Name _____ Date _____

Honors Physics Vectors/Projectiles WS #7H

Period _____ Mrs. Nadworny

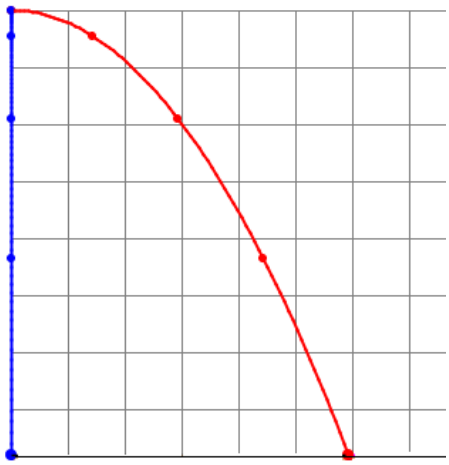
Projectile Simulations

Directions: Follow the directions below to access a simulation that investigates the properties projectiles. Use the information gathered to answer the questions.

Go to: http://surendranath.tripod.com/Applets.html

Part One: Horizontal Projectiles

1. From the **Applet Menu** in the upper left-hand corner, choose *Kinematics/Two Dimensional Motion/Horizontal Projection from a Height.*



2. With the red stone set at 3.0 m/s and the blue stone set at 0.0 m/s, click Start and watch the two stones travel to the ground. Which, if either, hits the ground first?

3. On the diagram at right, sketch and label the horizontal and vertical components of the red stone's velocity as it hits the ground as well as the resultant velocity.

4. Repeat the simulation again and pay careful attention to the horizontal and vertical components of the red stone's velocity as it travels to the ground.

   a. What happens to the horizontal component?

   b. What happens to the vertical component?

5. Play the simulation again several times, each time increasing the red stone's velocity from 0.0 m/s to 1.0 m/s to 2.0 m/s to 3.0 m/s to 4.0 m/s.

   a. What happens to the amount of time it takes the red stone to hit the ground?

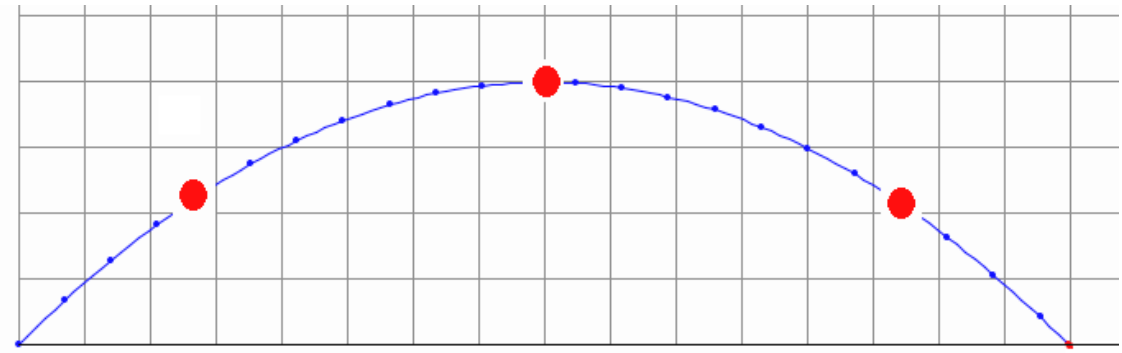
   b. What happens to the horizontal distance the red stone travels?

   c. What happens to the vertical distance the red stone travels?

Part Two: Angle Projectiles

6. From the **Applet Menu** in the upper left-hand corner, choose *Kinematics/Two Dimensional Motion/Projection from the Ground.*

7. With the velocity set to 8.0 m/s and the angle set to 45°, play the simulation. Pay careful attention to the horizontal and vertical components of the stone's velocity as it travels through the air. On the diagram below, sketch horizontal and vertical component vectors for the stone's velocity at each of the three positions shown as well as the resultant velocity.



   a. What happens to the horizontal component?

   b. What happens to the vertical component?

   c. What happens to the resultant velocity?

8. Click Clear to clear the screen. With the velocity set to 8.0 m/s **don't** play the simulation but instead increase the angle from the lowest to the highest possible angles. Watch what happens to the horizontal and vertical components as well as the resultant velocity.

   a. What happens to the horizontal component?

   b. What happens to the vertical component?

   c. What happens to the resultant velocity?

   d. What angle has equal horizontal and vertical components?

9. With the velocity still set to 8.0 m/s, launch the stone from each of the angles listed below. Note the time of flight (use a stopwatch), maximum height of the ball (count the boxes), and the horizontal range (count the boxes) and complete the chart below.

Angle	15^0	20^0	30^0	40^0	45^0	50^0	60^0	70^0	75^0
Time (s)									
Range (box)									
Height (box)									

Questions

Answer the following questions based on the results of your simulations.

1. As the angle increased, what happened to the time the stone was in the air?

2. Based on the pattern of the data, what angle would give the greatest time of flight?

3. As the angle increased, what happened to the maximum height the stone reached?

4. Based on the pattern of the data, what angle would give the greatest maximum height?

5. Which angle gave the greatest horizontal range?

6. As the angle increased, what happened to the horizontal range of the stone?

7. a) Do any two angles have (approximately) the same range? If so, which?

   b) What is the relationship between the two angles in any pair of angles listed above?