

NATIONAL  
MATH + SCIENCE  
INITIATIVE

*An easy way to  
remember this is with  
the phrase DRY MIX.*

*Dependent Responding*

*Y-axis*

*Manipulated*

*Independent X-axis*

# Graphing Skills

## Steps to Drawing an Acceptable Graph

1. Identify the independent and dependent variables.
  - a. The independent variable is the one “I” control (you manipulate it).
  - b. The dependent variable is the one that changes in response to the independent variable.
2. Assign each axis the appropriate variable and label each accordingly. Make certain to include the appropriate units.
  - a. The independent variable goes on the x-axis and the dependent variable goes on the y-axis.
  - b. In some graphs where time is the dependent variable, time is placed on the x-axis. This allows the slope of the line to represent rate.
3. Select and label the numerical scales on both axes. Most of the time, the scales on the two axes will be different.
  - a. Determine the “range” (the difference between the largest and the smallest numbers) in the data that is being plotted on the axis.
  - b. Next, count the number of spaces (“boxes”) on the graph paper along the axis being used. Using the range and the number of spaces, decide on a value for each space along the axis. Typically use only the values 1, 2, or 5, or multiples of those values (e.g. 0.1 or 50) for the value of each. This makes plotting a number that is not exactly on one of the box lines easier.
  - c. Label the lines of the axis (not all lines need be labeled).
  - d. The scale factor that you choose should allow your graph to be as large as possible (it must cover at least half of the available graph paper).
4. Plot the data points (choose a shape for the points that will allow them to still be seen once a line of best-fit or best smooth curve has been drawn).
5. Write a title at the top of your graph. The title should clearly state the purpose of the graph and include the independent and dependent variables
6. If there are multiple sets of data or multiple trend lines, a key must be included. If multiple colors are not available, use different types of shapes for points (stars, circles, squares, etc.) and different types of lines (long dashed, solid, short dashed, etc.).

7. Draw a “line of manual-fit” that passes through or between as many points as possible.
  - a. If the data points appear to lie roughly in a straight line, draw the best straight line you can with a ruler and sharp pencil. Have the line pass through as many points as possible, with approximately the same number of points on one side of the line as the other. (Do not “connect the dots” with straight segments — it is not likely that the erratic graph that would result actually reflects nature’s behavior.)
  - b. If the points do not form an obvious straight line, draw the best smooth curve that you can. Do not zigzag back and forth to force your curve through every one of the points.
  - c. Not all graphs pass through the origin (0,0). If (0,0) is not an obvious point for your data, do not force the line of best-fit to cross the y-axis at that point.

## SAMPLE OF AN ACCEPTABLE GRAPH

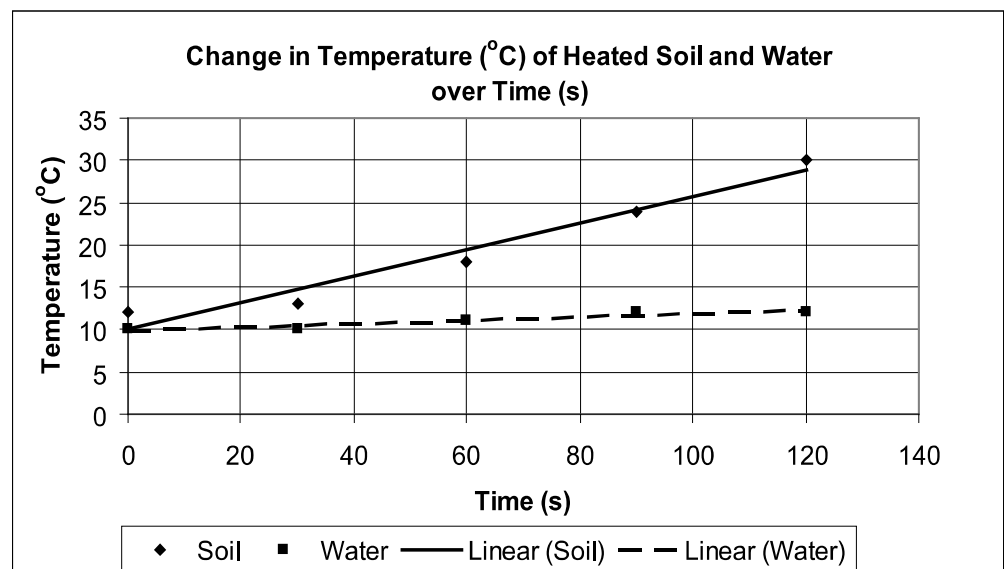
Time (s)	Temperature of Soil (°C)	Temperature of Water (°C)
0	12	10
30	13	10
60	18	11
90	24	12
120	30	12

Independent Variable = Time (s) (goes on x-axis)

- I control the time at which I take the temperature, not the temperature at which I record the time.

Dependent Variable = Temperature (°C) (goes on y-axis)

- The temperature depends on what time you take the reading, it depends on how long it has had to heat up.



Notice the lines of best-fit do not pass through the (0,0) mark, just as the data does not.

Slope – to calculate slope choose two points from the line of manual-fit

$$\text{Slope} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Interpolation – obtaining information from locations between data points

Extrapolation – predicting information from locations beyond your data points