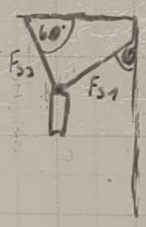
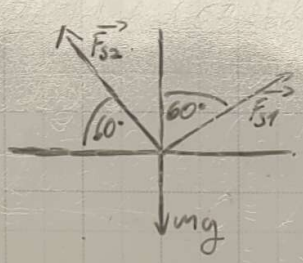
Übungsblatt 3

1) $m = 35\,kg$ a)





$F_{S1} < F_{S2}$ $F_{S1x} = F_{S2x}$ $|F_{S1}| < |F_{S2}|$

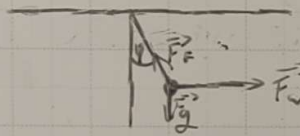
b) 1. Newtonsche Gesetz: $\vec{F} = 0$

$y: 0 = F_{S1y} + F_{S2y} + (-mg) = \vec{F_{S1}} \cdot \cos 60° + \vec{F_{S2}} \cdot \sin 60° - 35kg \cdot 9{,}81\,m/s^2$

$x: 0 = F_{S1x} - F_{S2x} = \vec{F_{S1}} \cdot \sin 60° - \vec{F_{S2}} \cdot \cos 60° \Leftrightarrow \vec{F_{S1}} = \frac{\vec{F_{S2}} \cdot \cos 60°}{\sin 60°} = \vec{F_{S2}} \cdot 0{,}57$

$\Rightarrow \vec{F_{S1}} < \vec{F_{S2}}$ ✓

2) $m = 3 \cdot 10^{-4}\,kg$ $\gamma = 37°$



b) $\vec{F_g} = \vec{F_F} \Leftrightarrow 3 \cdot 10^{-4}kg \cdot 9{,}81\,m/s^2 = \vec{F_W} \cdot \cos 37°$

$\Leftrightarrow \vec{F_F} = \frac{3 \cdot 10^{-4}kg \cdot 9{,}81\,m/s^2}{\cos 37°} = 3{,}69 \cdot 10^{-3}\,kg\,m/s^2$

$\vec{F_W} = \vec{F_F} \cdot \sin \gamma = 3{,}69 \cdot 10^{-3} \cdot \sin 37 = 2{,}22 \cdot 10^{-3}\,N$

4) $\vartheta = 10°$ $m_1 = 0{,}8kg$ $m_2 = 0{,}25kg$ $\mu_1 = 0{,}3$ $\mu_2 = 0{,}2$

2. Newtonsches Gesetz: $\vec{a} = \vec{F}/m$

1. Newtonsches Gesetz: $\vec{F_N} = \vec{F_R}$

$x: -F_{R1} + F_{S1} + m_1 g \cdot \sin\vartheta = m_1 a_{1x}$

$y: F_{N1} = m_1 g \cdot \cos\vartheta$

$F_{R1} = F_{N1} \cdot \mu_1 = m_1 g \cdot \cos\vartheta \cdot \mu_1$

$F_{S1} = -m_1 g \cdot \cos\vartheta\,\mu_1 - m_1 g \cdot \sin\vartheta - m_1 a_{1x}$

$x = -F_{R2} - F_{S2} + m_2 g \cdot \sin\vartheta = m_2 a_{2x}$

$y = F_{N2} = m_2 g \cdot \cos\vartheta$

$F_{R2} = F_{N2} \cdot \mu_2 = m_2 g \cdot \cos\vartheta \cdot \mu_2$

$F_{S2} = m_2 g \cdot \cos\vartheta\,\mu_2 - m_2 g \cdot \sin\vartheta - m_2 a_{2x}$

$F_{S1} = F_{S2}$ $a_{1x} = a_{2x} = a_x$

$-m_1 g \cdot \cos\vartheta \cdot \mu_1 - m_1 g \cdot \sin\vartheta - m_1 a_{1x} = -m_2 g \cdot \cos\vartheta\,\mu_2 - m_2 g \cdot \sin\vartheta - m_2 a_{2x}$

$-m_1 g \cdot \cos\vartheta \cdot \mu_1 - m_1 g \cdot \sin\vartheta + m_2 g \cdot \cos\vartheta\,\mu_2 + m_2 g \cdot \sin\vartheta = a_x (m_1 - m_2)$

$(-m_1 \mu_1 + m_2 \mu_2) g \cdot \cos\vartheta + (-m_1 + m_2) g \cdot \sin\vartheta = a_x (m_1 - m_2)$

$$\frac{(-m_1 r_1 + m_2 r_2)\, g \cdot \cos\alpha + (-m_1 + m_2)\, g \cdot \sin\alpha}{m_1 - m_2} = a_y$$

$$\frac{(-0{,}8\,\text{kg} \cdot 0{,}3 + 0{,}2\,\text{kg} \cdot 0{,}2) \cdot 9{,}81\,\text{m/s}^2 \cdot \cos 10 + (-0{,}8 + 0{,}2) \cdot 9{,}81 \cdot \sin 10}{0{,}8 - 0{,}2} = -4{,}9\,\text{m/s}^2$$