Data Analysis and Graphing

Data from Measurements

Physical Information (*qualitative or quantitative*) collected about matter or the change in matter in a chemical system

Quantitative Measurements

Measurements where data is collected using a measuring tool to compare to other measurements of the same type

Qualitative Measurements

Measurements where no data is collected but comparisons are made using the main human senses (*sight, smell, touch, sound, taste*)

2

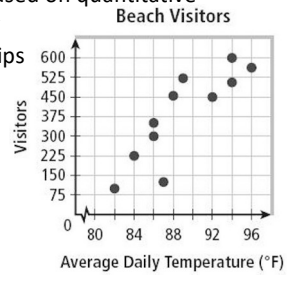
Analyzing Quantitative Data with Graphs

Systematic Data Collection

Data is collected using measuring devices based on quantitative sources (*mass, volume, length, etc*) The way data is collected is based on data relationships with variables and how variables change

Graphing and Data Analysis

Graphing is a method for showing relationships (*how data changes*) between variables when one or more variables change.



3

Understanding X/Y Graph Plots

Main Parts of a Graph

Axis

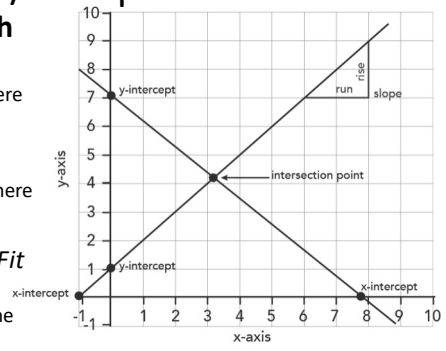
The main sides of the graph where data is plotted on grid lines

Grid Lines

The main layout of the graph where the points are placed

Plot Lines / Line of Best Fit

The main connection point between data points, straight line through the average of the data



4

Understanding X/Y Graph Plots

Main Parts of a Graph

Independent Variable (*x*)

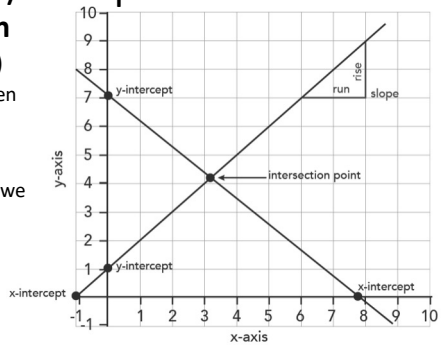
The variable that we control when we create the data set for graph

Dependent Variable (*y*)

The variable that changes when we create the data set for the graph

Intercepts (*x and y*)

The place where the line of best fit crosses the x and y axis lines on an x/y graph plot



5

Understanding X/Y Graph Plots

Main Parts of a Graph

Slope

The *steepness* of a graph, the change in the y-axis relative to the x-axis (*shown* -)

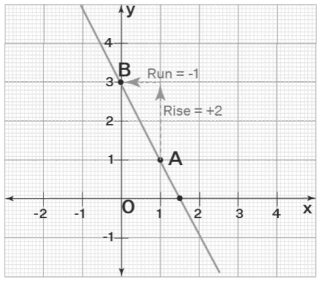
Signs of the Slope

+ (*positive*) Slope: Y and X axis both increase or decrease

+ Slope = *Direct Relationship*

- (*negative*) Slope: Y and X axis move in opposite directions

- Slope = *Indirect Relationship*



$$\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{+2}{-1} = -2$$

6

Understanding X/Y Graph Plots

Variable Relationships in Graphing

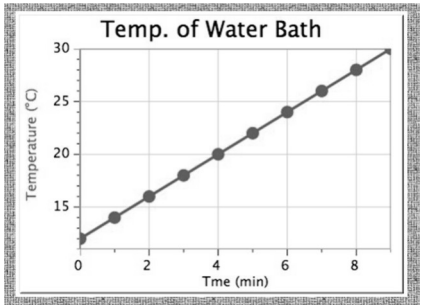
Direct Relationship

The dependent variable (*y*) changes in the same direction as the independent variable (*x*)

Slope (*m*) = positive (*+*)

X and Y on opposite sides of eqn

$$X = A \cdot Y$$



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Understanding X/Y Graph Plots

Variable Relationships in Graphing

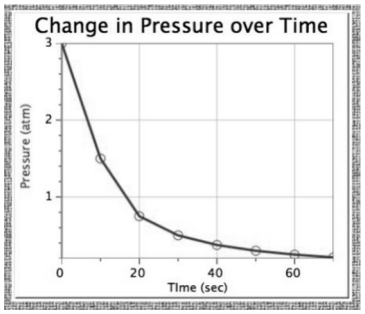
Indirect Relationship

The dependent variable (*y*) changes in the opposite direction as the independent variable (*x*)

Slope (*m*) = negative (-)

X and Y on same side of equation

$$A = X \cdot Y$$



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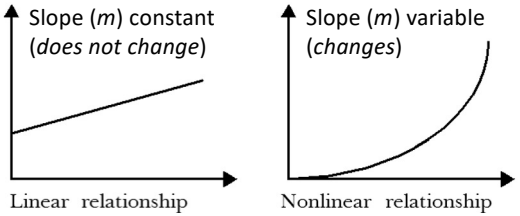
Linear and Non-Linear Relationships

Linear – Variables change at same rate (*speed*) to each other

Non-Linear – Variables change at rates that change over time



Science prefers linear over non-linear relationships for data analysis

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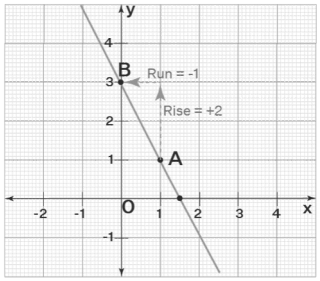
Calculating Slope of a Graph

Point Point Slope Method

$$m = \frac{\text{Rise}}{\text{Run}} = \frac{Y_2 - Y_1}{X_2 - X_1}$$

$A = (X_1, Y_1)$ $B = (X_2, Y_2)$



$$\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{+2}{-1} = -2$$

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