Answer on Question #48281, Physics, Mechanics | Kinematics | Dynamics

Question:

A ball is rolled horizontally off the edge of a 125 cm tall table. The ball lands 2.0 m away from the base of the table. How fast is the ball moving when it hits the floor. (This is not just the vertical final velocity).

Answer:

Coordinates of the ball equals:

$$x = v_x t$$

$$y = h_0 - \frac{gt^2}{2}$$

The ball hits the floor if y=0:

$$y = 0 \quad => \quad t = \sqrt{\frac{2h}{g}}$$

Therefore components of velocity equal:

$$v_x = \frac{x}{t}$$

$$v_y = gt$$

Total velocity:

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{\frac{x^2 g}{2h} + 2gh} = 6.34 \frac{m}{s}$$

Answer: $6.34 \frac{m}{s}$