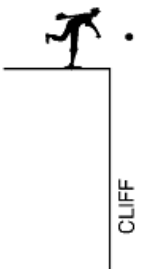
Name _____Answer Key_____ Date _____

Honors Physics Vectors/Projectiles WS #7H

Period _____ Mrs. Nadworny

Horizontal Projectiles

Directions - Read textbook pages 98 – 101. Solve the following problems using the GUESS method. Show ALL work neatly using proper units and significant figures.



A boy throws a baseball horizontally off the side of a cliff. [Neglect air resistance]

1. The magnitude of the horizontal component of the projectile's velocity as it falls is

   (A) increasing (B) decreasing (C) constant (D) zero

2. The magnitude of the vertical component of the projectile's velocity as it falls is

   (A) increasing (B) decreasing (C) constant (D) zero

3. A ball is thrown horizontally from the top of a building with an initial velocity of 15 meters per second. At the same instant, a second ball is dropped from the top of the building. The two balls have the same

   A) path as they fall
   B) initial horizontal velocity
   C) final velocity as they reach the ground
   D) initial vertical velocity

4. The flight time of a horizontal projectile is dependent upon all of the following EXCEPT

   A) initial horizontal velocity
   B) gravity
   C) height
   D) air resistance

5. A red ball and a green ball are simultaneously thrown horizontally from the same height. The red ball has an initial speed of 40. meters per second and the green ball has an initial speed of 20. meters per second. Compared to the time it takes the red ball to reach the ground, the time it takes the green ball to reach the ground will be

   (A) half as much (B) the same (C) twice as much (D) four times as much

6. A ball is rolled down a ramp and projected horizontally from a height of 1.6 meters. It lands 2.3 meters away. Calculate its initial speed. [Hint: You will need to solve for time first.]

$$t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(1.6m)}{9.81\ \frac{m}{s^2}}} = 0.57s$$

$$v_{ix} = \frac{d_x}{t} = \frac{2.3m}{.57s} = 4.0\ \frac{m}{s}$$

	x	y
d	2.3 m	1.6 m
t		
a	0 m/s^2	- 9.81 m/s^2
v_i	?	0 m/s
v_f		

7. The ball from question 6 is now raised to a height of 2.0 meters. Where is it going to land? [Hint: The initial velocity does not change with a height change, but the time does. This is also a two-step question.]

$$t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(2.0m)}{9.81\ \frac{m}{s^2}}} = .64s$$

$$d_x = v_{ix}t = 4.0\ \frac{m}{s}(.64s) = 2.6m$$

	x	y
d	?	2.0
t		
a	0 m/s^2	- 9.81 m/s^2
v_i	4.0 m/s	0 m/s
v_f		

1. The world's largest flower pot is 1.75 m high. Anita Brake jumped horizontally from the top edge of this flower pot at a speed of 2.8 m/s. [Remember to make the chart for your givens and unknowns – include units.]

   a. How long did it take her to hit the ground?

$$t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(1.75\ m)}{9.81\ \frac{m}{s^2}}} = 0.597\ s$$

   b. How fast was she going in the vertical direction when she hit the ground?

$$v_{fy} = v_{iy} + at = (-9.81\ \tfrac{m}{s^2})(0.597\ s)$$
$$= -5.86\ \tfrac{m}{s} \text{ or } 5.86\ \tfrac{m}{s} \text{ down}$$

   c. How fast was she going in the horizontal direction when she hit the ground?

$$v_{fx} = v_{ix} = 2.8\ m/s$$

	x	y
d		1.75m
t	?	?
a	0	-9.81m/s^2
v_i	2.8m/s	0
v_f	?	?

   d. What was the magnitude of the resultant final velocity when she hit the ground?

$$v_f = \sqrt{v_{fy}^2 + v_{fx}^2} = \sqrt{(5.86\ \tfrac{m}{s})^2 + (2.8\ \tfrac{m}{s})^2} = 6.5\ \tfrac{m}{s}$$

Answers in size order: 0.597, 2.6, 2.8, 4.0, 5.86, 6.5