

Answer on Question #51943, Physics, Other

A 30,000-kg truck travelling at 10.0m/s collides with a 1700-kg car travelling at 25m/s in the opposite direction. If they stick together after the collision, how fast and in what direction will they be moving

Solution:

Given:

$$m_1 = 30000 \text{ kg},$$

$$m_2 = 1700 \text{ kg},$$

$$v_{1i} = 10 \text{ m/s},$$

$$v_{2i} = 25 \text{ m/s},$$

$$v_f = ?$$

The equation that denotes the conservation of momentum is:

$$m_1 v_{1i} - m_2 v_{2i} = (m_1 + m_2) v_f$$

where, m_1 = mass of object or body 1

m_2 = mass of object or body 2

v_{1i} = initial velocity of object or body 1

v_{2i} = initial velocity of object or body 2

v_f = final velocity of both the objects

The final velocity is given by

$$v_f = \frac{m_1 v_{1i} - m_2 v_{2i}}{m_1 + m_2}$$

$$v_f = \frac{30000 \cdot 10 - 1700 \cdot 25}{30000 + 1700} = 8.12 \text{ m/s}$$

Answer: $v_f = 8.12 \text{ m/s}$ in direction of truck travelling.