## Making Data Tables and Graphs

Data tables and graphs are useful tools for both recording and communicating scientific data.

## Making Data Tables

You can use a data table to organize and record the measurements that you make. Some examples of information that might be recorded in data tables are frequencies, times, and amounts.

## EXAMPLE

Suppose you are investigating photosynthesis in two elodea plants. One sits in direct sunlight, and the other sits in a dimly lit room. You measure the rate of photosynthesis by counting the number of bubbles in the jar every ten minutes.

1. Title and number your data table.
2. Decide how you will organize the table into columns and rows.
3. Any units, such as seconds or degrees, should be included in column headings, not in the individual cells.

Table 1. Number of Bubbles from Elodea

Always number and title data tables.

| Time (min) | Sunlight | Dim Light |
| :--- | :--- | :--- |
| 0 | 0 | 0 |
| 10 | 15 | 5 |
| 20 | 25 | 8 |
| 30 | 32 | 7 |
| 40 | 41 | 10 |
| 50 | 47 | 9 |
| 60 | 42 | 9 |

The data in the table above could also be organized in a different way.
Table 1. Number of Bubbles from Elodea

| Light <br> Condition | Time (min) |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
|  | 0 | 10 | 20 | 30 | 40 | 50 | 60 |  |
| Sunlight | 0 | 15 | 25 | 32 | 41 | 47 | 42 |  |
| Dim light | 0 | 5 | 8 | 7 | 10 | 9 | 9 |  |

Put units in column heading

## Making Line Graphs

You can use a line graph to show a relationship between variables. Line graphs are particularly useful for showing changes in variables over time.

## EXAMPLE

Suppose you are interested in graphing temperature data that you collected over the course of a day.

Table 1. Outside Temperature During the Day on March 7

|  | Time of Day |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 7:00 A.M. | 9:00 A.M. | 11:00 A.M. | 1:00 P.M. | 3:00 P.M. | 5:00 P.M. | 7:00 P.M. |
| Temp $\left({ }^{\circ} \mathrm{C}\right)$ | 8 | 9 | 11 | 14 | 12 | 10 | 6 |

1. Use the vertical axis of your line graph for the variable that you are measuring-temperature.
2. Choose scales for both the horizontal axis and the vertical axis of the graph. You should have two points more than you need on the vertical axis, and the horizontal axis should be long enough for all of the data points to fit.
3. Draw and label each axis.
4. Graph each value. First find the appropriate point on the scale of the horizontal axis. Imagine a line that rises vertically from that place on the scale. Then find the corresponding value on the vertical axis, and imagine a line that moves horizontally from that value. The point where these two imaginary lines intersect is where the value should be plotted.
5. Connect the points with straight lines.


## Making Circle Graphs

You can use a circle graph, sometimes called a pie chart, to represent data as parts of a circle. Circle graphs are used only when the data can be expressed as percentages of a whole. The entire circle shown in a circle graph is equal to 100 percent of the data.

## EXAMPLE

Suppose you identified the species of each mature tree growing in a small wooded area. You organized your data in a table, but you also want to show the data in a circle graph.

1. To begin, find the total number of mature trees.

$$
56+34+22+10+28=150
$$

2. To find the degree measure for each sector of the circle, write a fraction comparing the number of each tree species with the total number of trees. Then multiply the fraction by $360^{\circ}$.

$$
\text { Oak: } \frac{56}{150} \times 360^{\circ}=134.4^{\circ}
$$

3. Draw a circle. Use a protractor to draw the angle for each sector of the graph.
4. Color and label each sector of the graph.
5. Give the graph a number and title.

Table 1. Tree Species in Wooded Area

| Species | Number of <br> Specimens |
| :--- | :--- |
| Oak | 56 |
| Maple | 34 |
| Birch | 22 |
| Willow | 10 |
| Pine | 28 |

Figure 1. Tree Species in Wooded Area


## Bar Graph

A bar graph is a type of graph in which the lengths of the bars are used to represent and compare data. A numerical scale is used to determine the lengths of the bars.

## EXAMPLE

To determine the effect of water on seed sprouting, three cups were filled with sand, and ten seeds were planted in each. Different amounts of water were added to each cup over a three-day period.
Table 1. Effect of Water on Seed Sprouting

| Daily Amount of Water (mL) | Number of Seeds That <br> Sprouted After 3 Days in Sand |
| :---: | :---: |
| 0 | 1 |
| 10 | 4 |
| 20 | 8 |

1. Choose a numerical scale. The greatest value is 8 , so the end of the scale should have a value greater than 8 , such as 10 . Use equal increments along the scale, such as increments of 2.
2. Draw and label the axes. Mark intervals on the vertical axis according to the scale you chose.
3. Draw a bar for each data value. Use the scale to decide how long to make each bar.


## Double Bar Graph

A double bar graph is a bar graph that shows two sets of data. The two bars for each measurement are drawn next to each other.

## EXAMPLE

The same seed-sprouting experiment was repeated with potting soil. The data for sand and potting soil can be plotted on one graph.

1. Draw one set of bars, using the data for sand, as shown below.
2. Draw bars for the potting-soil data next to the bars for the sand data. Shade them a different color. Add a key.

Table 2. Effect of Water and Soil on Seed Sprouting

| Daily Amount of <br> Water $(\mathrm{mL})$ | Number of Seeds <br> That Sprouted After <br> 3 Days in Sand | Number of Seeds <br> That Sprouted After <br> 3 Days in Potting Soil |
| :---: | :---: | :---: |
| 0 | 1 | 2 |
| 10 | 4 | 5 |
| 20 | 8 | 9 |

Figure 2. Effect of Water and Soil on Seed Sprouting


