Name: Solution

Quiz 6, 03/09/12

I will give partial credit for your work, only if you use the GOAL protocol.

A rubber superball and a lump of putty with equal mass are thrown with equal speed against an open door. The superball bounces back with essentially the same speed with which it was thrown, but the putty sticks to the door. Which of the following statements are true?

Choices: **True**, **False**.

A. During the superball-door interaction, both momentum and mechanical energy are conserved T

B. In the putty collision the system loses more kinetic energy than in the superball collision T

C. In the collision, the rubber ball experiences a smaller momentum change than the putty F

D. The impulse imparted to the door by the putty is equal to the impulse imparted by the rubber ball F

E. The putty is less effective than the superball in closing the door T

Tries 0/99

A tennis ball with a mass of 91.85 g is dropped from a height of 1.75 m. It rebounds to half that height 1.12 s later, What is the average force exerted on the floor by the tennis ball (in N)?

Tries 0/99

$F = 0.918\ m/s$

L) units check
is pretty close to estimate

G) known

$m = 0.09185\,kg$

$h_i = 1.75\,m$

$h_f = 0.875\,m$

$t_t = 1.12\,s$

unknown

$\Delta t_{coll} = ?$

$\Delta v = ?$

$\Delta P = ?$

$F = ?$

Estimate

$v_f^2 = 2gh = 8.17\ m^2/s^2$

$2mv_f \sim \Delta p \approx m\,12\,\frac{m}{s} \sim 1.2\ kg\,m/s$

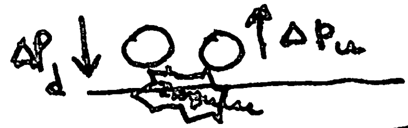
$F = \frac{\Delta p}{\Delta t} > \frac{1.2}{.5} = 2.4\,N$

O) momentum - Impulse
1-d kinematics

$v_y^2 = 2g\Delta y$

$F = \Delta p/\Delta t$

$y = \frac{1}{2}gt^2$



A) $P_d = mv_d = -m\sqrt{2gh_i}$

$P_u = mv_u = m\sqrt{2gh_f}$

$t_d = \sqrt{2h_i/g}$; $t_u = \sqrt{2h_f/g}$

$\Delta t = t_t - t_d - t_u$; $\Delta P = P_u - P_d$

$$F = \Delta P/\Delta t = \frac{m\sqrt{2g}\left(\sqrt{h_f} + \sqrt{h_i}\right)}{t_t - \sqrt{\frac{2}{g}}\left(\sqrt{h_f} + \sqrt{h_i}\right)}$$

$$F = \frac{0.09185\,kg\sqrt{2 \cdot 9.8\,m/s^2}\left(\sqrt{1.75\,m} + \sqrt{0.875\,m}\right)}{1.12\,s - \sqrt{\frac{2}{9.8\,m/s^2}}\left(\sqrt{1.75\,m} + \sqrt{0.875\,m}\right)}$$