

Conservation of Momentum

For any collision between objects in a closed and isolated system, the total momentum before the collision is equal to the total momentum after the collision.

The Law of Conservation of Momentum

$$\vec{p}_A + \vec{p}_B = \vec{p}_A' + \vec{p}_B'$$

Before = After

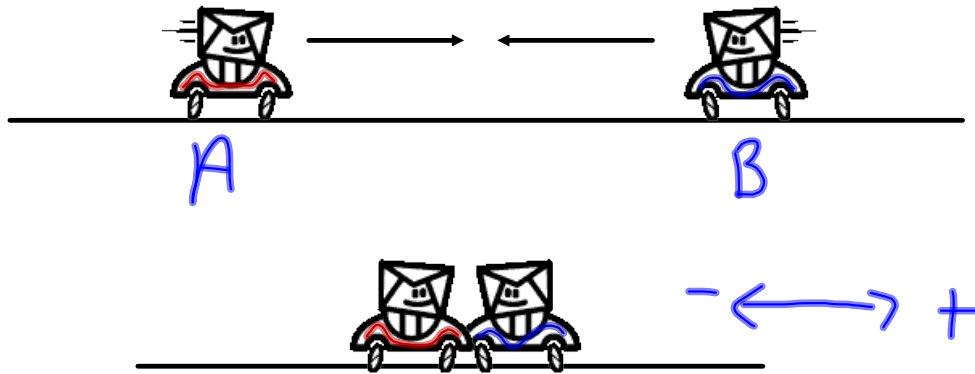
$$m_A \vec{v}_A + m_B \vec{v}_B = m_A \vec{v}_A' + m_B \vec{v}_B'$$

A → Object A B → Object B

← Prime After collision

1D Collisions

Example: When a car of mass 2.0×10^3 kg moving at 9.0 m/s collides head on with a second car having a mass of 1.5×10^3 kg, the cars lock and come to rest at the point of collision. What was the velocity of the second car before the collision?



$$m_A v_A + m_B v_B = m_A v_A' + m_B v_B'$$
$$m_A = 2000 \text{ kg} \quad m_B = 1500 \text{ kg} \quad v_A' = 0$$
$$v_A = 9.0 \text{ m/s} \quad v_B = ? \quad v_B' = 0$$
$$(2000)(9) + (1500)(v_B) = (2000)(0) + (1500)(0)$$

$$18000 + 1500v_B = 0$$

$$1500v_B = -18000$$

$$v_B = \frac{-18000}{1500} = -12 \text{ m/s}$$



Attachments

Song - Momentum.jpg