*Honors Physics*

*Winnetonka High School* Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hour: \_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_

**Horizontally Launched Projectiels Falling with Style**

**Horizontally Launched Projectile Virtual Lab**

**Learning Targets:**

I can design experiment within a simulator to test experimental questions.

I can describe the effect of initial horizontal velocity and initial vertical position on range for a horizontally launched projectile.

**UNPACK THE LEARNING TARGET**

What does initial horizontal velocity mean?

What does initial vertical position mean?

What does range mean?

A horizontally launched projectile is fired parallel to the ground. What is the angle measure in degrees of a horizontally launched projectile if the angle is measured from the horizontal ground?

*Restate the learning target using the answers to the questions above.*

**I can describe the effect of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

initial horizontal velocity initial vertical position

on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ projectile.

Range horizontally launched

**FIRST EXPERIMENT: RANGE AND TIME VS. CANNON LAUNCH HEIGHT**

Take out your laptop. Go to “bi https://phet.colorado.edu/sims/html/projectile-motion/latest/projectile-motion\_en.html”.  
Set the “angle” to “0”.  
Click and drag on the wheel of the cannon to adjust its height.

1. Conduct an experiment to determine how ***the height of the cannon*** affects the **range** of a projectile and **time** that it hits the ground. You can collect information about both RANGE and TIME for each trial.

What will be your independent variable?   
You can formulate two hypothesis since you will be collecting data on two outcomes (RANGE and TIME) for each trial.

Hypothesis one:

Hypothesis two:

What variables need to be held constant? (Name 3)

Make a table and a sketch to record your results.



|  |  |  |
| --- | --- | --- |
| Select the football. Record the football mass= \_\_\_\_\_  Set velocity to 30 m/s | | |
| Cannon Height  Variable:  Unit: | Range  Variable:  Unit: | Time  Variable:  Unit: |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Conclusions:  
a) Explain what you found about the effect of ***launch height*** on the **range** of a projectile launched horizontally.  
   
 When the launch height \_\_\_\_\_\_\_\_\_\_\_\_\_, the range \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  
   
b) Explain what you found about the effect of ***launch height*** on the **time** that a projectile hits the ground.  
   
 When the launch height \_\_\_\_\_\_\_\_\_\_\_\_\_, the time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**SECOND EXPERIMENT: RANGE AND TIME VS. HORIZONTAL VELOCITY**

1. Conduct an experiment to determine how ***initial horizontal velocity*** affects the **range** of a projectile and the **time** that it hits the ground.  
     
   What will be your independent variable?   
   You can formulate two hypothesis since you will be collecting data on two outcomes (RANGE and TIME) for each trial.

Hypothesis one:

Hypothesis two:

What variables need to be held constant? (Name 3)

Make a table and a sketch to record your results.



|  |  |  |
| --- | --- | --- |
| Select the fooball & record the FB’s mass here: \_\_\_\_\_\_\_\_\_\_\_\_\_  select the starting height & record it here: \_\_\_\_\_\_\_\_\_\_\_\_. | | |
| Initial Hor. Velocity  Variable:  Unit: | Range  Variable:  Unit: | Time  Variable:  Unit: |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Conclusions:  
  
a) Explain what you found about the effect of ***horizontal velocity*** on the **range** of a projectile launched horizontally.

When the horizontal velocity \_\_\_\_\_\_\_\_\_\_\_\_\_, the range \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  
  
   
  
b) Explain what you found about the effect of ***horizontal velocity*** on the **time** that a projectile hits the ground.  
   
  
 When the horizontal velocity \_\_\_\_\_\_\_\_\_\_\_\_\_, the time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**THIRD EXPERIMENT: RANGE AND TIME VS. MASS**

1. Conduct an experiment to determine how ***mass*** affects the **range** of a projectile and the **time** that it hits the ground.

What will be your independent variable?   
You can formulate two hypothesis since you will be collecting data on two outcomes (RANGE and TIME) for each trial.

Hypothesis one:

Hypothesis two:

What variables need to be held constant? (Name 3)

Make a table and a sketch to record your results.



|  |  |  |
| --- | --- | --- |
| Set the starting height at 15 m; set velocity to 30 m/s | | |
| Mass  Variable:  Unit: | Range  Variable:  Unit: | Time  Variable:  Unit: |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Conclusions:  
 a) Explain what you found about the effect of ***mass*** on the **range** of a projectile launched horizontally.  
   
 When the mass \_\_\_\_\_\_\_\_\_\_\_\_\_, the range \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  
   
b) Explain what you found about the effect of ***mass*** on the **time** that a projectile hits the ground.  
   
  
 When the mass\_\_\_\_\_\_\_\_\_\_\_\_\_, the time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**POST-LAB: SUMMARIZE AND STUDY**

List all of the factors that affect the **range** of a horizontally launched projectile:

List all of the factors that affect the **time** in the air of a horizontally launched projectile:

APPLICATION: \_\_\_\_\_/ 10 points

Would you expect a bowling ball (10 kg) rolling at a speed of 100 m/s and a ping pong ball (0.5 kg) rolling at a speed of 1 m/s off the edge of a table to land at the same time? In the same place? **Use evidence from your experiments to explain.**