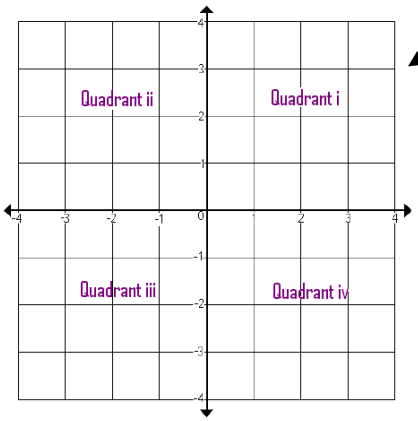
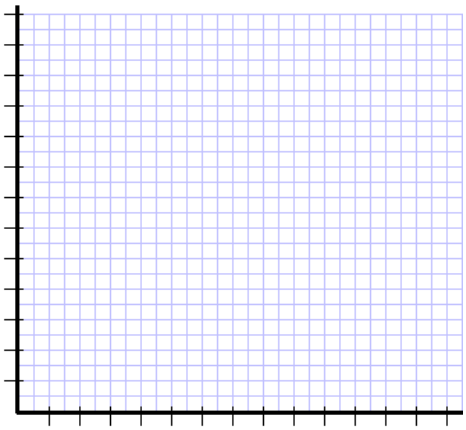
The Basics of Graphing for Academic Science

In Academic General Science, we will work in **Quadrant 1** of the Coordinate Plane Graph



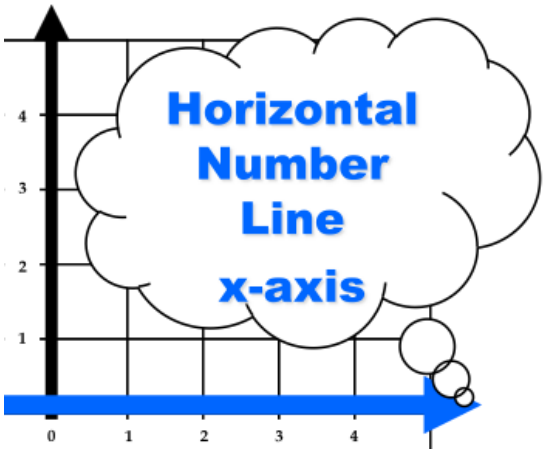
Your Graph will be set up like this



Step 1: Knowing the Axes (/' æksi: z/)

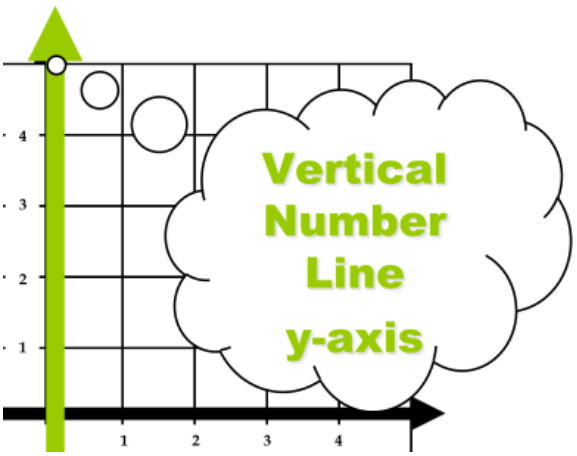
The **X-Axis** is the horizontal axis.

It is the axis that goes side to side.



The **Y-Axis** is the vertical axis.

It is the axis that goes up and down.



Step 2: Labeling the Axes (/' æksi: z/)

X-Axis: Place the manipulated (independent) variable on the x-axis **with units**.

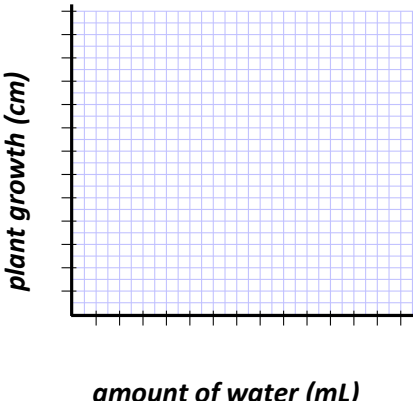
Y- Axis: Place the the responding (dependent) variable on the y-axis **with units**.

Example:

How does the ***amount of water*** affect ***plant growth***?

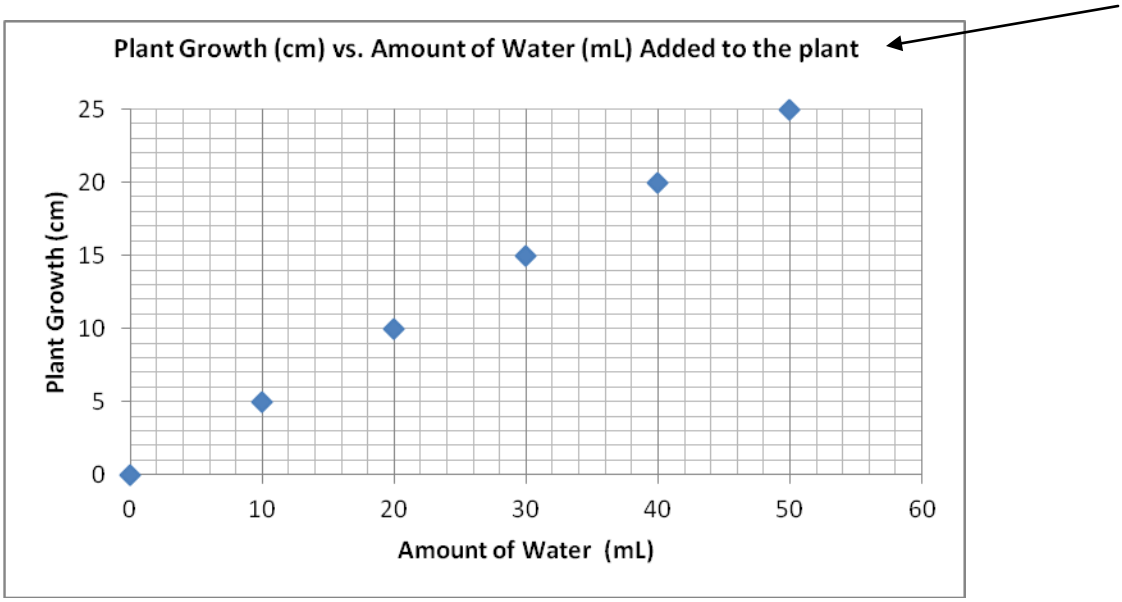
Manipulated / Independent

Responding / Dependent



Step 3: Title your graph

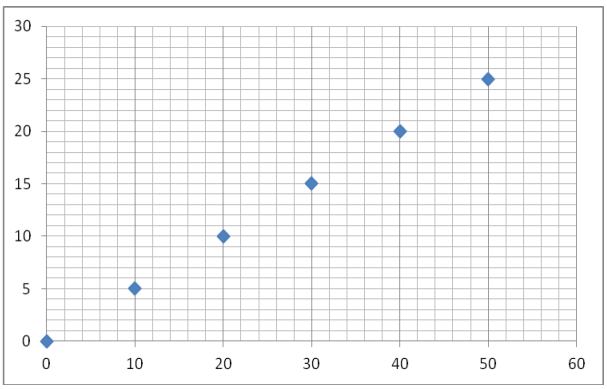
- The correct form for your title is ***responding (dependent) variable vs. manipulated (independent) variable***



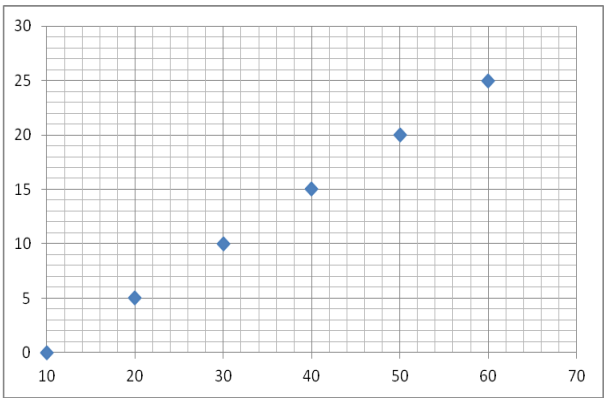
Step 4: Determine your Increments

- **Equal increments** must be used on a given axis.
  - The increments do ***NOT*** need to be the same for both axes. (See Example 1)
  - The increments can, but do ***NOT*** need to start at zero (See Example 2)
- Only label the **MAJOR** gridlines

Example 1: on the x-axis, every block may equal 10 milliliters, but on the y-axis, every block may equal 5 centimeters.



Example 2: on the x-axis, the numbers start at 10, on the y-axis, the numbers start at 0.



Step 5: Plot your data points

- Plot each point which is represented by an ordered pair (x,y)

X manipulated	Y responding
Amount of water (mL)	**Plant Growth (cm)**
0	0
10	5
20	10
30	15
40	20
50	25

This will **not** be labeled for you. If this helps you, you may label it.

* Move on the horizontal (⟶) according to the x value

* Then, move on the vertical (↑) according to the y value

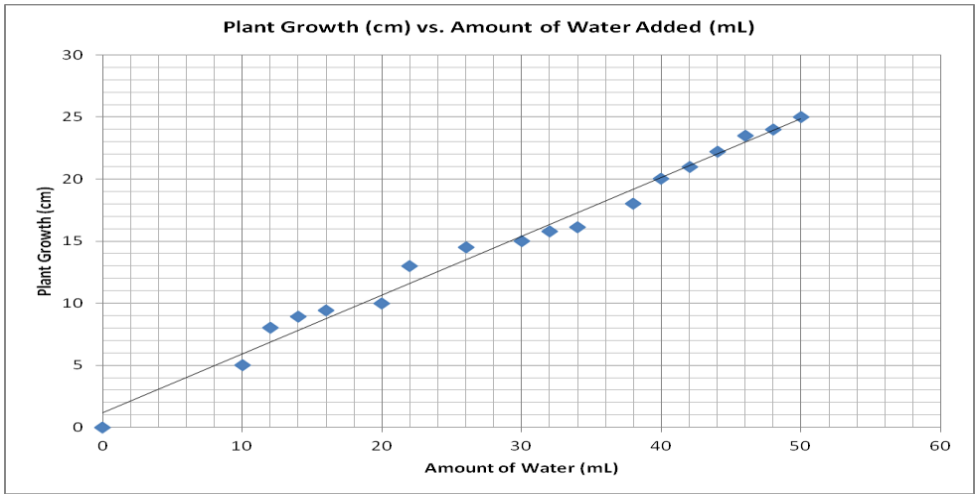
* Place your data point at that location

Look at data table: (10, 5)…this means move over 10, up 5.

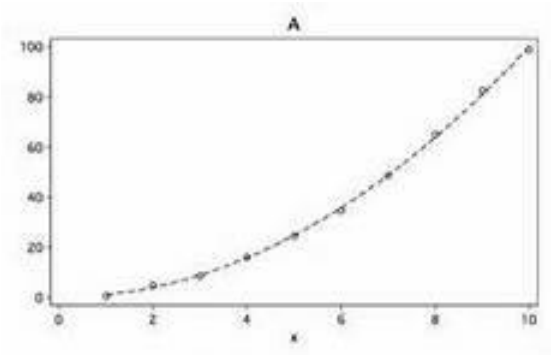
Step 6: Analyze the graph

- If the data is straight, use a ruler and draw **a line of best fit** and then calculate slope. (See Example 1)
- If the data is curved, then draw a best fit curve that is smooth. (See Example 2)

Example 1

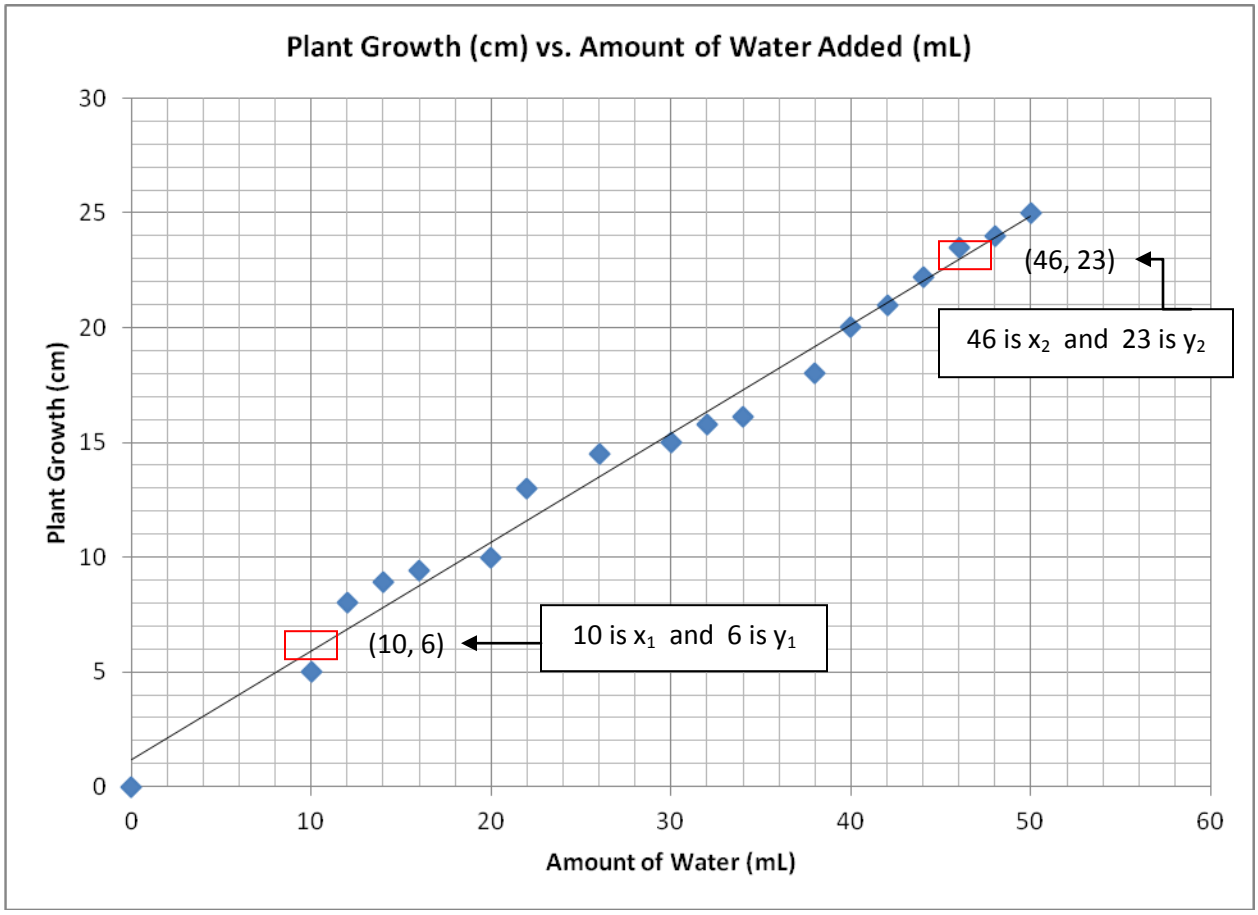


Example 2: This is to just show the curve.



Step 7: Calculating Slope (for line graphs)

- Identify two points on the graph where **the best fit line crosses through the corner of a grid block**
  - It does **not** need to be a data point. Generally, it will not be a data point. *(see boxes on graph)*
- Label the coordinate points (x, y) with the appropriate numbers *(see the numbers in parentheses on graph)*
- Use the slope formula to calculate slope: **slope = $(y_2 - y_1) / (x_2 - x_1)$**
- Turn all fractions into decimals by dividing the numerator (top) by the denominator (bottom)
- Label the unit y/x *(see calculation example at the bottom of the page)*



To calculate the slope of the best fit line:

$$\frac{(y_2 - y_1)}{(X_2 - X_1)} = \frac{(23 - 6)}{(46 - 10)} = \frac{17}{36} = \textbf{.472 cm/mL}$$

Step 8: Writing the conclusion statement

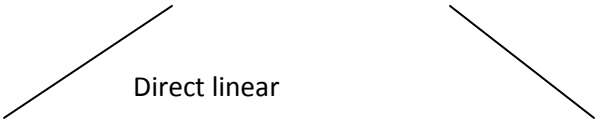
- Using your line of best fit, determine how the variables are acting
    - The manipulated (independent) variable should always increase
    - Determine if the responding (dependent) variable is increasing or decreasing as the manipulated (independent) increases

- Your conclusion statement will be written: As the manipulated/independent variable increases, the responding/dependent variable _____. (Fill in the blank with increases or decreases based on your graph)

Step 9: Determining the Relationship

- After you have written your conclusion statement, use it to determine your relationship
    - **Types of Relationships**
        - **Direct:** As manipulated (dependent) variable **increases**, the responding (dependent) variable **increases**.
        - **Inverse:** As manipulated (dependent) variable **increases**, the responding (dependent) variable **decreases**.

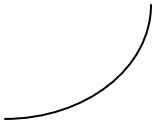
    - If your line is straight, it is considered to be direct or inverse linear



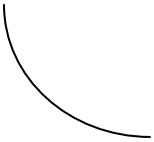
Direct linear

Inverse linear

    - If your line curves, it is considered to be direct or inverse curvilinear



Direct curvilinear



Inverse curvilinear