PhET Simulation: Projectile Motion

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Introduction**: Projectile Motion refers to the motion of an object that is shot through the air. Think an arrow shot from a crossbow or a cannonball shot from a cannon. This motion depends on many factors including gravity, air resistance, altitude, mass, initial speed, etc. In this simulation, we will be examining those factors.

**Directions:**  Go to PhET simulations by simply googling it. Search for projectile motion (html 5) and press play or download it to open the simulation. Begin with the one marked “Intro.”

**Intro**

1. Begin with the cannon as is: Pumpkin, 15 m/s initial v, 0 degree loft. Shoot the pumpkin here. Next shoot the pumpkin at initial speed of 25 m/s. Finally fire the pumpkin at the initial speed of 0 m/s. Use the crosshairs marked with time range and height to mark the last dot of the flight. Fill in the table below with the values.

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Speed | Time | Range  | Height |
| 0 m/s |  |  |  |
| 15 m/s |  |  |  |
| 25 m/s |  |  |  |

1. What do these values tell you?
2. Change to a different projectile like a car and repeat the same experiment. What does this tell you?

**Vectors**

Go to the next window at the bottom of the page labeled “Vectors.” To help you see them better, select Slow.

1. A. Change the Cannon’s angle to be 45 degrees. This is the optimal angle to achieve the most distance and the angle we shoot the rockets at. Fire the cannon with air resistance on. Draw the path below.
2. How is this trajectory different?
3. A. Next, select the velocity vector. Draw the trajectory below with the Velocity Vector at each dot.

 B. What does this tell you?

1. A. Next, select the acceleration vector. Draw the trajectory below with the acceleration vector at each dot.

 B. What does this tell you?

1. A. Next, select the Force vector. Draw the trajectory below with the Force vector at each dot.

 B. What does this tell you?

**Drag**

Go to the bottom of the page and select “Drag”

1. Experiment with the following variables. How do the following factors projectile motion:
2. Drag
3. Diameter
4. Mass
5. Altitude

**Lab**

Design an experiment in order to hit the target two different way. You can change the variables of objects, height, air resistance, etc. Describe your experimental design below.

**Simbucket**

Go to the website simbucket.com and find the sim called “The Monkey and the Zookeeper” under the Physics sims. Try to hit the target. What does this tell you about projectile motion?