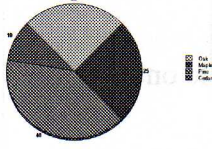
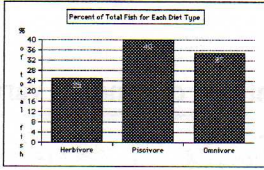
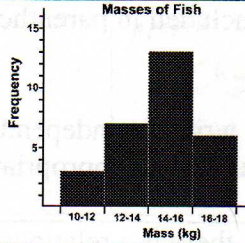
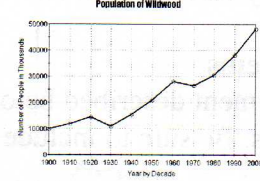
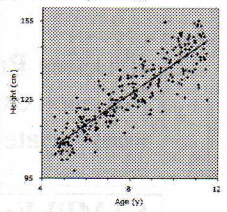


Name: Key

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				X	
2	A graph showing the percentage of the class earning As, Bs, and Cs.	X		X		
3	A graph showing the distribution of trees of different size groups (e.g. 0-10cm, 10-20cm, etc...) in a forest			X		
4	A graph showing the relationship between height and arm length					X
5	A graph showing the percentage of an allowance spent on different categories (e.g. food, movies, etc)	X	X			
6	A graph showing the amount of rainfall, by month over a 12 month period			X		
7	A graph showing the number of ice cream cones purchased as a function of the day's temperature					X
8	A graph showing the number of pushups done each day during a 2-week training program			X		

Name: _____

Date: _____ Period: _____

Graphing Skill #2: Labeling Axes

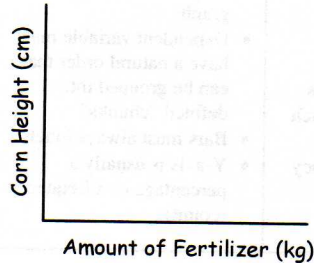
When labeling your axes, keep 3 things in mind:

- 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).



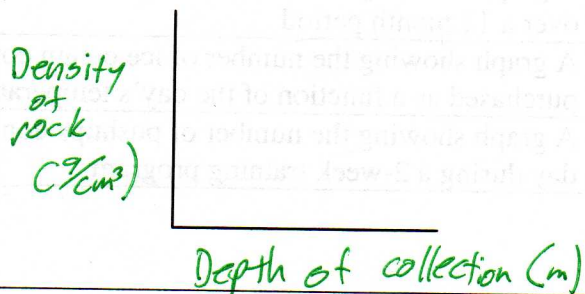
Graph 2: A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.



Graph 3: Is there a relationship between the numbers of hours a student studies and the score s/he gets on the weekly quiz?



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.

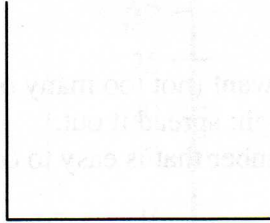


Name: _____

Date: _____ Period: _____

Graph 5: Sea otters were counted over a several years to see if their numbers were decreasing over time.

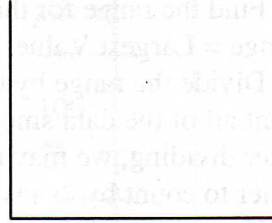
Number of sea otters



Number of Years

Graph 6: Does the amount of nitrogen in the soil (measured in kilograms) affect corn production (measured in kilograms)?

Corn production (kg)



Amount of nitrogen in soil (kg)

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="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>40-5 = 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>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 #: <u>12</u></p> <p>Smallest #: <u>3</u></p> <p>Range: <u>9</u></p>	Distance (cm)	3	5	6	7	9	10	12	<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 #: <u>1.74</u></p> <p>Smallest #: <u>0.22</u></p> <p>Range: <u>1.52</u></p>	Time (s)	0.22	0.51	0.78	1.01	1.23	1.60	1.74
Mass (g)																										
5																										
11																										
14																										
19																										
26																										
30																										
40																										
Distance (cm)																										
3																										
5																										
6																										
7																										
9																										
10																										
12																										
Time (s)																										
0.22																										
0.51																										
0.78																										
1.01																										
1.23																										
1.60																										
1.74																										

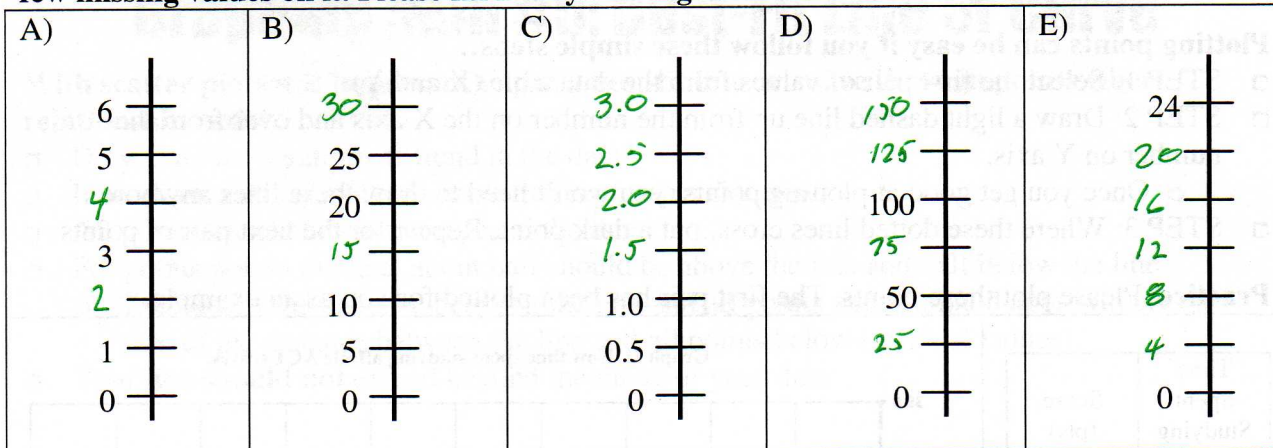
STEP 2: What number do I count by? Assume that our graph has 10 intervals (places to put numbers). If needed, round up to get to a good counting number.

<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 = <u>9</u></p> <p># of intervals = <u>10</u></p> $\frac{9}{10}$ <p>Round to Count = <u>10</u></p>	<p>B)</p> <p>Range = <u>1.52</u></p> <p># of intervals = <u>10</u></p> $\frac{1.52}{10}$ <p>Round to Count = <u>0.2</u></p>
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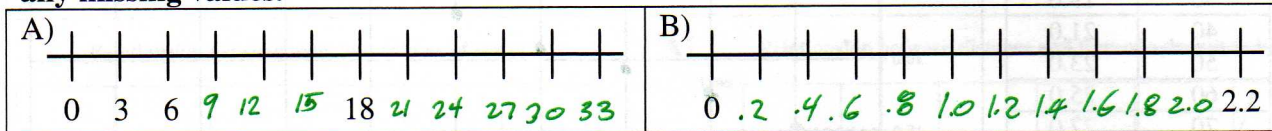
Name: _____

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.



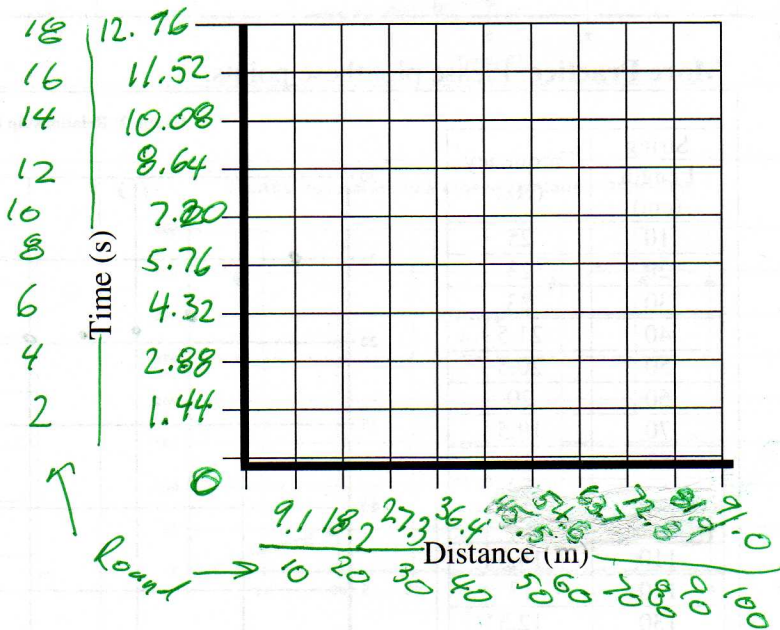
Each of the scales for the *independent* variables has a few missing values on it. Please fill in any missing values.



Putting it all together: Please create appropriate scaling for each axis. Note: you do not have 10 intervals here!! Count them.

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

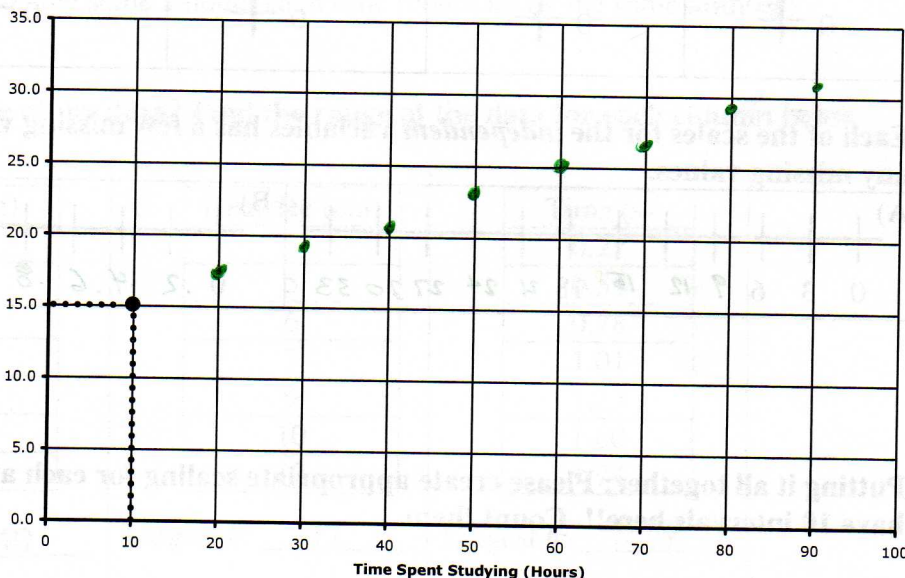
Plotting points can be easy if you follow these simple steps...

- ❑ 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.

Time Spent Studying (hours)	Score (pts)
10	15.0
20	17.0
30	19.0
40	21.0
50	23.0
60	25.0
70	27.0
80	29.0
90	31.0

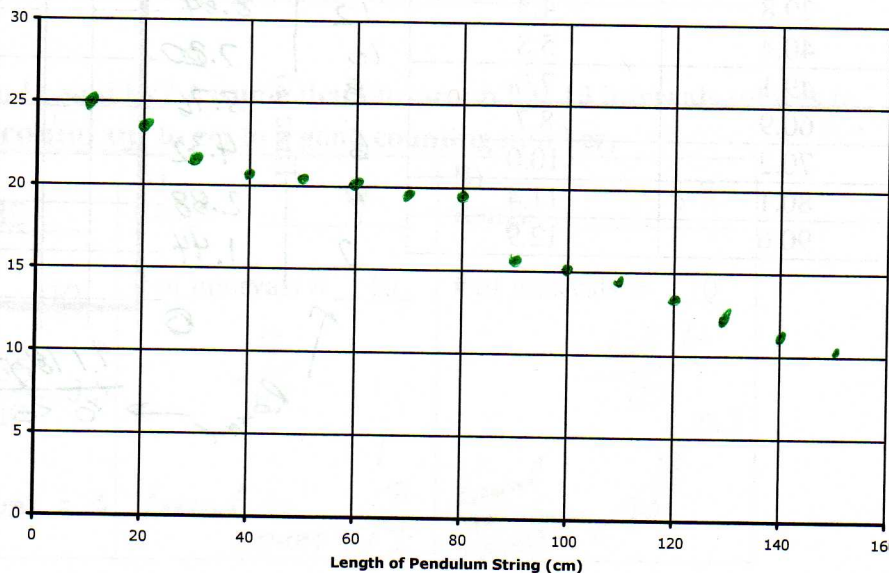
Graph 1: How time spent studying affects ACT scores.



More Practice: Please plot these points.

String Length (cm)	Frequency (Hz)
10	25
20	23
30	22
40	21.5
50	20.5
60	20
70	19.5
80	19
90	16
100	15
110	14.5
120	13
130	12.5
140	12
150	11

Graph 2: Relationship between length of pendulum string and frequency



Name: _____

Date: _____ Period: _____

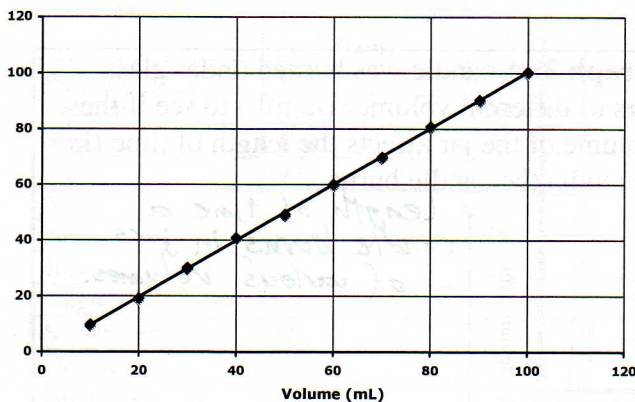
Graphing Skill #5: Best-Fit Line or Curve

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

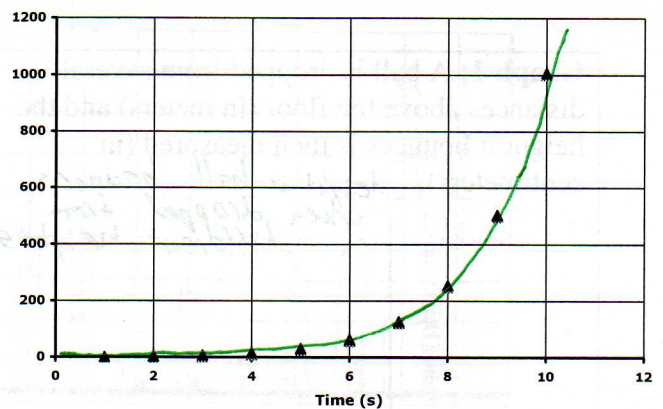
- Do you notice a pattern or trend in the data?
- If so, draw a straight line or curve that represents that trend.
- All points should lie on or very near the line
- For points not on the line, about half should be above the line and half below the line
 - The sum of the distance between the line and 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.

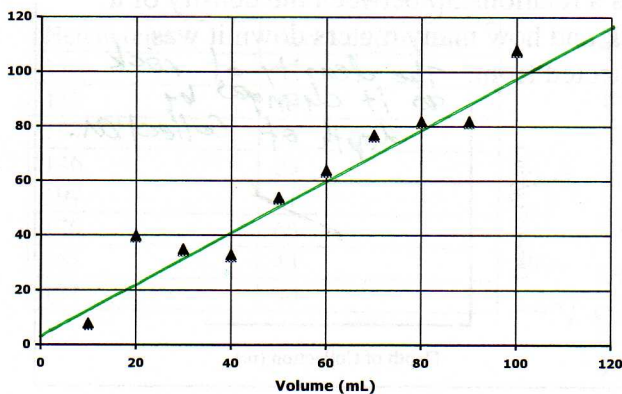
Ex. Relationship between mass and volume of water



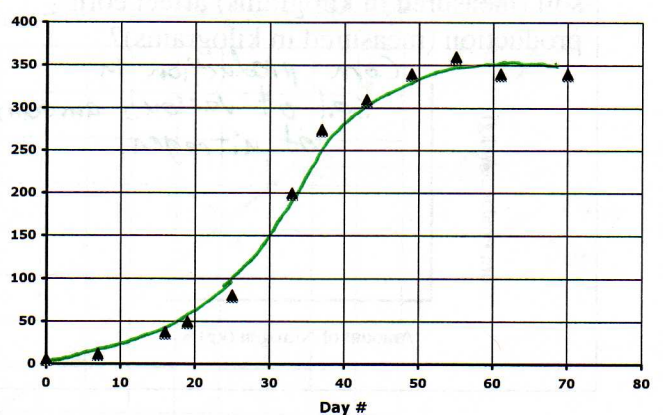
A) Relationship between distance and time of a dropped object



B) How the volume of water affects the mass



C) Fruitfly Population in a Closed Container Over Time



Name: _____

Date: _____ Period: _____

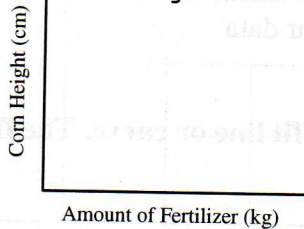
Graphing Skill #6: Creating Titles

When writing a title for you graph, please remember:

- ❑ Must communicate the dependent and independent variables
- ❑ Some graphs need more explanation than others. Make sure your reader would be able to understand what your data represents

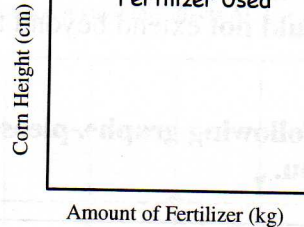
SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).

Effect of Amount Fertilizer
on Height of Corn

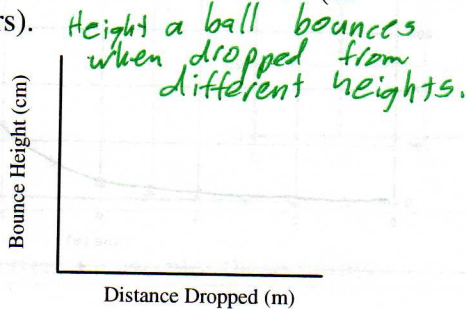


OR

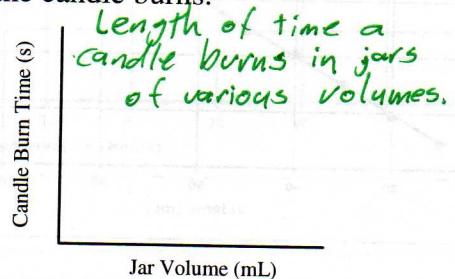
Relationship between Corn
Height and the Amount of
Fertilizer Used



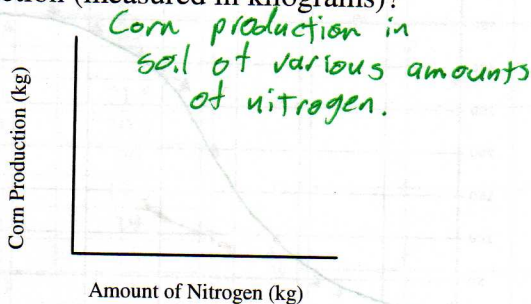
Graph 1: A ball is dropped from several distances above the floor (in meters) and the height it bounces is then measured (in centimeters).



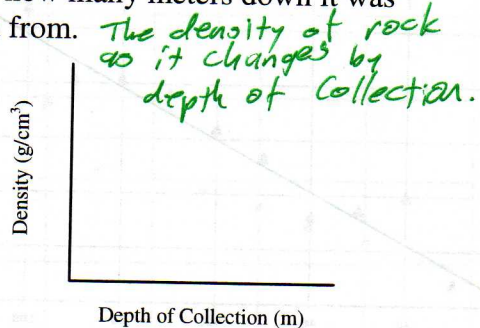
Graph 2: A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.



Graph 3: Does the amount of nitrogen in the soil (measured in kilograms) affect corn production (measured in kilograms)?



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.

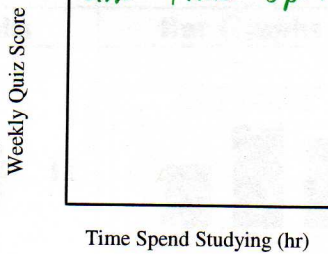


Name: _____

Date: _____ Period: _____

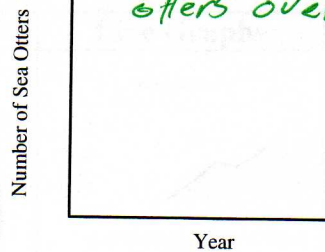
Graph 5: Is there a relationship between the numbers of hours a student studies and the score s/he gets on the weekly quiz?

Variation in students quiz scores and Time Spent studying



Graph 6: Sea otters were counted over a number of years to see if their numbers were decreasing over time.

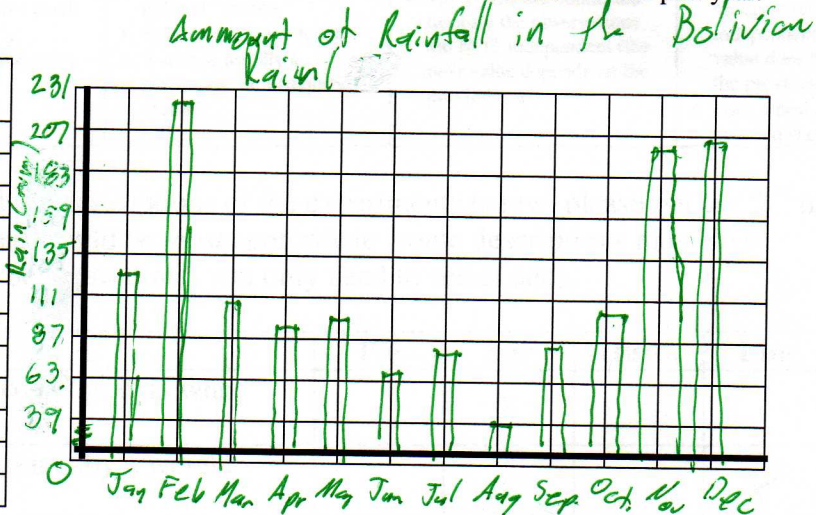
Population of sea otters over time



Design your own graph of the most appropriate type for the following experiment and data set:

A. A meteorologist was measuring the amount of rain received in the rainforest of Bolivia over the past year.

Month	Amount of Rain (mm)
January	125
February	226
March	110
April	90
May	99
June	65
July	78
August	39
September	86
October	102
November	198
December	205



B. A physiologist is studying the relationship between a person's height and the length of his/her arm.

Height (cm)	Arm Length (cm)
174	61
150	43
197	87
146	39
199	81
170	65
165	44
131	30

