Name _____Answer Key_____ Date _____

Honors Physics Vectors/Projectiles WS #8H

Period _____ Mrs. Nadworny

Angled Projectiles

Directions: Read textbook pages 102 -104. Solve the following problems using the GUESS method. Show ALL work neatly using proper units and significant figures.

1. A golf ball is hit at an angle of 45° above the horizontal. What is the acceleration of the golf ball at its highest point in its trajectory? [Neglect friction]

   A) 0.0 m/s^2
   B) 6.9 m/s^2 horizontally
   C) 9.8 m/s^2 upward
   D) 9.8 m/s^2 downward

2. The path of a projectile fired at a 30° angle to the horizontal is best described as

   A) circular B) parabolic C) linear D) hyperbolic

3. For a projectile launched at an angle, if it takes 4 seconds to reach the highest point, the total flight time is ___8 seconds_____.

4. Rhoda Bote throws a rock into the air with an initial speed of 49.0 m/s at an angle of 58.0^0 with the horizontal. It returns to Earth at the same level from which it was launched.

   a. Calculate the initial vertical speed of the rock.

   $$v_{iy} = v_i \sin\theta = (49.0\,\tfrac{m}{s})(\sin 58.0°) = 41.6\,\tfrac{m}{s}$$

   b. Calculate the initial horizontal speed of the rock.

   $$v_{iy} = v_i \cos\theta = (49.0\,\tfrac{m}{s})(\cos 58.0°) = 26.0\,\tfrac{m}{s}$$

   c. Calculate how long it was in the air.

   Use that $v_f = 0$ at the top

   $$t_{top} = \frac{\Delta v}{a} = \frac{0\,\tfrac{m}{s} - 41.6\,\tfrac{m}{s}}{-9.81\,\tfrac{m}{s^2}} = 4.24s$$

   $$t_{total} = 2 \times t_{top} = 2(4.24s) = 8.48s$$

   d. Calculate how far away it landed.

   $$d_x = v_{ix} t = 26.0\,\tfrac{m}{s}(8.48s) = 220.m$$

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

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5. A baseball is thrown with a horizontal component of 25 meters per second. It takes 3.00 seconds to return back to its original height.

   a. Calculate the horizontal range of the baseball.

$$d_x = v_{ix} t = 25.0 \tfrac{m}{s} (3.00s) = 75.0m$$

   b. Calculate the initial vertical component of the speed.

Use that $v_f = 0 \tfrac{m}{s}$ at the top

$$t_{top} = \frac{t_{total}}{2} = \frac{3.00s}{2} = 1.50s$$

$$v_i = v_f - at = 0 \tfrac{m}{s} - (-9.81 \tfrac{m}{s^2})(1.50s) = 14.7 \tfrac{m}{s}$$

   c. Calculate the initial angle of launch.

$$\theta = \tan^{-1}\left(\frac{v_{iy}}{v_{ix}}\right) = \tan^{-1}\left(\frac{14.7 \tfrac{m}{s}}{25.0 \tfrac{m}{s}}\right) = 30.5°$$

   d. Calculate the initial speed at which the speed was thrown.

$$v_i = \sqrt{v_{iy}^2 + v_{ix}^2} = \sqrt{(14.7 \tfrac{m}{s})^2 + (25.0 \tfrac{m}{s})^2} = 28.7 \tfrac{m}{s}$$

Answers in size order: 8.48, 14.7, 26.0, 28.7, 30.5, 41.6, 75.0, 220.