Fig. **1.2.**
Types of graphs

Different graphs are used in different situations; each has both advantages and disadvantages. For example, some graphs are useful for small data sets, whereas others are useful for large data sets. Some graphs display each data value individually, but others "hide" individual values in bars or other visual elements. This chart contains important information about the graphs that middle-grades students are likely to use.

Type of Graph

A *line plot* is a fast way to organize data. The possible data values are listed on a horizontal axis, and one *X* for each element in the data set is placed above the corresponding value. This display works best when the data set has fewer than twenty-five elements and when the range of possible values is not too great. A *dot plot* is similar to a line plot; small dots are used instead of *X*s.

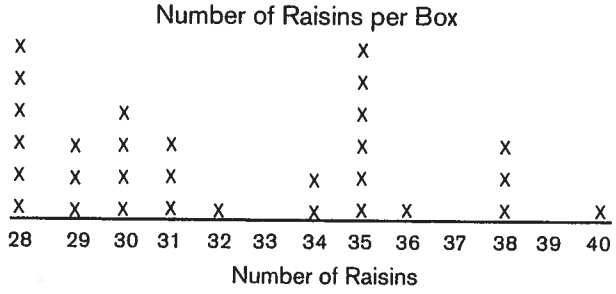
(Landwehr 1986, p. 5)

A *bar graph* shows the frequencies of specific data values in a data set. It can be used for categorical or numerical data, but it is one of the most common ways to display categorical data. The length of the bar drawn for each data value represents the frequency of that value. Bars may be drawn vertically or horizontally. To avoid confusion, the bars should be the same width. In elementary school mathematics, a *case-value plot* is sometimes created. In a case-value plot, the height of the bar drawn for each data element represents the data value. Bar graphs and case-value plots are not interpreted in the same ways, and sometimes students confuse the interpretation of these two displays.

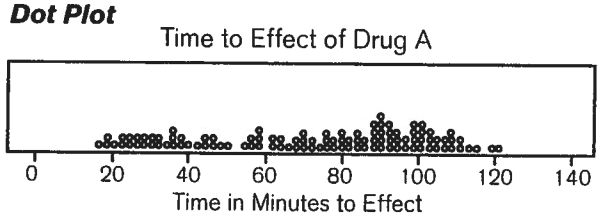
(Moore 1991, pp. 184–85)

Example

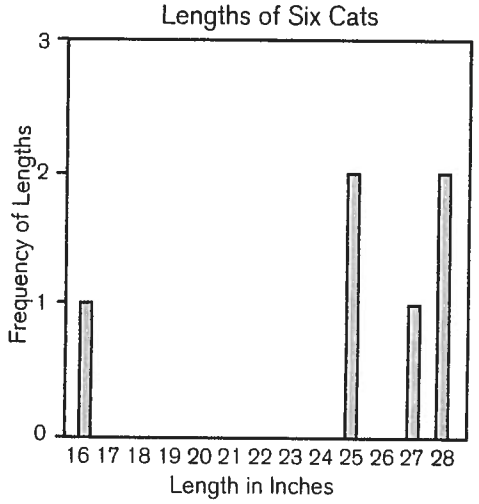
Line Plot



Dot Plot



Bar Graph



Case-Value Plot

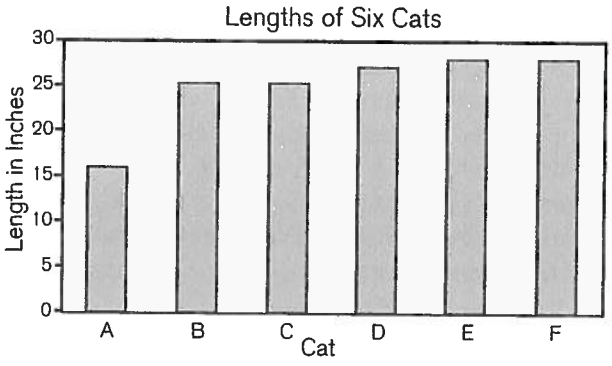


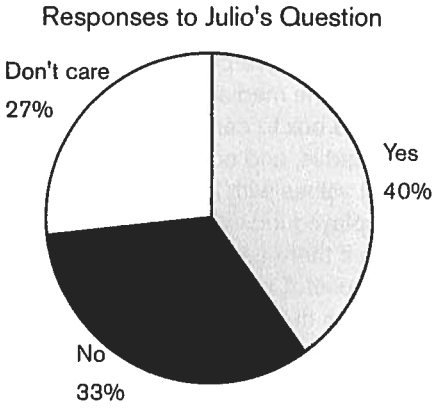
Fig. **1.2.**
Types of graphs

Type of Graph	Example

A *circle graph*, or *pie chart*, is a circle divided into parts, or sectors or wedges. Each part shows the percent of the data elements that are categorized similarly (e.g., grouped into intervals). The parts must sum to 100 percent. Circle graphs are often difficult to make, since each percent must be converted to an angle (i.e., the appropriate fraction of 360°) and the angles are sometimes difficult to draw.

(Moore 1991, pp. 180–81)

Circle Graph



A *stem plot* (also called a *stem-and-leaf plot*) is a display that is most often used to "separate" the tens digits from the ones digits of the data values. The tens digits are called the *stems*, and the ones digits are called the *leaves*. Each leaf represents one of the data elements. Ordering the leaves on each stem from least to greatest often facilitates the interpretation of this display. This display works best when the data set contains more than twenty-five elements and when the data values span several decades of values. A stem plot can also be adapted to show simple decimal values—for example, whole numbers and tenths. A back-to-back stem plot can be used to compare two data sets.

(Landwehr 1986, pp. 7–9, 33)

Stem Plot

Battery Life (in Hours) for Two Brands

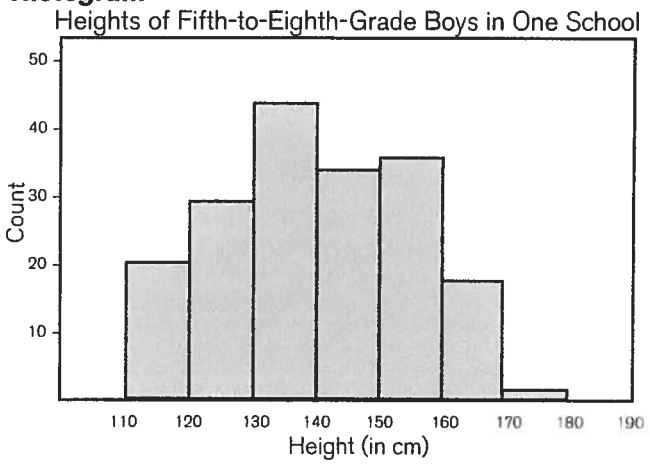
Always Ready Batteries		Tough Cell Batteries
9	1	
2	2	
1	3	
4	4	
2	5	
3	6	
4	7	
9, 6, 6, 4	8	4, 6, 8
9, 6, 6, 5, 3, 2	9	1, 1, 4, 5, 5, 6, 7, 7, 8, 9
7, 6, 5, 5, 1, 1	10	0, 1, 2, 3, 3, 3, 4, 5, 6, 7, 7, 8, 9
7, 6, 5, 5, 5, 5, 5, 4, 3, 1, 1, 0, 0, 0, 0	11	0, 0, 0, 0, 1, 2, 4, 5, 5
	12	1, 1, 1
	13	0
	14	0
	15	
	16	
5	17	
	18	
	19	
3	20	

On the left side, 6 | 8 means 86. On the right side, 8 | 6 means 86.

A *histogram* is used when data elements could assume any value in a range—heights or weights of people, for example. The data are organized in equal intervals; the data values are marked on the horizontal axis. Bars of equal width are drawn for each interval, with the height of each bar representing either the number of elements or the percent of elements in that interval; the number or percent is marked on the vertical axis. The bars are drawn without any space between them.

(Moore 1991, pp. 191–92)

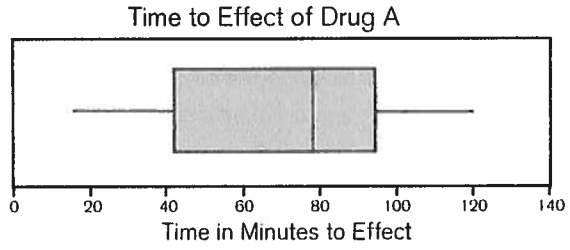
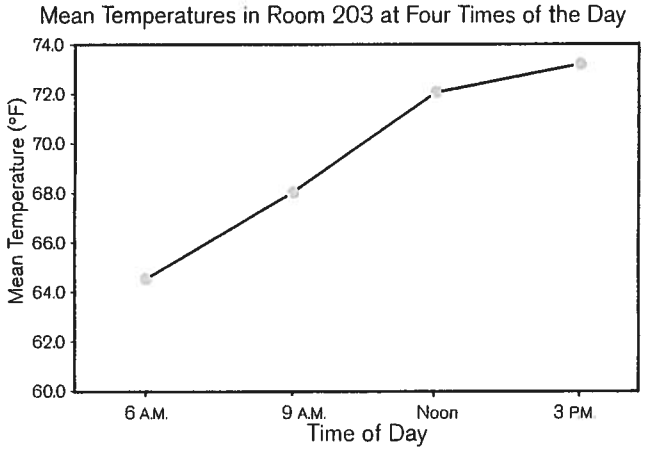
Histogram



Continued

Fig. **1.2.**

Types of graphs

Type of Graph	Example
A *box plot* (also called a *box-and-whiskers plot*) is constructed by marking the "five-point summary" (i.e., the least and greatest values, the median, and the first and third quartiles), drawing a box to capture the interval from the first to the third quartile, and connecting the box to the least and greatest values with line segments. The data elements are not displayed individually, which makes it impossible to determine if there are gaps or clusters in the data. Box plots are very useful, however, for comparing data sets, especially when the data sets are large or when they have different numbers of data elements. (Landwehr 1986, pp. 57, 73)	***Box Plot*** 
A *line graph* is typically used for continuous data to show the change in a variable–over time, for example. The time is marked on the horizontal axis, and the values of the variable are marked on the vertical axis. Each element of the sample is associated with a value for time and a value of the variable. Each pair of values is graphed, and the points are connected with line segments. It is important to look carefully at the scale marked on the vertical axis, since changing the scale of the vertical axis can dramatically change the visual impression of the graph. (Moore 1991, pp. 181–83)	***Line Graph*** 
A *scatterplot* is used when two measurements are made for each element of the sample. The graph consists of points on a two-dimensional grid; the two coordinates of each point are determined by the two measurements for the corresponding element of the sample. A scatterplot is one of the best ways to determine if two characteristics are related. (Landwehr 1986, pp. 84–86, 137)	***Scatterplot***