

# Principles of Graphing Lab

## Student Version

As data is gathered during a laboratory investigation or experiment, it is often helpful to not only generate data tables, but to graph the data for further analysis, comparison, and interpretation. Graphs help to show relationships between sets of data that may be difficult to appreciate in a table format only. These data are called *variables*. *Independent variables* can be changed, altered, or modified by the scientist running the experiment. *Dependent variables* rely on the conditions of the investigation. Dependent variables depend on the independent variables and can be thought of as the outcomes of an investigation or experiment. The type of graph that will be used in this activity is line graphs. *Line graphs* generally show connections between two sets of data in which the independent variable is continuous.

### Key Concepts:

- Understand the three components of a completed graph: (1) main title, (2) x and y-axis labels, and (3) using correct units of measurement.
- Distinguish between data representing *independent* and *dependent variables*.
- Analyzing and interpreting data that may be difficult to appreciate in a table format.

## Part 1 - Pre-lab Questions

*Q1. What are variables and how do they affect scientific investigations?*

*Q2. Describe the difference(s) between independent and dependent variables.*

Q3. Which is the independent and dependent variable?

*The temperatures in New York City on different days of a specific week*

*Independent Variable* \_\_\_\_\_

*Dependent Variable* \_\_\_\_\_

*A boys weight on his birthday from age 5 to 20*

*Independent Variable* \_\_\_\_\_

*Dependent Variable* \_\_\_\_\_

*Relationship between hours of studying and grades on a test*

*Independent Variable* \_\_\_\_\_

*Dependent Variable* \_\_\_\_\_

Q4. What are the three things that all graphs need to be complete?

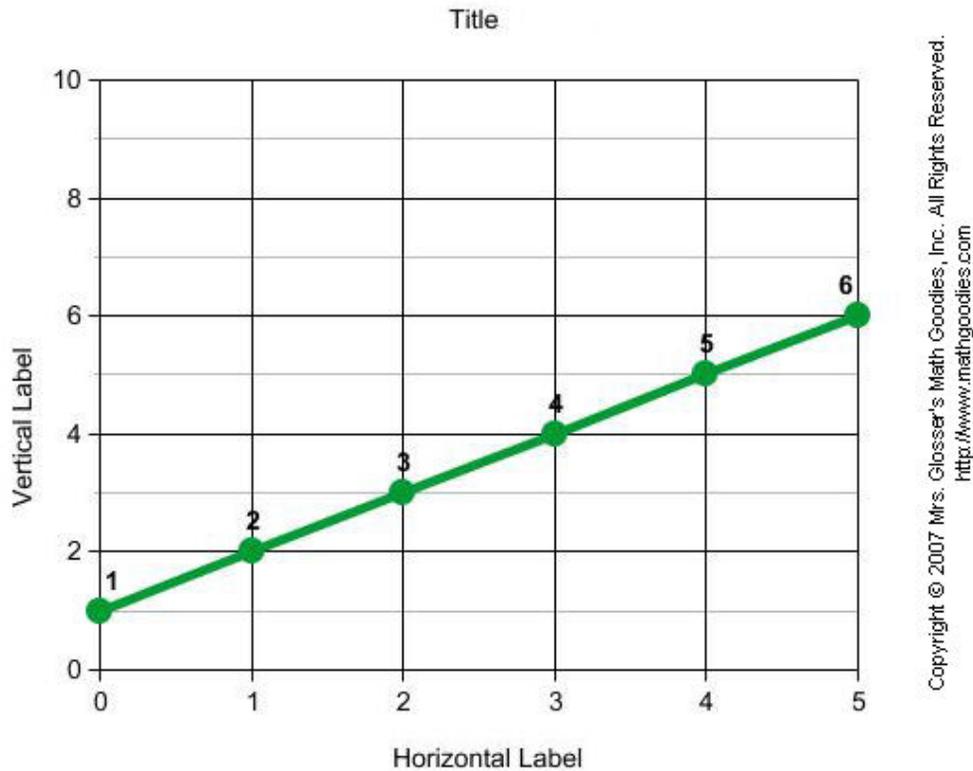
a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

## Part 2 - Making Line Graphs

The graph below will be used to help us define the parts of a line graph and show where each part should appear on a graph.

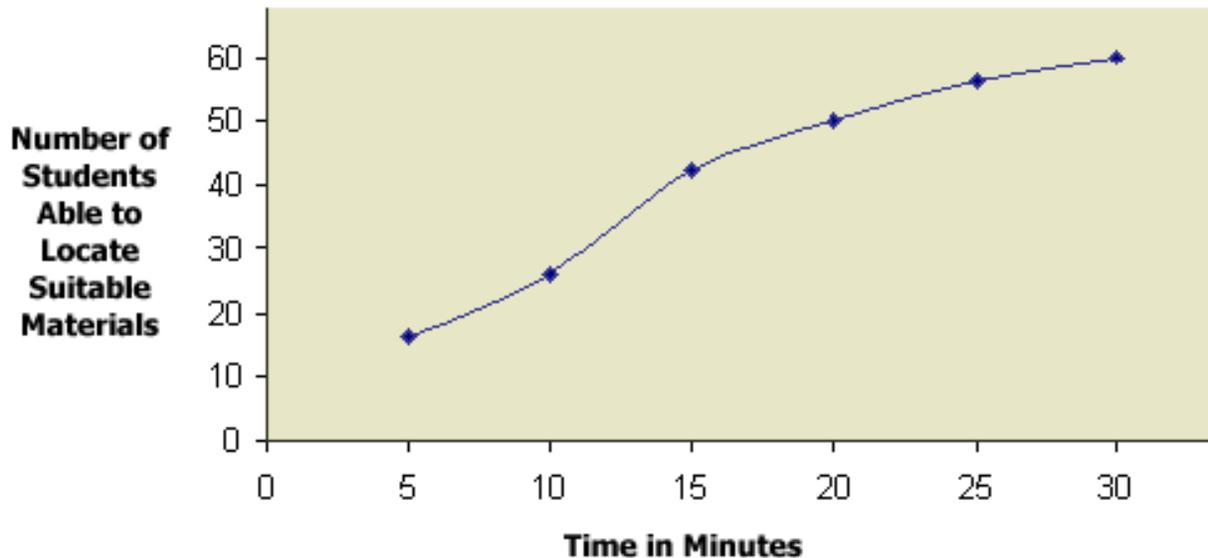


Let's define the various parts of a line graph.

<b>Title</b>	The title of the line graph tells us what the graph is about.
<b>Labels</b>	The horizontal label across the bottom for the <b>Independent Variable</b> and the vertical label along the side for the <b>Dependent Variable</b> tell us what kinds of facts are listed.
<b>Scales</b>	The horizontal scale across the bottom and the vertical scale along the side tell us how much or how many.
<b>Points</b>	The points or dots on the graph show us the facts.
<b>Lines</b>	The lines connecting the points give estimates of the values between the points.

## Example of a Line Graph

### **Time Needed to Locate Suitable Library Materials**



[http://www.galeschools.com/research\\_tools/images/src/LineGraph.gif](http://www.galeschools.com/research_tools/images/src/LineGraph.gif)

### **Steps for creating a Line Graph:**

1. Put a Title at the top of the graph.
2. Identify the Independent and Dependent variables for the graph. The Independent variable will use the horizontal axis and the Dependent variable will use the vertical axis.
3. Identify the range of values for the variables.
4. Draw the vertical and horizontal axes of your graph. Make sure they are long enough for the range of values for each variable.
5. Label the vertical axis with the Dependent Variable and the horizontal axis with the Independent Variable include the units if appropriate.
6. Plot points.
7. Connect points to complete line graph.

**Create line graphs for the following sets of data on a separate sheet of paper.**

1. People in a store at various times of day.

<b>Time</b>	<b>Number of people in store</b>
10am	2
11am	5
12pm	10
1pm	22
2pm	15
3pm	5
4pm	4
5pm	4
6pm	3

*Q5. What was the greatest number of people in the store and at what time did this occur?*

*Q6. During what hours are more people entering than leaving the store? During what hours are more people leaving than entering the store?*

*Q7. One employee is going away to college forcing you to reorganize your employees work hours. On which shift would it be best to reduce the staff: 10am-2pm, 12 pm-4pm or 3pm-6pm? Why?*

2. Relationship of Water Temperature to the Heart Rate of Northwest Pacific Salmon

<b>Temperature</b>	<b>Heartbeats/Minute</b>
10°C	0/min
11°C	8/min
13°C	12/min
15°C	16/min
21°C	19/min
29°C	23/min
31°C	23/min
34°C	20/min
38°C	0/min

*Q8. In what temperature range does the salmon's heart rate stay the same?*

*Q9. Assuming that a higher heart rate indicates the salmon is more comfortable in that temperature, would the salmon prefer that it is 7 degrees warmer or 7 degrees cooler than its ideal temperature? Explain your answer.*

*Q10. During what temperature range does the salmon's heart rate decrease the most: 10°-11°, 31°-34°, or 34°-38°? By how many beats does it decrease?*

3. The average monthly rainfall in millimeters in a tropical town.

<b>Average Rainfall in mm</b>	<b>Month</b>
180	January
199	February
116	March
55	April
38	May
37	June
20	July
19	August
35	September
35	October
53	November
110	December

*Q11. When is the amount of rainfall increasing, decreasing, and staying the same?*

*January-February:* \_\_\_\_\_ *February-August:* \_\_\_\_\_

*August-September:* \_\_\_\_\_ *September-October:* \_\_\_\_\_

*October-December:* \_\_\_\_\_

*Q12. During what season is the rainfall the highest (Spring, Summer, Fall, Winter)?*

*Q13. In between which two months does the amount of rainfall change from decreasing to increasing?*

References: Activity adapted from "Making Graphs" by MacMillan Publishing Co., Inc.