Using Graphs to Display Data

Each type of graph has its advantages and disadvantages:

<table>
<thead>
<tr>
<th>Graph</th>
<th>Advantages</th>
<th>Disadvantages</th>
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| **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** | • Visually strong  
• Can easily compare two or three data sets | • Graph categories can be reordered to emphasize certain effects  
• Use only with discrete data |
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<tbody>
<tr>
<td>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.</td>
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| **Line graph** | • Can compare multiple continuous data sets easily  
• Interim data can be inferred from graph line | • Use only with continuous data |
| 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. | | |
| **Frequency Polygon** | • Visually appealing | • Anchors at both ends may imply zero as data points  
• Use only with continuous data |
| 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. | | |
| **Scatterplot** | • 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 |
| A scatterplot displays the relationship between two factors of the experiment. A trend line is used to determine positive, negative, or no correlation. | | |
| **Stem and Leaf Plot** | • 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 |
| 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. | | |
| **Box plot** | • 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 |
| 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. | | |