Using Graphs to Display Data

Each type of graph has its advantages and disadvantages:

Graph	Advantages	Disadvantages
Pictograph A pictograph uses an icon to represent a quantity of data values in order to decrease the size of the graph. A key must be used to explain the icon.	• Easy to read • Visually appealing • Handles large data sets easily using keyed icons	• Hard to quantify partial icons • Icons must be of consistent size • Best for only 2-6 categories • Very simplistic
Line plot A line plot can be used as an initial record of discrete data values. The range determines a number line which is then plotted with X's for each data value.	• Quick analysis of data • Shows range, minimum & maximum, gaps & clusters, and outliers easily • Exact values retained	• Not as visually appealing • Best for under 50 data values • Needs small range of data
Pie chart A pie chart displays data as a percentage of the whole. Each pie section should have a label and percentage. A total data number should be included.	• Visually appealing • Shows percent of total for each category	• No exact numerical data • Hard to compare 2 data sets • "Other" category can be a problem • Total unknown unless specified • Best for 3 to 7 categories • Use only with discrete data
Map chart A map chart displays data by shading sections of a map, and must include a key. A total data number should be included.	• Good visual appeal • Overall trends show well	• Needs limited categories • No exact numerical values • Color key can skew visual interpretation
Histogram A histogram displays continuous data in ordered columns. Categories are of continuous measure such as time, inches, temperature, etc.	• Visually strong • Can compare to normal curve • Usually vertical axis is a frequency count of items falling into each category	• Cannot read exact values because data is grouped into categories • More difficult to compare two data sets • Use only with continuous data

Bar graph A bar graph displays discrete data in separate columns. A double bar graph can be used to compare two data sets. Categories are considered unordered and can be rearranged alphabetically, by size, etc.	• Visually strong • Can easily compare two or three data sets	• Graph categories can be reordered to emphasize certain effects • Use only with discrete data
Line graph A line graph plots continuous data as points and then joins them with a line. Multiple data sets can be graphed together, but a key must be used.	• Can compare multiple continuous data sets easily • Interim data can be inferred from graph line	• Use only with continuous data
Frequency Polygon A frequency polygon can be made from a line graph by shading in the area beneath the graph. It can be made from a histogram by joining midpoints of each column.	• Visually appealing	• Anchors at both ends may imply zero as data points • Use only with continuous data
Scatterplot A scatterplot displays the relationship between two factors of the experiment. A trend line is used to determine positive, negative, or no correlation.	• Shows a trend in the data relationship • Retains exact data values and sample size • Shows minimum/maximum and outliers	• Hard to visualize results in large data sets • Flat trend line gives inconclusive results • Data on both axes should be continuous
Stem and Leaf Plot Stem and leaf plots record data values in rows, and can easily be made into a histogram. Large data sets can be accommodated by splitting stems.	• Concise representation of data • Shows range, minimum & maximum, gaps & clusters, and outliers easily • Can handle extremely large data sets	• Not visually appealing • Does not easily indicate measures of centrality for large data sets
Box plot A box plot is a concise graph showing the five point summary. Multiple box plots can be drawn side by side to compare more than one data set.	• Shows 5-point summary and outliers • Easily compares two or more data sets • Handles extremely large data sets easily	• Not as visually appealing as other graphs • Exact values not retained