

# Drawing and interpreting graphs



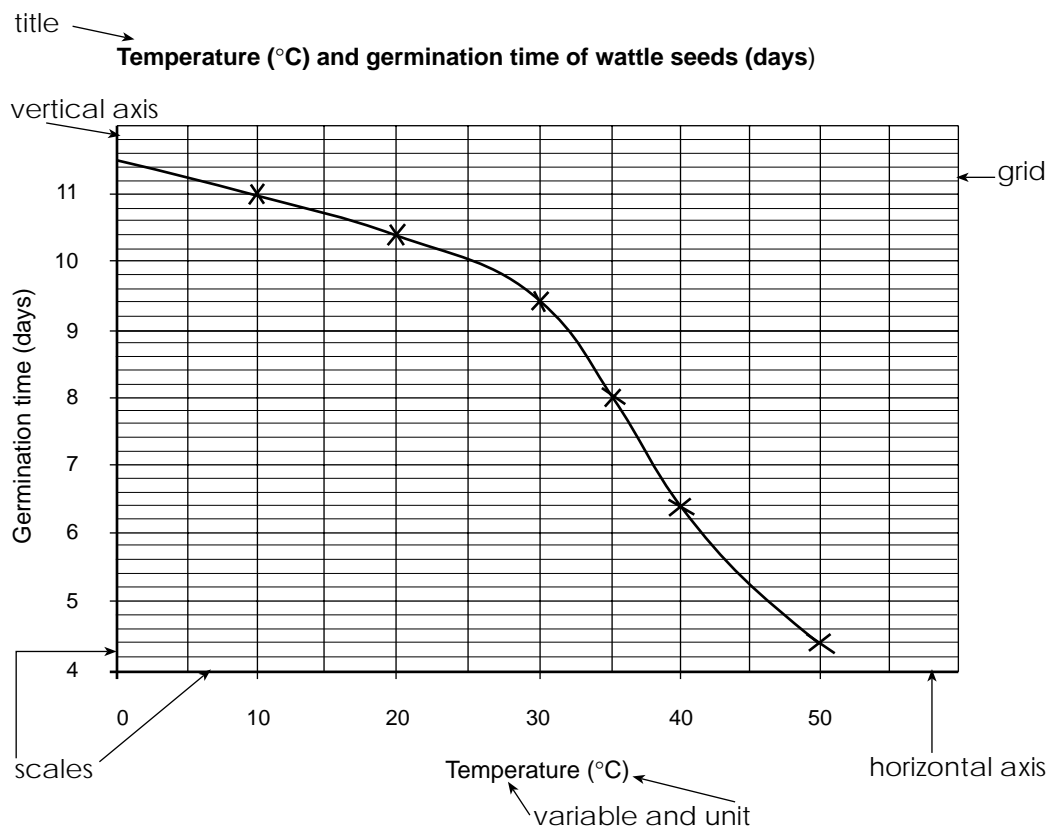
Graphs are especially useful for presenting quantitative data. So often, a graph is a visual form of data from a table.

A graph can make it easier to analyse and interpret the information you have collected. That is, it is easier to see what is happening and what trends or patterns there are. Graphs are ideal for communicating scientific information.

## What are some features of a graph?

Graphs have many features in common, such as:

- a **title** that describes what the graph shows
- a **grid** that is used to plot points or other data
- a **horizontal axis** or **X-axis** that is labelled with the name of a variable and the units represented
- a **vertical axis** or **Y-axis** that is labelled with the name of a variable and the units represented.



There are many different kinds of graphs. The kind of graph chosen by the researcher depends on the type of data that has been collected.

## Line graphs

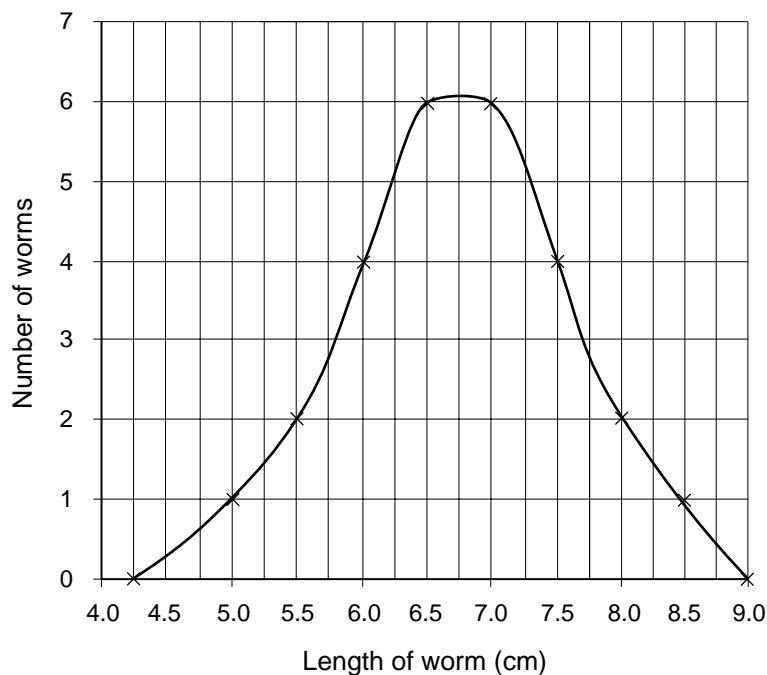
A line graph is commonly used in science to show how one variable affects another. The data is plotted onto the grid as points. Each point is marked with a cross. The plotted points are joined by a line or a line of best fit is drawn.

Line graphs are useful in that they show the relationship between two variables. The independent variable is usually placed on the X-axis and the dependent variable is placed on the Y-axis.

To draw a graph, you may need to first sort your data into groups. A scale for each axis must be selected and numbered. You can usually use the column headings from the table of results you are plotting as the headings for your two axes.

Here is an example of a simple line graph. It represents data from a study of the number of worms of different lengths in a compost heap.

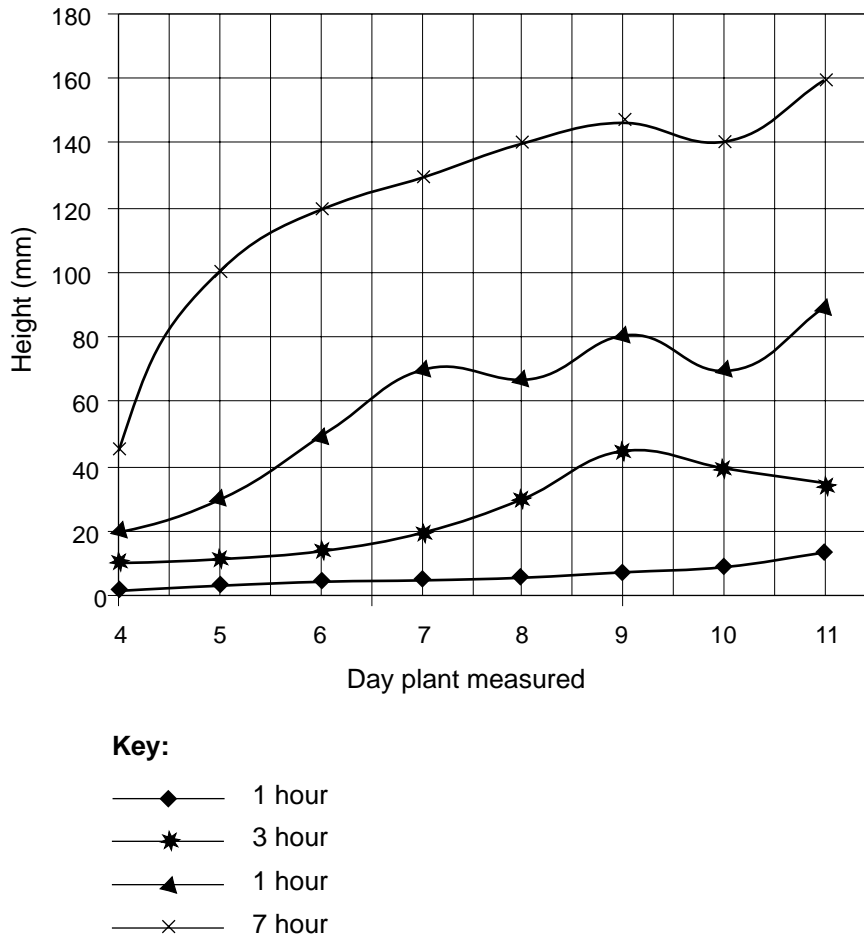
**Graph of number of worms found against worm length**



Here is an example of a more complex line graph. (Really, it is just four simple line graphs drawn on the same grid.)

Terry used a computer spreadsheet program to draw this graph to present his results of an investigation to see if the amount of sunlight a plant received each day would affect how high it grew.

**Length of time in the sunlight (hr) and height of wheat plants (mm)**



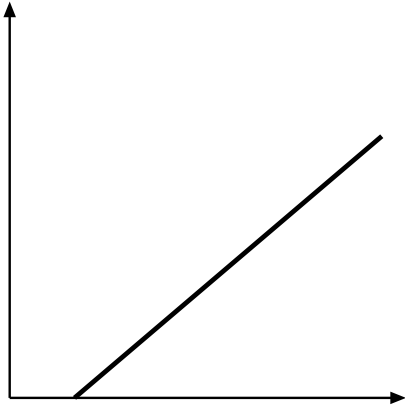
This graph looks complicated since it combines several sets of data. The graph for each plant (given different amounts of sunlight each day) has been drawn on the same grid.

When a graph contains more than one set of results, it must also contain a key, or legend. The key identifies the results that have been used for each line in the graph.

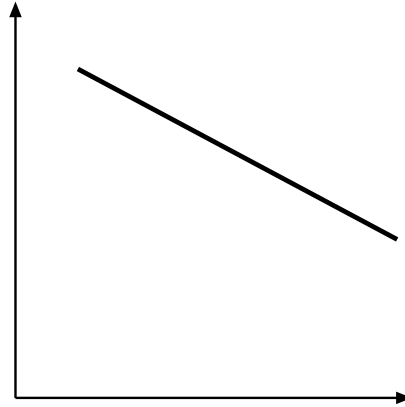
## Interpreting line graphs

Line graphs are used to plot data from an experiment when you want to see the relationship between a dependent and an independent variable.

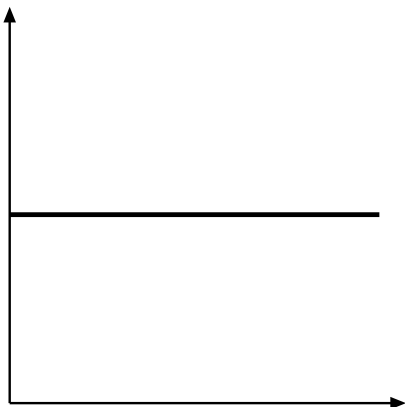
The slope of the line and the shape of the graph suggests how one variable affects another. Here are some examples.



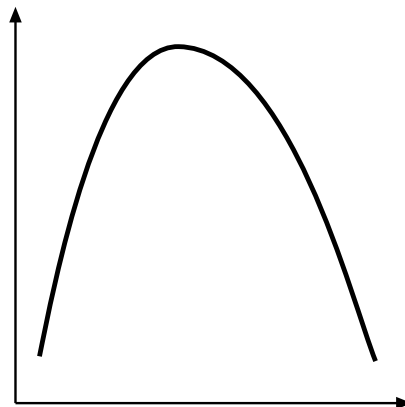
As the variable on the X-axis increases, so does the variable on the Y-axis. The line is straight. This means that the increase occurs at a constant rate.



As the variable on the X-axis increases, the variable on the Y-axis decreases. The line is straight. This means that the decrease occurs at a constant rate.



As the variable on the X-axis increases, the variable on the Y-axis stays the same. The line is straight. This shows that the variables are not affecting each other.



As the variable on the X-axis increases, the variable on the Y-axis increases then decreases. The line is curved so the rate is changing.

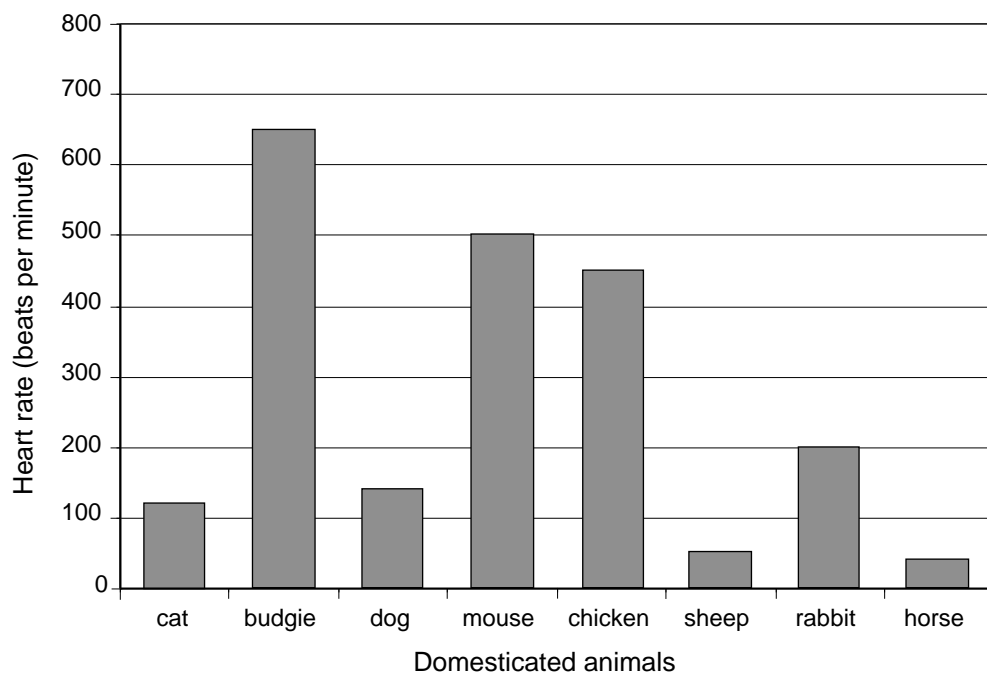
## Bar and column graphs

Bar and column graphs are very similar to each other. They are both used to show categories of data that has been counted. They show actual values as well as the proportion of each category.

In a column graph, the height of the column shows the number of individuals. In a bar graph, the length of the horizontal bar represents the number of individuals. Since the data is not related then the bars or columns stand alone.

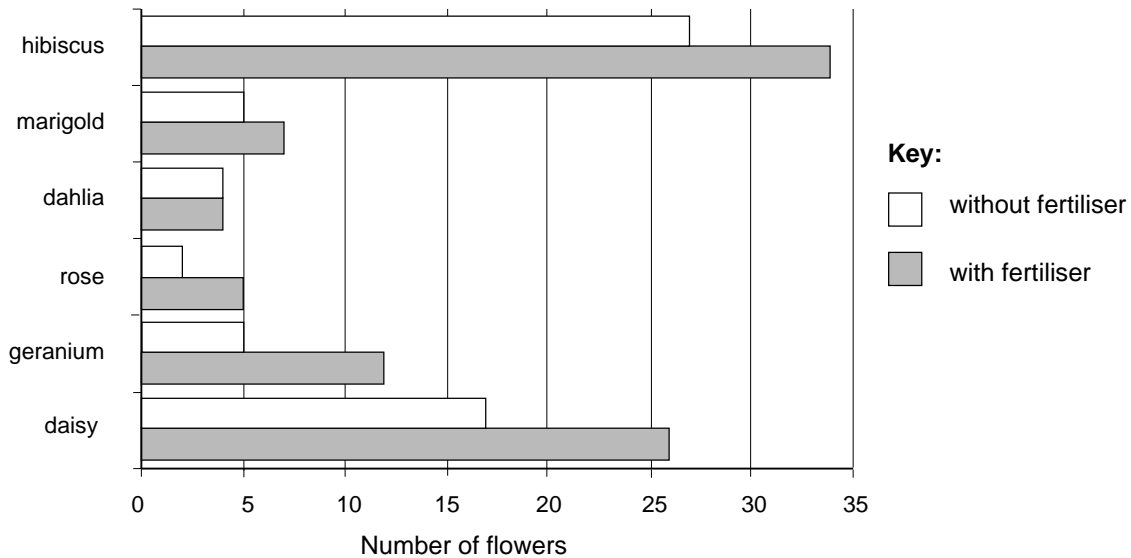
For example, a student was interested in investigating and comparing the pulse rates of different domesticated animals. He used a computer spreadsheet program to prepare the column graph below.

**Heart rate (beats per minute) of various domesticated animals**



Bar and column graphs can show multiple sets of data. For example, Ewad was investigating how fertiliser affects the number of flowers of different plants. His graph below shows the results.

**Number of flowers on various plants with and without fertiliser**

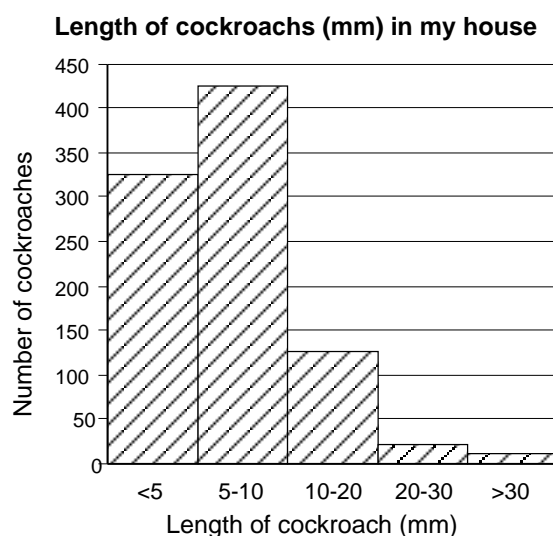


## Histograms

Histograms look similar to column graphs but are different because each column represents a group of related data.

The height of the column shows the number of individuals counted, like a column graph. But the columns in a histogram are touching to show that the data represented by the columns is related.

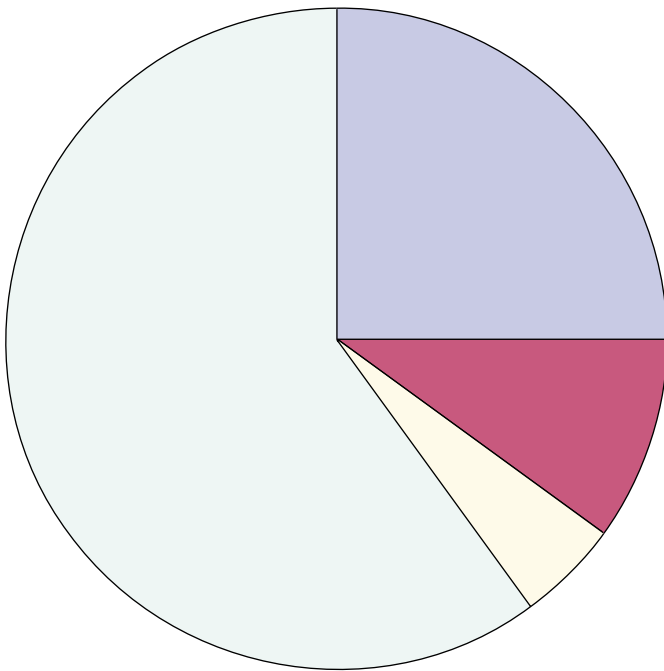
For example, Lucia was investigating the number and sizes of cockroaches in her house. She presented her results as a histogram.



## Pie graphs

Pie graphs are useful for showing the percentage composition of various categories that are unaffected by each other.

For example, Leah used a pie graph to show the percentage of cover on her dam by different types of plants.



### Key:

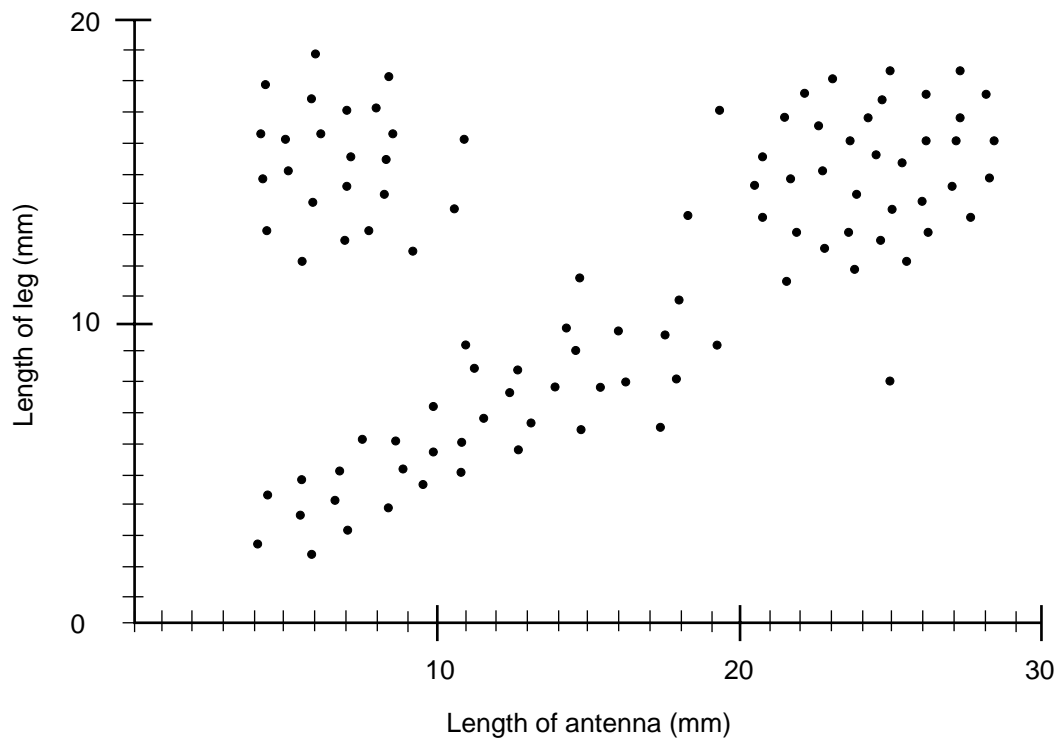
- large-leaved waterlilies
- small-leaved waterlilies
- reeds
- clear surface

Computer programs can present pie graphs in many different, interesting shapes. This can make your report look more appealing while still presenting your information clearly.

## Scattergrams

Scattergrams are graphs that are used to find patterns in some kinds of data. The information about each individual or test is plotted as a separate point. The points are not joined though groups of points may be circled or shaded to show relationships.

For example, in Wayne's research project, he caught 100 grasshoppers and measured the lengths of their legs and the lengths of their antennas. He used a scattergram to see if these two features of grasshoppers were related.



Each dot on the graph represents a grasshopper and shows the measurements of its leg and antenna. The scattergram suggests that there are some patterns in the leg length and antenna length of grasshoppers. For example, a grasshopper with long antennas will probably have long legs. However, a grasshopper with short antennas may have long legs or short legs but it is unlikely to have medium-length legs.

## Choosing a graph type

Each time you need to draw a graph, think about the different kinds of graphs. Decide which kind of graph will make your data the easiest to analyse and interpret.

Sometimes there are several kinds of graphs that would be suitable. For example, usually you can use a bar graph, a column graph or a pie graph to present the same kinds of information. A line graph and a histogram can show the same data.