

Janine Pizzimenti

Physics – A

Friday Problem: 27 October, 2006

Step I:

This is a problem about a baseball player sliding into a base. It asks to find the distance the player slides given only the initial speed and the kinetic coefficient of friction. Since the player comes to a stop, the final velocity is known to be 0.

Step II:

Since time is not given, the formula  $v^2 = v_0^2 + 2ad$  can be used to find the distance. All of the variables in this equation have been given to us, except for the acceleration. To find the acceleration, the formula  $\mu_k = -a/g$  can be used. Then the final velocity, initial velocity and acceleration can all be substituted into the first formula to find the distance.

Step III:

$$\mu_k = -a/g$$

$$.41 = -a/9.8$$

$$a = -4.018$$

$$v^2 = v_0^2 + 2ad$$

$$0^2 = 7.9^2 + (2)(-4.018)d$$

$$d = 7.766$$

Step IV:

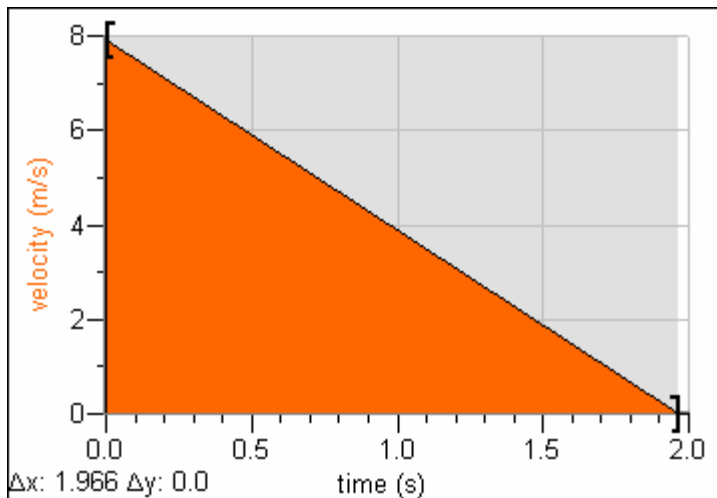
It is known that the area under a velocity-time graph is equal to the total distance traveled. The time it takes the player to stop can be found by the following formula:

$$a = (v_f - v_0)/t$$

$$-4.018 = (0 - 7.9)/t$$

$$t = 1.966$$

The initial velocity is 7.9, when the time is 0, and when the velocity is 0 the time is 1.966. Using these two points, this is my graph:



The area of the triangle formed by my graph can be found by the following formula:

$$A_{\Delta} = \frac{1}{2}b \cdot h$$

$$A_{\Delta} = .5 \cdot 1.966 \cdot 7.9$$

$$A_{\Delta} = 7.766 = d$$

Step V:

For the first half of the slide, the player is on grass, which has a kinetic coefficient of friction equal to 0.83. For the second half of the slide, he is on the gravel which has a kinetic coefficient of friction equal to 0.41. If his initial velocity is 7.9 m/s, how far did he slide?