Homework (LE 5)

Problem 5.1

A 0.25-lb ball thrown with a horizontal velocity $\mathbf{v}_0$ strikes a 1.5-lb plate attached to a vertical wall at a height of 36 in. above the ground. It is observed that after rebounding, the ball hits the ground at a distance of 24 in. from the wall when the plate is rigidly attached to the wall (Fig. 1), and at a distance of 10 in. when a foam-rubber mat is placed between the plate and the wall (Fig. 2). Determine (*a*) the coefficient of restitution *e* between the ball and the plate, (*b*) the initial velocity $\mathbf{v}_0$ of the ball.

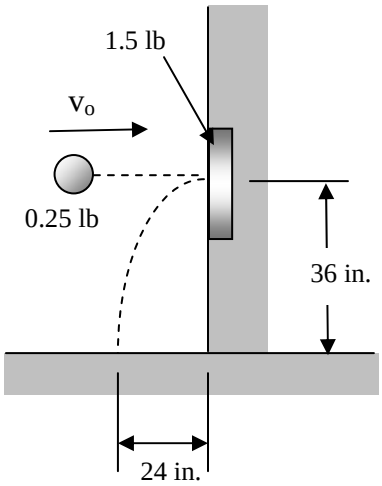


Figure 1

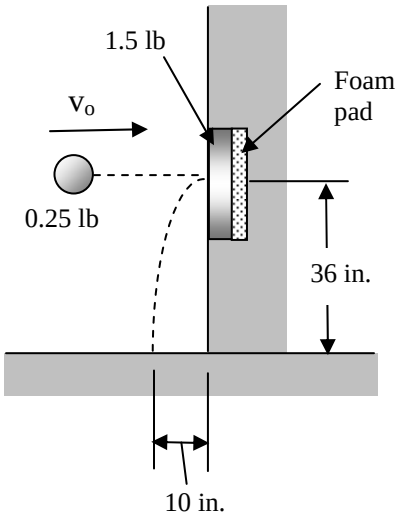


Figure 2

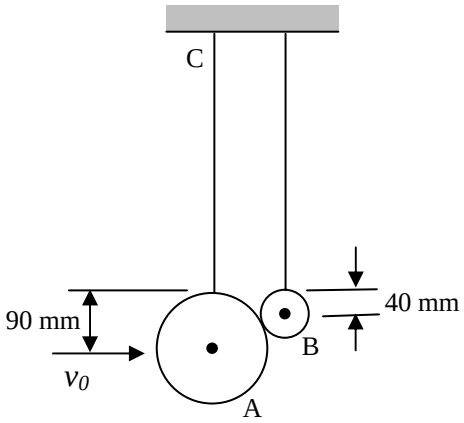
Answer: e = 0.324, v_0 = 14.3 ft/s

Problem 5.2

A 7.92-kg sphere *A* of radius 90 mm moving with a velocity $\mathbf{v}_0$ of magnitude v_0 = 2 m/s strikes a 720-g sphere *B* of radius 40 mm which was at rest. Both spheres are hanging from identical light flexible cords. Knowing that the coefficient of restitution is 0.8, determine

a) the velocity of each sphere immediately after impact

b) the impulses in the cables during the impact.



Answers: $v'_A = 1.741\,\text{m/s}$, $v'_B = 3.08\,\text{m/s}$

$T_A\Delta t$ = 0.854 N-s, $T_B\Delta t$ = 0 (it will go slack)