

Scaling a Graph

Name(s): _____

When creating graphs of functions in mathematics, we usually use the standard Cartesian coordinate system with an origin at (0, 0) and all four quadrants. In science, however, there is often a need to scale the axis so as to graph very large or very small values. In addition, the positive quadrant is often the only one of interest.

To Graph This Type of Data:

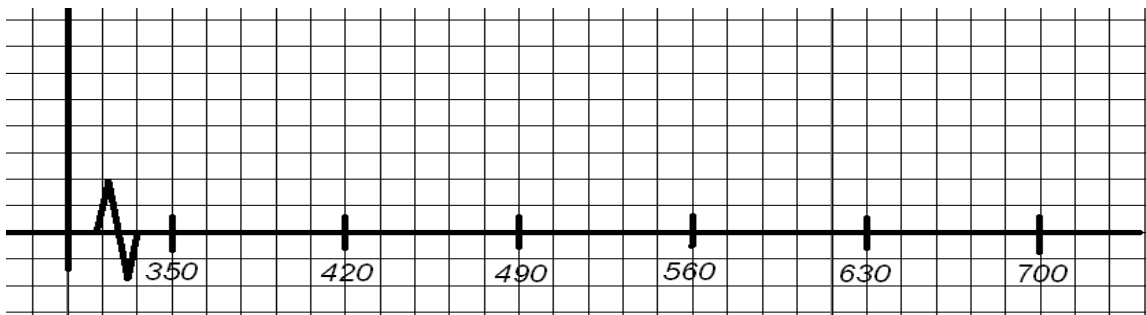
- choose an appropriate starting and ending point for each axis
- determine the appropriate scale for each axis by subtracting the starting point from the ending point and dividing by the number of squares you have on the graph paper – remember that the scale on the horizontal need not be the same as that for the vertical
- place a \backslash in between the origin (0,0) and the initial value

For Example: Consider the data to the right and let's look at how to scale the x-axis.

- The minimum value for Temperature is 356 and the maximum value is 698. So 350 would be a good starting point and 700 would be an appropriate ending point.
- Suppose the graph paper is about 25 units wide. The scale would be determined by finding the range $700 - 350 = 350$ and then dividing by 25, $350/25 = 14$

| Temperature (Kelvin) | Pressure (torr) |
|----------------------|-----------------|
| 356 | 0.24 |
| 406 | 0.97 |
| 590 | 1.78 |
| 698 | 4.98 |

Hence your graph would start at 350 with the \backslash between 0 and 350, then the scale would increase by 14 until it reached 700.



The following data was provided to the Math Department by the Mesa College Chemistry Department as examples of data students have to graph in their classes.

1. The sugar content of a soft drink can be determined by measuring its density. The following data represent a series of density measurements on aqueous sugar solutions. Using this data, plot the density as a function of % sugar.

| % Sugar by mass | Density (g/mL) |
|-----------------|----------------|
| 0.0 | .998 |
| 2.0 | 1.045 |
| 4.0 | 1.063 |
| 6.0 | 1.100 |
| 8.0 | 1.145 |
| 10.0 | 1.202 |
| 12.0 | 1.211 |
| 14.0 | 1.312 |
| 16.0 | 1.322 |
| 18.0 | 1.365 |
| 20.0 | 1.430 |

_____ Which variable will you represent on the horizontal (x) axis?

_____ What value will you use as the starting point for the horizontal axis?

_____ What scale will you use on the horizontal axis?

_____ Which variable will you represent on the vertical (y) axis?

_____ What value will you use as the starting point for the vertical axis?

_____ What scale will you use on the vertical axis?

Using the maximum area on the graph paper, graph the values given in the chart.

2. The following data values represent the temperature in degrees Kelvin and the vapor pressure in torr. Graph the vapor pressure as a function of the temperature.

| Temperature (°K) | Vapor Pressure (torr) |
|-----------------------------|----------------------------------|
| 352 | 0.1003 |
| 372 | 0.3081 |
| 392 | 0.8419 |
| 412 | 2.083 |
| 432 | 4.729 |

_____ Which variable will you represent on the horizontal axis?

_____ What value will you use as the starting point for the horizontal axis?

_____ What scale will you use on the horizontal axis?

_____ Which variable will you represent on the vertical axis?

_____ What value will you use as the starting point for the vertical axis?

_____ What scale will you use on the vertical axis?

Using the maximum area on the graph paper, graph the values given in the chart.

3. In general, equilibrium constants are only constant when the temperature is fixed. To investigate the temperature dependence of K_a (the equilibrium constant) plot the data below where the equilibrium constant is a function of the temperature.

| Temperature (°C) | K_a |
|------------------|------------------------|
| 4.0 | 2.055×10^{-5} |
| 9.0 | 2.099×10^{-5} |
| 14.0 | 2.127×10^{-5} |
| 19.0 | 2.147×10^{-5} |
| 24.0 | 2.166×10^{-5} |
| 29.0 | 2.180×10^{-5} |
| 34.0 | 2.175×10^{-5} |

_____ Which variable will you represent on the horizontal axis?

_____ At what value will you start the scale?

_____ What value will each square on the grid represent?

_____ Which variable will you represent on the vertical axis?

_____ At what value will you start the scale?

_____ What value will each square on the grid represent?

Using the maximum area on the graph paper, graph the values given in the chart.