

PHYS 172 Problem of the Week - #2 (Spring 2012)

A falling rubber ball bounces off the floor. The velocity just before it hits the floor is $\langle 2.7, -5.2, 0 \rangle$ m/s. Just after it hits the floor, the ball's velocity is $\langle 2.7, 5.2, 0 \rangle$ m/s (the y axis is the vertical axis). The ball's mass is 0.038 kg. The ball is in contact with the floor for only 1.8×10^{-3} seconds.

(a) What is the vector change in momentum of the ball from just before to just after it is in contact with the floor? Express your result as a vector.

(b) What is the net force exerted on the ball during the time it is in contact with the floor? (You may assume that the net force is approximately constant.) Express your result as a vector.

(c) Calculate the ratio of the magnitude of the net force on the ball to the magnitude of the gravitational force (due to Earth) on the ball.

(d) How far did the ball move horizontally during the time it was in contact with the floor? (That is, what is the x-component of the ball's change in position during this time?)