Linear momentum

The linear momentum $\vec{p}$ of a particle of mass m moving with a velocity $\vec{v}$ is:

$$\vec{p} = m\vec{v}$$

Conservation of Linear Momentum

If a system is isolated so that no net external force acts on it, the linear momentum $\vec{p}$ of the system remains constant:

$$\vec{p}_{total} = \text{constant}$$

This can also be written as :

$$\vec{p}_{\text{initial total}} = \vec{p}_{\text{final total}}$$

where the subscripts refer to the values of $\vec{p}$ at some initial and at a later time. This two equations are equivalent statements of the **law of conservation of momentum**.

The total linear momentum of the system equals to the some of their momenta:

$$\vec{p}_{total} = \sum_i m_i \vec{v}_i = \sum_i \vec{p}_i$$

1) A young hockey player stands at rest on the ice holding a 1.3-kg helmet. The player tosses the helmet with a speed of $6.4 m/s$ in a direction 10° above the horizontal, and recoils with a speed of 0.30 m/s. **Find the mass of the hockey player**. Show your reasoning and explain your work. **Answer: 27 kg**

2) A 1 kg block of wood sits at the edge of a table, 0.77 m above the floor. A 1.20×10^{-2} kg bullet moving horozontally with a speef of 725 m/s embeds itself within the block. **What horizontal distance does the block cover before hitting the ground?** Show your reasoning and explain your work. **Answer: 3.41 m**.