

# Grandfather Clock (Part 2)

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Last week you measured the oscillation period of a pendulum and (hopefully) decided what qualities affect this period. Now you want to be able to adjust your pendulum so that it swings at the proper rate. In order to do this, you need to determine *how* the period changes, quantitatively, when you change this other quantity. In other words, you're looking for a relationship between the two variables.



## Questions:

*From last week:*

1. (Does changing the length change the period?)
2. (Does changing the mass change the period?)

*For this week:*

3. **How does changing one of these factors change the period, quantitatively?**

Since this is our first time doing data analysis, let's start simply. Is there a *linear* relationship between the length of the pendulum and the period? Or between the mass of the pendulum and the period?

- Devise a **rule** which decides whether a data set is *linear* or *not linear*.
- Use this rule to determine whether your (and whether other groups') data is linear or not.
- Determine *as a class* whether or not the period of a pendulum increases linearly with its length.

<b>I. Introduction</b>	<b>10 min</b>	<b>Whole class</b>
<b>II. Brainstorm and plan</b>	<b>15 min</b>	<b>Groups of 4</b>
<b>III. Carry out the analysis</b>	<b>40 min</b>	<b>Groups of 4</b>
<b>IV. Group presentations</b>	<b>40 min</b>	<b>Whole Class</b>
<b>V. Evaluate your analysis</b>	<b>15 min</b>	<b>Groups of 4</b>

Write the data analysis section as you work.

Write the evaluation of your data analysis, including what you would do to strengthen your conclusions. Add it to what you prepared in last week's lab, and *turn in your lab report*.

**MAJOR GOAL:**

*Devise a reliable test for whether a data set is linear or not linear.*

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## Excel Hints:

### Creating a Data Set:

In cell A1, label the “A” column “Length”. In cell B1, label the “B” column “Period.” Put your data in these two columns. Now you have a simple data set to work with.

### Graphing Data

1. At the top of the screen is a blue, yellow, and red icon, the Chart Wizard icon. Click this and a menu will pop up. Here are fourteen different ways in which your data can be graphically illustrated. You’ll find during this semester that different kinds of data are best shown with different kinds of illustrations. Select XY (Scatter) and hit Next.
2. Here Excel asks you which data set you want to graph. Using the mouse, highlight the two columns of information you want to use. It will give you a preview of how this chart is going to look. This illustration is a basic point plot graph with the days on the x-axis and the times on the y-axis. Hit Next.
3. Excel now asks you to select what data you want to graph. Highlight the two columns (without the titles) and hit Next.
4. A graph needs to be detailed enough so that one can understand it without an explanation, yet concise enough to be understood at a glance. That’s why you must always give your chart a title and label your axes. Then hit Next.
5. Now Excel will give you the option to either place this chart next to your data, or on a separate sheet. For this chart, select As new sheet, and hit Finish. You now have a chart that displays your data!