Variables and Graphing

DMJHS Science

What Is Scientific Inquiry?

Scientific inquiry refers to the diverse ways in which scientist study the natural world and propose explanations based on the evidence they gather.

Some scientist follow the "scientific process" which is a series of steps to answer scientific questions:

- Pose a question
- Develop a hypothesis
- Perform an experiment
- Collect and interpret data
- Draw conclusions
- Communicate results

Posing Questions

Scientific inquiry often begins with a questions about an observation.

Examples:

- Why is it cold in the summer?
- Why did I receive a F on that assignment?
- Why are crickets chirping so much at night?

Developing Hypothesis

A hypothesis is a possible answer to a scientific question.

An hypothesis is not a fact!

An example hypothesis:

"The crickets chirping increases

as a result of warmer weather."

What makes a great hypothesis?

1. It's testable
2. It addresses conversion barriers
3. It aims at gaining marketing insights

WIDER
FUNNEL.

Complete the task on the bottom of the page of your notes.

How Do You Design and Conduct an Experiment?

An experiment must follow sound scientific principles for its results to be valid.

To test your hypothesis, you will observe crickets at different air temperatures.

All other <u>variables,</u> or factors that can change in an experiment, must be the same.

Types of Variables

Manipulated Variable	Responding Variable
Independent Variable	Dependent Variable
X- Axis	Y- Axis
The variable that is purposely changed to test a hypothesis.	The factor that may change in response to the manipulated/ independent variable.

Graph Setup

Y axis =
Dependent Variable

X axis = **Independent Variable**

Types of Variables Cont...

Experiments also have controlled variables. Controlled variables are quantities that a scientist wants to remain constant, and she or he must observe them as carefully as the dependent variables.

Types of Variables

Independent	Dependent	Controlled
The one thing you change. Limit to only one in an experiment.	The change that happens because of the independent variable.	Everything you want to remain constant and unchanging.
Example: The liquid used to water each plant.	Example: The height or health of the plant.	Example: Type of plant used, pot size, amount of liquid, soil type, etc.

Independent Variable — A

Dependent Variable — B

Controlled Variables — C

Setting Up a Controlled Experiment

A <u>controlled experiment</u> is an experiment in which only one variable is manipulated at a time.

You decided to test the crickets at three different temperatures: 15℃, 20℃ and 25℃.

Complete the activity on the bottom of the page for extra practice.

Collecting and Interpreting Data

You are almost ready to begin your experiment. You decided to test five crickets, one at a time, at each temperature.

Data are the facts, figures, and other evidence gathered through and quantitative observations.

Do you know the difference between quantitative and qualitative data?

Drawing Conclusions

A <u>conclusion</u> is a summary of what you have learned from an experiment.

To draw your conclusion, you must examine your data objectively to see if they support or do not support your hypothesis.

A conclusion is unreliable if it comes from an experiment with results that cannot be repeated.

You data won't always support your hypothesis.

Communicating Results
This is the sharing of ideas and results with others through writing and speaking.

What Are Scientific Law and Theories?

A scientific theory is a well-tested explanation for a wide range of observations and experimental results.

Ex: The atomic theory- all substances are composed of atoms.

A scientific law is a statement the describes what scientist expect to happen every time under a particular set of conditions.

A scientific law describes an observation pattern in nature without attempting to explain it.

What Kinds of Data Do Line Graphs Display?

A <u>graph</u> is a "picture" of your data. A graph helps to see what the data collected from an experiment means.
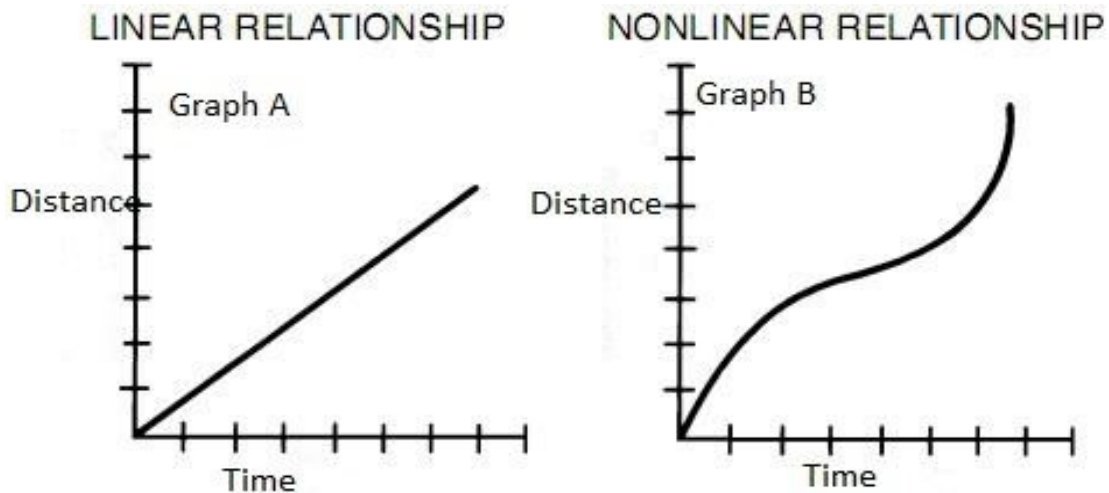
<u>Line graphs</u> display data that show how one variable (the dependent variable) changes in response to another variable (the independent variable).

Graph Setup

Y axis =
**Dependent
Variable**

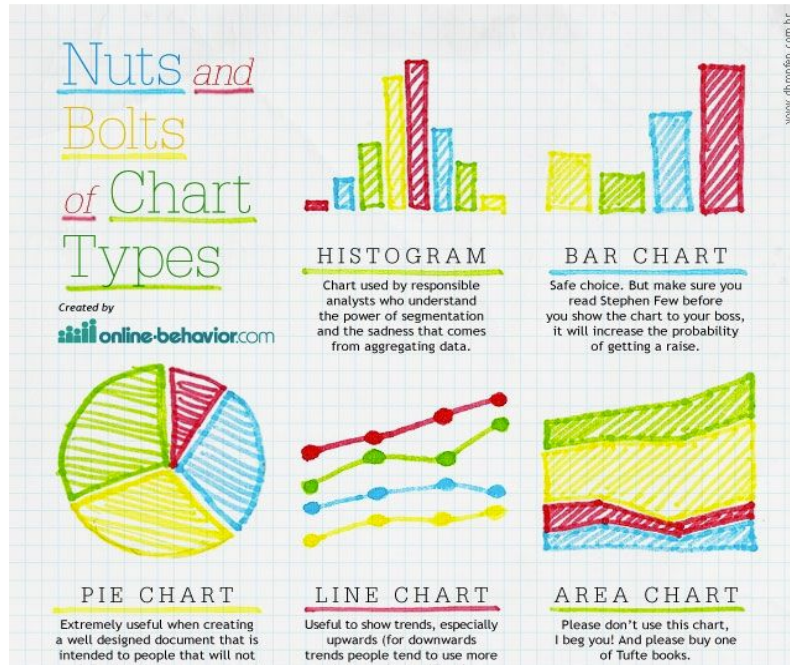X axis = **Independent Variable**
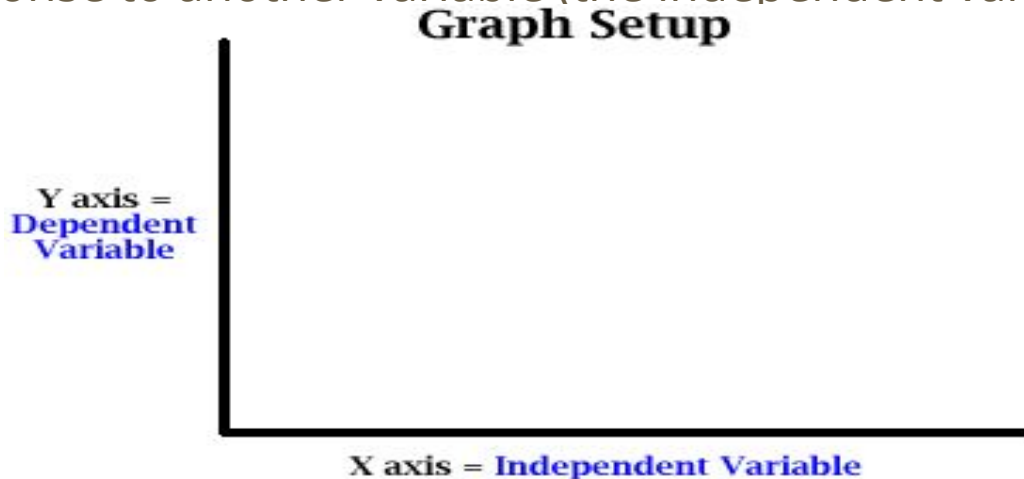
Line Graphs Cont..

A line graph in which the data points yield a straight ing is a <u>linear graph</u>.

The kind of graph in which the data points do not fall along a straight line is called a <u>nonlinear graph</u>.

LINEAR RELATIONSHIP

Graph A

Distance

Time

NONLINEAR RELATIONSHIP

Graph B

Distance

Time

Other Graphs

Chart & Graph Types Infographic

Nuts and Bolts of Chart Types

Created by online-behavior.com

HISTOGRAM
Chart used by responsible analysts who understand the power of segmentation and the sadness that comes from aggregating data.

BAR CHART
Safe choice. But make sure you read Stephen Few before you show the chart to your boss, it will increase the probability of getting a raise.

PIE CHART
Extremely useful when creating a well designed document that is intended to people that will not

LINE CHART
Useful to show trends, especially upwards (for downwards trends people tend to use more

AREA CHART
Please don't use this chart, I beg you! And please buy one of Tufte books.

www.dbronfen.com.br

Line graphs are powerful tools in science because they allow you to identify trends, make predictions, and recognize data.

Pie/circle graphs are used to show parts of a whole.

Bar graphs are used to compare amounts.