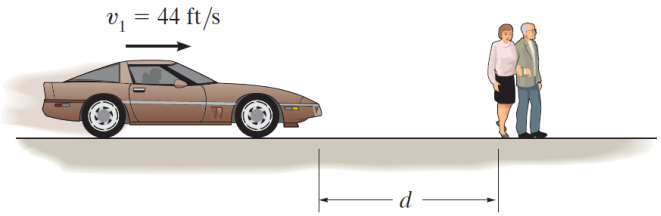
Problem 12-13

Tests reveal that a normal driver takes about 0.75 s before he or she can *react* to a situation to avoid a collision. It takes about 3 s for a driver having 0.1% alcohol in his system to do the same. If such drivers are traveling on a straight road at 30 mph (44 ft/s) and their cars can decelerate at 2 ft/s^2, determine the shortest stopping distance d for each from the moment they see the pedestrians. *Moral*: If you must drink, please dont drive!



Prob. 12–13

Solution

Because the cars have a constant deceleration, a kinematic formula can be used to find how far the car travels as it comes to a stop.

$$v_f^2 - v_i^2 = 2a\Delta s$$

Solve for Δs and plug in the numbers.

$$\Delta s = \frac{v_f^2 - v_i^2}{2a} = \frac{0^2 - 44^2}{2(-2)}\ \text{ft} = 484\ \text{ft}$$

Each driver goes this distance plus the distance travelled before the brakes are slammed.

$$d_{\text{sober}} = 484\ \text{ft} + \left(44\ \frac{\text{ft}}{\text{s}}\right)(0.75\ \text{s}) = 484\ \text{ft} + 33\ \text{ft} = 517\ \text{ft}$$

$$d_{\text{drunk}} = 484\ \text{ft} + \left(44\ \frac{\text{ft}}{\text{s}}\right)(3\ \text{s}) = 484\ \text{ft} + 132\ \text{ft} = 616\ \text{ft}$$

Alcohol makes the drunk driver travel an extra 99 feet before coming to a stop.