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Phys. 101 - Sec # 3

Quiz # 3 (Ch. 4)

Name:

Key

ID #

1- A ball is thrown horizontally from the top of a building 100 m high. The ball strikes the ground at a point 65 m horizontally away from the base of the building.

What is the speed of the ball just before it strikes the ground?

$$\Delta y = -100 \text{ m}$$

$$v_{0y} = 0$$

$$a_y = -9.8 \frac{\text{m}}{\text{s}^2}$$

apply

$$\Delta y = v_{0y} t + \frac{1}{2} a_y t^2$$

$$-100 = 0 - \frac{1}{2} (9.8) t^2$$

$$\Rightarrow t = 4.5 \text{ s}$$

we know that

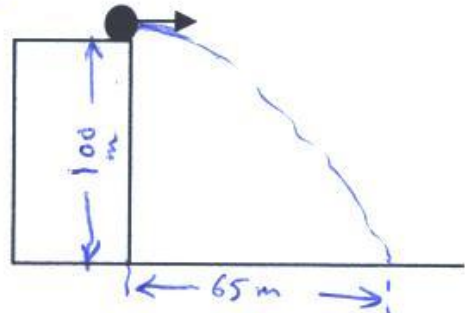
$$v_{0x} = v_x = \text{const.}$$

and

$$\Delta x = v_{0x} t$$

$$\Rightarrow v_{0x} = \frac{\Delta x}{t}$$

$$= \frac{65}{4.5} = 14.4 \frac{\text{m}}{\text{s}} = v_x$$



then

$$v_y = v_{0y} + a_y t$$

$$v_y = -9.8 (4.5) = -44 \frac{\text{m}}{\text{s}}$$

The final speed =  $|v| = \sqrt{v_x^2 + v_y^2}$ 

$$= \sqrt{14.4^2 + 44^2}$$

$$= 46.3 \frac{\text{m}}{\text{s}}$$

2- A train moves due **east** at 6 m/s, along a straight level track.

A boy on the train rolls a ball along the floor with a speed of 3 m/s relative to the train. The ball is rolled directly across the width of the train from **South to North**. Find the speed of the ball relative to the ground. (Show all steps)

$$\vec{v}_{tg} = 6 \hat{i}$$

$$\vec{v}_{bt} = 3 \hat{j}$$

$$\Rightarrow \vec{v}_{bg} = \vec{v}_{bt} + \vec{v}_{tg} = 6 \hat{i} + 3 \hat{j}$$

$$\text{Speed} = |\vec{v}_{bg}| = \sqrt{6^2 + 3^2} = 6.7 \frac{\text{m}}{\text{s}}$$

