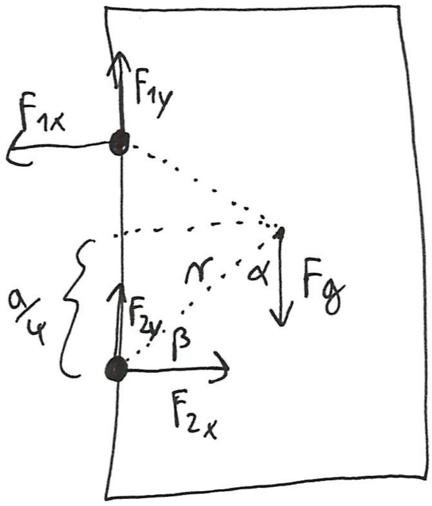
① $\sum F = 0$ $\quad \sum F_x = 0$

$\sum F_y = 0$



$$\Rightarrow F_{1x} = -F_{2x} \quad \oplus_1$$

$$F_{1y} + F_{2y} = F_g = m \cdot g$$

$$F_{1y} = F_{2y} = \frac{mg}{2} \quad \oplus_2$$

↑ iz navodil

$\sum M = 0$ Izberemo si os v enem od ~~krajiš~~ tečajev, recimo 2.

Navor F_{1y} je 0, zaradi kota $180°$.

$$\oplus_3 \quad F_{1x} \cdot \frac{a}{2} \cdot \sin(90°) = F_g \cdot r \cdot \sin(\alpha)$$

$$r = \sqrt{\left(\frac{a}{4}\right)^2 + \left(\frac{b}{2}\right)^2} \qquad b = 0{,}6\,m \quad a = 2\,m$$

$$r = 0{,}58\,m \quad \oplus_4$$

$$\alpha = \arctan\left(\frac{30}{50}\right) = 30{,}96° \quad \oplus_5$$

$$F_{1x} = \frac{m \cdot g \cdot r \cdot \sin(\alpha)}{a/2} = 44{,}75\,N \quad \oplus_6$$

Ko upoštevamo še smeri:

$F_{1x} = -44{,}75\,N \qquad F_{2x} = 44{,}75\,N$

$F_{1y} = 75\,N \quad \oplus_7 \qquad F_{2y} = 75\,N \quad \oplus_8$

$$|F_1| = |F_2| = \sqrt{F_{1x}^2 + F_{1y}^2} = 87{,}3\,N$$

φ_1 smer F_1 glede na navpičnico.

$$\varphi_1 = \arctan \frac{-44{,}75}{75} = -30{,}82°$$

$$\varphi_2 = \arctan \frac{44{,}75}{75} = 30{,}82°$$

② G se ohranja. ⊕1

x smer: ⊕2 $m_1 \cdot v_1 \cdot \sin\alpha - m_2 v_2 \sin\alpha = (m_1+m_2) v \cdot \sin\varphi$

y smer: ⊕3 $m_1 v_1 \cos\alpha + m_2 v_2 \cos\alpha = (m_1+m_2) \cdot v \cos\varphi$

Pravilna kotna funkcija.
α je definiran „drugače kot smo navajeni"

$m_2 = 3m_1$

$v_1 = 4\,\frac{m}{s}$

$v_2 = 2\,\frac{m}{s}$

iz enačbe za x: $v \cdot \sin\varphi = \frac{\cancel{m_1} v_1 \sin\alpha - 3\cancel{m_1} v_2 \sin\alpha}{4\cancel{m_1}}$

$v \sin\varphi = -0{,}25\,\frac{m}{s}$ ⊕4

y: $v \cdot \cos\varphi = \frac{\cancel{m_1} v_1 \cos\alpha + 3\cancel{m_1} v_2 \cos\alpha}{\cancel{m_1} + 3\cancel{m_1}}$

$v \cdot \cos\varphi = 2{,}16\,\frac{m}{s}$ ⊕5

$|v| = \sqrt{(v \sin\varphi)^2 + (v\cos\varphi)^2} = 2{,}17\,\frac{m}{s}$ ⊕6

$\frac{v \sin\varphi}{v \cos\varphi} = \tan\varphi = \frac{-0{,}25}{2{,}16}$

$\varphi = -6{,}6^0$ ⊕7

$W_{zač} = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} 3m_1 v_2^2$

$W_{kon} = \frac{1}{2} 4m_1 v^2$

delež izgubljene energije: $\frac{W_{zač} - W_{kon}}{W_{zač}} = 1 - \frac{W_{kon}}{W_{zač}}$ ⊕8

③ Najprej izračunamo nadomesten upor.

$$R_{23} = R_2 + R_3 \qquad \oplus_1$$

$$R_{234} = \left(\frac{1}{R_{23}} + \frac{1}{R_4} \right)^{-1} = \frac{R_{23} R_4}{R_{23} + R_4} \qquad \oplus_2$$

$$R_{1234} = R_1 + R_{234} = R_1 + \left(\frac{1}{R_{23}} + \frac{1}{R_4} \right)^{-1} \qquad \oplus_3$$

Celoten tok: $I = \frac{U}{R_{1234}}$ $\oplus_4$

Napetost na zunanji zanki: $U = I \cdot R_1 + I_3 \cdot R_{23}$ $\oplus_5$

$$U = U \frac{R_1}{R_{1234}} + I_3 R_{23}$$

Ena enačba, ena neznanka $-R_{23}-$, ki pa je skrita tudi v R_{1234}.

$$U = U \frac{R_1}{R_1 + \frac{R_{23} R_4}{R_{23} + R_4}} + I_3 R_{23} \quad \Big| \cdot R_1 + \frac{R_{23} R_4}{R_{23} + R_4}$$

$$\cancel{UR_1} + U \frac{R_{23} R_4}{R_{23} + R_4} = \cancel{UR_1} + I_3 R_1 R_{23} + I_3 R_{23} \frac{R_{23} R_4}{R_{23} + R_4} \quad \Big| \cdot \frac{R_{23} + R_4}{R_{23}}$$

$$U \cdot R_4 = I_3 R_1 R_{23} + I_3 R_1 R_4 + I_3 R_{23} R_4$$

$$R_{23} (I_3 R_1 + I_3 R_4) = U R_4 - I_3 R_1 R_4 \qquad \oplus_6$$

$$R_{23} = \frac{R_4 (U - I_3 R_1)}{I_3 (R_1 + R_4)} = \frac{50\,\Omega\,(5\,V - 0{,}25\,A \cdot 5\,\Omega)}{0{,}25\,A\,(5\,\Omega + 50\,\Omega)}$$

$$R_{23} = 13{,}63\,\Omega \qquad \oplus_7$$

$$R_2 = R_{23} - R_3 = 3{,}63\,\Omega \qquad \oplus_8$$

④ V smeri gibanja je skrčitev dolžin.
V prečni smeri je ni.

V gibajočem sistemu: $\vartheta = 30^0 = \arctan\left(\frac{\Delta y'}{\Delta x'}\right)$

$\Delta y' = \Delta y$ ⊕$_1$ $\quad \Delta x' = \frac{\Delta x}{\gamma} = \sqrt{1-\frac{v_0^2}{c^2}}\,\Delta x$ ⊕$_2$

V mirujočem sistemu:

$L = \sqrt{(\Delta x)^2 + (\Delta y)^2} = 1\,m$

$\varphi = \arctan\left(\frac{\Delta y}{\Delta x}\right) = ?$

$\vartheta = 30^0 = \arctan\left(\frac{\Delta y'}{\Delta x'}\right) = \arctan\left(\frac{\Delta y}{\sqrt{1-\frac{v_0^2}{c^2}}\,\Delta x}\right) \quad \Big|\tan$

$\tan\vartheta = \frac{\Delta y}{\Delta x}\;\frac{1}{\sqrt{1-\frac{v_0^2}{c^2}}} \quad \Big|\cdot\sqrt{}$

$\tan\vartheta\sqrt{1-\frac{v_0^2}{c^2}} = \frac{\Delta y}{\Delta x} \quad \Big|\cdot\arctan$

$\arctan\left[\tan\vartheta\sqrt{1-\frac{v_0^2}{c^2}}\right] = \arctan\frac{\Delta y}{\Delta x} = \varphi$ ⊕$_3$

$\varphi = 19{,}1^0$ ⊕$_4$

$\Delta x' = \sqrt{1-\frac{v_0^2}{c^2}}\,\Delta x \qquad \Delta x = L\cdot\cos\varphi = 0{,}945\,m$ ⊕$_5$

$\Delta y = \Delta y' = L\sin\varphi = 0{,}327\,m$ ⊕$_6$

$\Delta x' = 0{,}567\,m$ ⊕$_7$

$L' = \sqrt{(\Delta x')^2 + (\Delta y')^2} = 0{,}65\,m$ ⊕$_8$