

## Answer on Question 73798, Physics, Other

### Question:

A marble rolls off horizontally from the edge of tabletop  $1.50\text{ m}$  above the floor. It strikes the floor  $2.0\text{ m}$  from the base of the table.

- how long it takes marble to reach the floor?
- what is its initial velocity?

### Solution:

a) We can find the time that the marble takes to reach the floor from the kinematic equation:

$$y = v_{0y}t + \frac{1}{2}gt^2,$$

here,  $y = 1.50\text{ m}$  is the height of the tabletop,  $v_{0y} = 0$  is the initial vertical velocity of the marble,  $g = 9.8\text{ m/s}^2$  is the acceleration due to gravity (we choose the downwards as the positive direction, therefore, the acceleration due to gravity will be positive).

Then, we get:

$$y = \frac{1}{2}gt^2,$$
$$t = \sqrt{\frac{2y}{g}} = \sqrt{\frac{2 \cdot 1.50\text{ m}}{9.8 \frac{\text{m}}{\text{s}^2}}} = 0.55\text{ s}.$$

b) We can find the initial velocity of the marble from the formula:

$$x = v_{0x}t,$$

here,  $x = 2.0\text{ m}$  is the distance from the base of the table,  $v_{0x}$  is the initial horizontal velocity of the marble,  $t$  is time that the marble takes to reach the floor.

Then, we get:

$$v_{0x} = \frac{x}{t} = \frac{2.0\text{ m}}{0.55\text{ s}} = 3.64 \frac{\text{m}}{\text{s}}.$$

### Answer:

- $t = 0.55\text{ s}$ .
- $v_{0x} = 3.64 \frac{\text{m}}{\text{s}}$ .