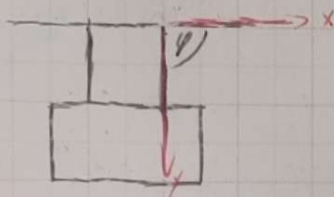


# Übung 5 Aufgabe 3

$$m_1 = 16g = 0,016kg, m_2 = 15kg, l = 2,3m, \varphi = 60^\circ$$



$$h = y: \sin \varphi \cdot l = \cos 60^\circ \cdot 2,3m = 1,15m$$

$$E_{pot} = mgh = 1,15m \cdot 9,81m/s^2 \cdot 1,15m = 12,1J$$

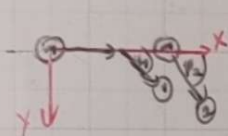
Energieerhaltungssatz:  $E_{kin} = E_{pot}$

$$mgh = \frac{1}{2}mv^2 \Leftrightarrow 2mgh = mv^2 \Leftrightarrow 2gh = v^2 \Leftrightarrow v = \sqrt{2gh} = \sqrt{2 \cdot 9,81 \cdot 1,15} = 4,75m/s$$

$$v_2 = \left(\frac{m}{m_2} + 1\right) \cdot v = \left(\frac{0,016kg}{15kg} + 1\right) \cdot 4,75m/s = 4,90m/s$$

# Übung 5 Aufgabe 4

$$m = 5kg, v_1 = 2m/s, \varphi_1 = 30^\circ, \varphi_2 = 60^\circ$$



Impulserhaltungssatz:  $m_1\vec{v}_1 + m_2\vec{v}_2 = m_1\vec{v}_1' + m_2\vec{v}_2'$

$$5kg \cdot 2m/s + 5kg \cdot 0m/s = 5kg(\vec{v}_1' + \vec{v}_2')$$

$$x: 5kg(\cos \varphi_1 \cdot \vec{v}_1' + \cos \varphi_2 \cdot \vec{v}_2') = 10kgm/s \Leftrightarrow \vec{v}_1' = (2m/s - \cos \varphi_2 \cdot \vec{v}_2') \cdot \frac{1}{\cos \varphi_1}$$

$$y: 5kg(\sin \varphi_1 \cdot \vec{v}_1' + \sin \varphi_2 \cdot \vec{v}_2') = 0 \Leftrightarrow \vec{v}_2' = -\sin \varphi_1 \cdot \vec{v}_1' \cdot \frac{1}{\sin \varphi_2}$$

$$\Rightarrow \vec{v}_2' = -\sin \varphi_1 \cdot (2m/s - \cos \varphi_2 \cdot \vec{v}_2') \cdot \frac{1}{\cos \varphi_1} \cdot \frac{1}{\sin \varphi_2} \quad (*)$$

$$\left(\vec{v}_2' \cdot \frac{1}{\sin \varphi_2} \cdot \cos \varphi_1 \sin \varphi_1 - 2m/s\right) \cdot \left(-\frac{1}{\cos \varphi_2}\right) = \vec{v}_2'$$

$$\Leftrightarrow \vec{v}_2' \cdot \left(-\frac{1}{\cos \varphi_2}\right) \cdot \cos \varphi_1 \sin \varphi_1 - 2m/s \cdot \frac{1}{\cos \varphi_2} = -\vec{v}_2'$$

$$\Leftrightarrow -\frac{1}{\cos \varphi_2} \cdot \cos \varphi_1 \sin \varphi_1 \cdot \frac{2m/s}{\cos \varphi_2} = \frac{1}{\vec{v}_2'} \Leftrightarrow -4,6m/s = \vec{v}_2'$$

$$\vec{v}_1' = 4,97m/s$$

falsch!

### Übung 5 Aufgabe 2

$$t_1 = 0, \quad m_1 = 2 \text{ kg}, \quad t_2 = 100 \text{ ms}$$

$$a) \quad y_1(t) = y_0 + v_0 \cdot t + \frac{1}{2} g t^2 = 0 + 0 \cdot 0,3 + \frac{1}{2} \cdot 9,81 \cdot 0,3^2 = 0,44 \text{ m}$$

$$y_2(t) = y_0 + v_0 \cdot 0,3 + \frac{1}{2} \cdot 9,81 \cdot 0,3^2 = 0,19 \text{ m}$$

$$\vec{v}_s = \frac{1}{2 m_1} \cdot \sum \vec{v}_i m_i = \frac{1}{m_1 + 2 m_1} (y_1 \cdot m_1 + y_2 \cdot 2 m_1) = (y_1 + 2 y_2) \cdot \frac{1}{3} = (0,44 + 0,19) \cdot \frac{1}{3} = 0,27 \text{ m/s}$$

$$b) \quad \vec{v}_1 = v_0 + a t = g t = 9,81 \text{ m/s}^2 \cdot 0,3 \text{ s} = 2,943 \text{ m/s}$$

$$\vec{v}_2 = v_0 + a t = 9,81 \text{ m/s}^2 \cdot 0,2 \text{ s} = 1,962 \text{ m/s}$$

$$\vec{v} = \frac{\vec{v}_1 \cdot m_1 + \vec{v}_2 \cdot 2 m_1}{3 m_1} = \frac{\vec{v}_1 + 2 \vec{v}_2}{3} = \frac{2,943 \text{ m/s} + 2 \cdot 1,962 \text{ m/s}}{3} = 2,3 \text{ m/s}$$