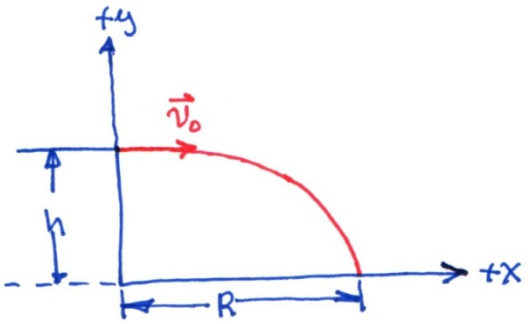
Physics 2211K, Quiz # 3 solutions. (September 7, 2010)

Version #1:

An object is projected horizontally off a cliff **h=10.0 m** high as sketched below. It is observed to travel **R=20.0 m** before hitting the ground.



a. How long was it in the air?

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

v_{oy} = 0 (v_0 is horizontal)

$a_y = -g$

$$\therefore 0 = h - \tfrac{1}{2}gt^2 \Rightarrow t = \sqrt{\frac{(2)(10m)}{9.8m/s^2}} = 1.43\ s$$

b. What was its initial speed **v_0**? $R = v_{0x}t = v_0 t \Rightarrow v_0 = \frac{R}{t} = \frac{20m}{1.43s}$ = 14.0 m/s

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Version #2:

An object is projected horizontally off a cliff **h=40.0 m** high as sketched above. It is observed to travel **R=30.0 m** before hitting the ground.

a. How long was it in the air?

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

v_{oy} = 0 (v_0 is horizontal)

$a_y = -g$

$$\therefore 0 = h - \tfrac{1}{2}gt^2 \Rightarrow t = \sqrt{\frac{(2)(40m)}{9.8m/s^2}} = 2.86\ s$$

b. What was its initial speed **v_0**? $R = v_{0x}t = v_0 t \Rightarrow v_0 = \frac{R}{t} = \frac{30m}{2.86s} = 10.5\ m/s$

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Version #3:

An object is projected horizontally off a cliff **h=2.50 m** high as sketched below. It is observed to travel **R=40.0 m** before hitting the ground.

a. How long was it in the air?

$0 = h + v_{0y}t + \frac{1}{2}a_y t^2$ $\quad v_{oy} = 0$ ($v0$ is horizontal) $\quad a_y = -g$

$$\therefore 0 = h - \tfrac{1}{2}gt^2 \Rightarrow t = \sqrt{\frac{(2)(2.5m)}{9.8m/s^2}} = 0.71s$$

b. What was its initial speed **v_0**? $R = v_{0x}t = v_0 t \Rightarrow v_0 = \frac{R}{t} = \frac{40m}{0.71s} = 56.0\ m/s$