

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

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 th 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					

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Graphing Skill #2: Labeling Axes

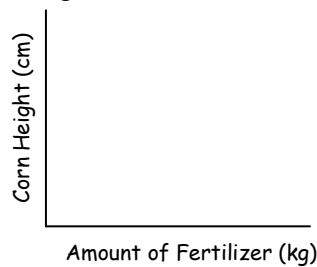
When labeling your axes, keep 3 things in mind:

- 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.

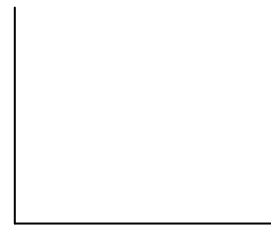
SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



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 g/cm^3) of a rock and how many meters down it was collected from.



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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)?



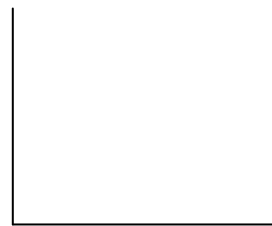
Graph 8: Does the grade point average that a student earns in college depend on his/her SAT score from high school?



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)?



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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
 - o 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.
 - o 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.
 - o 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="margin-left: auto; margin-right: auto;"> <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="margin-left: auto; margin-right: auto;"> <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="margin-left: auto; margin-right: auto;"> <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="margin-left: auto; margin-right: auto;"> <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)																																			
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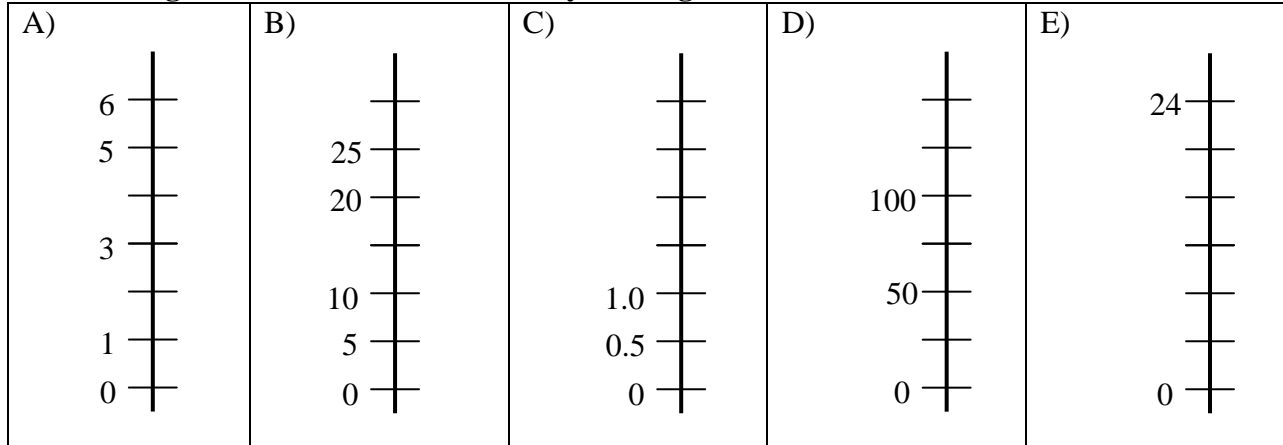
STEP 2: What number do I count by? Assume that our graph has 10 intervals (places to put numbers). If needed, round up to get to a good counting number.

<p>A)</p> <p>Range = <u>35</u></p> <p># of intervals = <u>10</u></p> $\frac{\text{Range}}{\text{Intervals}} = \frac{35}{10} = 3.5$ <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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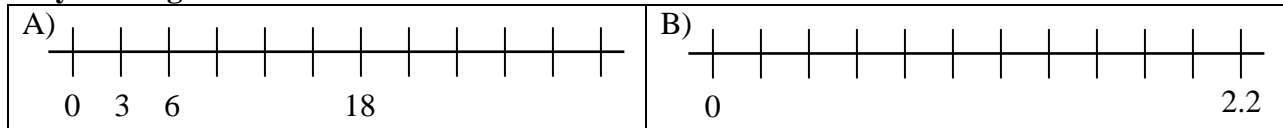
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STEP 3: What does my scale look like? Each of the scales for the *dependent* variables has a few missing values on it. Please fill in any missing values.



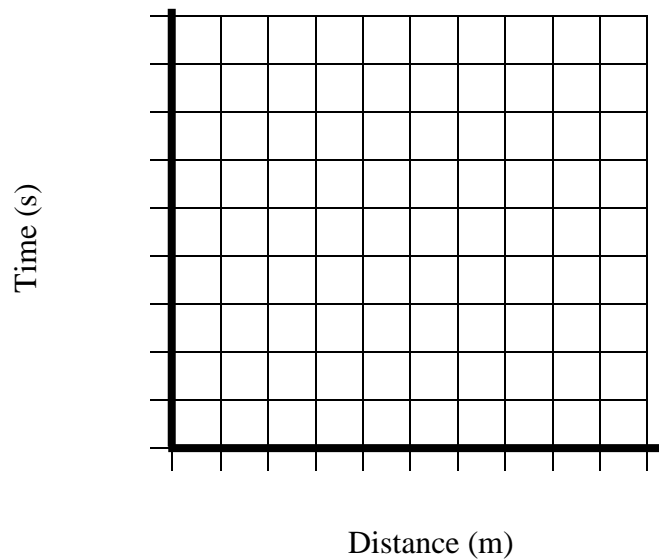
Each of the scales for the *independent* variables has a few missing values on it. Please fill in any missing values.



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

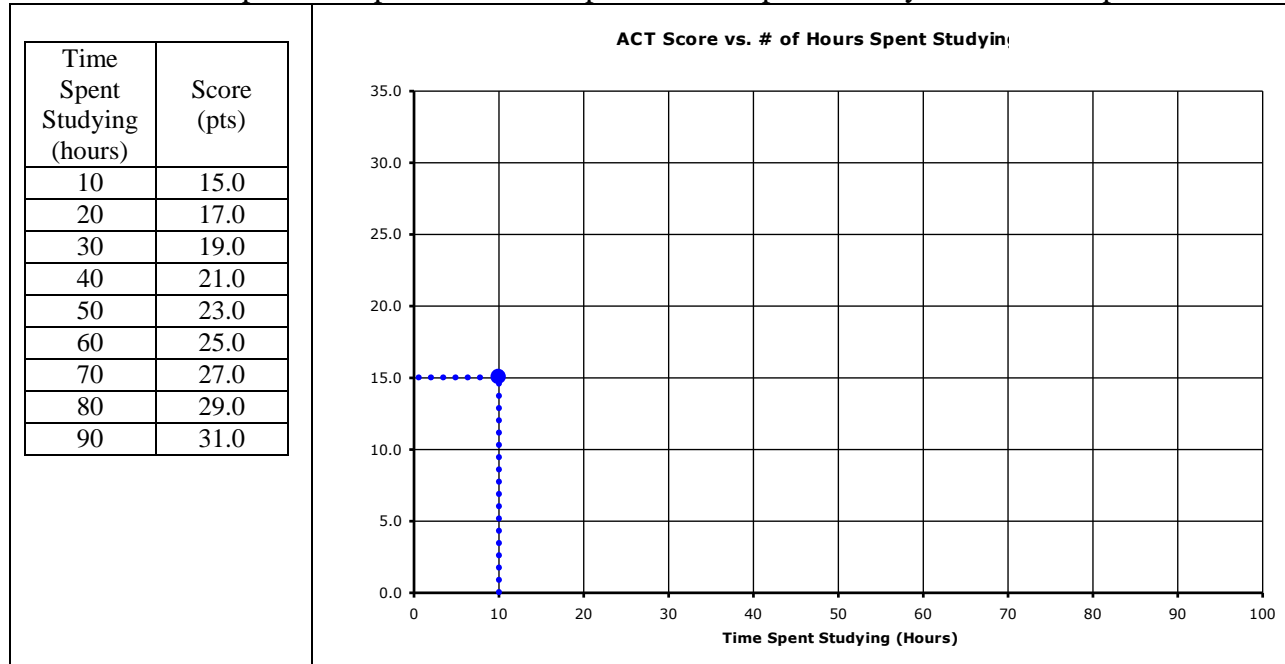


Graphing Skill #4: Plotting Points

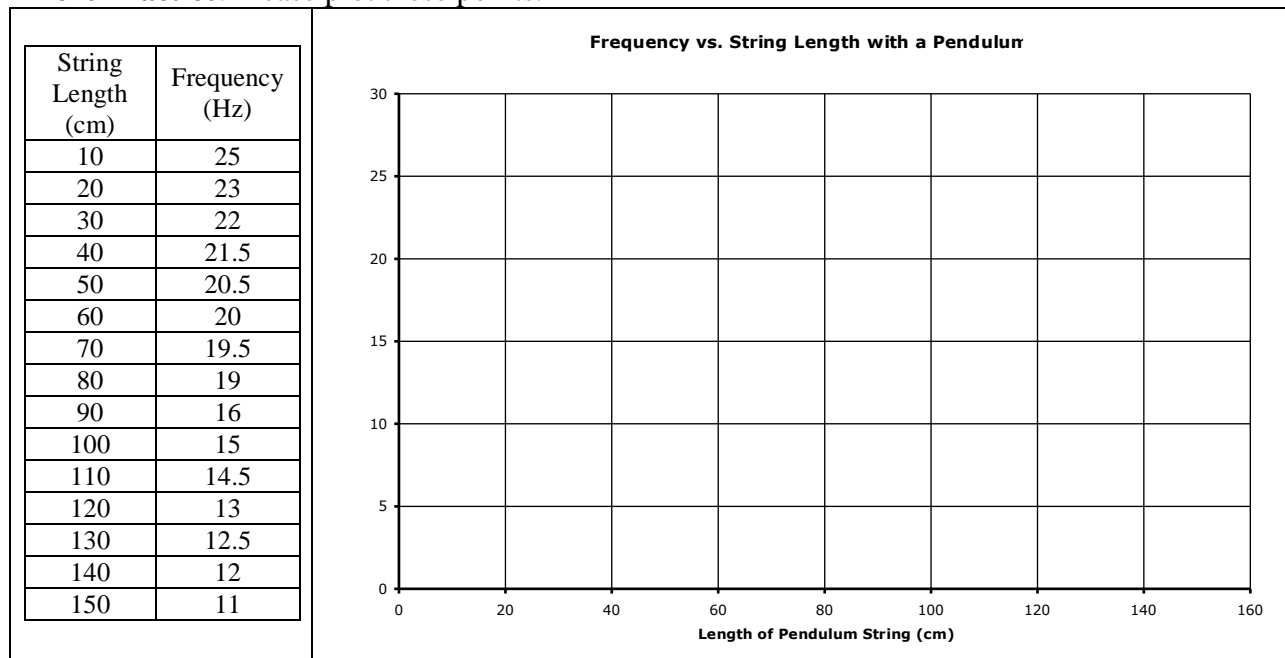
Plotting points can be easy if you follow these simple steps...

- 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.

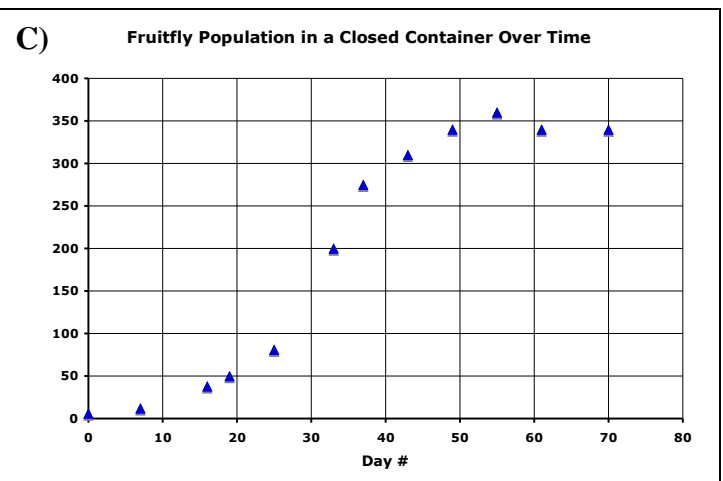
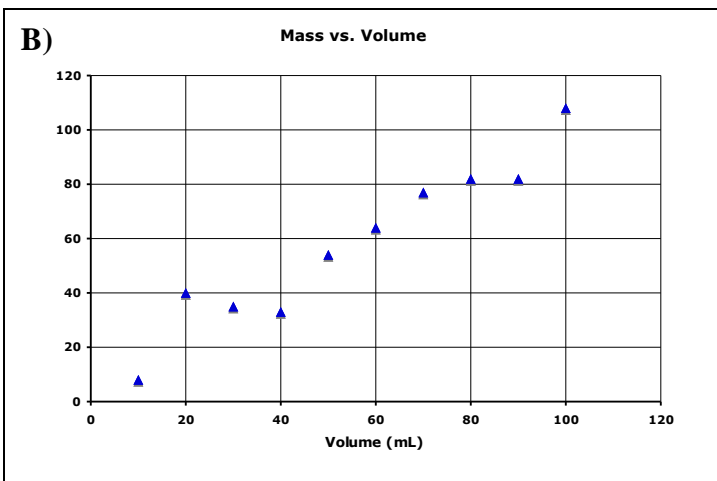
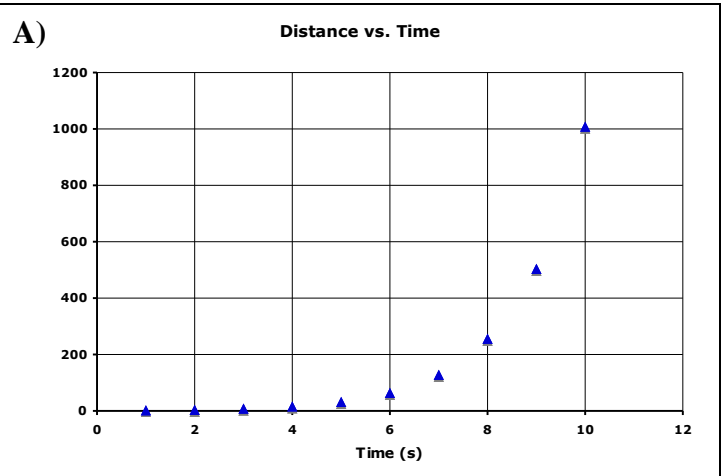
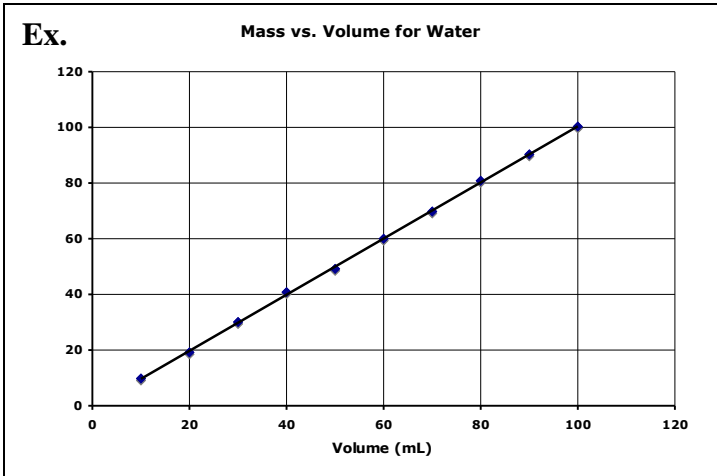


Graphing Skill #5: Best-Fit Line or Curve

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: _____

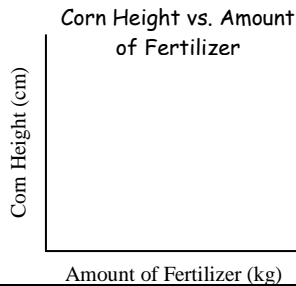
Date: _____ Period: _____

Graphing Skill #6: Creating Titles

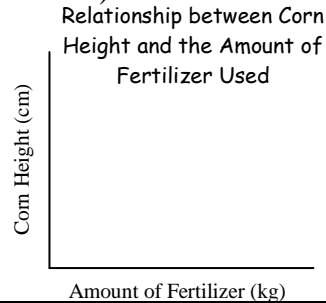
When writing a title for you graph, please remember:

- 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

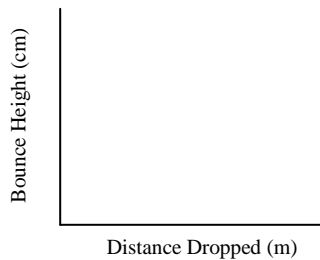
SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



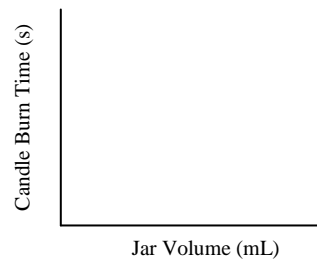
OR



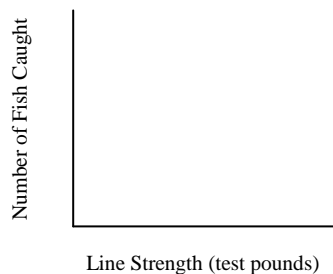
Graph 1: A ball is dropped from several distances above the floor (in meters) and the height it bounces is then measured (in centimeters).



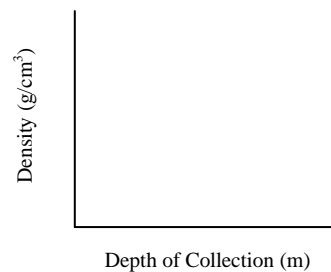
Graph 2: A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.



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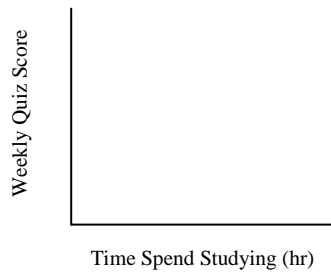
Graph 4: Geologists wanted to know if there was a relationship between the density of a rock and how many meters down it was collected from.



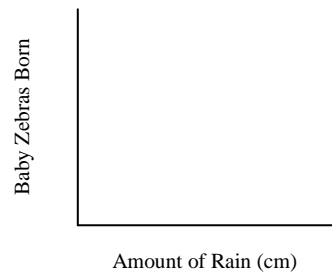
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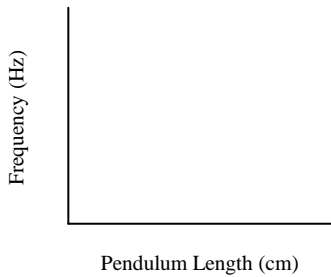
Graph 5: Is there a relationship between the numbers of hours a student studies and the score s/he gets on the weekly quiz?



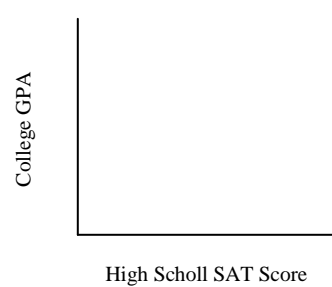
Graph 6: A scientist studied the relationship between amount of rain (in cm) and the numbers of zebra babies born each spring.



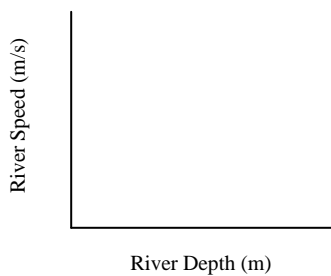
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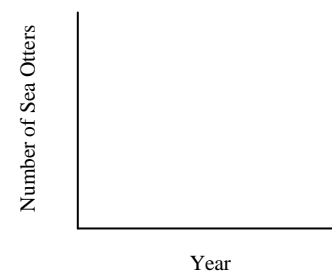
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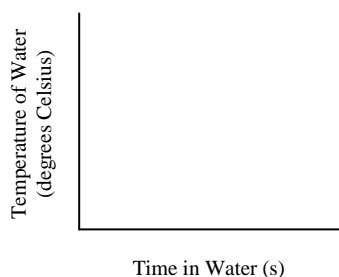
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