

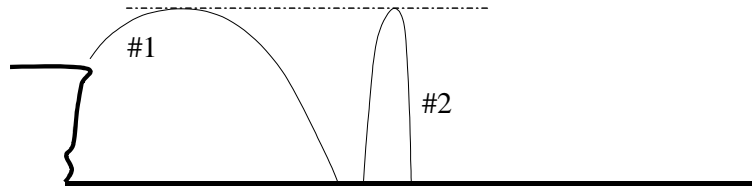
Name: KEY

TA: _____

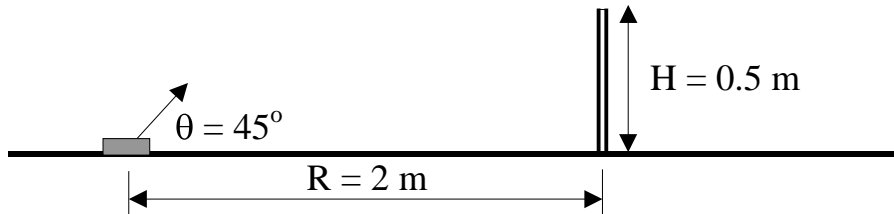
$$x = x_0 + v_{x0}t + \frac{1}{2}a_x t^2 \quad v_x = v_{x0} + at \quad v_x^2 = v_{x0}^2 + 2a(x - x_0)$$

Multiple Choice: Shown below are the paths for two projectiles. One is thrown from a cliff and the other from the bottom of the valley. Which of the following statements is true. (circle one) (5 pts)

- a.) #2 and #1 both spend the same amount of time in flight
- b.) #2 and #1 both have the same initial velocity.
- c.) #2 and #1 both have the same vertical component of velocity when they *end* their flight and strike the ground.
- d.) The acceleration is largest for projectile #2
- e.) The acceleration is largest for projectile #1
- f.) Not enough information is given.



Show all work: A small dog is running to chase a car. It has to jump over a fence that is 0.5 meter high. The dog is 2 meters from the fence when it leaves the ground and has an initial angle of 45° measured with respect to the ground. The dog just barely clears the top of the fence (assume its vertical position is equal to the height of the fence at that moment). What is the dog's speed just as it leaves the ground? (15 pts).



Define the dog's starting position as $x_0=0$ and $y_0=0$. The top of the fence is at the position $x=R=2m$ and $y=0.5$ m. First, determine the time that it takes to get to the x position of the fence.

$$x = x_0 + v_0 \cos \theta t \rightarrow R = 0 + v_0 \cos \theta t \rightarrow t = R / (v_0 \cos \theta)$$

Now substitute this into the equation for the y-direction motion and

$$y = y_0 + v_0 \sin \theta t - \frac{1}{2}gt^2$$

$$H = v_0 \sin \theta [R / (v_0 \cos \theta)] - \frac{1}{2}g [R / (v_0 \cos \theta)]^2$$

$$H = R \tan \theta - \frac{1}{2}g [R / (v_0 \cos \theta)]^2 \quad (\text{Now solve for } v_0)$$

$$\frac{1}{2} g R^2 / (\cos \theta)^2 [1/v_0]^2 = R \tan \theta - H$$

$$[1/v_0]^2 = 2 (\cos \theta)^2 [R \tan \theta - H] / [g R^2]$$

$$v_0 = \{ [g R^2] / [2 (\cos \theta)^2 (R \tan \theta - H)] \}^{1/2} = 5.1 \text{ m/s}$$

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