As you complete this scientific investigation, fill in any needed information on this template. If you need more information about each section, please visit the Developmental Module.

**Title**

Projectile Motion Scientific Investigation

**Hypothesis**

Read through the procedural information for this scientific investigation. Based on your understanding of the procedure, develop your own hypotheses which describe your expected results. You should consider the following questions:

* When a projectile is launched into the air, what is the relationship between vertical and horizontal motion?
* How will the initial speed of the projectile affect the range (or distance travelled)?

Record your hypotheses below:

**Data**

Using the table below, record your data from this scientific investigation.

|  |  |  |  |
| --- | --- | --- | --- |
| **Initial Horizontal Speed (m/s)** | **Range (m)** | **Height (m)** | **Time (s)** |
| 0 |  |  |  |
| 2 |  |  |  |
| 4 |  |  |  |
| 6 |  |  |  |
| 8 |  |  |  |
| 10 |  |  |  |
| 12 |  |  |  |
| 14 |  |  |  |
| 16 |  |  |  |
| 18 |  |  |  |
| 20 |  |  |  |

**Data Analysis**

Once you have completed the Procedure and Data portions of the scientific investigation, create two graphs based on the data you collected in your data table. On one graph, plot the time versus initial speed. On the second graph, plot the range versus initial speed.

Options for creating and submitting your graphs include:

* Hand-draw the graphs using graph paper and then take a picture of it for submission to the assignment's dropbox.
* Hand-draw the graphs using graph paper and then scan it for submission to the assignment's dropbox.
* Utilize a spreadsheet or graphing program to create the graphs for submission to the assignment’s dropbox.

A digital file containing a grid is available on the Scientific Investigations webpage.

In addition, provide responses to the following questions:

1. What is the relationship between initial horizontal speed and the time of flight?
2. How does a change in the initial speed affect the time that the projectile is in the air?
3. Does the data that you collected through this simulation support or refute the idea that the horizontal motion and the vertical motion are independent?
4. What is the relationship between initial horizontal speed and the range of the projectile?
5. How does a change in the initial speed affect how far an object moves vertically?

**Conclusion**

Compose three to four sentences describing an overall conclusion about the relationship between horizontal and vertical motion, and the effect that the initial speed had on the range of the projectile. Were your hypotheses true or false, and how do you know? Use the data and notes that you collected from your simulation experience to form your conclusion. Make sure that you include information that you gained from data analysis to support your conclusion.

**Experimental Sources of Error**

Provide responses to the following questions: Are there any sources of error? If so, what are they, and what could be done to minimize error?