,m/s - 4{,}7\,kg\,m/s = 0{,}2\,kg\,m/s = \underline{\underline{0{,}2\,J}}$

$\cancel{E_{ki} = \frac{1}{2} m v_p^2 = \frac{1}{2} \cdot 0{,}1\,kg \cdot (9{,}81\,m/s)^2 =}$

$E_{ki} = \frac{1}{2} m v_p^2 = \frac{1}{2} \cdot 0{,}1\,kg \cdot (98{,}43\,m/s)^2 = \underline{484{,}4\,J}$

$E_{kf} = \frac{1}{2} M v_f^2 = \frac{1}{2} \cdot 3{,}0\,kg \cdot (3{,}15\,m/s)^2 = \underline{14{,}9\,J}$

Tappet av energi er da

$E_{ki} - E_{kf} = 484{,}4\,J - 14{,}9\,J = \underline{\underline{469{,}5\,J}}$

oppgave 3

a) vi Bruke bevaring av energi

~~$E_k + E$~~ $E_{k_1} + E_{p_1} = E_{k_0} + E_{p_0}$

$$\frac{1}{2}mv_1^2 + \underbrace{mgh_1}_{=0} = \underbrace{\frac{1}{2}mv_0^2}_{=0} + mgh_0$$

setter $h_1 = 0$

$$\frac{1}{2}mv_1^2 = mgh_0 \quad \Big| \cdot \frac{2}{m}$$

$$v_1^2 = 2gh_0$$

$$v_1 = \sqrt{2gh_0}$$

b) Bruke formelen for sentrifugal kraft

$$F = \frac{mv^2}{r}$$

Så finner vi Gravitasjons krafta på toppen

$$F = mg$$

setter disse opp mot hverandre

$$mg = \frac{mv^2}{r} \quad \Big| \cdot \frac{r}{m}$$

$$g \cdot r = v^2$$

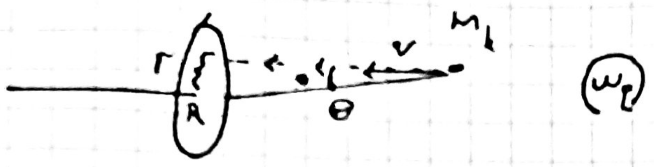
$$v = \sqrt{g \cdot r}$$

Vi setter så v_1 som vi fant i a)

$$\sqrt{2gh} = \sqrt{gr} \quad \Big| \cdot (\,)^2$$

$$2gh = gr \quad \Big| \frac{1}{2g} \Rightarrow h = \frac{r}{2}$$

Oppgave 4



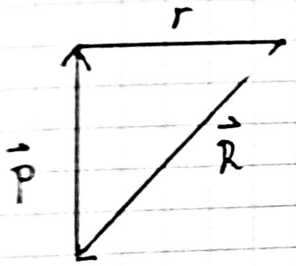
Kullen har masse m_k og hastighet $\vec{v} = v\vec{j}$

Vi bruker så Bevegelses mengde

$p = m_k \cdot \vec{v} = m_k \cdot v\vec{j}$

Spinn: $\vec{L}_k = \vec{R} \times \vec{p}$

$$|\vec{L}_k| = |\vec{R}| \times |\vec{p}| \sin\theta$$



$|\vec{R}| \cdot \sin\theta = \underline{r}$

$\vec{L}_k = r \cdot m_k \vec{v}$, spinn til kula

Treghets moment til skiva: $\cancel{\frac{1}{2} M_k R^2}$ $\frac{1}{2} MR^2$ $\cancel{(R+r)}$

$L_s = I_{cm}\, \omega_0 = \frac{1}{2} MR^2 \cdot \omega_0$

Spinn til kule + skive

$$L_{tot} = L_s + L_p = \frac{1}{2} MR^2 \cdot \omega_0 + r \cdot m_k v$$

I ein kollisjon er spinnet bevart $\tau = 0$

Spinn etter kollisjon

$L_e = I_t \cdot \omega$

$\cancel{I_t = \frac{1}{2} Mr^2 + r^2 m_k v = \left(\frac{1}{2} Mr + m_k v\right) \cdot r^2}$

$I_t = \frac{1}{2} MR^2 + r^2 m_k v$

oppgave 4

$L_f = L_e$

$$\frac{1}{2} MR^2 \cdot \omega_0 + r m_k \cdot v = \left(\frac{1}{2} MR^2 + r^2 m_k \cdot v\right) \omega$$

$$\omega = \frac{\frac{1}{2}\cancel{M}R^2 \cdot \omega_0 + \cancel{r m_k} \cdot v}{\frac{1}{2}\cancel{MR^2} + r^2 \cancel{m_k} \cdot v} = \frac{\omega_0}{r}$$

Som ein ser vil vinkelhastigheten endre seg