

## Solution to Question #87676, Physics / Classical Mechanics |

A bullet weighing 0.0045kg is fired horizontally into 1.8kg wooden block at rest on a horizontal surface. The coefficient of kinetic friction between block and surface is 0.2. The bullet comes to rest in the block which moves 1.8m. Find the speed of the bullet.

### Solution:

Assume the collision is inelastic

Energy conservation and momentum conservation equation must be used

Total work done due to displacement is equivalent to final kinetic energy of combined block and bullet

$W=K_2$

$$\begin{aligned}\mu \times (m_1 + m_2) \times g \times x &= \frac{1}{2} (m_1 + m_2) \times V^2 \\ &= -0.2 \times (0.0045 + 1.8) \times (-9.81) \times 1.8 = \frac{1}{2} (0.0045 + 1.8) \times V^2\end{aligned}$$

Thus,

$$V=2.75\text{m/s}$$

Now apply law of conservation of momentum

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) V$$

Initially  $v_2=0$

$$m_1 v_1 + 0 = (m_1 + m_2) V$$

$$m_1 v_1 = (m_1 + m_2) V$$

$$0.0045 \times v_1 = (0.0045 + 1.8) \times 2.75$$

Thus

$$v_1=1102.75 \text{ m/s}$$

Answer provided by <https://www.AssignmentExpert.com>