**Question #79756, Physics / Classical Mechanics**

Mary wants to throw a can straight up in air and then hits it with second can. She the collision to occur at height h=10m above the throw point. In addition, she knows that she needs t1=4.0s between successive throws. Assume that she throws both cans with same speed. Take g=9.81m/s^2. How long it takes after the first can has been thrown into air for the two cans to collide?

**Solution**

Let the height of the first can be x, that of the second can be y; and both cans be thrown at speed v.

$$x(t) = v\,t - g\frac{t^2}{2}$$

$$y(t) = v\,(t - t_1) - g\frac{(t - t_1)^2}{2}$$

$$x(t) = y(t) = h$$

From the first height equation:

$$v = \frac{h}{t} + \frac{gt}{2}$$

Substituted into the second equation:

$$h = \left(\frac{h}{t} + \frac{gt}{2}\right)(t - t_1) - \frac{g(t - t_1)^2}{2}$$

$$10 = \left(\frac{10}{t} + 9.81\frac{t}{2}\right)(t - 4) - \frac{9.81(t - 4)^2}{2}$$

$$t = 4.46\ s.$$

**Answer:  4.46 s.**

Answer provided by https://www.AssignmentExpert.com