A bullet of mass 50 g moving with an initial velocity of 100 m/s, strikes a wooden block and comes to rest after penetrating a distance of 2 cm in it. Calculate the retardation caused by the wooden block.

Coordinate for uniformly accelerated motion equals:

$$l = v_0 t - \frac{at^2}{2}$$

v_0 - initial velocity of the bullet

a –deceleration

$t -$ time

Velocity for uniformly accelerated motion equals:

$$v = v_0 - at$$

If bullet comes to rest: $v = 0$ => $t = \frac{v_0}{a}$

Therefore, from the equation for coordinate:

$$l = v_0 \frac{v_0}{a} - \frac{a\left(\frac{v_0}{a}\right)^2}{2} = \frac{v_0^2}{2a}$$

deceleration equals:

$$a = \frac{v_0^2}{2l} = \left(100 \frac{m}{s}\right)^2 /2$$

And, finally, retardation equals:

$$F = ma = m\frac{v_0^2}{2l} = 0.05\ kg * \frac{\left(100 \frac{m}{s}\right)^2}{2 * 0.02\ m} = 12500\ N = 12.5\ kN$$

Answer: $12500\ N$