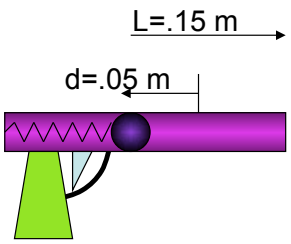
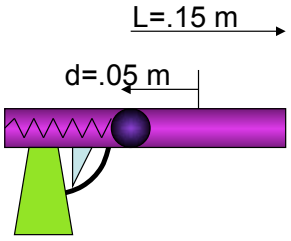
# Problem 5.70




A 5.3 gram ball is projected by a spring in a gun. The spring's spring constant is 8 nt/m. If the gun barrel is 15 cm and a constant frictional force of .032 nts exists between the ball and the barrel, what is the ball's speed when it leaves the barrel. Assume the spring was compressed 5 cm for the launch?



# Problem 5.70




A 5.3 gram ball is projected by a spring in a gun. The spring's spring constant is 8 nt/m. If the gun barrel is 15 cm and a constant frictional force of .032 nts exists between the ball and the barrel, what is the ball's speed when it leaves the barrel. Assume the spring was compressed 5 cm for the launch?

$$\sum KE_1 + \sum U_1 + \sum W_{extraneous} = \sum KE_2 + \sum U_2$$

$$(0) + \left(\frac{1}{2}kx_1^2\right) + (-fd) = \frac{1}{2}mv_2^2 + (0)$$

$$\Rightarrow \quad v_2 = \left[\frac{2}{m}\left(\frac{1}{2}kx_1^2 - fd\right)\right]^{1/2}$$

$$\Rightarrow \quad v_2 = \left[\frac{2}{(.0053\ \text{kg})}\left(\frac{1}{2}(8\ \text{nt/m})(.05\ \text{m})^2\right) - (.032\ \text{nt})(.15\ \text{m})\right]^{1/2}$$

$$\Rightarrow \quad v_2 = 1.4\ \text{m/s}$$