Projectile Device Project

***** Safety is a HUGE concern with this project! Please have an adult on hand when testing the device!*****

I. Introduction

Projectiles are objects that are shot through the air. Examples of projectiles include simple objects such as baseballs, arrows, or bullets. Projectiles follow a path through space called a trajectory. The parabolic path of the trajectory is the result of a combination of horizontal and vertical forces and the angle of release. Precise measurements of trajectories are needed for military and space missions. For example, missiles need to be accurately calibrated in order to strike the correct target (and not civilians), whereas NASA needs to precisely measure trajectories of rockets to place objects in proper orbit. To become better acquainted with projectiles and trajectories, you will construct a projectile device, perform range and accuracy tests, and perform calculations related to trajectories. The project is worth 100 points, and you will have three weeks to construct the device.

II. Expectations & Grading

1. Construct one of the following devices :

- Catapault	- Rocket	- Canon
- Flinger	- Trebuchet	- Choose another device not listed

2. Create a detailed sketch of the device with the following :

1. Realistic Sketch – not copied from another source – "Make it your own" **(8 points)**
2. Sketch Labels – for every piece used **(4 points)**
3. Materials List – everything used at all **(4 points)**
4. Parts Scale & Sizes – lengths, diameters, etc. **(2 points)**

3. Create an instruction manual on how to use your device with the following :

1. Title Page – Name of Device, Your Name, Class Name, Date **(2 points)**
2. Introduction – History of your device (at least 10 sentences) **(10 points)**
3. Materials List – list of materials actually used on project **(5 points)**
4. Step-By-Step Assembly Instructions – do not use paragraphs **(10 points)**
5. Operating Instructions – step-by-step; safety warnings included **(5 points)**
6. Sources Cited – minimum 3 sources; include people helpers **(5 points)**

4. Create a projectile device with the following :

1. Projectile Device **(25 points)**
2. Workmanship / Effort – typed manual, ½ page manual **(20 points)**
   - device well-constructed, painted

III. Projectile Device Discussion

1. **Discuss with your project team members ways to alter the trajectory of the projectile released from your device. Record three ways that the path of the projectile can be changed.**

   1. _____

   2. _____

   3. _____

IV. Projectile Device Testing

A. Range Test

1. **Record the distance traveled, hang time, and angle of release of the projectile for each trial.**

	Distance	Hang Time	Angle
Trial #1	_____	_____	_____
Trial #2	_____	_____	_____
Trial #3	_____	_____	_____
Average	_____	_____	_____

B. Accuracy Test

1. **Place a target 15 meters from your projectile device.**

2. **Record the distance the projectile lands away from the target for each trial.**

	Distance
Trial #1	_____
Trial #2	_____
Trial #3	_____
Average	_____

V. Computations

1. **Using the average distance, average time, and average angle, calculate the initial velocity of the projectile.**

$$v_i = \frac{\frac{1}{2}(g)(t)^2}{(\sin \Theta)(t)} \qquad vi = \frac{d}{(\cos \Theta)(t)}$$ *(Use these equations.)*

Initial Velocity = _____m/s

VI. Analysis & Conclusions

1. **In what ways did you alter your device to change the projectile distance?**

_____

_____

_____

_____

2. **List three different ways that an understanding of trajectories can assist you in your daily life.**

1. _____

_____

2. _____

_____

3. _____

_____