

Phys 11: Conservation of Momentum Lab

Ms Lysne

Rockridge Secondary School
Phys 11

February 14, 2013

Conservation of Momentum Lab quiz

- 1 Assume there is a student of mass 60 kg on roller blades heading towards his twin brother, also 60 kg, sitting on a chair. The skating twin is going 5.0 m/s and the twin on the chair is initially at rest. If the skating twin holds onto the seated twin's chair, what will be their velocity together, assuming no outside forces?
- 2 Assume that the skating twin is replaced by a football player who has mass 120 kg and initial velocity 5m/s. What is the final velocity in this case

Impulse Quiz solutions

What is the final velocity of the twins?

Known:

Let the twin on skates be 1 and the one on the chair be 2.

$$m_1 = m_2 = 60 \text{ kg}, \mathbf{v}_{1,i} = +5.0\text{m/s}, \mathbf{v}_{2,i} = 0\text{m/s}$$

$$\mathbf{v}_f = ?$$

Since the collision is inelastic, with them sticking together after, we have the equation

$$\begin{aligned} m_1\mathbf{v}_{1,i} + \cancel{m_2\mathbf{v}_{2,i}} &= (m_1 + m_2)\mathbf{v}_f \\ \mathbf{v}_f &= \frac{m_1\mathbf{v}_{1,i}}{(m_1 + m_2)} \\ &= \frac{(60\text{kg})(5.0\text{m/s})}{(60\text{kg} + 60\text{kg})} \\ &= \boxed{2.5 \text{ m/s}} \end{aligned}$$

Impulse Quiz solutions

What is the final velocity of the football player and twin?

Known:

$$m_1 = 120\text{kg}, m_2 = 60 \text{ kg}, \mathbf{v}_{1,i} = +5.0\text{m/s}, \mathbf{v}_{2,i} = 0\text{m/s}$$

$$\mathbf{v}_f = ?$$

Since the collision is inelastic, with them sticking together after, we have the equation

$$\begin{aligned} m_1\mathbf{v}_{1,i} + \cancel{m_2\mathbf{v}_{2,i}} &= (m_1 + m_2)\mathbf{v}_f \\ \mathbf{v}_f &= \frac{m_1\mathbf{v}_{1,i}}{(m_1 + m_2)} \\ &= \frac{(120\text{kg})(5.0\text{m/s})}{(120\text{kg} + 60\text{kg})} \\ &= \boxed{3.3 \text{ m/s}} \end{aligned}$$

True or False

- Momentum is always conserved.
- For the lab today, we are working with elastic collisions.
- Inelastic collisions can happen in one of two ways.