

Physics hour 05

1) Rakete 1

$$v = \frac{m}{M-m} u \quad \begin{array}{l} m = 0,8 \cdot M \\ \downarrow \end{array} = \frac{0,8M}{\underbrace{M - 0,8M}_{0,2M}} u = \frac{0,8}{0,2} u = 4 \cdot u = 4 \cdot 3 \frac{\text{km}}{\text{s}} = 12 \frac{\text{km}}{\text{s}}$$

2) Rakete 2

1. Abwurf:

$$m = 0,4 M$$
$$v_1 = \frac{0,4M}{0,6M} u = \frac{2}{3} u$$

$\nearrow$
 $u = 1 \frac{\text{km}}{\text{s}} \rightarrow v = 0,67 \frac{\text{km}}{\text{s}}$

$\searrow$
 $u = 3 \frac{\text{km}}{\text{s}} \rightarrow v = 2 \frac{\text{km}}{\text{s}}$

2. Abwurf

$$M' = 0,6M, \quad m = 0,4M$$

$$v_2 = \frac{0,4M}{\underbrace{0,6M - 0,4M}_{0,2}} u = \frac{0,4}{0,2} u = 2u =$$

$\nearrow$
 $u = 1 \frac{\text{km}}{\text{s}} \rightarrow v_2 = 2 \frac{\text{km}}{\text{s}}$

$\searrow$
 $u = 3 \frac{\text{km}}{\text{s}} \rightarrow v_2 = 6 \frac{\text{km}}{\text{s}}$

Gesamtgeschwindigkeit: $V = v_1 + v_2 = \begin{cases} 2,67 \frac{\text{km}}{\text{s}} & (u = 1 \frac{\text{km}}{\text{s}}) \\ 8 \frac{\text{km}}{\text{s}} & (u = 3 \frac{\text{km}}{\text{s}}) \end{cases}$

3) Stöße

falsch ist: (B)

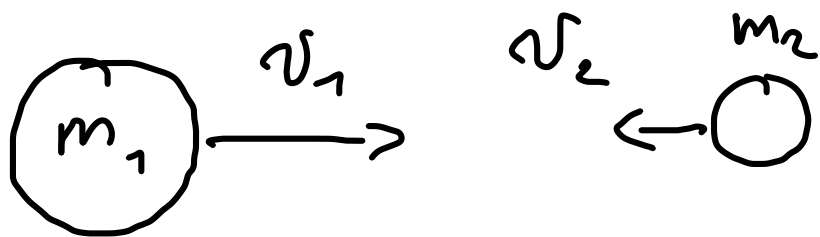
Gegenbeispiel: elastischen Stoß zwischen ICE und Fußball

4) Inelastischer Stoß



$$(2m) u = \frac{m_1 v_1 + m_2 v_2}{m_1 + m_2} = \frac{m (v_1 + v_2)}{2m} = \frac{v - v}{2} = 0$$

5) Elastischer Stoß

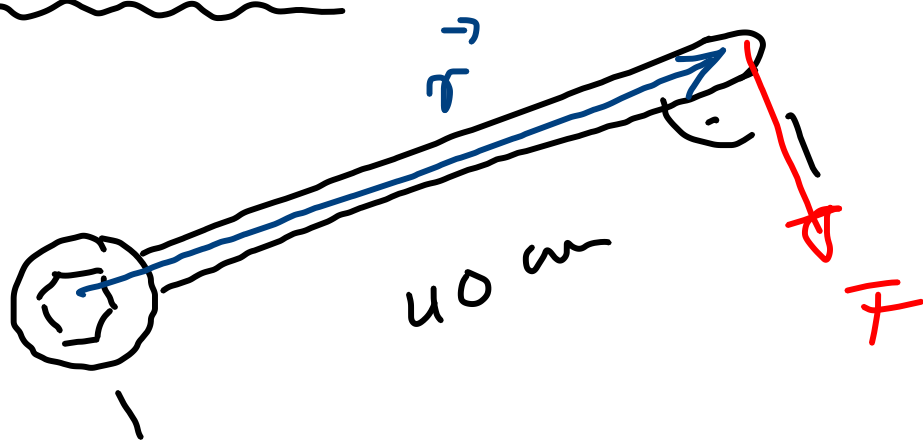


$$u_2 = \frac{2m_1}{m_1 + m_2} v_1 + \frac{m_2 - m_1}{m_1 + m_2} v_2$$

$$= \frac{20 \cancel{\text{kg}}}{12 \cancel{\text{kg}}} \cdot 1 \frac{\text{m}}{\text{s}} + \frac{2 \cancel{\text{kg}} - 10 \cancel{\text{kg}}}{12 \cancel{\text{kg}}} \cdot \left(-0,5 \frac{\text{m}}{\text{s}} \right)$$

$$= \frac{20}{12} \frac{\text{m}}{\text{s}} + \frac{8}{12} \cdot 0,5 \frac{\text{m}}{\text{s}} = \frac{20}{12} \frac{\text{m}}{\text{s}} + \frac{4}{12} \frac{\text{m}}{\text{s}} = \frac{24}{12} \frac{\text{m}}{\text{s}} = 2 \frac{\text{m}}{\text{s}}$$

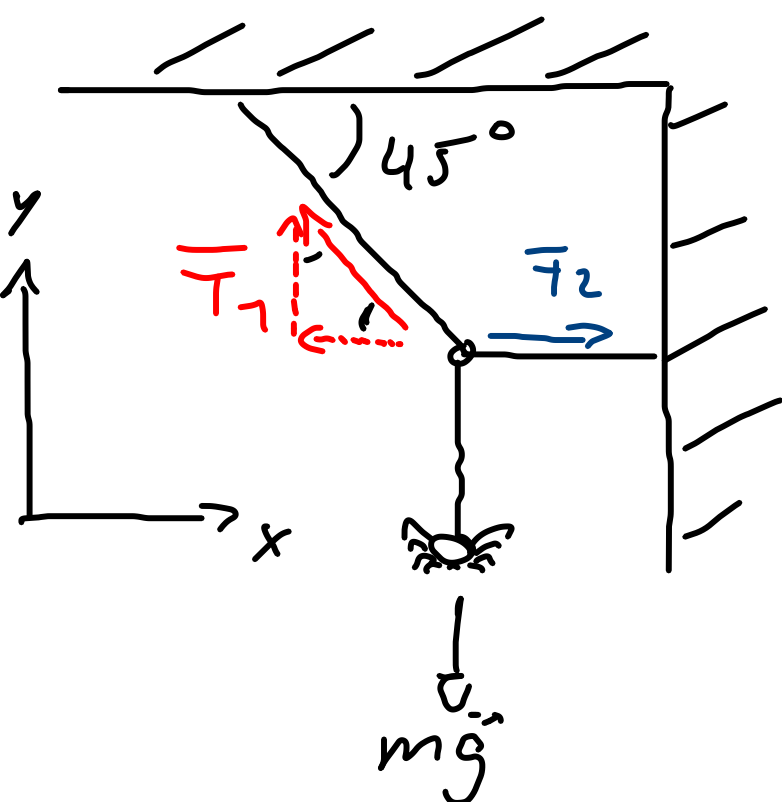
6) Drehmoment



$$\vec{M} = \vec{r} \times \vec{F}$$

$$|M| = r \cdot F \rightarrow F = \frac{M}{r} = \frac{120 \text{ Nm}}{0.4 \text{ m}} = 300 \text{ N}$$

7) Pluri-Spinne



Statik $m\vec{g} + \vec{F}_1 + \vec{F}_2 = 0$

$$\begin{pmatrix} 0 \\ -mg \end{pmatrix} + \begin{pmatrix} -F_1 \cos(45^\circ) \\ F_1 \sin(45^\circ) \end{pmatrix} + \begin{pmatrix} F_2 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

2. Zeile: $-mg + F_1 \sin(45^\circ) = 0$

$$\begin{aligned} F_1 &= \frac{mg}{\sin(45^\circ)} = mg \sqrt{2} = 10^{-2} \text{ kg} \cdot 10 \frac{\text{m}}{\text{s}^2} \sqrt{2} \\ &= 1,41 \cdot 10^{-1} \text{ kg} \frac{\text{m}}{\text{s}^2} = \underline{\underline{141 \text{ mN}}} \end{aligned}$$