

## Answer on Question #75724, Physics Mechanics Relativity

Particles of  $m_1=1,5\text{kg}$  and  $m_2=3,5\text{kg}$  undergo an elastic collision. their velocities before collision are  $v_{1i}=12\text{m/s}$  and  $v_{2i}=-7,5\text{m/s}$ . Find the velocities of the two particles after the collision

### Solution.

The law of conservation of momentum

$$m_1 \cdot v_{1i} + m_2 \cdot v_{2i} = m_1 \cdot v_1 + m_2 \cdot v_2$$

where  $v_{1i}$ - velocities before collision are  $v_{1i}=12\text{m/s}$  Particles of  $m_1=1,5\text{kg}$

$v_{2i}$  - velocities before collision are  $v_{2i}=-7.5 \text{ m/s}$  Particles of  $m_2=3,5\text{kg}$

$v_1$  - velocities after collision Particles of  $m_1=1,5\text{kg}$

$v_2$  - velocities after collision Particles of  $m_2=3,5\text{kg}$

Energy conservation law

$$\frac{m_1 \cdot v_{1i}^2}{2} + \frac{m_2 \cdot v_{2i}^2}{2} = \frac{m_1 \cdot v_1^2}{2} + \frac{m_2 \cdot v_2^2}{2}$$

From here

$$v_1 = \frac{v_{1i} \cdot (m_1 - m_2)}{m_1 + m_2} + \frac{v_{2i} \cdot 2 \cdot m_2}{m_1 + m_2} = \frac{12 \cdot (1.5 - 3.5)}{1.5 + 3.5} + \frac{-7.5 \cdot 2 \cdot 3.5}{1.5 + 3.5} = -15.3 \frac{\text{m}}{\text{s}}$$

$$v_2 = \frac{v_{1i} \cdot 2 \cdot m_1}{m_1 + m_2} + \frac{v_{2i} \cdot (m_2 - m_1)}{m_1 + m_2} = \frac{12 \cdot 2 \cdot 1.5}{1.5 + 3.5} + \frac{-7.5 \cdot (3.5 - 1.5)}{1.5 + 3.5} = 4.2 \frac{\text{m}}{\text{s}}$$

**Answer:**  $v_1 = -15.3 \frac{\text{m}}{\text{s}}$ ,  $v_2 = 4.2 \frac{\text{m}}{\text{s}}$

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