Answer on Question #48042, Physics, Mechanics | Kinematics | Dynamics

Question:

A child in a boat throws a 5.75-kg package out horizontally with a speed of 10.0 m/s. The mass of the child is 23.6kg and the mass of the boat is 37.6kg. Calculate the velocity of the boat immediately after, assuming it was initially at rest. v'A=?

Answer:

The law of conservation of momentum:

$$m_p v + (M + m)u = 0$$

$$u = -\frac{m_p}{m + M} v$$

where m_p is mass of the package, M is mass of the boat, m is mass of the child, u is speed of the boat after collision.

$$u = \frac{10\frac{m}{s} \cdot 5.75}{23.6 + 37.6} = -0.93\frac{m}{s}$$

Sign "-" means boat's velocity directed opposite to package's velocity.

Answer: 0.93 m/s