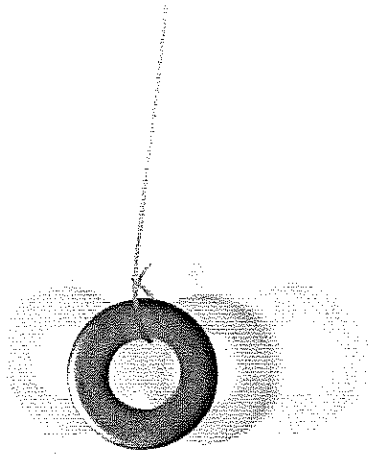
# Summer Assignment

Welcome to Cambridge incoming 6th graders! Your assignment for the summer involves designing a cool experiment around a pendulum. All summer assignments are due on the first day of school, **August 10th**. They must be all ready to turn in that Tuesday.

## Directions

All the information you need to complete this assignment is on the "Pendulum Project" assignment handout. Bring your project with you on the first day of school in the fall. We are excited to see everyone and to discover what you came up with for this experiment!



# The Pendulum Project – *Can YOU figure it out?*

## Project Goals:

- To design and conduct an experiment to determine how the length of a string and how the weight affect the number of swings of the pendulum.
- To understand how to isolate and manipulate variables and carry out a scientific investigation.
- To demonstrate an ability to organize and interpret data.

Materials: String, masking tape, timers, washers or paper clips to serve as weights.

## Project Guidelines:

The instructions are left vague because it is up to you to determine a hypothesis, design a test for the hypothesis and present your findings in a lab report.
Some questions to consider before you get started:
1. You are working with two variables (length and weight). Do you want to have a separate hypothesis for each variable? Do you test both variables at once?
2. How will you write your hypothesis? Traditionally it is written as an if-then statement. Two statements with two separate tests are acceptable, just be clear in how you write it.
3. How will you measure the number of swings? 60 seconds, 30 seconds? What do you consider a full swing to be? How will you measure the weight? Grams? 1 washer, 2, 3? How will you measure the length of the string? Inches? Centimeters?
4. How will you make sure each test is the same (constants and controls)? Will you always drop the pendulum in the same way? How will you secure the pendulum? Why is holding the pendulum in your hand not a good idea?
5. Research must be topic related. Example of a research question, "how does weight affect gravity on earth? How does air friction affect the rate of speed an object has?"

## Lab Report:

You will prepare a lab report which should include:
1. Abstract: The abstract is a summarization on your entire investigation. The abstract should include an abbreviated version of all the components in your investigation.
2. Introduction: Includes hypothesis, purpose, and variables.
3. Procedure: Explains how you will test your hypothesis. Procedures should include precise step-by-step directions. Your procedures should be clear enough for others to replicate. Pictures or a sketch can be used to show your lab set-up.
3. Data table/s and graphs: Tables and graphs summarize your experiment results and show dependent and independent variables. Tables and graphs should show trends. Your graphs should

have a title, and axis should be labeled (x-axis should show your independent variable- string length or weight; y-axis should show your dependent variable-swings).
4. Conclusions - Make sure you use your data to answer the question. Remember you have two variables in the experiment - length and weight. Both may have differing effects on the number of swings. It's up to you to find out exactly how each variable changes the pendulum's period (swings per minute).
5. Use the grading rubric to check that you have all parts of the lab report included. You may type the report or print neatly.

## Grading Rubric

| | Needs Work (1) | Satisfactory (2) | Excellent (3) |
|---|---|---|---|
| **Introduction, Research & Hypothesis** | Experiment objective is not clear; hypothesis would be difficult to test; reader does not get a clear sense of what will happen in the experiment. | Hypothesis is a testable statement, with a clear goal. Variables are included, or a statement that explains what tests will be conducted. | At least 3 paragraphs of research before investigation in order to create a solid hypothesis. Research 3 different websites. Hypothesis is clearly written as an "if…then" statement that can be tested in an experiment. Variables clearly stated and are separated with respect to the prediction. One for each independent/ test variable. |
| **Procedure** | Procedure is lacking details, could not easily be repeated, missing photos or sketch | Explanation of procedure is included; unclear at parts or missing photos or sketch | Clear explanation shows how data was collected; including photos or sketch of the lab set-up. Procedures must be replicable. One for each independent/ test variable. |
| **Data Tables & Graphs** | Data is minimal, disorganized, trends not evident, looks like a rough draft. Missing tables or graphs. | Data is included, but parts may be difficult to read. Trends are not obvious. Some labels may be unclear. Tables and graphs included. | Tables are organized, each column or row is labeled. Any reader can clearly see the trends in the data. At least one table and graph for each independent/ test variable. The mean, median, mode and range must also be identified. |
| **Conclusions** | Concluding statements unclear or off topic. Data is not used to support statement or conclusions do not follow data. | Data is used to state an outcome of the experiment, supporting statements (data) unclear or missing elements, conclusion only partly follows data. | Data is used to clearly state the outcome of the experiment; the hypothesis is either supported or rejected, conclusion follows data. One for each independent/ test variable. |
| **Data Gathering** | Very little data was collected, or unorganized | Some data was collected | Enough data was collected to draw conclusions. One for each independent/ test variable. |

**The following is a guide you can use throughout your investigation. Remember to thoroughly read the rubric, and ensure all components are included.**

# Abstract:

## Purpose:

## Problem Question:

## Research:

## Hypothesis:

**If _____ is related to _____, then _____.**

## Variables:

**Test/Independent Variable: _____**
**Outcome/Dependent Variable: _____**
**Controlled Variables: _____**
_____

# Materials:

# Procedure:

# Data Analysis:

| | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | Average |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
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| | | | | | | |

# Discussion of Results:

# Graphs:

# Conclusion: