COMMUNICATING IN SCIENCE

CREATING DATA TABLES

Data tables are an effective way to record both qualitative and quantitative observations. Making a data table should be one of your first steps when conducting an investigation. You may decide that a data table is enough to communicate your data, or you may decide to use your data to draw a graph. A graph will help you analyze your data. (See "Graphing Data," on page 298, for more information about graphs.)

Sometimes you may use a data table to record your observations in words, as shown below.

Data table for Investigation 7.2

Mineral number	Colour	Streak	Lustre	Hardness	Magnetism	Reaction with vinegar	Cleavage	Name
1	grey-black	reddish brown	metallic					

Sometimes you may use a data table to record the values of the independent variable (the cause) and the dependent variables (the effects), as shown to the left. (Remember that there can be more than one dependent variable in an investigation.)

Average Monthly Temperatures in Cities A and B

Month	Temperature (°C) in City A	Temperature (°C) in City B
January	-7	-6
February	-6	-6
March	-1	-2
April	6	4
May	12	9
June	17	15

Follow these guidelines to make a data table:

- Use a ruler to make your table.
- Write a title that describes your data as precisely as you can.
- Include the units of measurements for each variable, when appropriate.
- List the values of the independent variable in the left-hand column of your table.
- List the values of the dependent variable(s) in the column(s) to the right of the independent variable.

GRAPHING DATA

When you conduct an investigation or do research, you often collect a lot of data. Sometimes the patterns or relationships in the data are difficult to see. For example, look at the data in **Table 1**.

Table 1 Average Rainfall in Campbell River

Month	Rainfall (mm)
January	142
February	125
March	128
April	73
May	59
June	50
July	40
August	43
September	62
October	154
November	210
December	197

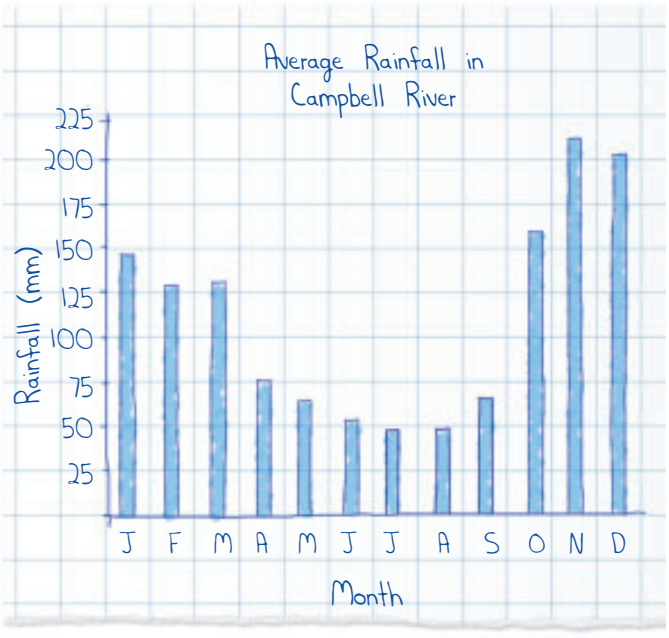
One way to arrange your data so that it is easy to read and understand is to draw a graph. A graph shows numerical data in the form of a diagram. There are three kinds of graphs that are commonly used:

- bar graphs
- line graphs
- circle (pie) graphs.

Each kind of graph has its own special uses. You need to identify which type of graph is best for the data you have collected.

Bar Graphs

A **bar graph** helps you make comparisons and see relationships when one of two variables is in numbers and the other is not. The following bar graph was created from the data in **Table 1**. It clearly shows the rainfall in different months of the year and makes comparison easy.

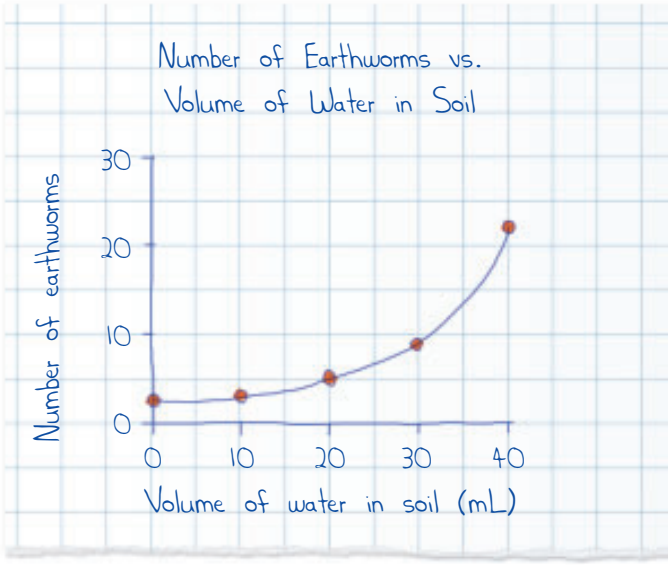


Line Graphs

A **line graph** is useful when you have two variables in numbers. It shows changes in measurement. It helps you decide whether there is a relationship between two sets of numbers: for example, "if this happens, then that happens." **Table 2** gives the number of earthworms found in specific volumes of water in soil. The line graph for these data helps you see that the number of earthworms increases as the volume of water in soil increases.

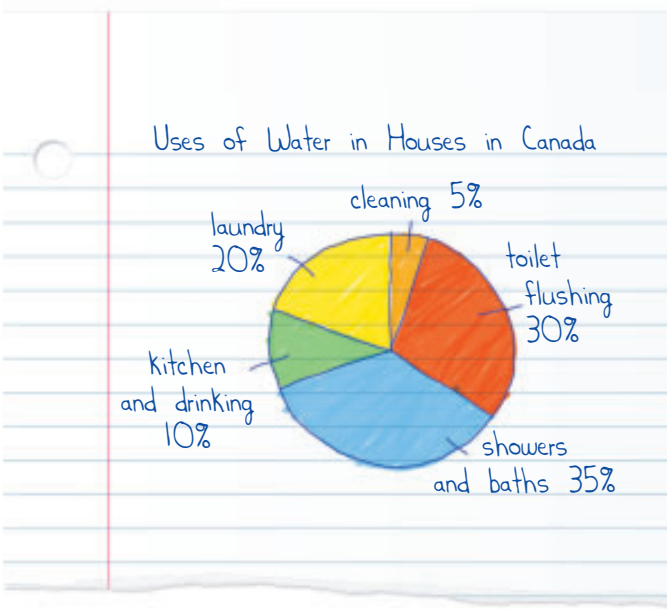
Table 2 Number of Earthworms per Volume of Water in Soil

Volume of water in soil (mL)	Number of earthworms
0	3
10	4
20	5
30	9
40	22



Circle Graphs

A **circle graph** (or pie graph) shows the whole of something divided into all its parts. A circle graph is round and shows how large a share of the circle belongs to different things. You can use circle graphs to see how the different things compare in size or quantity. It is a good way to graph data that are percentages or can be changed to percentages.



WRITING A LAB REPORT

When you design and conduct your own experiment, it is important to report your findings. Other people may want to repeat your experiment, or they may want to use or apply your findings to another situation. Your write-up, or report, should reflect the process of scientific inquiry that you used in your experiment.

Write the title of your experiment at the top of the page.

List the question(s) you were trying to answer. This section should be written in sentences.

Write your hypothesis. It should be a sentence in the form "If … then …."

Write the materials in a list. Your list should include equipment that will be reused and things that will be used up in the investigation. Give the amount or size, if this is important.

Describe the procedure using numbered steps. Each step should start on a new line and, if possible, it should start with a verb. Make sure that your steps are clear so that someone else could repeat your experiment and get the same results. Include any safety precautions.

Draw a large diagram with labels to show how you will set up the equipment. Use a ruler for straight lines.

Conductivity of Water

Question

Which type of water – pure water, water with dissolved sugar, or water with dissolved salt – conducts electricity the best?

Hypothesis

If water is very pure, like distilled water with no solutes, then it will conduct electricity better than water with sugar or salt dissolved in it.

Materials

- 3 clean glass jars
- distilled water
- sugar
- salt
- 3 short strips of masking tape
- pen
- 2 D-cell batteries
- battery holder
- 1 piece of wire, 25 cm long
- 2 pieces of wire, each 10 cm long
- wire strippers
- light-bulb holder
- small light bulb (such as a flashlight bulb)

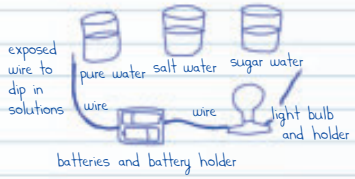
Procedure

1. Put 250 mL of distilled water in each clean jar. Do not add anything to the first jar. Add 30 mL of salt to the second jar, and mix. Add 30 mL of sugar to the third jar, and mix. Label the jars "pure water," "salt water," and "sugar water."
2. Put the batteries in the holder.
3. Strip the plastic coating off the last centimetre at the ends of all three wires, using the wire strippers.

CAUTION: Always pull the wire strippers away from your body.

4. Attach one end of the 25-cm wire to the knobby end of the battery by tucking it in the battery holder. The other end of the wire should hang free for now.
5. Attach one end of a 10-cm wire to the flat part of the battery. Attach the other end to the clip in the light-bulb holder.

6. Place the light bulb in the holder.
7. Attach one end of the other 10-cm wire to the clip in the light-bulb holder. Let the other end hang free for now.
8. Dip the loose wire ends into the distilled water. Observe whether the light bulb goes on. Record "yes" or "no."
9. Repeat step 8 for the other two types of water.



Data and Observations

Type of water	Does the light bulb go on?
distilled water	no
water with salt	yes
water with sugar	no

Analysis

The salt water was the only type of water that turned on the light bulb. Something in the salt must help to conduct electricity. Since the distilled water did not turn on the light bulb, this must mean that it cannot conduct electricity. Something is missing from the distilled water. The sugar water did not conduct electricity either, so it must also be missing the ingredient that helps to conduct electricity.

Conclusion

Pure (distilled) water does not conduct electricity. The hypothesis is not supported by the data, so it is incorrect. Salt water conducts electricity.

Applications

Knowing that salt water conducts electricity might help scientists recover materials from seawater by running electricity through it. Also, I think the water in the human body has salt and other things dissolved in it. It would conduct electricity well, so people should be careful about electricity.

Present your observations in a form that is easily understood. The data should be recorded in one or more tables, with units included. Qualitative observations can be recorded in words or drawings. Observations in words can be in point form.

Interpret and analyze your results. If you have made graphs, include and explain them here. Answer any questions from the student text here. Your answers should include the questions.

A conclusion is a statement that explains the results of an experiment. Your conclusion should refer back to your hypothesis. Was your hypothesis correct, partly correct, or incorrect? Explain how you arrived at your conclusion. This section should be written in sentences.

Describe how the new information you gained from doing your experiment relates to real-life situations. How can this information be used?