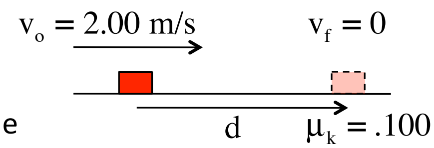
Problem 8.12

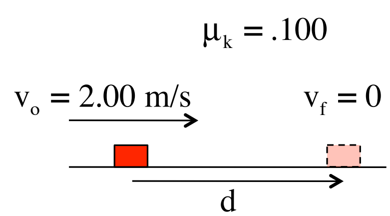


How far does the mass travel under the influence of friction before it comes to rest?

There is going to be non-conservative work done by friction in this problem. We know that the kinetic frictional force equals "$\mu_k N$," where "N" should technically be derived using N.S.L. In this case, though, it is obvious that "N = mg," so we'll circumvent the f.b.d. and all the stuff that goes with N.S.L. and simply note that:

$$f_k = \mu_k N = \mu_k mg$$

There is no spring in the system, and the body does not change positions vertically (which means there is no change of *gravitational potential energy*), so the execution of the *modified Conservation of Energy* is fairly simple. That presentation is shown on the next page.



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

$$\frac{1}{2}mv_o^2 + \quad 0 \quad + \quad \vec{f} \bullet \vec{d} \quad = \quad 0 \quad + \quad 0$$

$$\Rightarrow \quad \frac{1}{2}mv_o^2 + |\vec{f}||\vec{d}|\cos 180^\circ = 0$$

$$\Rightarrow \quad \frac{1}{2}mv_o^2 + (\mu_k mg)(d)(-1) = 0$$

$$\Rightarrow \quad d = \frac{v_o^2}{2(\mu_k g)}$$

$$\Rightarrow \quad d = \frac{(2.00 \text{ m/s})^2}{2(.100)(9.80 \text{ m/s}^2)}$$

$$\Rightarrow \quad d = 2.04 \text{ m}$$