Methodology Draft

This is the place to upload a draft of your methodology, which is the next part of your written report following the intro. IF you put your hypothesis at the end of the intro/background paper, you don't need it here...if you did not include the hypothesis before, you'll include it in this section.

This section will include the following pieces of information:

- Hypothesis
- Discussion of your variables: suggested questions to guide the explanation of your variables are listed --
    - Manipulated variable -- what is it, what units will you be measuring it in, what tools will be used to measure them; also include a statement of the range of values you will be using for your different manipulations and how/why you selected that range of values. What validity measures are you to help keep measurements consistently precise? what is the precision of the chosen measuring tool?
    - Responding variable -- what is it, what units will it be measured in, how are you going to be measuring it? If you're measuring something else and calculating the actual RV, elaborate on how/why? What is the precision of the chosen measuring tool(s)? What validity measures are present for the RV?
    - Controlled variables -- ideally there will be a minimum of 3 variables that you are intentionally making sure aren't changing for each of them, state the variable, explain why it would be/could be important to keep it controlled, and explain how you will keep it controlled. Also mention how (and how often) you're going to measure it to verify that it is being controlled.
        - You should list as many variables as you can think of that may affect the outcome of your experiment if not controlled. It's okay if there aren't that many, but if you do NOT control something that very obviously should be controlled, that's when you run the risk of losing points in the methodology section
- Materials list (include graduation (limit of reading), brand if relevant, and/or size of the piece of equipment. Do NOT include things such as "calculator, pencil, note paper" unless they are directly related to the collection of raw data for your experiment.

> - Procedural steps -- clearly explaining the steps that need to be taken and the appropriate order in which to take them. Be specific so that your procedure could be repeated easily by someone else who has access to your supplies and is reading your steps. They should be able to recreate your experimental results.
> - Discussion of safety precautions that need to be observed for your experimental data collection.

Once again, my hypothesis is:

The radius of the frisbee will relate to the distance the frisbee travels parabolically, with an optimal radius for maximum difference and the distance decreasing exponentially as the circumference becomes bigger and smaller than the optimal value.

My manipulated variable will be the radius of the frisbee, which will be measured in centimeters with a ruler. For my range of values, I will be using 12 centimeters to 16 centimeters, with 0.5 cm intervals, for a total of 9 manipulations. I will do each of these manipulations for 5 trials. I picked these values due to the radius for the Frisbee that I have used being 12 cm. It is nearly impossible for me to reduce the radius of the frisbee using power tools accurately, so I will just measure the distance the frisbee goes if the radius increases. I expect a decline in distance if the radius gets bigger, since there has to be a reason that all frisbees are usually the same size. . I am using an architect's ruler, which has a uncertainty of 0.025 centimeters, which will be adequate for my measurement. My validity measure is if the responding variable varies dramatically from the expected value in the trial.

My responding variable is the distance that the frisbee flies, measured in meters. I will be measuring it using a measuring tape, which has an uncertainty of 0.0125 inches, or about 0.013175 centimeters. To help keep the responding variable safe, I will use a stand for the frisbee to keep the same angle throughout all the trials and use the same pushing motion with my hand to attempt to keep the speed the same. I recognize that the speed of my hand might affect the Frisbee's distance, and will account for variations in hand speed with uncertainty.

My controlled variables are:

- Angle that the frisbee flies; if the angle differs drastically, the distance the frisbee flies differs equally as drastically, since a Frisbee's flying distance is dependent on the amount of air lift beneath it, which is changed by the angle. I will try to keep the angle the same by using a ramp to launch the frisbee from. Since the ramp is unlikely to change angles in the space of a few trials, I will measure the angle of the ramp every four trials with a protractor.

- The wind speed; if the wind differs drastically, the distance the frisbee flies will differ equally as drastically, since a Frisbee's flying distance is dependent on the amount of air lift beneath it, which is changed by the wind speed. I will try to keep the wind speed the same by conducting the experiment on a calm day, and waiting until I can feel no wind to start a trial.
- The hand speed; if the hand speed differs drastically, the distance the frisbee flies will differ equally as drastically, since a Frisbee's flying distance is dependent on the speed at which it is launched. I will try to keep the speed the frisbee is launched at the same by using the same hand motion, and attempting to keep the speed the same. I have no way to verify that I am using close to the exact same speed for each trial, so I will have to eyeball it.

Materials

- A frisbee with radius 11.5 cm.
- A ruler to check the radius of the frisbee
- A measuring tape to check the distance of the frisbee
- A wooden ramp with an incline of approximately 15 degrees, measured with a protractor
- Paper, scissors, and tape
- An assistant to measure where the frisbee touches down

Procedure

1. You will need a wide open space for this experiment. Set the frisbee at the bottom of the ramp and clear space up for the trajectory of the frisbee.
2. With one smooth motion, push the frisbee off the ramp, putting your hand on the top of the frisbee. Make sure your assistant is ready to mark down the exact place where the frisbee touches the ground.
3. Measure the distance the frisbee travels from the ramp to the place it touches down and record the value.
4. Repeat steps 2 and 3 four more times.
5. Use scissors to cut out a hollow circle with that has a border radius of 0.5 inches. Tape this to the outside of the frisbee.
6. Repeat steps 2-4.
7. Repeat steps 5 and 6 7 more times, each time adding a circle to the outside of the frisbee.

Safety Precautions

As you are throwing objects,you are recommended to wear goggles while doing this experiment.