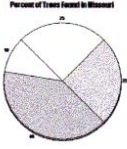
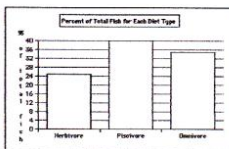
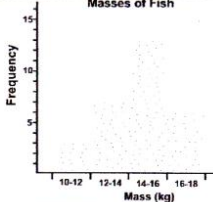
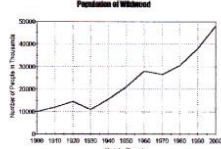
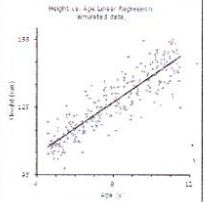


Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

# Graphing Skill #1: What Type of Graph is it?

There are several types of graphs that scientists often use to display data. They include:

Pie Graphs	Bar Graphs	Histograms	Line Graphs	Scatter Plots
				
<ul style="list-style-type: none"> <li>• Dependent variable is NOT continuous</li> <li>• Usually presents data as a "part of a whole" or as percentages</li> </ul>	<ul style="list-style-type: none"> <li>• Dependent variable is NOT continuous</li> <li>• There is no order to the categories on the X-axis</li> <li>• Bars typically don't touch</li> <li>• Y-axis is usually a percentage or a frequency (count)</li> </ul>	<ul style="list-style-type: none"> <li>• A specific type of bar graph</li> <li>• Dependent variable must have a natural order that can be grouped into defined "chunks"</li> <li>• Bars must always touch</li> <li>• Y-axis is usually a percentage or a frequency (count)</li> </ul>	<ul style="list-style-type: none"> <li>• Dependent variable IS continuous</li> <li>• Points are plotted using x- and y-components</li> <li>• The points are connected because the observations are NOT independent (the next value depends on the previous value)</li> </ul>	<ul style="list-style-type: none"> <li>• Dependent variable IS continuous</li> <li>• Points are plotted using x- and y-components</li> <li>• The points are NOT connected because the observations are independent (the next value does NOT depend on the previous value)</li> <li>• Uses a best-fit line or curve to show relationship</li> </ul>

Based on these definitions, and the descriptions of the experiments below, please put an "X" in the box for the type of graph that would be *most* appropriate (some descriptions may have several graph types that would be appropriate; you only need to select one).

#	Description	Pie	Bar	Histo.	Line	Scatter
Ex	A graph showing the number of 5 <sup>th</sup> graders who prefer Coke or Pepsi		X			
1	A graph showing how a newborn baby's weight changes over time					
2	A graph showing the percentage of the class earning As, Bs, and Cs.					
3	A graph showing the distribution of trees of different size groups (e.g. 0-10cm, 10-20cm, etc...) in a forest					
4	A graph showing the relationship between height and arm length					
5	A graph showing the percentage of an allowance spent on different categories (e.g. food, movies, etc)					
6	A graph showing the amount of rainfall, by month over a 12 month period					
7	A graph showing the number of ice cream cones purchased as a function of the day's temperature					
8	A graph showing the number of pushups done each day during a 2-week training program					

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

## Graphing Skill #2: Labeling Axes

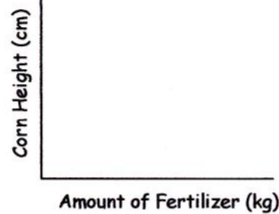
**When labeling your axes, keep 3 things in mind:**

- The independent (manipulated) variable is written along the horizontal axis (X axis)
- Dependent (responding) variable is written along the vertical axis (Y axis)
- Units on any variables should be included in parentheses ( ) following the axis title

### Practice Problems

For each experiment described below, write the independent and dependent variable on the appropriate axis. Be sure to include units when appropriate.

**SAMPLE:** A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



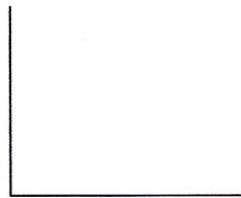
**Graph 1:** A ball is dropped from several distances above the floor (in meters) and the height it bounces is then measured (in centimeters).



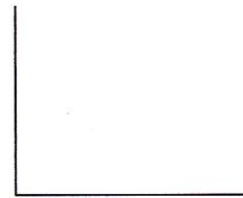
**Graph 2:** A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.



**Graph 3:** A fisherman used fishing lines of several different gauges (test pounds) and recorded the number of fish caught on each gauge.



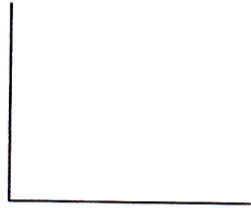
**Graph 4:** Geologists wanted to know if there was a relationship between the density (in  $\text{g/cm}^3$ ) of a rock and how many meters down it was collected from.



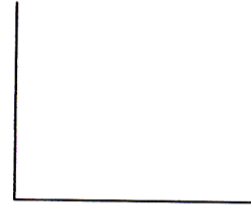
Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

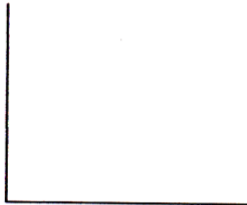
**Graph 5:** Is there a relationship between the numbers of hours a student studies and the score s/he gets on the weekly quiz?



**Graph 6:** A scientist studied the relationship between amount of rain (in cm) and the numbers of zebra babies born each spring.



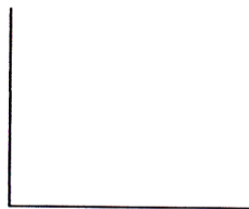
**Graph 7:** Do longer pendulums (measured in cm) have higher frequencies (measured in Hertz)?



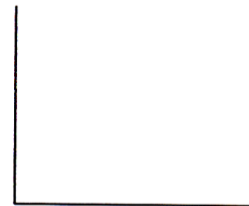
**Graph 8:** Does the grade point average that a student earns in college depend on his/her SAT score from high school?



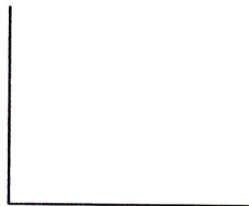
**Graph 9:** How does the depth of a river (in meters) impact its speed (measured in meters per second)?



**Graph 10:** Sea otters were counted over a several years to see if their numbers were decreasing over time.



**Graph 11:** Does the length of time an ice cube is in water (in seconds) affect the temperature of the water (in degrees Celsius)?



**Graph 12:** Does the amount of nitrogen in the soil (measured in kilograms) affect corn production (measured in kilograms)?



Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

## Graphing Skill #3: Scaling Axes

**There are a few important steps involved in correctly scaling an axis:**

- STEP 1: Find the range for the variable
  - Range = Largest Value - Smallest Value
- STEP 2: Divide the range by the number of intervals you want (not too many or too few). We don't want all of the data smooshed in only part of the graph; spread it out.
  - After dividing, we may need to round up to get a number that is easy to count by. (It is easier to count by 2s instead of 1.9s)
- STEP 3: Use the rounded number to mark off intervals along the axis.
  - The interval must be the same amount each time (count up by the same number).

**STEP 1: What is the range of my data? Find the range of the data for each column below.**

<p>EX.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><th>Mass (g)</th></tr> <tr><td>5</td></tr> <tr><td>11</td></tr> <tr><td>14</td></tr> <tr><td>19</td></tr> <tr><td>26</td></tr> <tr><td>30</td></tr> <tr><td>40</td></tr> </table> <p>Largest #: <u>40</u></p> <p>Smallest #: <u>5</u></p> <p>Range: <u>35-5 = 35</u></p>	Mass (g)	5	11	14	19	26	30	40	<p>A)</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><th>Students</th></tr> <tr><td>100</td></tr> <tr><td>99</td></tr> <tr><td>88</td></tr> <tr><td>70</td></tr> <tr><td>72</td></tr> <tr><td>64</td></tr> <tr><td>55</td></tr> </table> <p>Largest #: _____</p> <p>Smallest #: _____</p> <p>Range: _____</p>	Students	100	99	88	70	72	64	55	<p>B)</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><th>Distance (cm)</th></tr> <tr><td>3</td></tr> <tr><td>5</td></tr> <tr><td>6</td></tr> <tr><td>7</td></tr> <tr><td>9</td></tr> <tr><td>10</td></tr> <tr><td>12</td></tr> </table> <p>Largest #: _____</p> <p>Smallest #: _____</p> <p>Range: _____</p>	Distance (cm)	3	5	6	7	9	10	12	<p>C)</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><th>Time (s)</th></tr> <tr><td>0.22</td></tr> <tr><td>0.51</td></tr> <tr><td>0.78</td></tr> <tr><td>1.01</td></tr> <tr><td>1.23</td></tr> <tr><td>1.60</td></tr> <tr><td>1.74</td></tr> </table> <p>Largest #: _____</p> <p>Smallest #: _____</p> <p>Range: _____</p>	Time (s)	0.22	0.51	0.78	1.01	1.23	1.60	1.74
Mass (g)																																			
5																																			
11																																			
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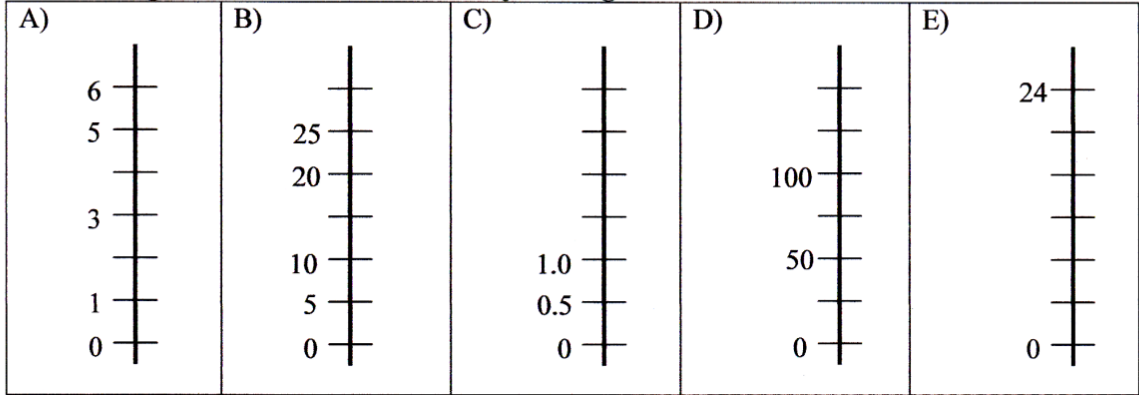
**STEP 2: What number do I count by? Assume that our graph has 10 intervals (places to put numbers). If needed, round up to get to a good counting number.**

<p>A)</p> <p>Range = <u>35</u></p> <p># of intervals = <u>10</u></p> <p><math>\frac{\text{Range}}{\text{Intervals}} = \frac{35}{10} = 3.5</math></p> <p>Round to Count = 4</p>	<p>A)</p> <p>Range = _____</p> <p># of intervals = _____</p>	<p>B)</p> <p>Range = _____</p> <p># of intervals = _____</p>	<p>C)</p> <p>Range = _____</p> <p># of intervals = _____</p>
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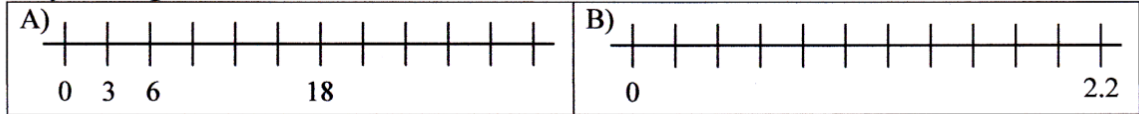
Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

**STEP 3: What does my scale look like? Each of the scales for the *dependent* variables has a few missing values on it. Please fill in any missing values.**



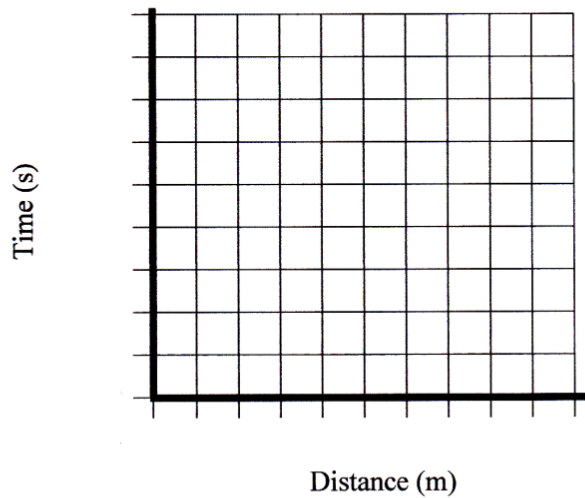
**Each of the scales for the *independent* variables has a few missing values on it. Please fill in any missing values.**



**Putting it all together: Please create appropriate scaling for each axis.**

Time vs. Distance

Distance (m)	Time (s)
10.3	1.5
20.2	2.9
29.8	4.3
40.4	5.8
49.1	7.0
60.9	8.7
70.2	10.0
80.1	11.4
90.6	12.9



Name: \_\_\_\_\_

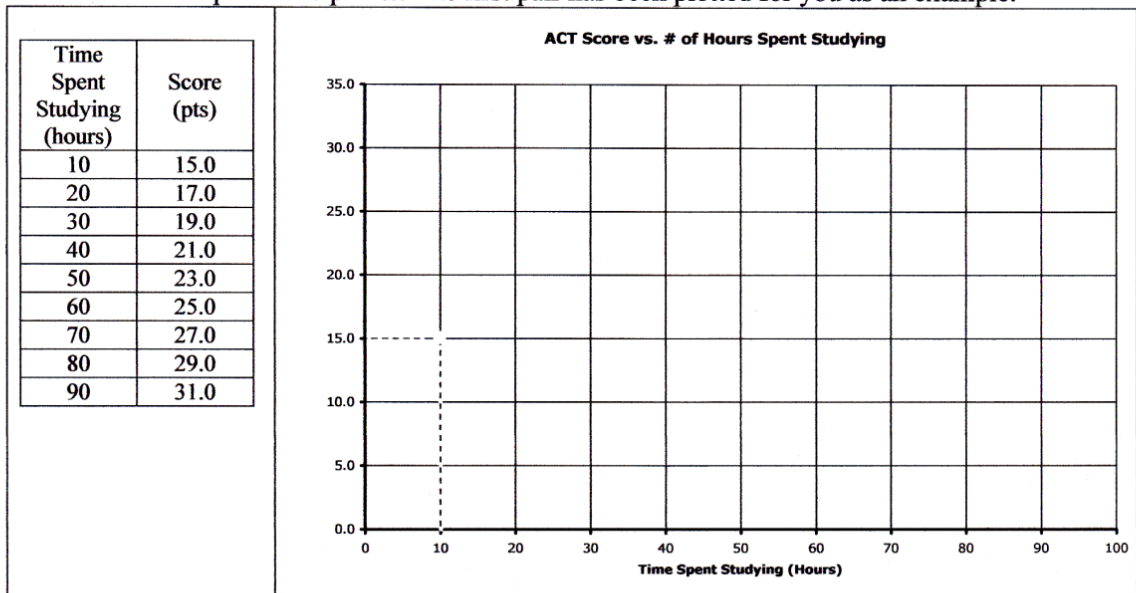
Date: \_\_\_\_\_ Period: \_\_\_\_\_

## Graphing Skill #4: Plotting Points

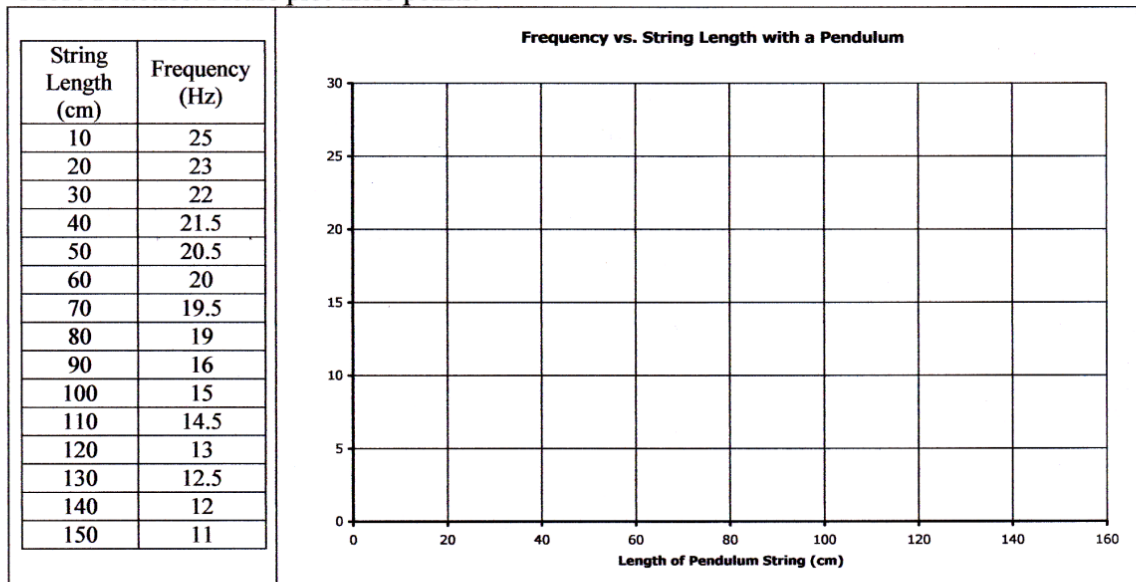
**Plotting points can be easy if you follow these simple steps...**

- STEP 1: Select the first pair of values from the data table (X and Y).
- STEP 2: Draw a light dashed line up from the number on the X axis and over from the number on Y axis.
  - Once you get good at plotting points, you won't need to draw these lines anymore
- STEP 3: Where these dotted lines cross, put a dark point. Repeat for the next pair of points.

**Practice:** Please plot these points. The first pair has been plotted for you as an example.



**More Practice:** Please plot these points.



Name: \_\_\_\_\_

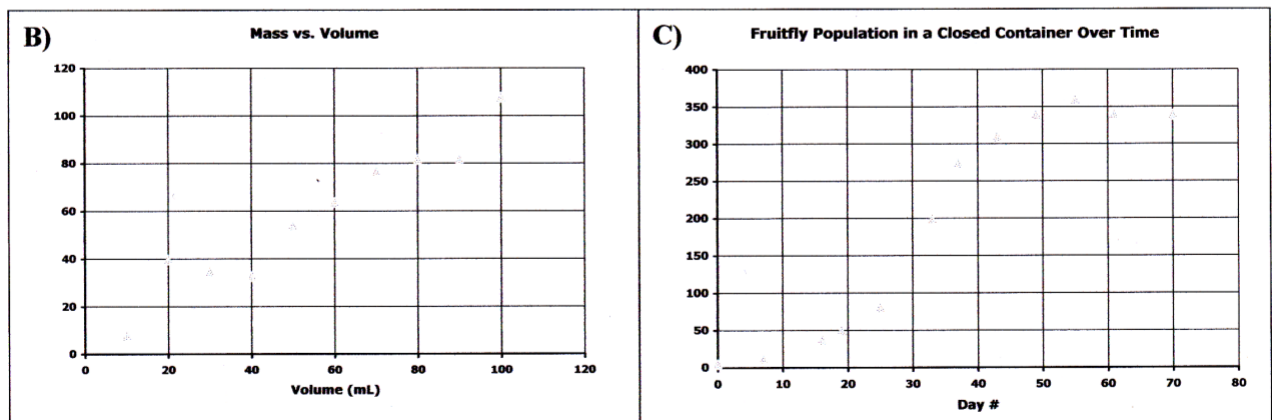
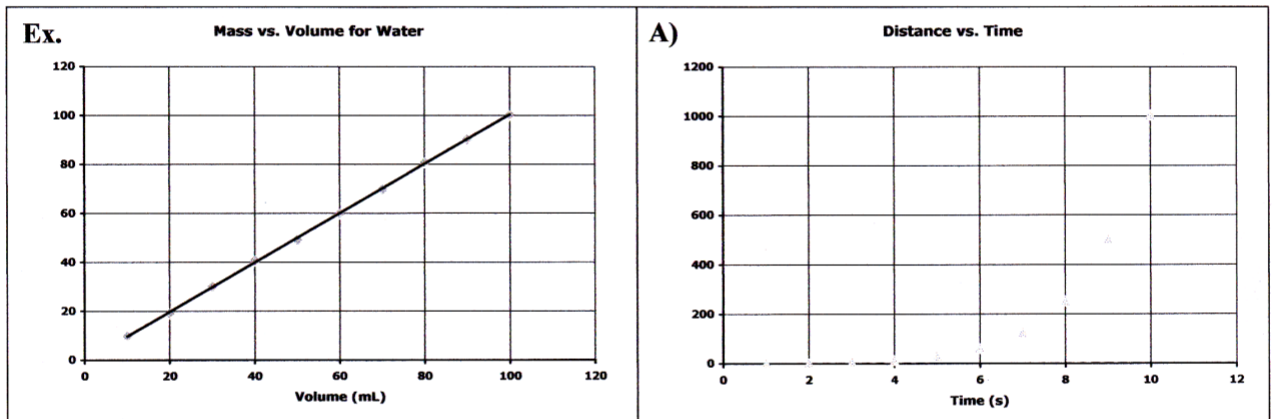
Date: \_\_\_\_\_ Period: \_\_\_\_\_

## Graphing Skill #5: Best-Fit Line or Curve

With scatter plots it is important to put a best-fit line or curve through points where relationships exist.

- Do you notice a pattern or trend in the data?
- If so, draw a straight line or curve that represents that trend.
- All points should lie on or very near the line
- For points not on the line, about half should be above the line and half below the line
  - The sum of the distance between the line and all points above should approximate the sum of the distance between the line and all points below (residual values)
- Your line **should not** extend beyond the range of your data

For each of the following graphs, please add the best-fit line or curve. The first one has been done for you.



Name: \_\_\_\_\_

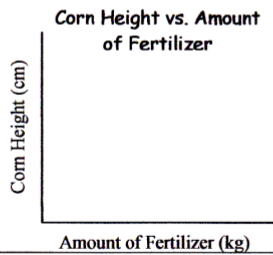
Date: \_\_\_\_\_ Period: \_\_\_\_\_

## Graphing Skill #6: Creating Titles

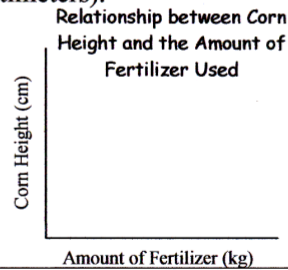
**When writing a title for your graph, please remember:**

- Must communicate the dependent and independent variables
- Can be presented in the form “Y versus X”
- Some graphs need more explanation than others. Make sure your reader would be able to understand what your data represent

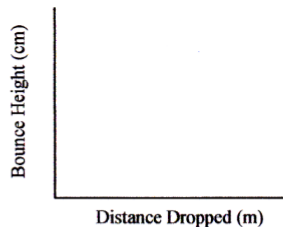
**SAMPLE:** A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



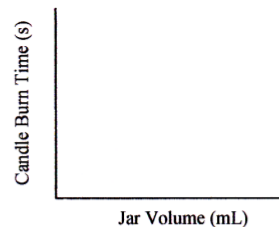
OR



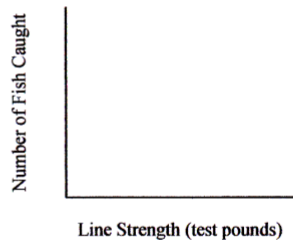
**Graph 1:** A ball is dropped from several distances above the floor (in meters) and the height it bounces is then measured (in centimeters).



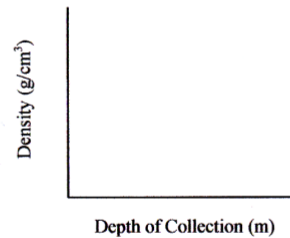
**Graph 2:** A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.



**Graph 3:** A fisherman used fishing lines of several different gauges (test pounds) and recorded the number of fish caught on each gauge.



**Graph 4:** Geologists wanted to know if there was a relationship between the density of a rock and how many meters down it was collected from.

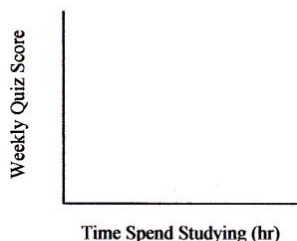




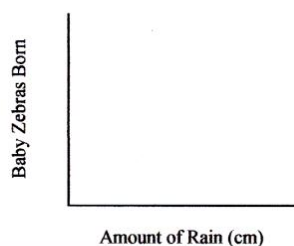
Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

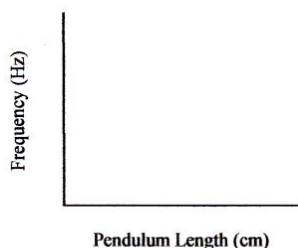
**Graph 5:** Is there a relationship between the numbers of hours a student studies and the score s/he gets on the weekly quiz?



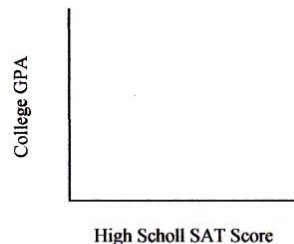
**Graph 6:** A scientist studied the relationship between amount of rain (in cm) and the numbers of zebra babies born each spring.



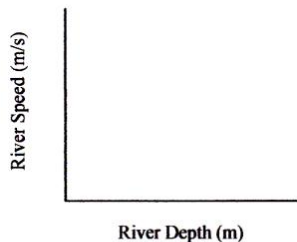
**Graph 7:** Do longer pendulums (measured in cm) have higher frequencies (measured in Hertz)?



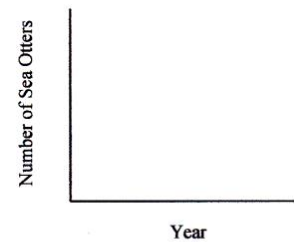
**Graph 8:** Does the grade point average that a student earns in college depend on his/her SAT score from high school?



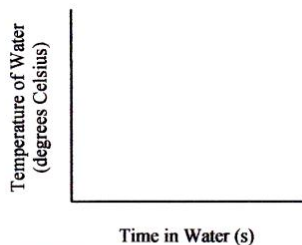
**Graph 9:** How does the depth of a river (in meters) impact its speed (measured in meters per second)?



**Graph 10:** Sea otters were counted over a number of years to see if their numbers were decreasing over time.



**Graph 11:** Does the length of time an ice cube is in water (in seconds) affect the temperature of the water (in degrees Celsius)?



**Graph 12:** Does the amount of nitrogen in the soil (measured in kilograms) affect corn production (measured in kilograms)?

