Answer on Question #72806-Physics-Mechanics-Relativity

A bullet loses 1/n if its velocity while penetrating a distance x into the target. The further distance travelled before coming to rest?

Solution

$$Fx = \frac{mv^2}{2} - \frac{m}{2}\left(\left(1-\frac{1}{n}\right)v\right)^2 = \frac{mv^2}{2}\left(1-\left(1-\frac{1}{n}\right)^2\right) = \frac{mv^2}{2}\left(1-1-\frac{1}{n^2}+\frac{2}{n}\right) = \frac{mv^2}{2}\left(\frac{2n-1}{n^2}\right)$$

The initial kinetic energy is

$$\frac{mv^2}{2} = \frac{Fx}{\left(\frac{2n-1}{n^2}\right)} = FD.$$

Where $D = x + d$.

$$\frac{Fx}{\left(\frac{2n-1}{n^2}\right)} = F(x+d)$$

$$(x+d) = \frac{x}{\left(\frac{2n-1}{n^2}\right)} = \frac{n^2}{2n-1}x$$

The further distance travelled before coming to rest is

$$d = \frac{n^2}{2n-1}x - x = x\frac{n^2-2n+1}{2n-1} = x\frac{(n-1)^2}{2n-1}.$$