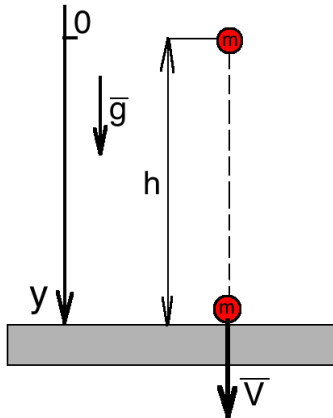A golf ball weighs 0.45N is dropped from a height of 1.0m. assume that the ball has perfectly elastic collistion with the floor. what will the instantaneous momentum of the golf ball be immediately before it strikes the floor?

Solution:

W- weight of the ball.

The equation of motion for the ball along the Y-axis:

$$h = \frac{gt^2}{2}; t - \text{ time of the fall from a height } h = 1.0m$$

$$t = \sqrt{\frac{2h}{g}} \qquad (1)$$

The rate equation for the ball at the end of the movement (V – the velocity of the ball immediately before it strikes the floor):

$$V = gt \qquad (2)$$

(1) in (2):

$$V = gt = g\sqrt{\frac{2h}{g}} = \sqrt{2gh} \quad (3)$$

The instantaneous momentum of the golf ball is the product of the mass and velocity:

$$p = mV \qquad (4)$$

(3) in (4):

$$p = mV = m\sqrt{2gh} = mg\sqrt{\frac{2h}{g}} = W \cdot \sqrt{\frac{2h}{g}} = 0.45N \cdot \sqrt{\frac{2 \cdot 1m}{9.8\frac{m}{s^2}}} = 0.2\frac{m}{s} \cdot kg$$

Answer: instantaneous momentum of the golf ball immediately before it strikes the floor is $p = 0.2\frac{m}{s} \cdot kg$