Types of Data
Scientific Notation
The appropriate units to use when making measurements

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>meter</td>
</tr>
<tr>
<td>Temperature</td>
<td>Kelvin</td>
</tr>
<tr>
<td>Mass</td>
<td>gram</td>
</tr>
<tr>
<td>Volume (liquid)</td>
<td>liter</td>
</tr>
<tr>
<td>Volume (solid)</td>
<td>meter$^3$</td>
</tr>
<tr>
<td>Time</td>
<td>second</td>
</tr>
</tbody>
</table>

Prefixes:  
- Kilo: 1000
- centi: 1/100
- milli: 1/1000
- micro: 1/1000000
Presenting data using graphs

Power generated by miniature wind turbines

- 15 mph
- 30 mph
- 45 mph

the dependent variable
the independent variable
Labeling Graphs

Graph titles should be *descriptive* and explain the results.

**GRAPH TITLE FORMULAS:**

*The Effect of _______ on _______*

*The Relationship between _______ and _______*

*“_______ vs _________” is not acceptable*
**prsA2 is expressed during exponential growth in broth culture.** *L. monocytogenes* strain 10403S carrying pJZ095 (strain DP-L5755) was grown for 8 h in BHI medium. Each hour, an OD$_{600}$ measurement was taken, and the β-glucuronidase (Gus) level from 1 ml of culture was measured. The levels of Gus were normalized to the OD$_{600}$ measurements of the culture at each time point. The error bars represent the standard errors of the means. Data were collected from duplicate samples from three independent experiments. Solid line: Gus concentration; Dashed line: OD$_{600}$. 

Forster et al., 2011

*J. Bacteriology*
When to use a bar graph OR line graph

Forster et al., 2011
J. Bacteriology

Ramirez et al.
JMBE (In Review)
In order to determine the effect of a certain antibiotic on a bacterium, an experiment was performed. The antibiotic was added to a culture of bacteria. Every couple of days, a sample of the culture was taken and the number of bacteria present was counted. The results are shown below.

<table>
<thead>
<tr>
<th>Days incubated with antibiotic</th>
<th>0</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Bacteria Present in Culture</td>
<td>1000</td>
<td>500</td>
<td>50</td>
<td>200</td>
<td>500</td>
<td>1000</td>
</tr>
</tbody>
</table>
Writing a valid conclusion from a graph

State the relationship between the independent and dependent variable.

Give a scientifically valid reason as to why you see this trend in the data.

Example:

One year of CO₂ daily and weekly means at Mauna Loa

[Graph showing CO₂ levels with months and parts per million on the y-axis]
Measures of Central Tendency

When looking at your data, you may notice that the majority of the numbers focus around the center of your data set or distribution. Three measures of central tendency include:

- **Mean:**
- **Median:**
- **Mode:**
Measures of Central Tendency

The table below shows the temperature outside Connelly Hall at 11:00am for 5 consecutive days.

<table>
<thead>
<tr>
<th></th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>20</td>
<td>13.4</td>
<td>22.8</td>
<td>19.5</td>
<td>13.4</td>
</tr>
</tbody>
</table>

Mean:  

Median:  

Mode: