Answer on Question #50081, Physics, Mechanics | Kinematics | Dynamics

This question refers to: Laws of motion

A rubber ball of mass 0.12 kg moving at a speed of 25 m/s perpendicular to a smooth vertical wall, rebounds from the wall without loss of speed in an impact lasting 0.004 s

Calculate the change of momentum of the ball.

Give your answer in kg.m/s

Tip: consider the change of direction of the velocity before and after impact in your calculation. The answer could be a negative value.

Solution:

the ball's mass (m = 0.12 kg),

the ball's initial velocity ($v_i = 25\ m/s$) towards the wall, and

the ball's final velocity ($v_f = 25\ m/s$) away from the wall.

The momentum and velocity are vectors so we have to choose a direction as positive. Let us choose towards the wall as the positive direction.

We are asked to calculate the change in momentum of the ball,

$$\Delta \vec{p} = m\vec{v}_f - m\vec{v}_i = m(\vec{v}_f - \vec{v}_i) = 0.12(-25 - 25) = -6\ \text{kg} \cdot \text{m/s}$$

Answer: $-6\ \text{kg} \cdot \text{m/s}$