

7. A 44-g bullet strikes and becomes embedded in a 1.54-kg block of wood placed on a horizontal surface just in front of the gun. If the coefficient of kinetic friction between the block and the surface is 0.28, and the impact drives the block a distance of 18.0 meters before it comes to rest, what was the muzzle speed of the bullet? (Hint: this is very, very similar to the ballistic pendulum problems that were highlighted in the reading).

Handwritten notes and diagrams illustrating the physics problem:

Initial State (Green):

- Bullet mass: $m = 44\text{g}$
- Bullet initial velocity: $U_i = ?$
- Block mass: 1.54kg

Intermediate State (Blue):

- Bullet and block move together with velocity $U' = ?$

Final State (Red):

- Block travels a distance of 18.0m before coming to rest ($U = 0$).
- Final velocity of the block: $U' = ?$

Force Diagram (Green):

Work Equations (Blue):

- Work done by friction: $W_{Fr} = \mu F_N \cdot d$
- Work done by friction: $W_{Fr} = F_{Fr} \cdot d$

Energy Equation (Black):

- Conservation of energy: $\frac{1}{2} m U^2 + W_{nc} = \frac{1}{2} m v^2$