

## Answer on Question 49997, Physics, Mechanics | Kinematics | Dynamics

### Question:

A ball of mass 0.5kg moving horizontally with a velocity of 30 m/s strikes a vertical wall and rebounds horizontally with a velocity of 20 m/s. Calculate the impulse (Ft) exerted by the wall on the ball and the force acting if the time of contact of the ball is 0.045s.

### Solution:

Let us find the impulse exerted by the wall on the ball. By the definition of the impulse:

$$\Delta p = p_1 - p_2 = m_b v_b - (-m_b v'_b) = 0.5kg \cdot 30 \frac{m}{s} - \left( -0.5kg \cdot 20 \frac{m}{s} \right) = 25N \cdot s,$$

where  $m_b$  is the mass of the ball,  $v_b$  is the velocity of the ball before strike with the vertical wall,  $v'_b$  is the velocity of the ball after rebound from the wall and we choose it with sign minus as it directed opposite to the  $v_b$ .

In order to obtain the force acting on the ball we again use the definition of the impulse:

$$\bar{F} \Delta t = \Delta p ,$$

from this formula we can obtain  $\bar{F}$  :

$$\bar{F} = \frac{\Delta p}{\Delta t} = \frac{25N \cdot s}{0.045s} = 555.5N.$$

### Answer:

1)  $\Delta p = 25N \cdot s.$

2)  $\bar{F} = 555.5N.$