

Lesson: Rules for Graphing

An independent variable is a manipulated variable in an experiment that determines the change in the dependent variable. e.g., The volume of water added to a plant would determine the plant height that results. Therefore the volume of water added is the independent variable.

Step #1: Draw the x and y-axis so that it uses up most of the page.

Step #2: Label the x-axis with the independent variable and the y-axis with the dependent. Abbreviate the units and put the units in brackets.

Step #3: Select an appropriate scale for the data. To do this, one should look at the largest value given in the data table and divide the appropriate axis into **increments of equal value**. The scale on the x-axis does not have to be the same as the y-axis.

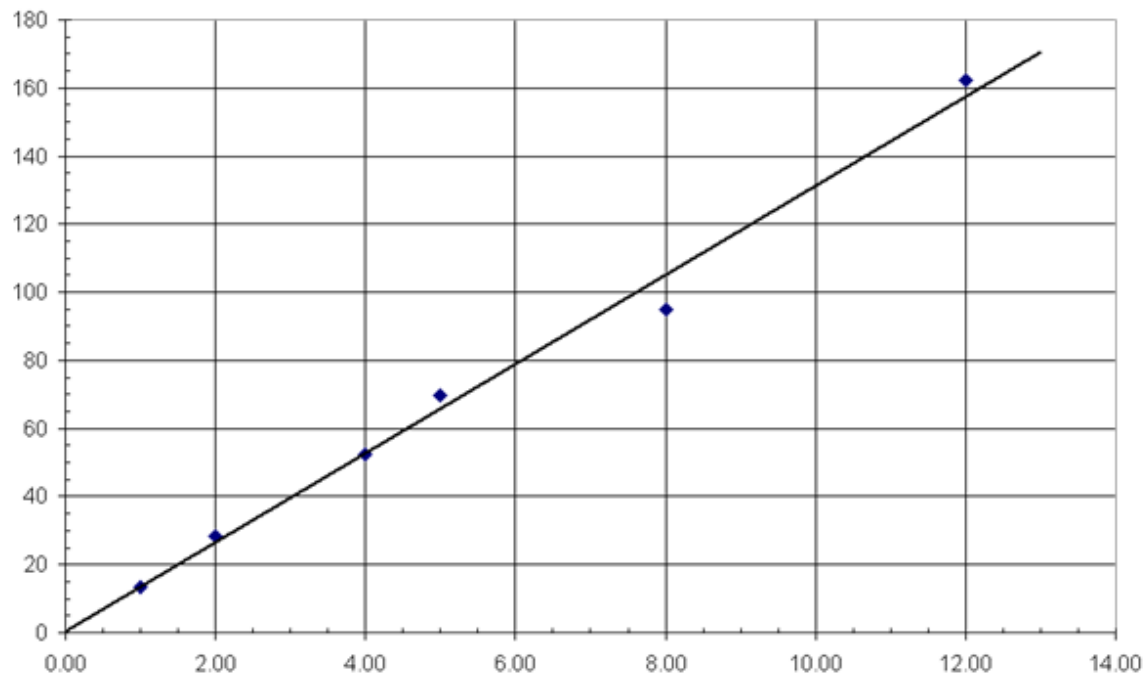
Step #4: Plot the data and circle your points to show a degree of uncertainty in the measurements. A computer program will use enlarged points which serve the same purpose.

Step #5: Draw the best fit line (or curve) which will pass through a maximum number of points. Not all points need to be on the line, but a relatively equal number of points should be above and below the line of best fit. The line need not pass through the origin unless this value is implied. **Do not connect the dots** unless instructed to do so! For a curve, it should be drawn using the rules for a straight line and the magnitude of the curve should be consistent throughout.

Step #6: Write the equation if the relationship is a straight line.
Use slope-intercept form ($y = mx + b$)

Step #7: Provide a title in the form of a figure caption which is **located at the bottom** of the page. The dependent variable is listed first in the title.

Complete the graph below for the height (cm) of a plant over the course of time in days.



Part II: Interpolating and Extrapolating

Notes:

Interpolation - a method of determining an unknown value that occurs within a given data set.

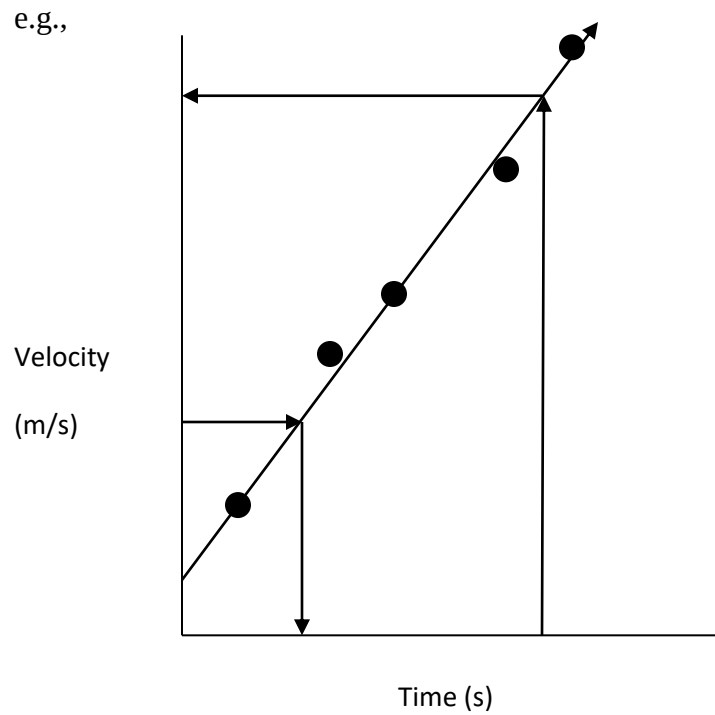


Figure 1: The velocity (m/s) of a train over the course of time during acceleration.

e.g., What is the velocity (m/s) of the moving object at 30s?

Answer:

e.g., How much time (s) elapses when the object reaches a velocity of 20m/s?

Answer:

Extrapolation – a method of making predictions about an unknown value that occurs beyond a given data set. If the relationship of the graph is linear, the equation

$Y = mX + b$ can be used.

<http://www.ltcconline.net/green/java/BasicAlgebra/LineGraph/LineGraph.htm>

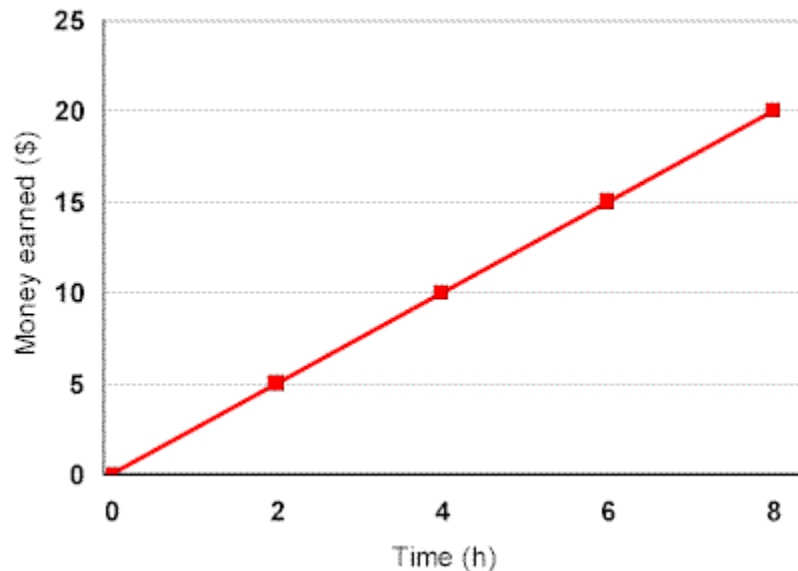


Figure 2: The money earned (\$) vs time(h) by a student working at a fast food restaurant.

e.g., Determine the time required to earn \$100 based on the relationship in the above graph using $Y = mX + b$.

Step #1: Determine the value for b (Y-intercept).

Answer: *The graph crosses the Y-axis at zero therefore $b = 0$.*

Step #2: Determine the value for “ m ” (the slope) using any two points on the graph. Points that are further apart on the graph will give a more accurate slope value.

Answer: The slope is determined using $\text{Rise/Run} = \$20/8h = 2.5\$/h$

Step #3: Substitute into the equation $Y = mx + b$ all of the known values and solve for the unknown value.

$$Y = mX + b$$

$$100 = 2.5X + 0$$

$$100 = 2.5X$$

$40 = X = \text{time (h)}$ because the x value represents the X- axis.

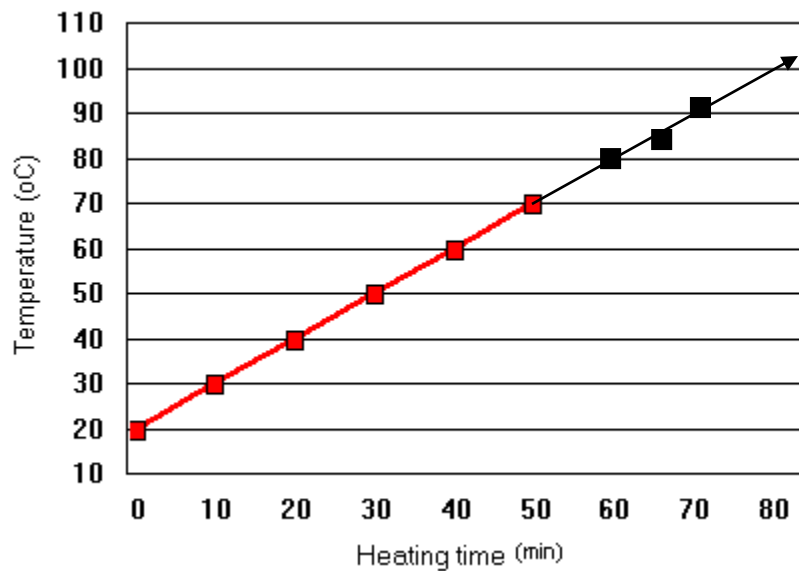


Figure 3: The temperature (°C) of water as it is heated over time (min)

Do several questions where the x value is unknown

e.g., Determine the temperature if the water is heated for 200 minutes.

Step #1: Determine the Y-intercept (b)

Answer: $b = 20$

Step #2: Determine the slope (m)

Answer: $Slope = Rise/Run = 70^{\circ}C/70min = 1^{\circ}C/1min = 1^{\circ}C/min$

Step #3: Substitute into $Y = mX + b$ all the knowns and solve for the unknown value.

$$Y = mX + b$$

$$Y = 1(200) + 20 \text{ which is the same as } Y = 200 + 20$$

$$Y = 220 = \text{temperature } (^{\circ}C) \text{ because the y value represents the Y – axis.}$$

Do several questions where the y value is unknown.