Science 3–4

Chapter 2 — Working scientifically: representing, evaluating and communicating

Aboriginal and Torres Strait Islander content has been excluded as accuracy cannot be guaranteed, and it is better to be respectful than cover the entire curriculum inaccurately.

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Contents

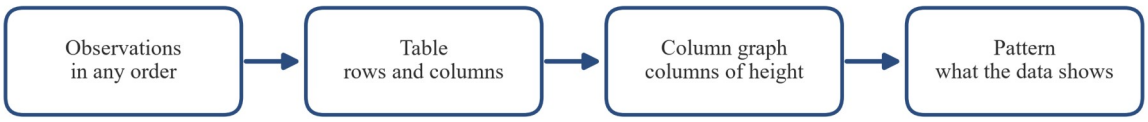
Tables, graphs and models

What we teach here — VC2S4I04 (Victorian Curriculum F–10 Version 2.0, Science, Levels 3 and 4): "data and information can be organised and represented to identify patterns and simple relationships by constructing tables, graphs and visual or physical models". **In our words:** the same facts can be set out in a table, a graph or a model so they are easier to read — and a good set-out helps you see what repeats, and what changes with what.

The ideas

Data arrives in any order

In 1A we said that scientists write down what they notice, and we called what they write down **data**. Data almost never arrives in order. You watch the weather for a week and your notes are all over the place: *rain on Tuesday, no rain on Wednesday, rain again on Thursday.* To see a **pattern** — what the data keeps showing — you first set the data out. That is what this subtopic is about. Tables, graphs and models are three ways of setting data out so it makes sense.



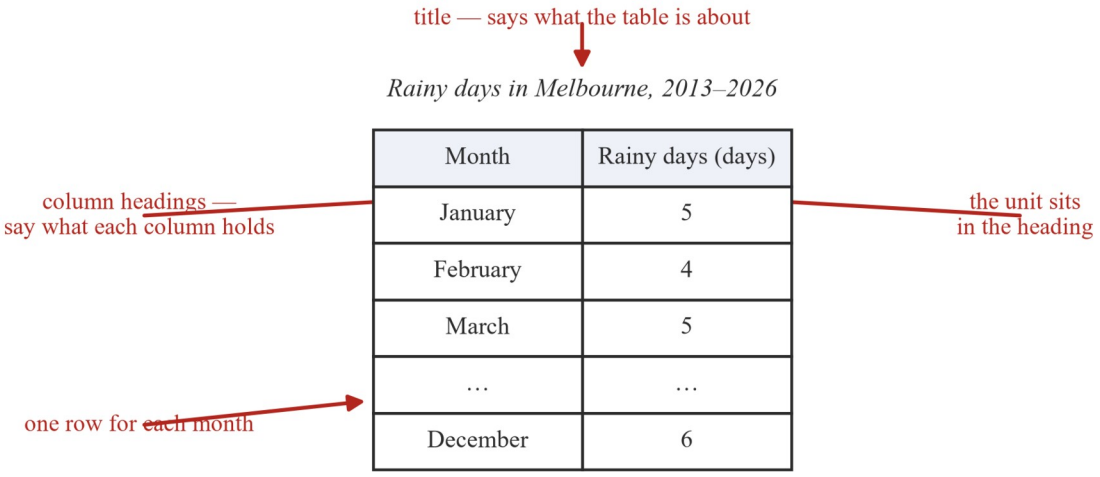
Each step makes the data easier to read.

Four boxes joined by arrows, left to right: observations in any order; a table with rows and columns; a column graph with columns of different heights; the pattern, what the data shows. Under it: each step makes the data easier to read.

Follow the picture from left to right. The facts are the same in every box. Each step sets them out so they make more sense, and the last box is the point of it: the pattern. (From 1A: a pattern is something that repeats in what you noticed, or a change you can describe. A **relationship** is when one thing changes and another thing changes with it.)

Tables

A **table** sets data out in rows and columns, in order.



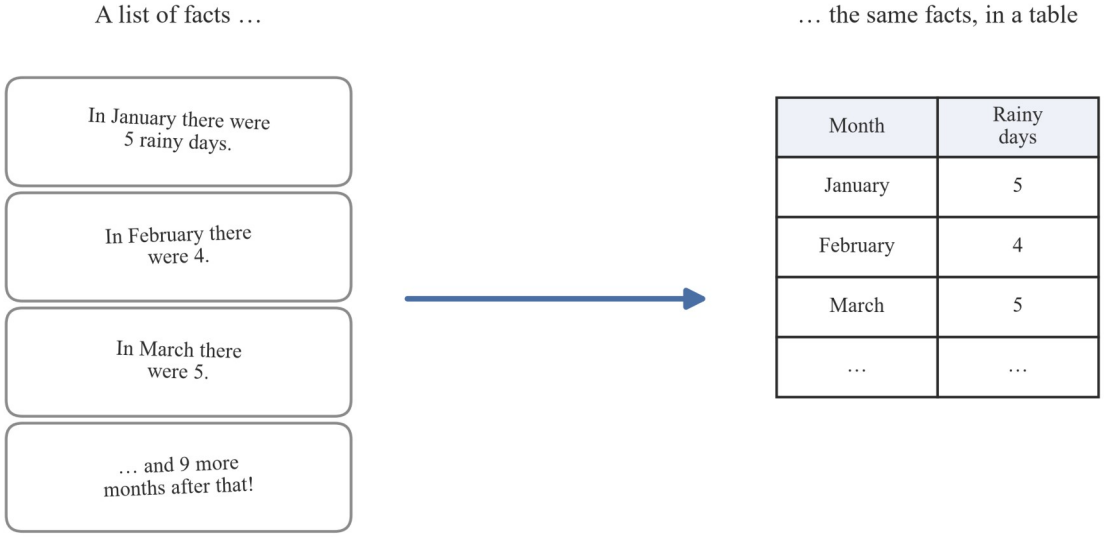
Month	Rainy days (days)
January	5
February	4
March	5
…	…
December	6

A table puts the data in rows and columns, in order.

A table titled Rainy days in Melbourne, 2013–2026, with red labels: the title says what the table is about; the column headings say what each column holds; the unit sits in the heading; one row for each month. Under it: a table puts the data in rows and columns, in order.

The picture names the parts of a table. The **title** says what the table is about. The top row is the heading row: each **column heading** says what that column holds, and the **unit** — what was counted — sits in the heading too, here "(days)". After that comes one row for each thing we looked at, here one row for each month.

Why bother with a table? Compare it with a list.



Month	Rainy days
January	5
February	4
March	5
…	…

The numbers are the same. The table is easier to read.

On the left, fact cards written as sentences; a big arrow; on the right, the same facts in a table with the headings Month and Rainy days. Under it: the numbers are the same, the table is easier to read.

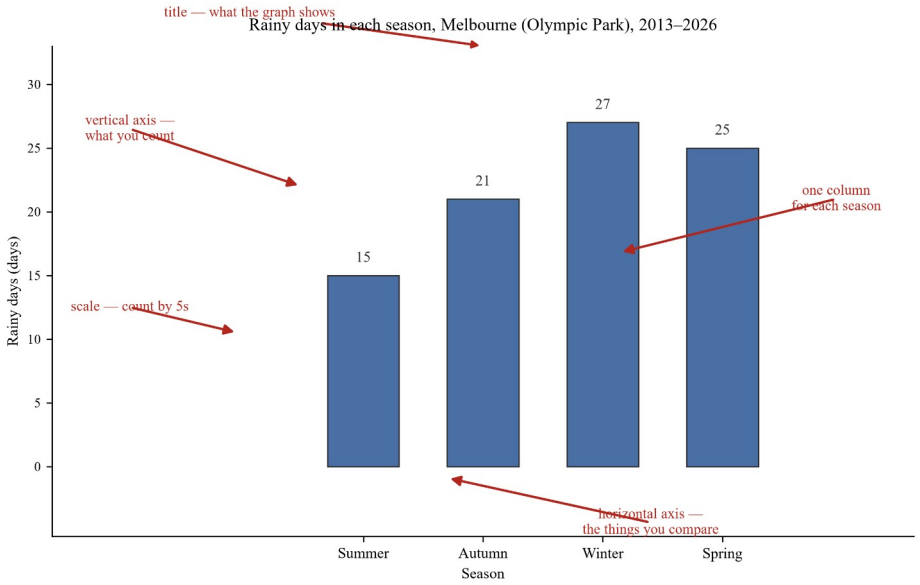
Both sides hold the same facts. But in the list you must read every sentence to find March. In the table your eye goes straight to the March row. A table is a list that has been tidied up, and tidied data is easier to check and easier to compare.

The data in both pictures is real: the mean number of days of rain (1 mm or more) in each month at Melbourne (Olympic Park), 2013–2026, rounded to the nearest whole day.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean number of rain days (1 mm or more) for each month, 2013–2026, rounded to the nearest whole day, bom.gov.au — looked up 2026-08-15 (page made 2026-08-13; saved copy at _sources/bom086338.html; bom.gov.au did not answer when checked again on 2026-08-20).

Column graphs

A table tidies data. A **column graph** goes one step further: it turns each number into a column of that height, so you can *see* the pattern.



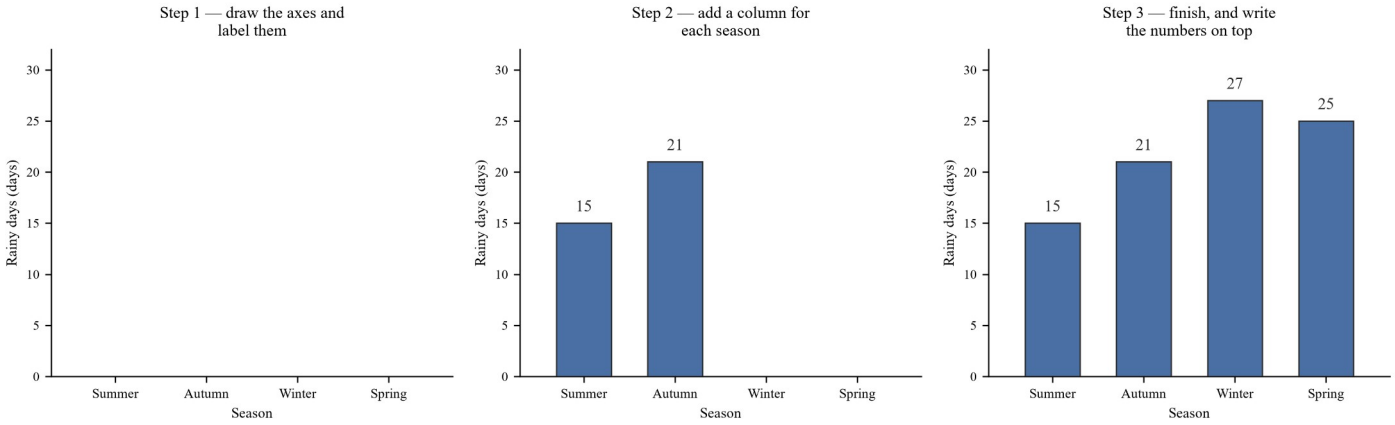
Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, climate data for each month, 2013–2026, bom.gov.au — looked up 2026-08-15 (page made 2026-08-13; saved copy at _sources/bom086338.html; bom.gov.au did not answer when checked again on 2026-08-20).

A column graph of rainy days in each season with red labels: the title says what the graph shows; the vertical axis is what you count; the scale counts by 5s; the horizontal axis is the things you compare; one column for each season.

The picture names the parts of a column graph. The **title** says what the graph shows. The two lines that frame the graph are the **axes** (one line is an **axis**). The **vertical axis** — the up-and-down line — holds what you count, here rainy days. Its **scale** is the numbers up the side and the jump between them, here counting by 5s. The **horizontal axis** — the side-to-side line — holds the things you compare, here the four seasons. And there is one column for each thing, as tall as its number.

Building a column graph, step by step

Here is how the season graph gets built, using real rainy-day counts for Melbourne (Olympic Park).

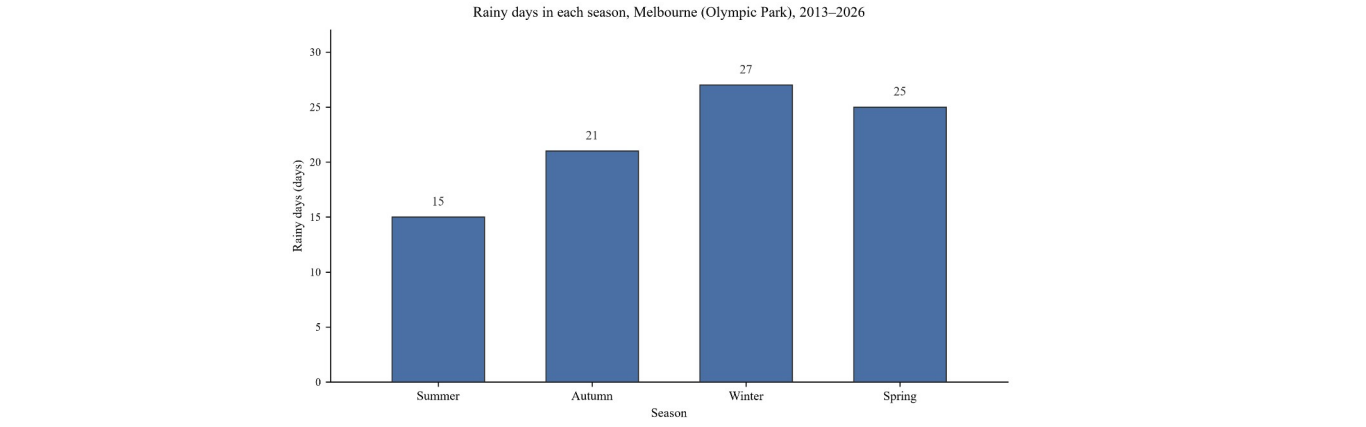


Three graphs side by side. Step 1: draw the axes and label them. Step 2: add a column for each season. Step 3: finish, and write the numbers on top.

- **Step 1 — draw the axes and label them.** The horizontal axis is labelled "Season" and the vertical axis "Rainy days (days)". The unit sits in the label, just as it sat in the table heading.
- **Step 2 — add a column for each season.** One column per thing you compare, and each column is as tall as its number on the scale.
- **Step 3 — finish, and write the numbers on top.** Writing each number on top of its column makes the graph easy to check against the table.

Before Step 2, choose a scale. The biggest number is 27, so counting by 5s up to 30 fits: every number has a home on the scale, and the columns are easy to draw. Counting by 10s would give only 0, 10, 20, 30 — 27 would have no clear home.

The finished graph, with its source:



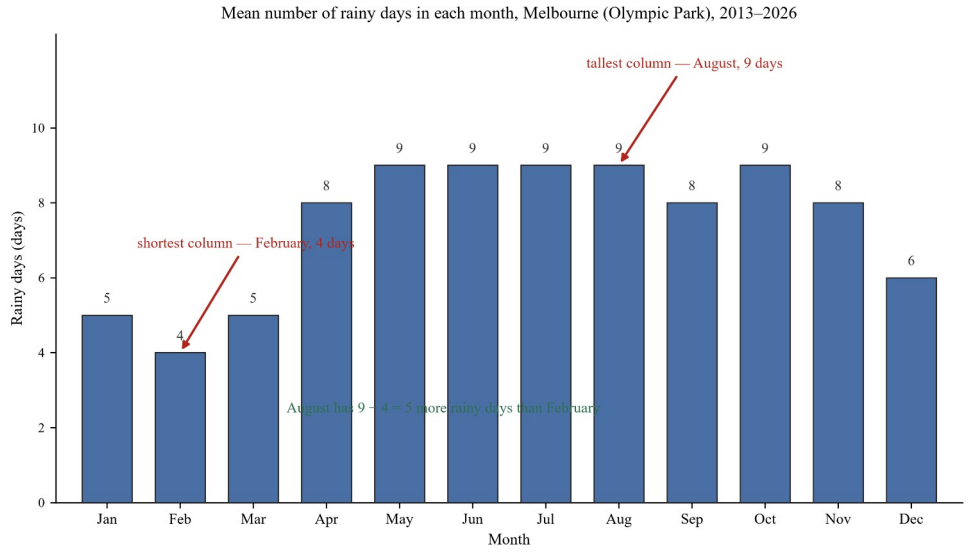
A finished column graph titled Rainy days in each season, Melbourne (Olympic Park), 2013–2026: summer 15, autumn 21, winter 27, spring 25, with the source written under it.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean number of rain days (1 mm or more) for each month, 2013–2026, bom.gov.au — looked up 2026-08-15 (page made 2026-08-13; saved copy at _sources/bom086338.html; bom.gov.au did not answer when checked again on 2026-08-20). Season totals: add the three monthly means, then round.

Now the pattern jumps out. The winter column is the tallest and the summer column the shortest: Melbourne has more rainy days in winter than in summer. The table held that fact all along — the graph makes it visible at once.

Reading a column graph

Reading a graph means asking it questions. Here is a graph with more columns — every month, not just every season.



A column graph of rainy days in each month of the year. The tallest column is August with 9 days and the shortest is February with 4 days, and a label says August has 9 − 4 = 5 more rainy days than February.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean number of rain days (1 mm or more) for each month, 2013–2026, rounded to the nearest whole day, bom.gov.au — looked up 2026-08-15 (page made 2026-08-13; saved copy at _sources/bom086338.html; bom.gov.au did not answer when checked again on 2026-08-20).

Read it the same way every time. *Tallest column:* August, 9 rainy days. *Shortest column:* February, 4. *Difference:* 9 − 4 = 5, so August has 5 more rainy days than February. *Pattern:* the middle of the year — June, July, August — is a block of tall columns, and the start and end of the year are shorter. Winter is the wetter time.

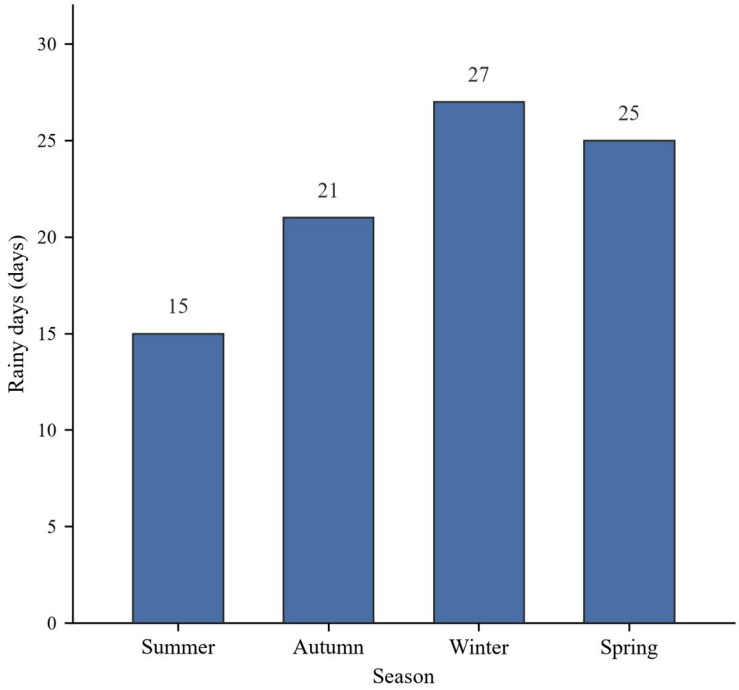
The same data, two ways

The same data, two ways

As a table

Season	Rainy days
Summer	15
Autumn	21
Winter	27
Spring	25

As a column graph



The same data two ways. Left: a table with the headings Season and Rainy days, rows summer 15, autumn 21, winter 27, spring 25. Right: the same numbers as a column graph.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean number of rain days (1 mm or more) for each month, 2013–2026, bom.gov.au — looked up 2026-08-15 (page made 2026-08-13; saved copy at

_sources/bom086338.html; bom.gov.au did not answer when checked again on 2026-08-20). Season totals: add the three monthly means, then round.

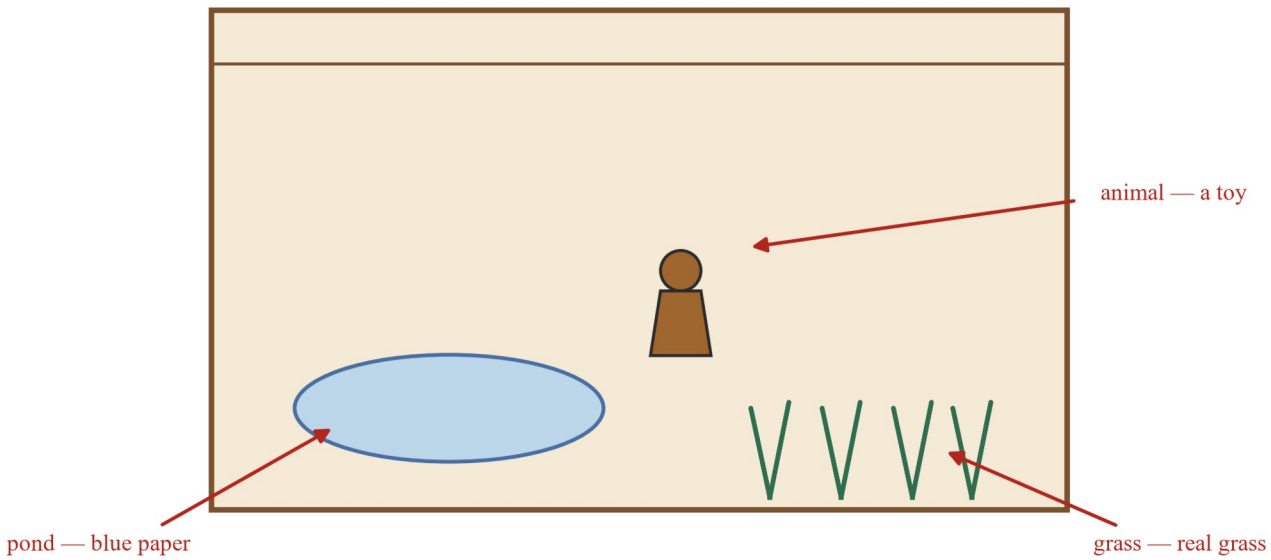
Both sides show the very same four numbers. Now ask two questions. *Which one shows the pattern — winter tallest, summer shortest — more quickly?* The graph: your eye sees the heights. *Which one keeps every exact number in front of you?* The table: nothing to read off a scale, the numbers are right there.

So a display is a choice. You pick the one that fits what you want your reader to see. That is the question to ask of any table or graph: *what do I want my reader to see?*

Models

A third way to set out what we know is a **model**. A model stands in for a real thing, so we can look at it, point at it and change it.

A physical model: a habitat in a shoebox



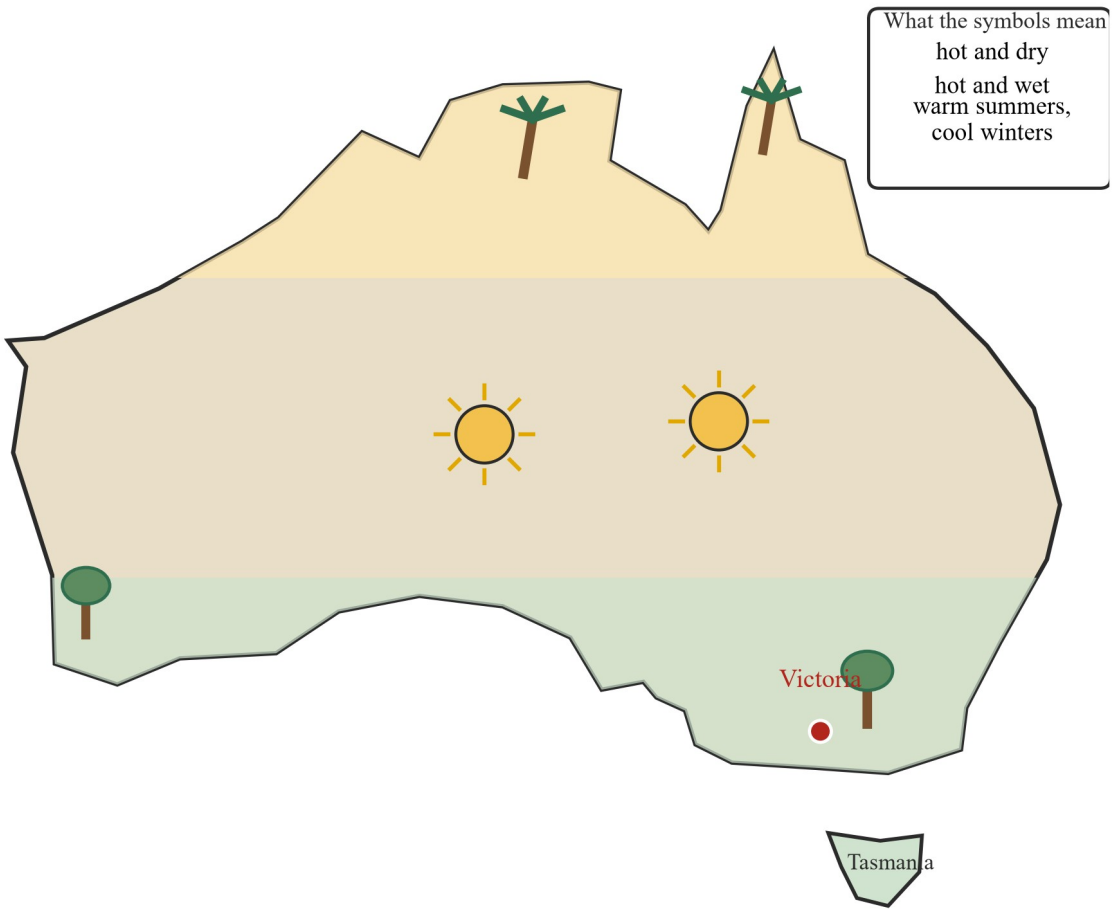
The model stands in for a real habitat. It shows where things live — and it leaves out many real details.

A physical model: a shoebox habitat with a pond made of blue paper, real grass and a toy animal, each with a red label. Under it: the model stands in for a real habitat, it shows where things live, and it leaves out many real details.

The shoebox is a **physical model** of a habitat — a place where plants and animals live. The blue paper stands in for a pond. The toy stands in for an animal. What the model shows is where things live in the habitat. What it leaves out is nearly everything else: real water, weather, smells, sounds, and the true size of it all. A model is always simpler and not as big as the real thing. Saying what a model leaves out is part of using it well.

A model can also be a picture.

A simple picture map of Australia's climates (the real edges are not this straight)

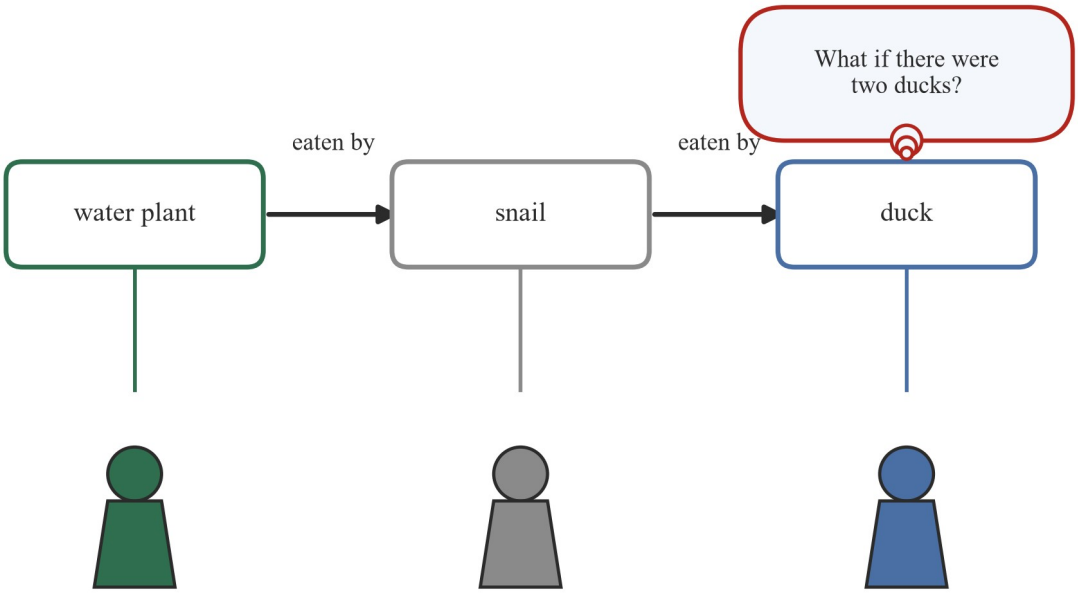


A simple picture map of Australia. The top of the map is marked hot and wet with a palm picture, the middle hot and dry with a sun picture, and the bottom warm summers, cool winters with a gum-tree picture. Victoria is marked with a dot in the warm-summer part, and a key explains the three pictures.

This picture map is a **visual model** of Australia's climates — the weather each part of the country usually has. It sets out a great many facts in one picture you can point at: the north is hot, wet in places and dry in others; the south, where Victoria sits, has warm summers and cool winters. Like every model, it leaves things out — the real edges of the country are not this straight, and the parts run into each other.

A model can even be a role-play.

A role-play: each child stands for one living thing



Changing one number — here, the ducks — lets you watch what happens to the rest.

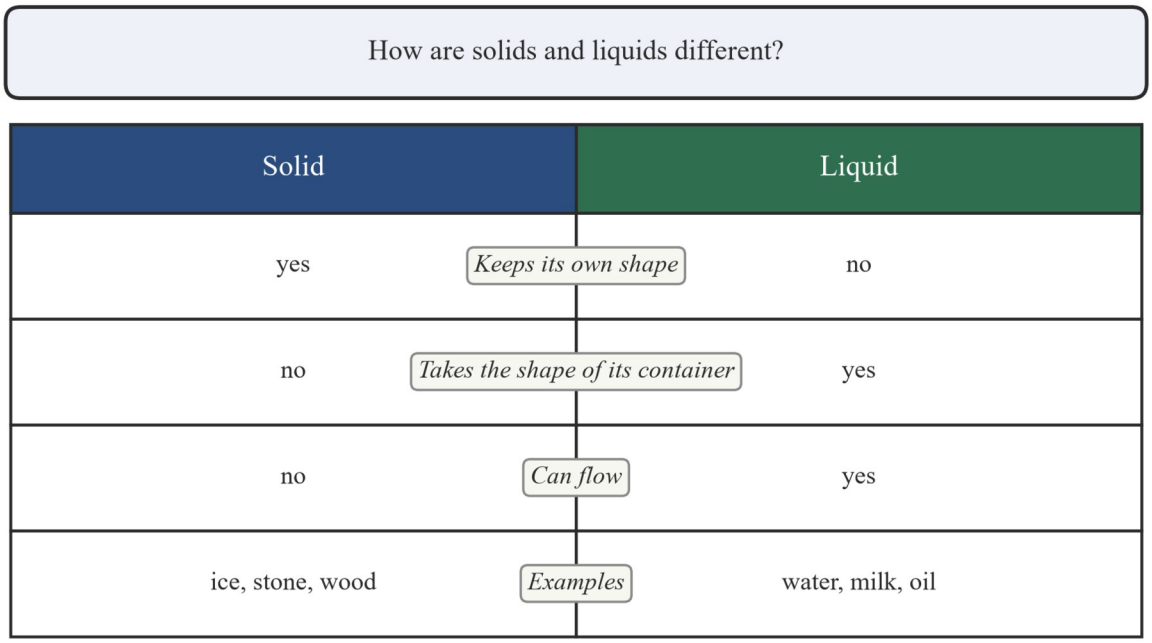
A role-play of a food chain. Three children stand under three cards: water plant, then snail with an arrow saying eaten by, then duck with an arrow saying eaten by. A thought bubble over the duck asks, what if there were two ducks? Under it: changing one number lets you watch what happens to the rest.

In 1A's pond story, water plants grow, snails eat the plants, and ducks eat the snails. Act it out: each child stands for one living thing. The role-play is a model you can change — *what if there were two ducks?* — and then watch what the model says happens to the snails and the plants. Changing one number and watching the rest is exactly what models are for.

Graphic organisers

A **graphic organiser** is a table-like picture that sets ideas out side by side, so they are easy to compare.

A graphic organiser: solids and liquids



Each row asks the same question of both. The organiser puts the answers side by side.

A graphic organiser titled How are solids and liquids different? Two columns, Solid and Liquid, with the same idea in each row: keeps its own shape, yes for a solid and no for a liquid; takes the shape of its container, no for a solid and yes for a liquid; can flow, no for a solid and yes for a liquid; examples, ice, stone and wood against water, milk and oil.

Every row asks the same thing of both sides: does it keep its own shape? Does it take the shape of its container? Can it flow? With the answers side by side, the difference between solids and liquids is easy to see. The same facts written in a long paragraph would make you hunt for them.

Finding patterns and relationships

Set-out data is not the finish line. It is the start. Once the data is tidied into a table, a graph, a model or an organiser, do the 1A move: ask *what repeats?* (a pattern) and *when this changes, does that change too?* (a relationship). The graphs above answered pattern questions about Melbourne's rain. Later questions in this subtopic will set up relationship questions — like whether the distance a toy car rolls changes when the surface it rolls on changes.

Words to know in 2A

Word	What it means here
data	what we notice, count or measure, and write down (from 1A)
table	a way of setting data out in rows and columns, in order
title	the line that says what a table or graph is about
column heading	the words at the top of a column that say what it holds, with the unit
unit	what was counted (here, days)
axes (one axis)	the two lines that frame a graph; the vertical one runs up and down, the horizontal one runs side to side
scale	the numbers on an axis and the jump between them
column graph	a graph where each number becomes a column of that height

Word	What it means here
model	a thing that stands in for a real thing, simpler and not as big
graphic organiser	a table-like picture that sets ideas out side by side so they are easy to compare
pattern	something that repeats in the data, or a change you can describe (from 1A)
relationship	when one thing changes and another thing changes with it (from 1A)

Worked examples

Example 1 — with help

Maya's class watched the weather. Her notes are a list of sentences: *In January there were 5 rainy days. In February there were 4. In March there were 5. In April there were 8.* Turn Maya's list into a table.

Working	Comment
Title: Rainy days in Melbourne, 2013–2026	The title says what the table is about. Maya's data is the Melbourne rainy-day data, so the title names it.
Heading row: Month | Rainy days (days)	Two columns, so two headings. Each heading says what its column holds, and the unit — days — sits in the heading.
Rows: January 5; February 4; March 5; April 8	One row for each month, in order. Each row copies one sentence from the list.
Check: read April's row — 8. Read April's sentence — 8. They match.	Checking one row against the list catches slips. The table now holds the same facts as the list, in order.

Example 2 — with help

The table shows rainy days in each season at Melbourne (Olympic Park): summer 15, autumn 21, winter 27, spring 25. Build a column graph from it.

Working	Comment
Step 1: draw the axes. Label the horizontal axis "Season" and the vertical axis "Rainy days (days)".	The horizontal axis holds the things you compare; the vertical axis holds what you count. The unit sits in the label.
Step 2: choose a scale. Biggest number is 27, so count by 5s up to 30.	Every number needs a home on the scale. Counting by 5s to 30 fits 15, 21, 27 and 25. Counting by 10s would not.
Step 3: draw one column for each season, as tall as its number: 15, 21, 27, 25.	One column per thing you compare. The height is the number — that is the whole trick of a column graph.
Step 4: write the numbers on top of the columns, and the title on top of the graph.	Numbers on top make the graph easy to check against the table. The title says what the graph shows.
Step 5: write the pattern: winter is the tallest column and summer the shortest, so Melbourne has more rainy days in winter than in summer.	The graph is built so the pattern can be seen. Finish by saying the pattern out loud.

Example 3 — on your own

Look at the 12-month rainy-day graph above. Say the tallest column, the shortest column, the difference between them, and the pattern.

The tallest column is August, at 9 rainy days. The shortest is February, at 4. The difference is 9 − 4 = 5, so August has 5 more rainy days than February. The pattern is that the middle of the year — June, July and August, the winter months — is a block of tall columns, while the start and end of the year are shorter: winter is the wetter time.

So the graph answers all four questions at a look: tallest August (9), shortest February (4), difference 5, and a winter-wetter pattern — the same facts the table holds, made visible.

Example 4 — on your own

Your class has the season data two ways, as in the picture above: the table (summer 15, autumn 21, winter 27, spring 25) and the column graph of the same numbers. You must put one display on a poster for the school assembly, and keep the other in your notebook. Choose which goes where, and say why each fits its job.

The poster's job is to show the pattern — winter tallest, summer shortest — to people walking past. The graph fits that job: the heights show the pattern at once, with no numbers to read off. The notebook's job is to keep the exact numbers safe for later. The table fits that job: every number is written right there, so nothing has to be read off a scale.

So the graph goes on the poster and the table goes in the notebook — a display is a choice, and the right choice fits what you want your reader to see.

Practice questions

With help

Q1. Look at the parts-of-a-table picture above. (a) What does the title say? (b) What do the column headings say? (c) What does the "(days)" in the heading tell you?

Q2. Here are four more facts from the Melbourne rainy-day data, written as sentences: *In March there were 5 rainy days. In April there were 8. In May there were 9. In June there were 9.* (a) Set the four facts out as a table, with a title, a heading row and one row for each month. (b) Say why the table is easier to read than the list of sentences.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean number of rain days (1 mm or more) for each month, 2013–2026, rounded to the nearest whole day, bom.gov.au — looked up 2026-08-15 (page made 2026-08-13; saved copy at _sources/bom086338.html; bom.gov.au did not answer when checked again on 2026-08-20).

Q3. Look at the parts-of-a-column-graph picture above. (a) Which axis holds what you count? (b) What is the scale counting by? (c) How many columns does the graph have, and why that many?

Q4. Look at the 12-month rainy-day graph above. (a) Which month has the most rainy days, and how many? (b) Which month has the fewest? (c) How many more rainy days does the wettest month have than the driest?

Q5. Complete the pattern sentence about the 12-month graph: "In Melbourne there are _____ rainy days in winter (June to August) than in the summer months (December to February)." (more / fewer)

Q6. The season numbers are 15, 21, 27 and 25. Three scales are suggested for the vertical axis: count by 5s up to 30; count by 5s up to 25; count by 10s up to 20. (a) Which scale fits the data? (b) Say what goes wrong with each of the other two.

Q7. Look at the same-data-two-ways picture above. (a) Which display shows the pattern — winter tallest, summer shortest — more quickly? (b) Which display keeps every exact number in front of you? (c) You want a poster that shows the pattern to your class. Which display do you choose, and why does it fit that job?

Q8. Look at the graphic organiser about solids and liquids. (a) Can a solid flow? (b) Which side takes the shape of its container? (c) The same facts could be written in a long paragraph. Say what the organiser does better.

Q9. Look at the shoebox habitat model. (a) What stands in for the pond? (b) Name one real thing the model leaves out. (c) The model leaves a lot out. Say why it is still useful.

On your own

Q10. Here is real rainfall data for Melbourne (Olympic Park), as a list: *January about 53 mm. February about 25 mm. March about 35 mm. April about 67 mm.* Write the data as a table with a title, a heading row (including the unit) and one row for each month.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean rainfall for each month, 2013–2026, rounded to the nearest whole mm, bom.gov.au — looked up 2026-08-15 (page made 2026-08-13; saved copy at _sources/bom086338.html; bom.gov.au did not answer when checked again on 2026-08-20).

Q11. The table shows rainy days at Melbourne (Olympic Park) for the first six months of the year.

January	February	March	April	May	June
5	4	5	8	9	9

(a) Draw a column graph of the data. Include a title, labelled axes and a scale that fits.

(b) Write one pattern your graph shows.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean number of rain days (1 mm or more) for each month, 2013–2026, rounded to the nearest whole day, bom.gov.au — looked up 2026-08-15 (page made 2026-08-13; saved copy at _sources/bom086338.html; bom.gov.au did not answer when checked again on 2026-08-20).

Q12. The school newsletter wants to show, at a look, which season has the most rainy days in Melbourne. Choose the table or the column graph for the newsletter, and say why your choice fits that job.

Q13. Look at the picture map of Australia's climates. (a) Which part of the country is hot and wet? (b) Victoria sits in which part? (c) Name one thing the map leaves out.

Q14. Look at the role-play food chain: water plant → snail → duck. (a) Predict what happens to the snails if there are two ducks instead of one. (b) What does that mean for the water plants? (c) Say one thing the role-play leaves out about real ponds.

Q15. Your class investigates friction — the rub between two surfaces. A toy car rolls down a ramp and onto a surface; you measure how far it rolls. You test carpet, tiles and grass. (a) Plan the table you will fill in as you test. Say the title, the column headings and the unit. (b) Say why a table fits the facts as you collect them. (c) When the data is in, you want to show the pattern. Say which display you would make, and why.

Q16. Your class investigates melting: three ice blocks, one with no wrapping, one wrapped in one layer of cloth, one wrapped in two layers. You time how long each takes to melt. (a) Plan a column graph for the data: what goes on the horizontal axis, what goes on the vertical axis (with its unit), and a scale that would fit times up to 60 minutes. (b) Predict which column will be tallest, and say what that thinking is based on.

Q17. Your class compares materials — what things are made of. You drop water onto paper, plastic and fabric, counting the drops each holds before it soaks through. (a) Plan a column graph: what goes on each axis, and the unit. (b) If plastic holds the most drops, what will its column look like next to the others?

Q18. Your friction data from Q15 is in your table. A friend says, "just show me the pattern". (a) Which display do you make for your friend? (b) Say why that display fits the job. (c) Write your result as a relationship: name the thing that changes and the thing that changes with it.

Answers

Q1. (a) “Rainy days in Melbourne, 2013–2026” — it says what the table is about; (b) they say what each column holds: Month, and Rainy days; (c) the unit — the count is in days. **Q2.** (a) title “Rainy days in Melbourne, 2013–2026”; headings Month and Rainy days (days); rows March 5, April 8, May 9, June 9; (b) in the table your eye goes straight to the month you want, and the numbers line up so they are easy to compare — in the list you must read every sentence. **Q3.** (a) the vertical axis (the up-and-down line); (b) 5s; (c) four columns — one for each season, because there are four seasons to compare. **Q4.** (a) August, 9 days; (b) February; (c) 9 − 4 = 5 more days. **Q5.** more. **Q6.** (a) count by 5s up to 30; (b) counting by 5s up to 25 stops below 27, so the winter column has no home; counting by 10s up to 20 also stops below 27, and 15, 21 and 25 sit between its marks, so the columns are hard to draw and hard to read. **Q7.** (a) the column graph; (b) the table; (c) the graph — the poster’s job is to show the pattern, and the heights show it at once. **Q8.** (a) no; (b) the liquid side; (c) it puts the same ideas side by side, so the differences are easy to see — in a paragraph you would have to hunt for them. **Q9.** (a) the blue paper; (b) e.g. real water (or weather, sounds, smells, the true size); (c) it shows where things live in the habitat, and you can point at it and change it. **Q10.** title e.g. “Rainfall in Melbourne, 2013–2026”; headings Month and Rainfall (mm); rows January 53, February 25, March 35, April 67. **Q11.** (a) a column graph with a title, horizontal axis “Month”, vertical axis “Rainy days (days)”, a scale counting by 1s, 2s or 5s up to at least 9, and columns of heights 5, 4, 5, 8, 9, 9; (b) e.g. the columns get taller from February to May — the later months have more rainy days than the start of the year. **Q12.** the column graph — the newsletter’s reader should see the tallest column (winter) at a look, with no numbers to hunt for. **Q13.** (a) the top of the country, the north; (b) the warm-summers, cool-winters part (the south); (c) e.g. towns, rivers, or the true shape of the coast — the real edges are not this straight. **Q14.** (a) with two ducks eating them, the snails get eaten faster, so there are fewer snails; (b) with fewer snails eating them, the water plants grow more; (c) e.g. real ducks eat other things too, and real snails and ducks move about — the role-play holds them still in a line. **Q15.** (a) title e.g. “How far the car rolled on each surface”; headings Surface and Distance rolled (cm); one row for each surface: carpet, tiles, grass; (b) the table records every run in order as it happens, so no fact is lost; (c) a column graph — one column for each surface, so the heights show which surface let the car roll the longest distance. **Q16.** (a) horizontal axis: wrapping (0, 1 and 2 layers); vertical axis: time to melt (minutes); a scale counting by 5s or 10s up to 60 fits; (b) e.g. the two-layer column, because wrapping slows the melting — or any answer that can say what it is based on. **Q17.** (a) horizontal axis: material (paper, plastic, fabric); vertical axis: drops held before soaking through (drops); (b) the tallest column. **Q18.** (a) a column graph of the table; (b) the heights show the pattern at once, which is what your friend asked for; (c) e.g. when the surface gets rougher, the car rolls a shorter distance — the surface changes, and the distance changes with it.

The answers, step by step

Q1. (a) The title is the line above the table: *Rainy days in Melbourne, 2013–2026.* A title says what the table is about. (b) The column headings are *Month* and *Rainy days (days)*; headings say what each column holds. (c) “(days)” is the unit. It says the numbers are counts of days, so nobody mistakes them for anything else.

Q2. (a) The list has one fact per sentence, so the table has one row per month. The title names the data, the heading row says what each column holds — Month, and Rainy days (days), with the unit in the heading — and the rows copy the facts in order: March 5, April 8, May 9, June 9. (b) In the list, finding May means reading every sentence. In the table, your eye goes straight to the May row. And because the numbers sit in one column, one under the other, they are easy to compare. Same facts — easier to read.

Q3. (a) What you count — rainy days — sits on the vertical axis, the up-and-down line. (b) The scale counts by 5s: 0, 5, 10, 15, 20, 25, 30. (c) Four columns, because there are four seasons to compare — one column for each thing on the horizontal axis.

Q4. (a) Read across the tops of the columns for the tallest: August, 9 rainy days. (b) The shortest column is February, 4 days. (c) The difference is 9 − 4 = 5, so August has 5 more rainy days than February.

Q5. Winter months on the graph: June 9, July 9, August 9. Summer months: December 6, January 5, February 4. Every winter column is taller than every summer column, so there are **more** rainy days in winter.

Q6. (a) The biggest number is 27. Counting by 5s up to 30 gives every number a home: 15, 20, 25 and 30 are on the scale, and 21 and 27 sit between marks. (b) Counting by 5s but stopping at 25 goes wrong on the biggest number: 27

is above the top of the scale, so the winter column cannot be drawn. Counting by 10s up to 20 goes wrong twice: it also stops below 27, and the numbers 15, 21 and 25 all sit between marks, so the columns are hard to draw and hard to read.

Q7. (a) The graph shows the pattern more quickly: your eye compares the heights without reading any numbers. (b) The table keeps every exact number in front of you: 15, 21, 27 and 25 are written, not read off a scale. (c) The poster's job is to show the pattern to the class, so the graph fits it — the tall winter column and the short summer column say the pattern at once. A display is a choice, and the choice fits the job.

Q8. (a) Read the "Can flow" row on the solid side: no. (b) The liquid side says yes to "takes the shape of its container". (c) The organiser asks the same thing of both sides in each row and puts the answers side by side, so the difference between solids and liquids shows at a look. In a long paragraph the same facts are hiding in the middle of sentences, and you must hunt for them.

Q9. (a) The pond is stood in for by blue paper. (b) Any one of: real water, weather, sounds, smells, the true size of a habitat. (c) A model does not need to be the real thing to be useful. The shoebox shows where things live in the habitat, and you can point at it, talk about it and change it — which is exactly what models are for.

Q10. One fact per sentence means one row per month. The title names the data — e.g. *Rainfall in Melbourne, 2013–2026* — the heading row says what each column holds, with the unit in the heading: Month, and Rainfall (mm). The rows copy the facts in order: January 53, February 25, March 35, April 67.

Q11. (a) Build it in the three steps from above. Step 1: draw the axes and label them — horizontal axis "Month", vertical axis "Rainy days (days)". Step 2: choose a scale — the biggest number is 9, so counting by 1s up to 10 (or by 2s or 5s up to 10) fits; draw one column per month, heights 5, 4, 5, 8, 9, 9. Step 3: write the numbers on top and the title on top of the graph. (b) Any pattern the graph shows, e.g. the columns get taller from February to May, so the middle of the year starts wetter than the start of the year; or June is wetter than January and February.

Q12. The newsletter wants readers to see the answer at a look, so the column graph fits: the tallest column — winter — shows which season has the most rainy days without any numbers to hunt for. The table would make the reader compare four numbers in their head. (The table is still the right home for the exact numbers in your notes.)

Q13. (a) The hot-and-wet part is at the top of the map, in the north. (b) Victoria's dot sits in the warm-summers, cool-winters part, in the south. (c) Any one of: towns, rivers, the true shape of the coast (the real edges are not this straight), or the fact that the parts run into each other.

Q14. (a) Two ducks eat more snails than one, so the snails are eaten faster and there are fewer of them. (b) Fewer snails means fewer plants get eaten, so the water plants grow more. (c) Any one of: real ducks eat other things too; real snails and ducks move about instead of standing in a line; a real pond has many more living things in it. The role-play is a model — useful, and simpler than the real thing.

Q15. (a) The table needs a title — e.g. *How far the car rolled on each surface* — and two columns: Surface, and Distance rolled (cm), with the unit in the heading; one row for each surface tested: carpet, tiles, grass. (b) As the test runs, the table records every run in order, so no fact is lost and every number has its place. (c) A column graph, with one column for each surface: the heights then show at once which surface let the car roll the longest distance, which is the pattern.

Q16. (a) The horizontal axis holds the things you compare — the wrapping: 0 layers, 1 layer, 2 layers. The vertical axis holds what you count — time to melt (minutes). Times can run up to 60 minutes, so a scale counting by 10s up to 60 (or by 5s) fits. (b) Any answer that can say what it is based on, e.g. *I predict the two-layer ice will take the longest, because wrapping slows the melting* — based on the idea that the wrapping stands between the ice and the warm room. A sentence of the form *I predict … because …* is the kind 1A taught.

Q17. (a) Horizontal axis: the materials — paper, plastic, fabric. Vertical axis: drops held before soaking through, counted in drops. (b) The plastic column would be the tallest, because the tallest column always holds the biggest number — most drops held.

Q18. (a) A column graph built from your table, one column per surface. (b) Your friend asked for the pattern, not the raw facts: the heights show which surface let the car roll the longest distance at a look, so the graph fits the job — the table stays in your notes for the exact numbers. (c) Name both changing things, e.g. *when the surface gets rougher, the*

car rolls a shorter distance. The surface changes, and the distance changes with it — that is a relationship, and the graph made it visible.

Comparing findings and judging fairness

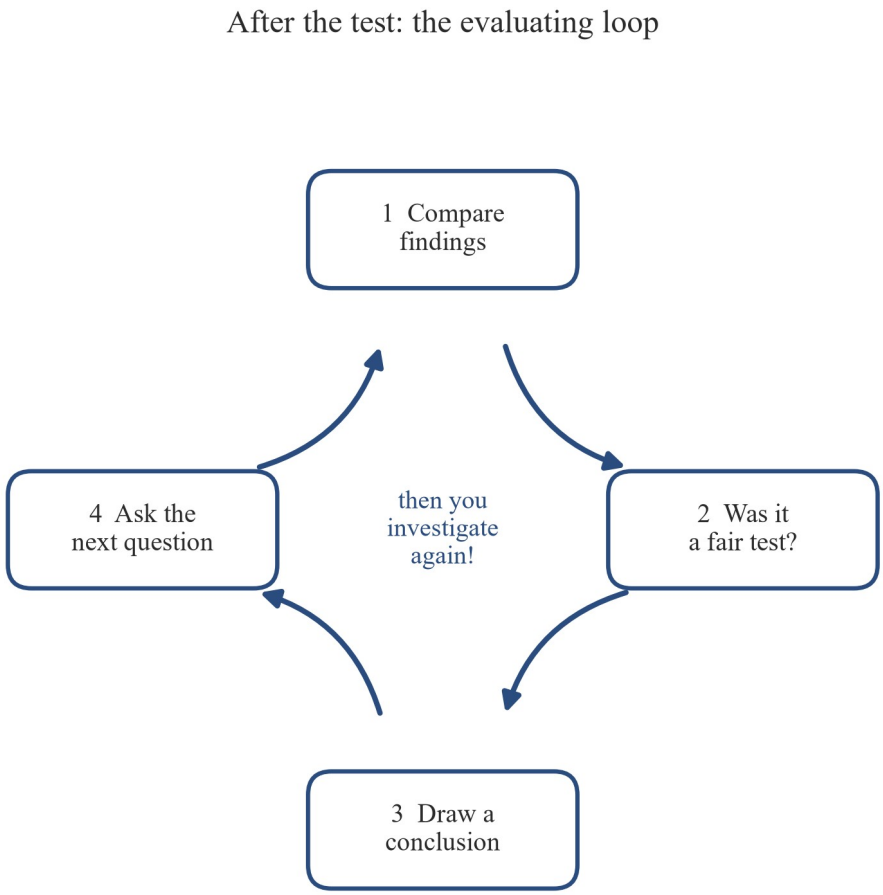
What we teach here — VC2S4I05 (Victorian Curriculum F–10 Version 2.0, Science, Levels 3 and 4): "findings can be compared to those of others, including, as appropriate, whether a test was fair or not, to enable conclusions to be drawn, and may lead to the identification of further questions for investigation".
In our words: when your test is finished, the thinking is not finished. You compare what you found with what others found, you judge whether the test was fair, you draw a conclusion — and then you ask the next question.

What you learn here

After the test

In 1A you learned to ask a question and make a prediction. In 1B you planned a fair test. In 1C you measured and recorded. In 2A you made tables and column graphs. Now the test is done, and you have your **findings**. A finding is what your investigation shows — what you found out, from what you observed and measured. Your prediction was what you thought would happen. Your findings are what did happen.

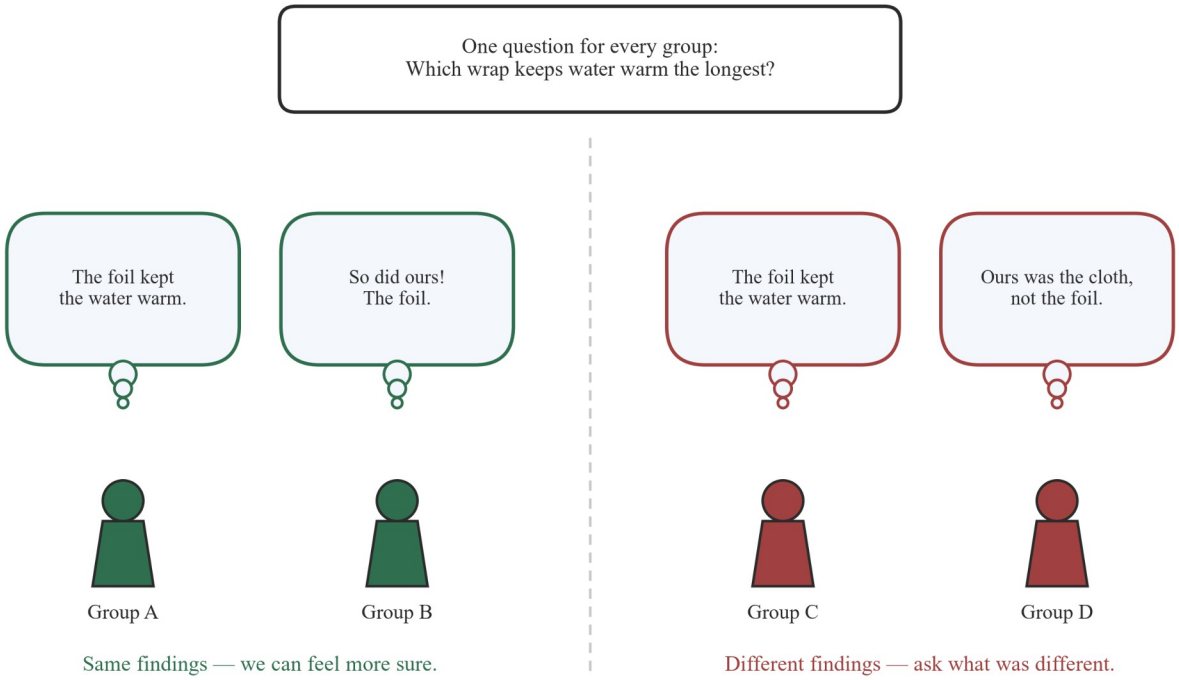
Here is the loop this subtopic teaches. Scientists go around it again and again:



A cycle with four boxes joined by arrows in a loop: 1 compare findings, 2 was it a fair test?, 3 draw a conclusion, 4 ask the next question, with "then you investigate again" in the middle.

Comparing findings with others

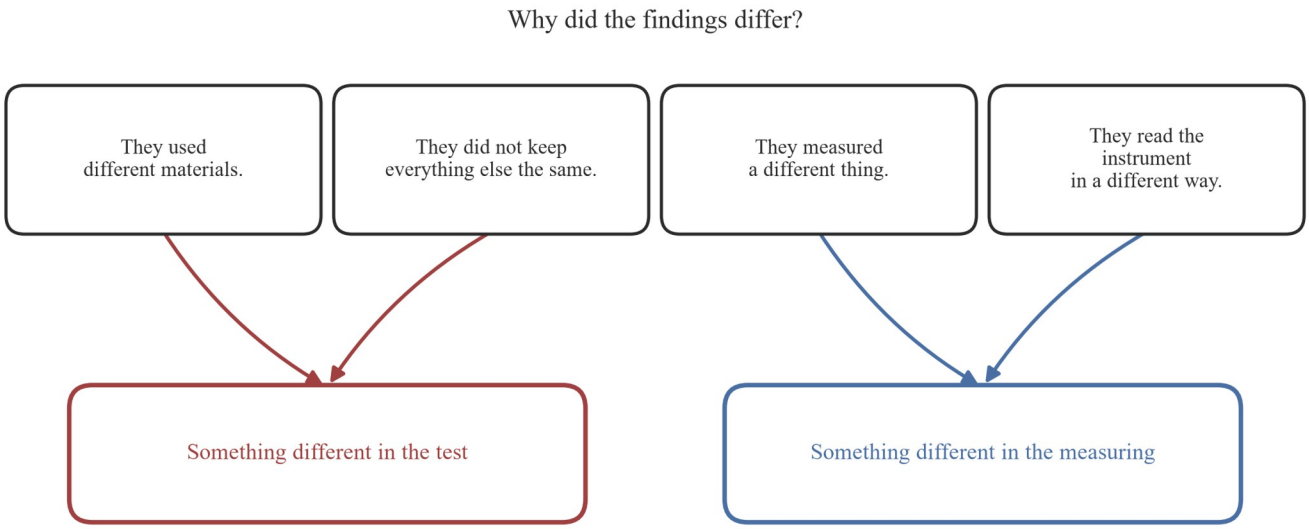
You never keep your findings to yourself. You **compare** them — you put them next to someone else's and look for what is the same and what is different. And "someone else" can be another group in your class, another class, or people who did the same test somewhere else.



One question box at the top, "Which wrap keeps water warm the longest?", above two panels. Left panel: Group A and Group B both report the foil, with the caption "Same findings — we can feel more sure." Right panel: Group C reports the foil and Group D reports the cloth, with the caption "Different findings — ask what was different."

Look at the diagram. On the left, two groups asked the same question and got **the same findings**. That is useful: when two groups find the same thing, we can feel more sure of it. On the right, two groups asked the same question and got **different findings**. That is useful too — because it makes us ask the magic question of this subtopic: *what was different?*

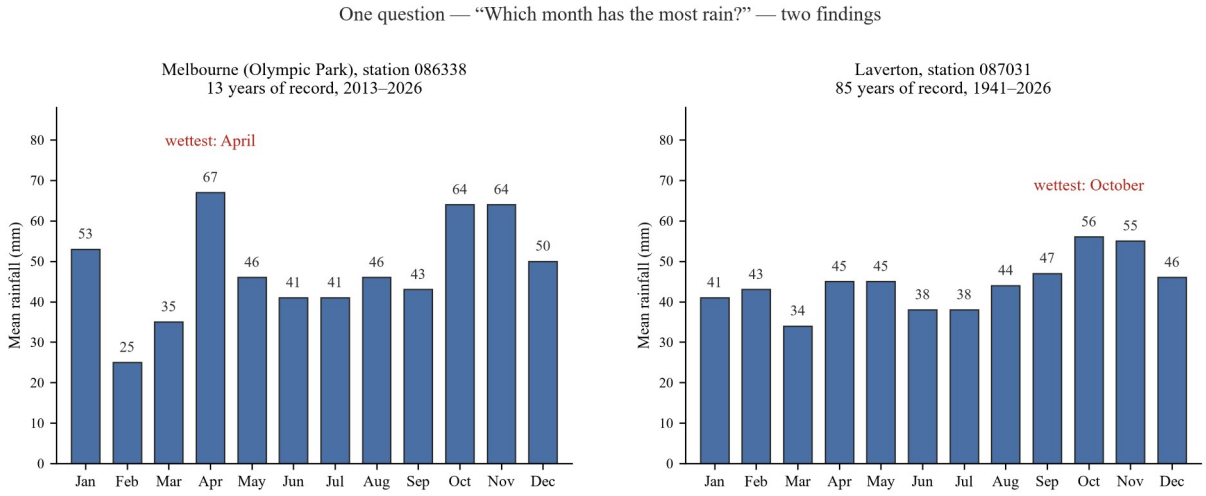
Important: different findings do not mean someone got it wrong. Two honest groups can find different things, and both be right. The findings differ because something in the test or in the measuring was different. So we sort the reasons like this:



A sorting diagram titled "Why did the findings differ?" Four cards — "They used different materials", "They did not keep everything else the same", "They measured a different thing", "They read the instrument in a different way" — are sorted into two groups: "Something different in the test" and "Something different in the measuring".

A real example: two stations, two findings

Here is a real comparison. Two weather stations in Melbourne answer one question: *which month has the most rain?* Each station's findings are its mean monthly rainfall — the average rain for each month, worked out over many years of records.



Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean monthly rainfall 2013–2026 (rounded to the nearest mm), bom.gov.au — retrieved 2026-08-20.

Source: Bureau of Meteorology, Laverton station 087031, mean monthly rainfall 1941–2026 (rounded to the nearest mm), bom.gov.au — retrieved 2026-08-20.

Two column graphs side by side of mean monthly rainfall in mm. Left: Melbourne (Olympic Park), station 086338, 13 years of record 2013–2026, with April tallest at 67 mm and labelled "wettest: April". Right: Laverton, station 087031, 85 years of record 1941–2026, with October tallest at 56 mm and labelled "wettest: October".

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean monthly rainfall 2013–2026 (rounded to the nearest mm), bom.gov.au — retrieved 2026-08-20. Source: Bureau of Meteorology, Laverton station 087031, mean monthly rainfall 1941–2026 (rounded to the nearest mm), bom.gov.au — retrieved 2026-08-20.

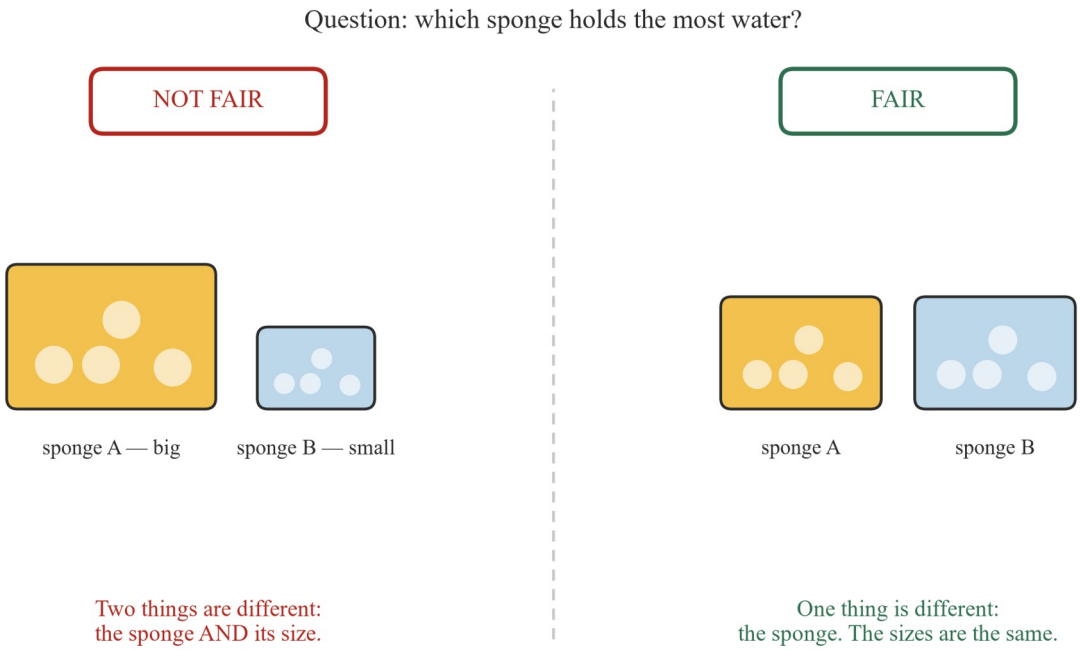
Compare the findings. The Olympic Park station finds *April* is the wettest month. The Laverton station finds *October* is the wettest month. **Different findings — and both are right.** A weather station only measures the weather where it stands, so two stations in different places can honestly get different answers. The two stations also counted different numbers of years: 13 years at Olympic Park and 85 years at Laverton. Different place and different years are two reasons the findings differ.

Now look for a finding the two stations **share**: at both stations, summer is drier than spring, and the middle of the year is not the wettest time. When two stations agree, we can feel more sure of the finding. That is the whole skill: *compare, then ask what is the same, what is different, and why.*

Was the test fair? What *fair* means in this book

Outside science, *fair* is a word people can disagree about — different people mean different things by it. The Victorian Curriculum uses the words *fair test* and does not say what they mean. So this book gives *fair test* one clear meaning, and every question here can be answered with that meaning alone: a test is **fair** when the things you compare are different in only one way — the one thing you are testing — and everything else is kept the same. If you ever use the word in a different way, say so, so your reader knows what you mean.

In 1B you met the three parts of a fair test: the **one thing you change**, the **things you keep the same**, and the **thing you measure**. In 2B you use those parts to *judge* a test — your own or someone else's.

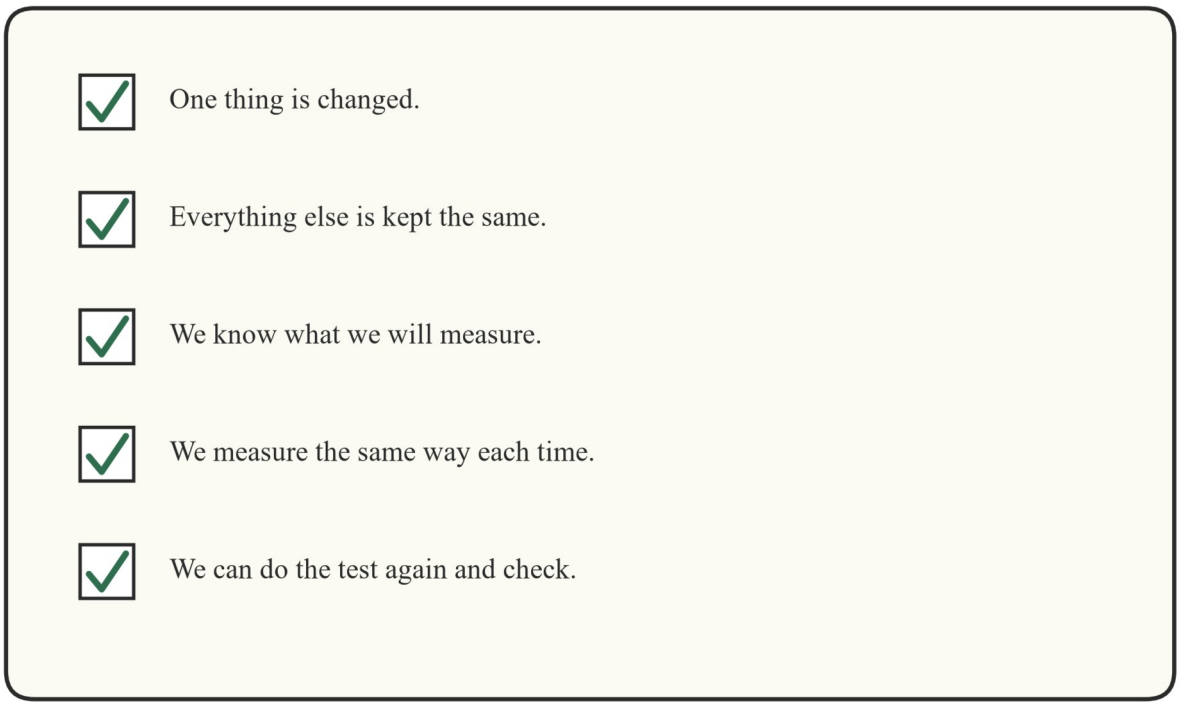


Two panels under the question "which sponge holds the most water?" Left panel, labelled NOT FAIR: a big yellow sponge and a small blue sponge, with the caption "Two things are different: the sponge AND its size." Right panel, labelled FAIR: a yellow sponge and a blue sponge cut to the same size, with the caption "One thing is different: the sponge. The sizes are the same."

Look at the diagram. In the left panel, two things are different — the sponge **and** its size. If the big sponge holds more water, we do not know if that is because of the sponge or because of the size. The test is **not fair**. In the right panel, only one thing is different — which sponge it is. The sizes are kept the same. Now if one sponge holds more, we know the sponge made the difference. The test is **fair**.

The fair-test checklist

Judging a test is easier with a **checklist** — a list you check off, one line at a time. Here is the checklist this book uses. It works on your own plan and on anyone else's.



Tick each line for the plan you are checking. A missed line shows what to fix.

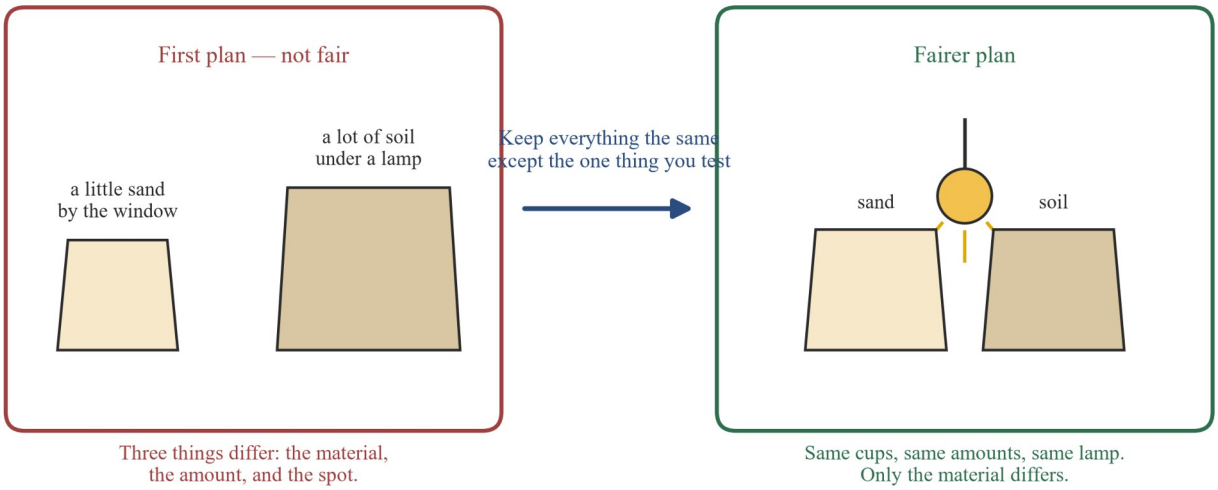
A checklist card titled "The fair-test checklist" with five ticked lines: one thing is changed; everything else is kept the same; we know what we will measure; we measure the same way each time; we can do the test again and check.

To use it, read a plan once for each line. If the plan passes the line, tick it. If it fails, the line that fails tells you exactly what to fix. **Try it yourself only with your teacher: warm water from a kettle may be used, and only the teacher pours it; never boiling water; wipe up spills so nobody slips.**

Making a test fairer

A plan that is not fair is not a failure — it is a first plan. The fix is always the same move: find the things that are different, and keep them the same, until only the one thing you are testing is different.

Sam asks: does sand or soil get hotter in the light?

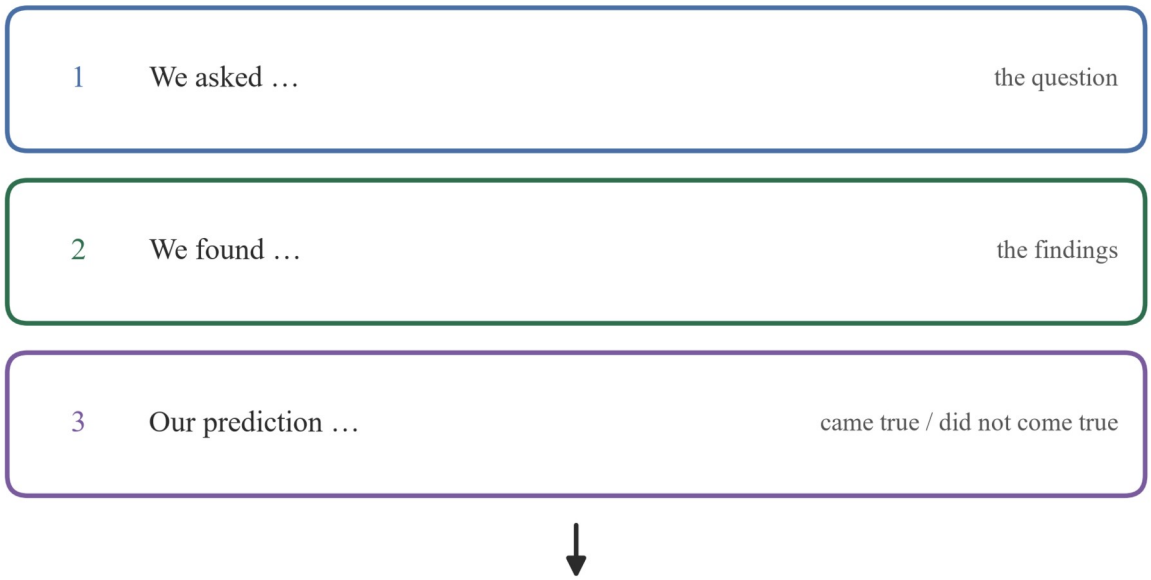


Two panels. Left, "First plan — not fair": a small cup of sand by the window and a big tray of soil under a lamp, captioned "Three things differ: the material, the amount, and the spot." An arrow labelled "Keep everything the same except the one thing you test" points to the right panel, "Fairer plan": two same-sized cups, one of sand and one of soil, side by side under one lamp, captioned "Same cups, same amounts, same lamp. Only the material differs."

In the first plan, three things are different, so no finding from it can be trusted. In the fairer plan, everything is kept the same except the material. Now a difference in how hot the cups get can only come from the material.

Drawing a conclusion

A **conclusion** is your answer to the question, made from the findings. It is not just your findings said again — it says what the findings *mean* for the question. Three sentences make a good conclusion at this level:

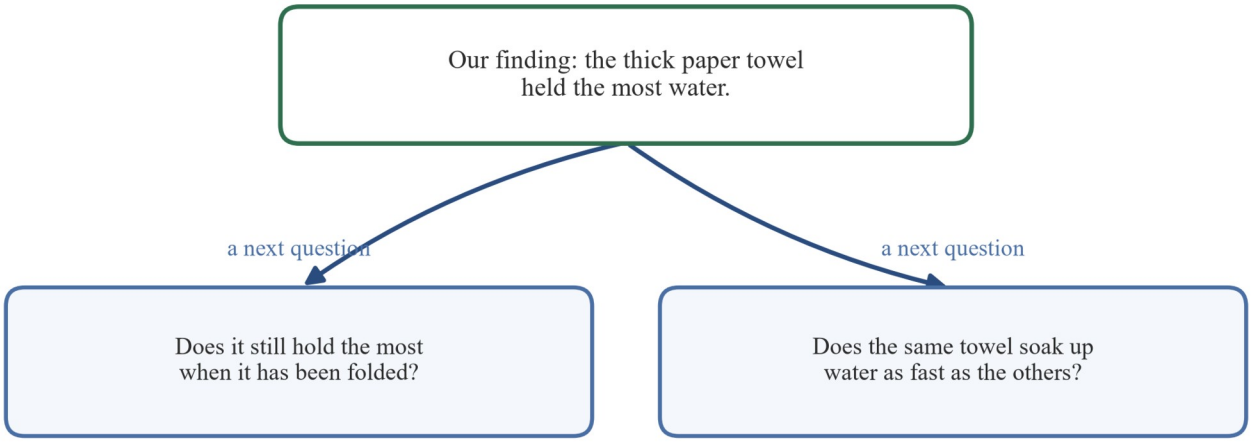


A card titled "Writing a conclusion" with three stacked lines: 1 "We asked …" (the question), 2 "We found …" (the findings), 3 "Our prediction …" (came true / did not come true), above the sentence "A conclusion answers the question with the findings."

Sentence 1 names the question. Sentence 2 says the findings that answer it. Sentence 3 checks the prediction: did it come true, or not? A prediction that did not come true is not a bad prediction — it tells you what to look at again. That is science working.

The next question

Findings almost never end the story. They raise **further questions** — new questions that could be investigated next.



Findings raise new questions — that is how the loop starts again.

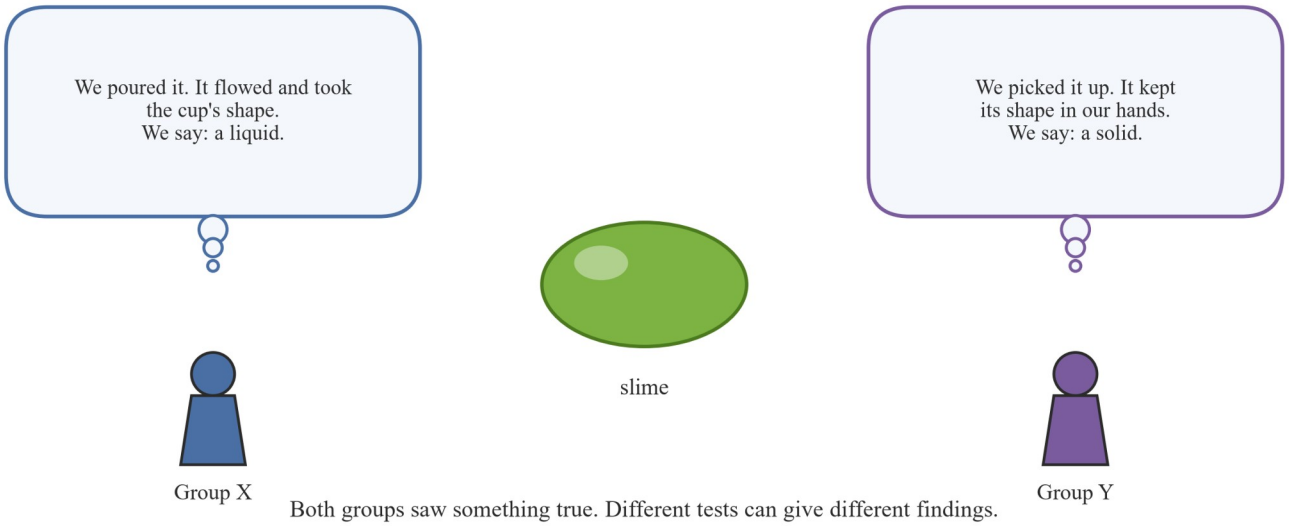
A finding box, "Our finding: the thick paper towel held the most water", with arrows down to two boxes labelled "a next question": "Does it still hold the most when it has been folded?" and "Does the same towel soak up water as fast as the others?"

Look at the diagram. One finding grows two new questions, and each new question can start the loop again: predict, test, compare, judge, draw a conclusion. That is why science never runs out of work.

When two ways of sorting disagree

Sometimes two groups classify the same thing in different ways, and *both* observed carefully. **Classify** means to sort things into groups by what you observe. If the groups disagree, ask: *did they use the same test?*

One slime, two findings — they used different tests



Both groups saw something true. Different tests can give different findings.

Two groups look at one green blob of slime in the middle. Group X says, "We poured it. It flowed and took the cup's shape. We say: a liquid." Group Y says, "We picked it up. It kept its shape in our hands. We say: a solid." The caption reads, "Both groups saw something true. Different tests can give different findings."

Slime is a famous example. Poured, it flows like a liquid. Picked up, it holds together like a solid. Two groups using different tests can honestly reach different findings. When that happens, the conclusion names the tests: *slime behaves like a liquid when poured and like a solid when held.* And a next question appears by itself: *are there things that a solid and a liquid do not usually do?* (Deciding the answer is a later topic; comparing the findings and drawing the careful conclusion is this one.)

Words to know in 2B

Word	What it means here
findings	what your investigation shows — what you found out, from what you observed and measured
compare	to put things side by side and look for what is the same and what is different
fair test	a test where the things compared are different in only one way — the thing being tested — and everything else is kept the same
checklist	a list you check off, one line at a time
judge	to decide, using what you know — scientists also say *evaluate*
conclusion	your answer to the question, made from the findings
further question	a new question the findings raise, that could be investigated next
classify	to sort things into groups by what you observe

You already know from earlier subtopics: observe, record, question, prediction, data, and the three parts of a fair test — change one thing, keep the rest the same, measure the result.

Worked examples

Example 1 — with help

Two groups test the same question: *which wrap keeps a cup of warm water warm the longest?* Each group wraps one cup and leaves one cup unwrapped, then feels the cups after an hour. Group 1 finds the foil-wrapped cup stayed warmest. Group 2 finds the cloth-wrapped cup stayed warmest. Compare the findings and work out what to do next.

Working	Comment
Compare: Group 1 says foil kept the water warm. Group 2 says cloth did. The findings are different.	Comparing means putting the findings side by side and saying what is the same and what is different. Here: different.
Ask what was different: the groups look at each other's tests. They find two differences: Group 2's water started with more warmth, and Group 2's cups stood in the Sun.	These are "different in the test" reasons. Two things that should have been kept the same were not.
Judge fairness: the test was not fair. More than one thing was different between the groups.	A fair test keeps everything the same except the one thing being tested. Two differences means we cannot trust either finding against the other.
Fix: both groups start with water of the same warmth, stand all the cups in the same spot, and test again.	Making a test fairer is always the same move: keep everything the same except the wrap.

Safety: the teacher pours the warm water; it is warm, never boiling, and spills are wiped up.

Example 2 — with help

Use the two rainfall graphs above. One question was asked at two stations: *which month has the most rain?* Compare the findings, say why they differ, draw a conclusion, and ask a further question.

Working	Comment
Compare: Olympic Park finds April the wettest month (about 67 mm). Laverton finds October the wettest (about 56 mm).	Different findings. Both come from real records, so we do not say one is wrong — we ask what was different.
Why they differ: the stations stand in different places, and they counted different years — 13 at Olympic Park, 85 at Laverton.	Two honest reasons from the "different measuring" side: a different place and a different number of years.
Conclusion: we asked which month has the most rain; we found the answer depends on where you measure and for how many years.	The conclusion answers the question with the findings — including the finding that the answer is not the same in every place.
Further question: which month is wettest at our own school, if we keep a rain gauge this year?	A good further question is one that can be investigated next — and this one can.

∴ comparing the two stations' findings gives a conclusion *and* a next question — the loop goes around again.

Example 3 — on your own

Tui's plan: *I want to know which paper towel soaks up the most water. I will use a big sheet of Brand A and a small square of Brand B. I will dip them in the same bowl and see which holds more.* Use the fair-test checklist on Tui's plan, then say how to make it fairer.

The checklist, line by line: *one thing is changed* — yes, the brand of towel, so that line is ticked. *Everything else is kept the same* — no: the sheet sizes are different, so that line fails. *We know what we will measure* — yes, how much water each holds. *We measure the same way each time* — yes, the same bowl and dip. *We can do the test again and check* — yes.

One line fails, and that failed line is the fix: cut both towels to the same size. Then the only difference is the brand.

∴ Tui's plan is not fair as it stands (the sizes differ), and it becomes fair when both towels are cut to the same size — because then the brand is the only difference.

Example 4 — on your own

Two groups classify the same three things — toothpaste, slime and hair gel — as solid or liquid. Group X pours each thing and records whether it flows. Group Y presses each thing and records whether it squashes into a new shape. Group X says all three are liquids. Group Y says all three are solids. Compare the findings and draw the best conclusion.

Compare: the findings disagree on all three things. Ask what was different: the test. Group X watched flowing; Group Y watched squashing. Both groups observed carefully — no group made a mistake. A conclusion that fits *both* sets of findings is: *toothpaste, slime and hair gel flow when poured and keep their shape when gently held, so they behave like liquids in one test and like solids in the other.*

∴ when careful groups disagree, the conclusion can hold both findings at once by naming the tests — and the further question (are these things a group of their own?) is exactly how science grows a new topic.

Practice questions

With help

Q1. Two groups test which lunchbox keeps an ice block frozen the longest. Both groups put their lunchboxes in the same spot, out of the Sun. Group A finds the metal lunchbox wins. Group B finds the plastic lunchbox wins. (a) What does it mean to compare the two groups' findings? (b) Give one "different in the test" reason the findings might differ. (c) If a third group also finds plastic wins, what happens to how sure we feel?

Q2. Look at the two rainfall graphs above. (a) Write the wettest month and its rainfall at each station. (b) Are the two findings the same or different? (c) Give two reasons the findings can differ even though both are right. (d) Name one thing the two stations agree about.

Q3. Mia's plan: *Does a plant grow taller in the window or in the cupboard? I will put a bean plant in the window and a bean plant in the cupboard. I will give both the same water. I will measure both with the same ruler after three weeks.* Run the fair-test checklist on Mia's plan and say which lines are ticked and which fail.

Q4. A class asked: *does the jumper dry faster on a windy day or a still day?* Their findings: *the jumper dried faster on every windy day we tested.* Their prediction was: *the jumper will dry faster on a windy day.* Write the class's conclusion in the three sentences of the conclusion card.

Q5. Two classes survey water use. Class 3R counts how many times the toilets are flushed in a day. Class 4K reads the school water meter at the start and end of the day. Class 3R draws this conclusion: *the toilets use the most water*. Class 4K draws this conclusion: *the school uses more water in the morning than the afternoon*. (a) How were the two methods different? (b) Why can the conclusions be different without either class being wrong? (c) What could both classes do so it is fair to compare their findings?

Q6. A group finds: *our cup wrapped in bubble wrap stayed warm longer than the unwrapped cup.* Write two further questions this finding raises.

On your own

Q7. Say whether each test is fair or not fair, and give the reason using the checklist. 1. Two identical cups of sand; one in the Sun, one in the shade; same thermometer; read after one hour. 2. A big sponge and a small sponge dipped in the same bowl. 3. A test of whether watering time matters: two same-sized cups of soil, one watered in the morning and one in the afternoon; a different child measures each cup. 4. The same chocolate in the Sun and in the fridge, checked every 5 minutes by the same person.

Q8. Each plan below is not fair. Say the fix that makes it fairer. 1. Which shoe slides further on tiles — my big boot or my little sandal? 2. Which dissolves faster, a whole sugar cube or the same cube crushed? One stirred, one not stirred. 3. Which magnet is stronger — the long one held close, or the short one held far away?

Q9. Look at the slime diagram above. Group X says slime is a liquid; Group Y says it is a solid. (a) What was different about the two groups' tests? (b) Why can both groups be right about what they saw? (c) Write one conclusion that holds both findings, and one further question.

Q10. Two groups test which wrap keeps water warm the longest. Group 1 wraps with foil; Group 2 wraps with cloth. Group 1's cup kept more warmth. They compare and find that Group 2's cup started with cooler water. (a) Is comparing the two groups' findings fair as it stands? Say why. (b) Which checklist line fails? (c) Write the fix, and write one further question for when the fair test is done.

Q11. The table shows mean monthly maximum temperature (how hot the hottest part of each month usually is) at the same two stations, rounded to the nearest °C.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Melbourne (Olympic Park)	27	26	24	21	18	15	15	16	18	21	22	25
Laverton	26	26	24	20	17	14	14	15	17	19	22	24

(a) Which month is warmest at Olympic Park, and at what temperature?

(b) Which month is warmest at Laverton?

(c) In which month do the two stations' findings differ by 2 °C? Give both readings.

(d) The stations give different numbers but the same big finding. What is it?

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338 (13 years, 2013–2026) and Laverton station 087031 (82 years, 1943–2026), mean monthly maximum temperature (rounded to the nearest °C), bom.gov.au — retrieved 2026-08-20.

Q12. Here is Dev's plan. *I want to know if soil from the oval or soil from the garden holds more water. I will take one cup of each. I will pour the same water into each. I will catch what drips out. I will do it twice.* (a) Use the checklist and say whether Dev's plan is fair. (b) Dev's friend says the cups are different sizes. Which checklist line does that fail, and what is the fix? (c) Why is "I will do it twice" a good line to have in a plan?

Safety for any soil work: wear gloves, wash hands after, and a teacher stays with you.

Q13. A group's findings: *the towel dried in 2 hours in the Sun and in 5 hours in the shade.* Their prediction: *the towel will dry faster in the shade.* Which of these conclusions follows from the findings, and why do the others not follow? **A.** The towel dried faster in the Sun, so our prediction did not come true. **B.** The towel dried faster in the Sun, so the shade is bad. **C.** The towel dried faster in the Sun, so the Sun dries everything fastest.

Q14. Ruby tests her plan once and writes her finding. Kai does the same test three times and gets the same finding each time. Whose finding can we feel more sure of, and why?

Q15. A class asked *which bubble mix makes the biggest bubbles?* Their findings: *mix 1 made the biggest bubbles in all five tries.* Write (a) the conclusion in three sentences, and (b) one further question.

Q16. Look again at the fair/unfair sponge diagram. Explain to a Year 3 student, in your own words, why the left panel cannot tell us which sponge holds the most water.

Q17. Put the loop in order, and say what is done at step 2: **a** draw a conclusion · **b** compare findings · **c** ask the next question · **d** judge whether the test was fair.

Q18. After the bubble-mix test, one group's findings differ from the rest of the class. List two things they could check — one "different in the test" and one "different in the measuring" — and say what they do if both checks find nothing.

Answers

Q1. (a) putting the findings side by side and saying what is the same and what is different; (b) any one thing that was not kept the same, e.g. the ice blocks started at different sizes; (c) we feel more sure — more groups agreeing makes a finding stronger. **Q2.** (a) Olympic Park: April, about 67 mm; Laverton: October, about 56 mm; (b) different; (c) the stations are in different places, and they counted different years (13 vs 85); (d) e.g. summer is drier than spring at both; the middle of the year is not the wettest time at either. **Q3.** Ticked: one thing changed (window or cupboard); know what to measure (height); same way of measuring (same ruler); can be done again. The fifth line — everything else kept the same — passes only if the two plants and pots also start the same; that is the line to watch. **Q4.** We asked whether the jumper dries faster on a windy day or a still day. We found it dried faster on every windy day we tested. Our prediction came true. **Q5.** (a) 3R counted toilet flushes; 4K read the water meter at two times of day; (b) they measured different things, so their conclusions answer different questions; (c) measure the same thing the same way (e.g. both read the meter, same days) then compare. **Q6.** any two next questions we can investigate, e.g. does bubble wrap keep a cold drink cold longer too? Does two layers of bubble wrap work better than one? **Q7.** 1 fair (only the spot differs — and the spot *is* the thing being tested, everything else same). 2 not fair (size differs as well as the sponge). 3 not fair (watering time is the one thing tested, but different children measure the cups — a second difference). 4 fair (only the place differs; same chocolate, same checker, same timing). **Q8.** 1 test the same shoe size, or two shoes of the same size. 2 stir both cups the same way, or leave both still. 3 hold both magnets the same distance away. **Q9.** (a) the test: pouring vs pressing; (b) each group only saw what its own test shows, and both things are true of slime; (c) conclusion: slime flows when poured and holds its shape when held, so it behaved like a liquid in one test and a solid in the other; further question: e.g. do toothpaste and hair gel do the same? **Q10.** (a) not fair — the starting water was not the same, so the wraps were not the only difference; (b) "everything else is kept the same"; (c) fix: start both cups with water of the same warmth; further question: e.g. does the winning wrap also keep ice blocks cold the longest? **Q11.** (a) January, 27 °C; (b) January; (c) October: 21 °C at Olympic Park, 19 °C at Laverton; (d) January is the warmest month at both (summer is the warmest time). **Q12.** (a) as Dev wrote it: fair — soil source is the only change, same water, same catching, done twice; (b) "everything else kept the same" fails; fix: use two cups of the same size; (c) doing it again lets you check the finding — if it comes out the same twice, you can feel more sure. **Q13.** A follows: it answers the question with the findings and checks the prediction. B adds an opinion ("bad") the findings do not support; C says more than was tested (only a towel was tested, not "everything"). **Q14.** Kai's — the same finding three times is like three groups agreeing; we can feel more sure of it. **Q15.** (a) We asked which mix makes the biggest bubbles. We found mix 1 made the biggest bubbles in all five tries. (Prediction line: state yours and whether it came true.) (b) e.g. does mix 1 also make the longest-lasting bubbles? **Q16.** because two things are different — the sponge and the size — so if one holds more we cannot tell which difference caused it. **Q17.** order b, d, a, c; at step 2 (d) you judge whether the test was fair, using the checklist. **Q18.** test check: e.g. was the mix made the same way? measuring check: e.g. did we read bubble size the same way? If both find nothing, the difference may be real — do the test again and compare once more.

Worked answers

Q1. (a) To compare findings is to put them side by side and say what is the same and what is different. (b) A "different in the test" reason is anything that was not kept the same: the ice blocks may have started at different sizes, or the two lunchboxes may have stood in spots with different warmth. (c) A third group agreeing means more groups have the same finding, and we can feel more sure of it. Same findings from more groups is exactly what makes a finding stronger.

Q2. (a) Read the tallest bar on each graph: Olympic Park — April, about 67 mm; Laverton — October, about 56 mm. (b) The findings are different: two different wettest months. (c) Two reasons: the stations stand in different places, and their records cover different years — 13 years against 85. Different place and different years are honest reasons for different findings, so both stations can be right. (d) They agree that summer is drier than spring, and that the middle of the year is not the wettest time. Agreeing stations let us feel more sure of that finding.

Q3. Run the five lines. One thing changed: yes — where the plant stands. Everything else kept the same: as written, same water is named; the plan must also keep the plants and pots the same to pass this line, and that is the line to watch. Know what to measure: yes — height. Same way of measuring: yes — the same ruler. Can be done again: yes. So the plan passes four lines, and the fifth passes only if the plants and pots also start the same.

Q4. Sentence 1: *We asked whether a jumper dries faster on a windy day or a still day.* Sentence 2: *We found it dried faster on every windy day we tested.* Sentence 3: *Our prediction came true.* That three-sentence block is a conclusion because it answers the question with the findings and checks the prediction.

Q5. (a) The methods differed in what they measured: 3R counted toilet flushes; 4K read the water meter at the start and end of the day. (b) Different measurements answer different questions, so different conclusions do not mean either class is wrong — it means they were not measuring the same thing. (c) To compare in a fair way, measure the same thing the same way: both classes read the meter, on the same days, and then compare.

Q6. A further question must be one we can investigate. Two good ones: *does bubble wrap keep a cold drink cold longer too?* and *does two layers of bubble wrap keep water warm longer than one?* Both can be tested with the same loop the first test used.

Q7. Apply the checklist to each. 1 — the one thing changed is the spot (Sun or shade), which is the thing being tested; same cups, same sand, same thermometer, same hour: **fair**. 2 — the sponges differ and the sizes differ: two differences, **not fair**. 3 — watering time is the one thing tested, but a different child measures each cup, so the measuring is not kept the same: **not fair**. 4 — same chocolate, same checker, same timing; only the place differs: **fair**.

Q8. The fix is always: keep everything the same except the one thing tested. 1 — the boot and the sandal differ in size as well as kind, so test shoes of the same size. 2 — stirring is a second difference, so stir both cups the same way, or leave both still. 3 — distance is a second difference, so hold both magnets the same distance from the object.

Q9. (a) Group X poured the slime; Group Y pressed and held it. (b) Each test shows something true: slime does flow when poured and does hold together when held, so both groups observed well. (c) A conclusion holding both: *slime behaves like a liquid in the pouring test and like a solid in the holding test.* A further question: *do toothpaste and hair gel behave the same way?* The loop starts again from there.

Q10. (a) Not fair: the wraps were meant to be the only difference, but the starting water differed too, so the comparison cannot be trusted. (b) The failed line is *everything else is kept the same.* (c) The fix is to start both cups with water of the same warmth and repeat. A further question afterwards: *does the winning wrap keep an ice block frozen the longest too?*

Q11. (a) January is warmest at Olympic Park at 27 °C. (b) January is warmest at Laverton too (26 °C). (c) October: 21 °C at Olympic Park against 19 °C at Laverton — a difference of 2 °C. (d) The shared big finding: summer is the warmest time and January the warmest month at both stations. The numbers differ because the stations are in different places and counted different years, but the pattern agrees.

Q12. (a) Line by line: one thing changed (oval soil or garden soil) — tick; same water — tick; know what to measure (water held) — tick; same way of measuring — tick; done twice — tick. As written, the plan is fair. (b) Different cup sizes fail *everything else is kept the same*; the fix is two cups of the same size. (c) "Do it twice" is a check: the same finding twice lets you feel more sure, and a different second result tells you to look again before drawing a conclusion.

Q13. A conclusion must stay inside the findings. **A** stays inside them: it answers the question (Sun dried faster) and checks the prediction (it did not come true). **B** slides from a finding into an opinion — "the shade is bad" is not what was measured. **C** reaches past the test — a towel is not "everything", so the findings cannot support that claim.

Q14. Kai's finding is the one to feel more sure of. Doing the same test three times and getting the same finding is like three groups agreeing: the more times a finding repeats, the stronger it is. Ruby's single result might still be right, but one try cannot show that.

Q15. (a) *We asked which bubble mix makes the biggest bubbles. We found mix 1 made the biggest bubbles in all five tries. Our prediction …* (completed with the group's own prediction and whether it came true). (b) A further question grows from the finding: *does mix 1 also make bubbles that last the longest?*

Q16. In the left panel two things are different: which sponge it is and how big it is. If the big sponge holds more water, we cannot tell whether the sponge or the size caused it — the test cannot separate the two. That is what "not fair" means here, and it is why the left panel cannot answer the question. The right panel fixes it by cutting both sponges to the same size, leaving only one difference.

Q17. The loop runs: **b** compare findings, **d** judge whether the test was fair, **a** draw a conclusion, **c** ask the next question. Step 2 is judging fairness: you run the fair-test checklist over the test that was done, and a failed line tells you whether the findings can be trusted — and what to fix next time.

Q18. A “different in the test” check: was each group’s mix made the same way, with the same amounts? A “different in the measuring” check: did the groups measure bubble size the same way, with the same tool? If both checks find nothing, the difference may be real — do the test again and compare once more. Repeating and comparing is not a punishment for a wrong group; it is the loop doing its job.

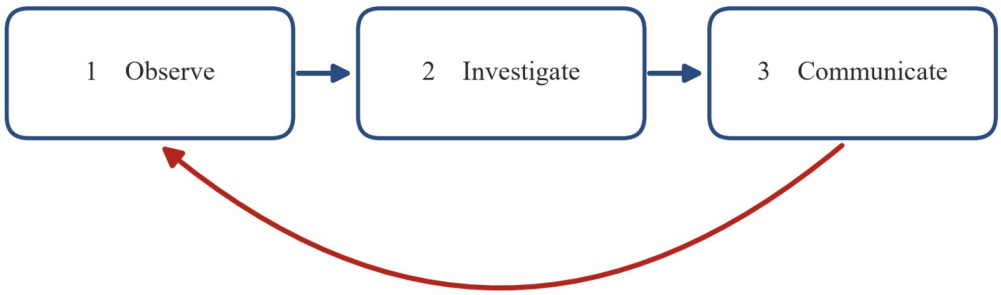
Communicating for a purpose and an audience

What we teach here — VC2S4I06 (Victorian Curriculum F–10 Version 2.0, Science, Levels 3 and 4): "observations, findings and ideas can be communicated for an identified purpose and audience by using scientific vocabulary and digital tools as appropriate". **In our words:** sharing your science means choosing what to say to fit your reason and your readers — and using the science words you have learned.

Ideas

Why scientists share

In 1A you learned to observe, and to ask questions and predict. In 1B and 1C you planned investigations, worked safely, and recorded what happened. One step is left. Scientists **communicate**: they share what they observed and found out. Science is not finished until it is shared.



Sharing lets others check your work — and ask the next question.

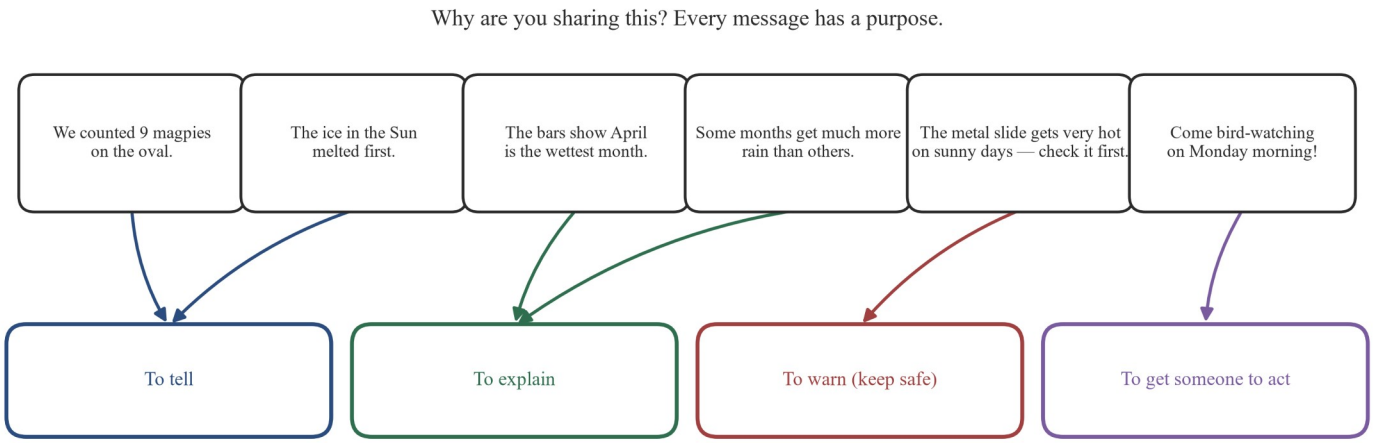
A flow diagram of three boxes joined by arrows: 1 Observe, 2 Investigate, 3 Communicate. A red arrow loops back from Communicate to Observe.

Sharing lets others check your work. It also starts the next question — that is the red arrow going back to the start. Good science needs good sharing, so this part of the book teaches you how to share on purpose.

Every message has a purpose

Before you share, ask: *why am I sharing this?* That why is your **purpose**. In this book we sort purposes into four kinds.

- **To tell** — you want people to know what you observed or found out.
- **To explain** — you want people to understand why something happens.
- **To warn (keep safe)** — you want people to know about a hazard, so nobody gets hurt.
- **To get someone to act** — you want your readers to do something.



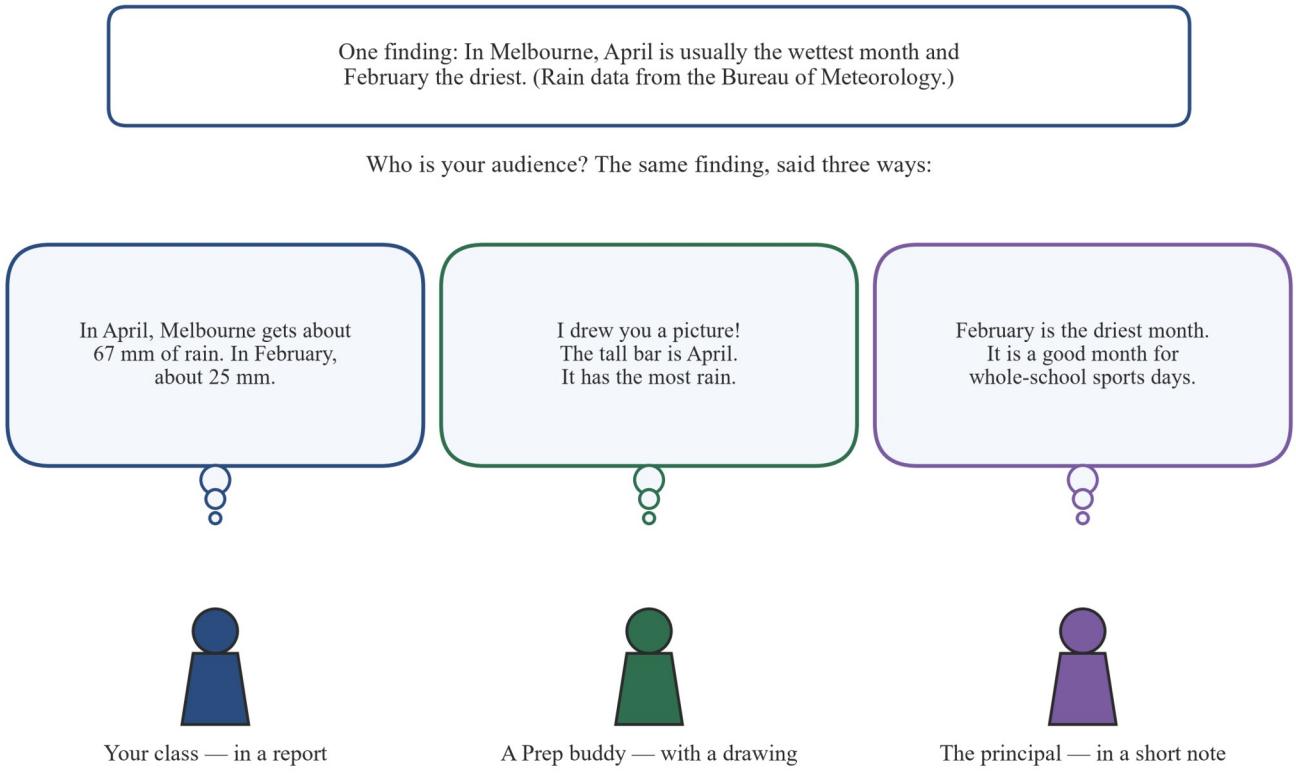
A sorting diagram. Six message boxes sit above four purpose boxes. "We counted 9 magpies on the oval." and "The ice in the Sun melted first." point to To tell. "The bars show April is the wettest month." and "Some months get much more rain than others." point to To explain. "The metal slide gets very hot on sunny days — check it first." points to To warn (keep safe). "Come bird-watching on Monday morning!" points to To get someone to act.

Look at the diagram. *We counted 9 magpies on the oval* is **to tell**: it shares what someone observed. *The ice in the Sun melted first* tells too — it shares a result. *The bars show April is the wettest month* is **to explain**: it helps you understand the rain through the year, and *Some months get much more rain than others* says the same thing in words. *The metal slide gets very hot on sunny days — check it first* is **to warn**: it keeps people safe. And *Come bird-watching on Monday morning!* is **to get someone to act**: it wants you to do something.

One message can do two jobs. *The slide is hot — check it first* tells what someone observed and warns at the same time. That is fine. The purpose that matters most is the one you plan your message around.

Who is your audience?

The people you share with are your **audience**. The same finding changes shape for different audiences.



One finding in a box at the top: In Melbourne, April is usually the wettest month and February the driest. Below, three people say it three ways. Your class gets a report with numbers: about 67 mm of rain in April and about 25 mm in

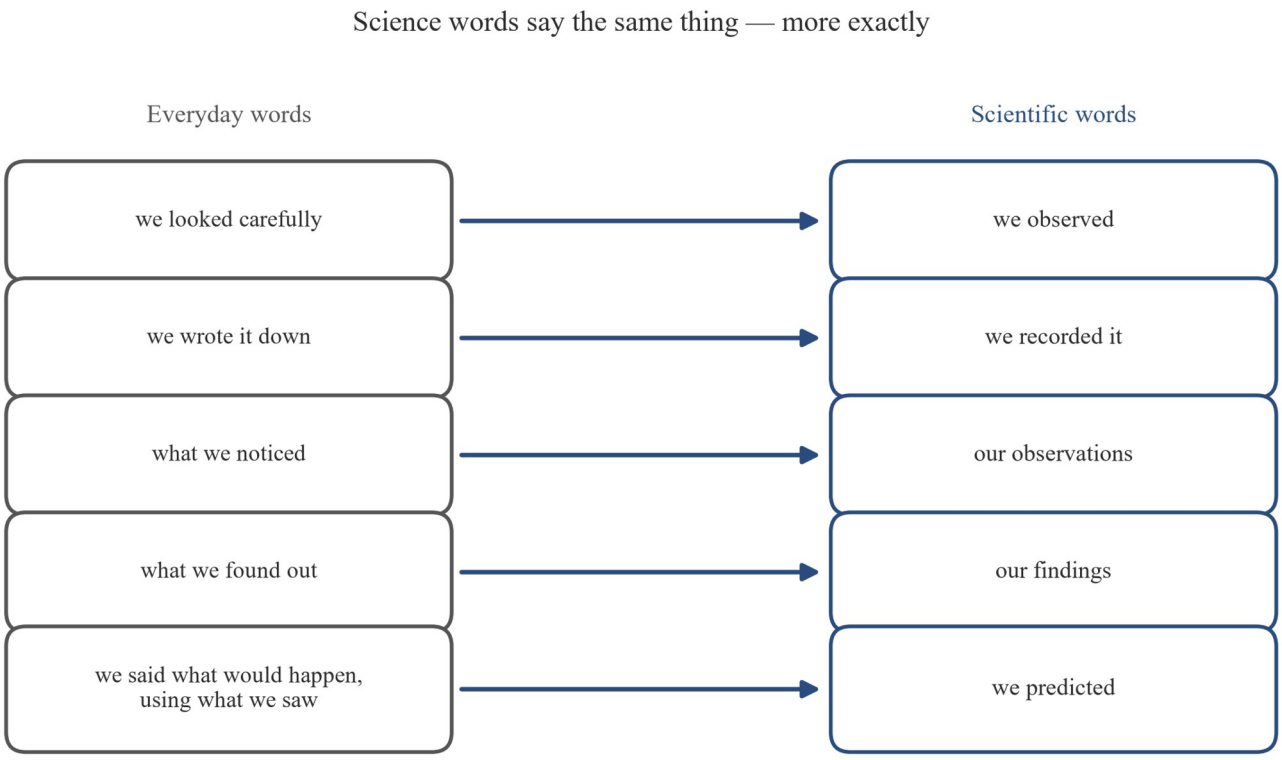
February. A Prep buddy gets a drawing: the tall bar is April, it has the most rain. The principal gets a short note: February is the driest month, a good month for whole-school sports days.

In the diagram the finding is the same every time: April is usually the wettest month and February the driest. But each audience gets a different message. Your **class** can read numbers, so the report uses 67 mm and 25 mm. Your **Prep buddy** cannot read those numbers yet, so the drawing does the talking and the words stay short. The **principal** plans the whole school year, so the note picks the one fact the principal needs: February is the driest month — a good month for sports days.

Same science, three shapes. That is the skill: **know your audience, then pick what they need.**

Your science words

When you share in science, you use the science words this band has taught you. They say the same thing more exactly, and any scientist can understand them.

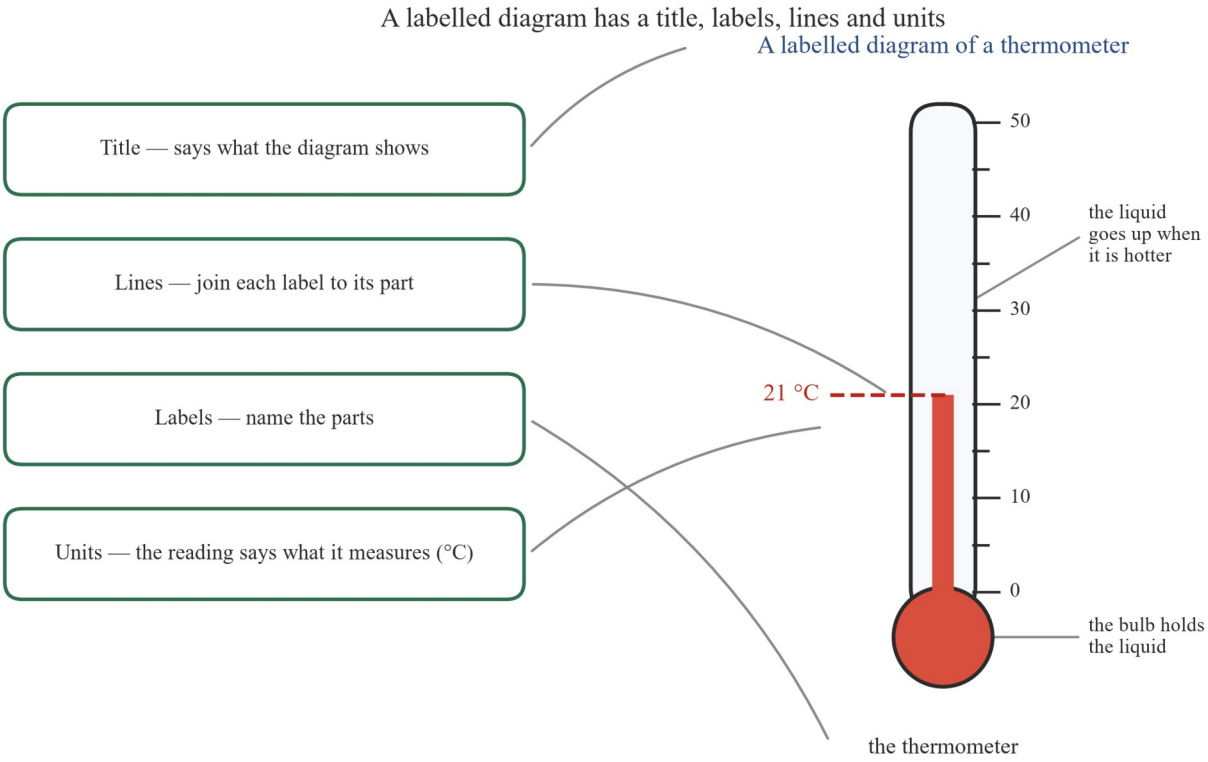


A matching diagram with everyday words on the left and scientific words on the right. "we looked carefully" matches "we observed". "we wrote it down" matches "we recorded it". "what we noticed" matches "our observations". "what we found out" matches "our findings". "we said what would happen, using what we saw" matches "we predicted".

These are words you met in 1A. *We looked carefully* becomes *we observed*. *What we found out* becomes *our findings*. Your message gets shorter and clearer, and other scientists know exactly what you mean.

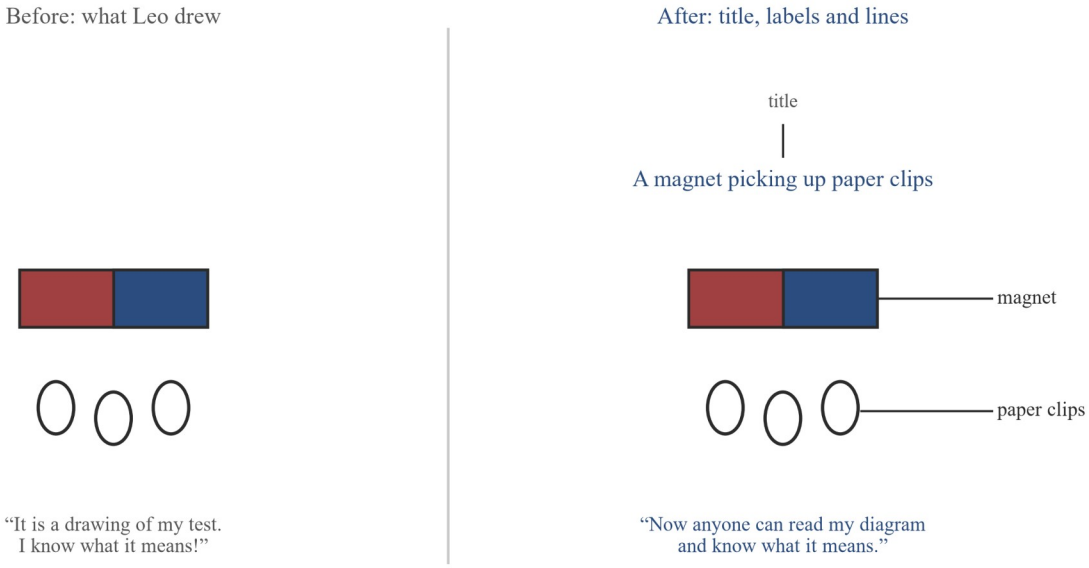
Labelled diagrams

A drawing becomes a **labelled diagram** when anyone can read it without you standing next to it. Four things do the work: a **title**, **labels**, **lines** and **units**.



A labelled diagram of a thermometer. The title "A labelled diagram of a thermometer" sits above the tube. Labels name the bulb and the liquid, and lines join each label to its part. A dashed line at the reading points to 21 °C, and the unit °C says what is measured.

In the thermometer diagram, the **title** says what the diagram shows. The **labels** name the parts. The **lines** join each label to its part. The **units** sit in the reading — 21 °C — so you know it is how hot something is, not how long or how much.



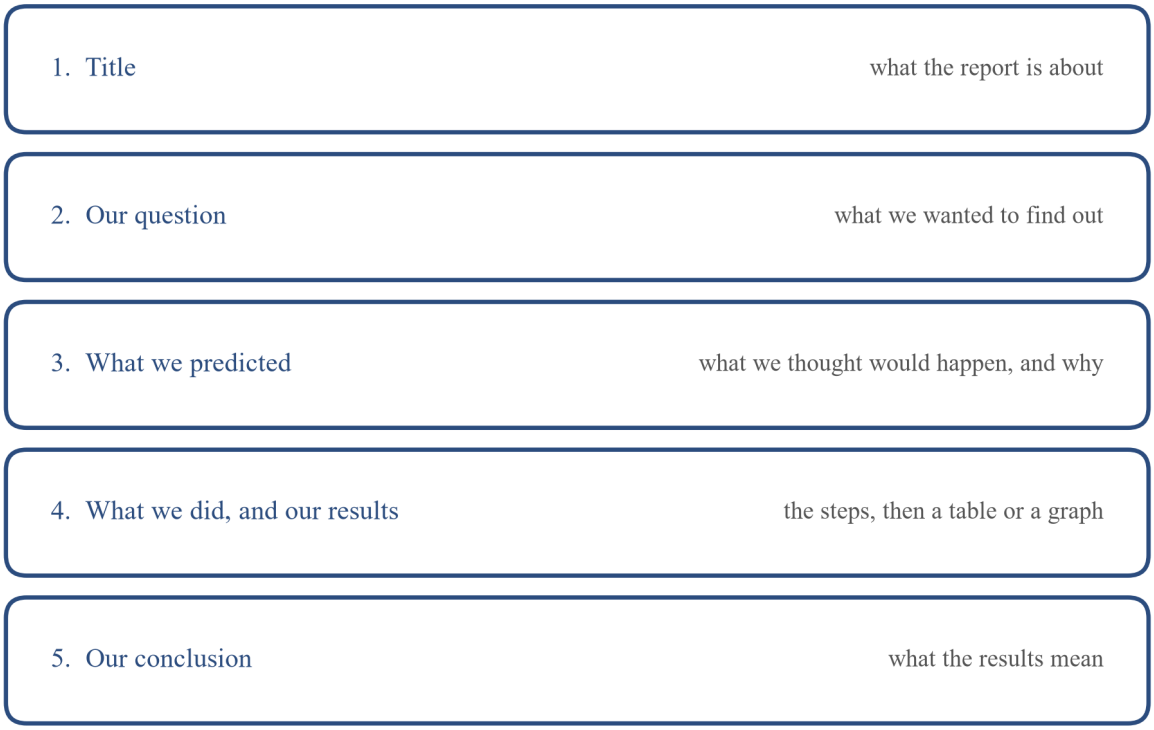
Two drawings side by side. Before: what Leo drew, a bar magnet and three paper clips with no title and no labels. After: the same drawing with a title, "A magnet picking up paper clips", labels "magnet" and "paper clips", and lines joining each label to its part.

Leo's first drawing meant something to Leo. After he added a title, labels and lines, it means the same thing to **anyone**. That is the whole point of labelling: your readers see what you saw.

A simple report

A **report** is short writing that tells your findings in order. A simple report has five parts.

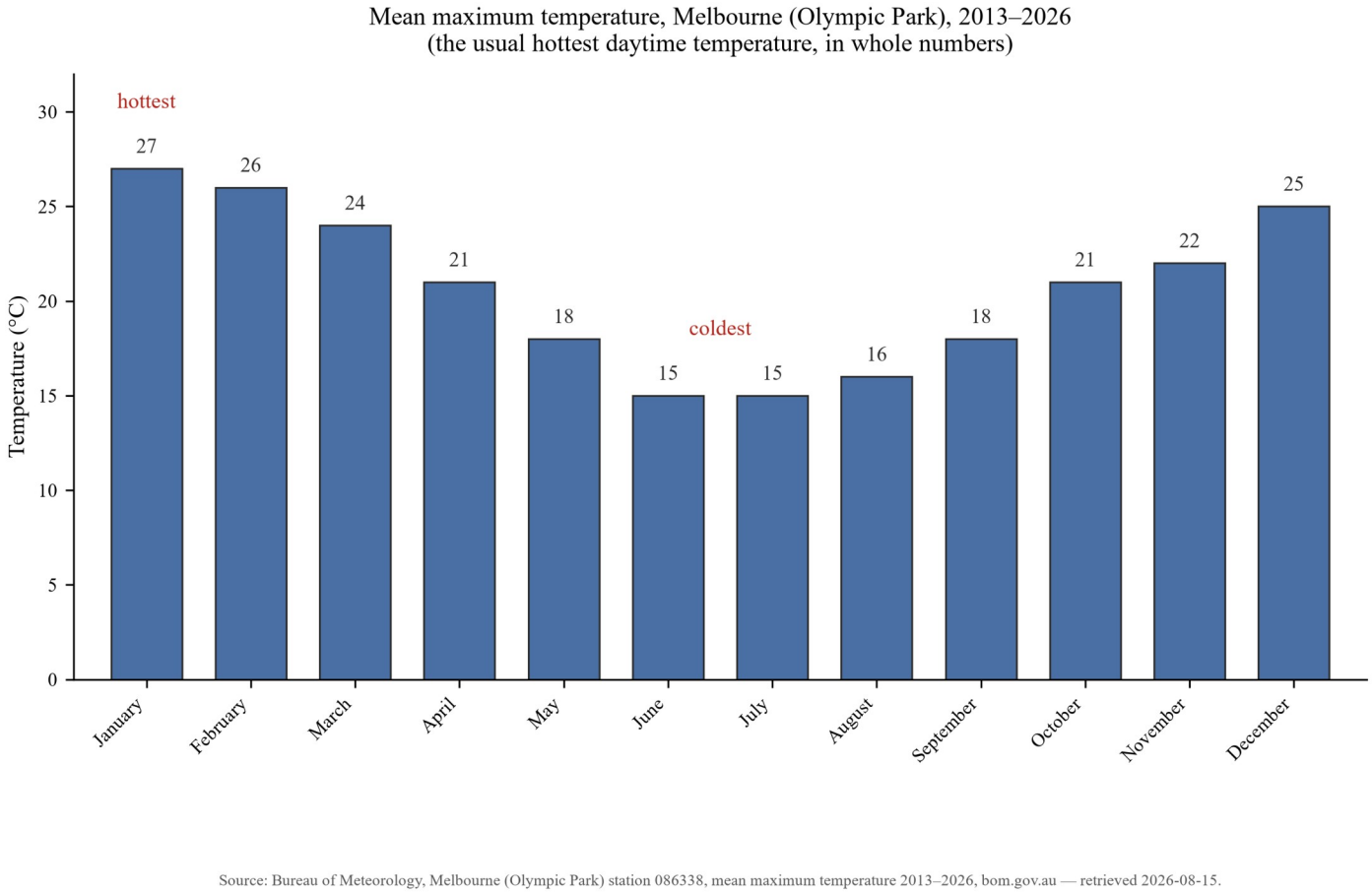
A simple report has five parts



A stack of five boxes, top to bottom. 1. Title — what the report is about. 2. Our question — what we wanted to find out. 3. What we predicted — what we thought would happen, and why. 4. What we did, and our results — the steps, then a table or a graph. 5. Our conclusion — what the results mean.

The **conclusion** is the new word here: it is what the results mean. You have been drawing conclusions since 1A — saying what a pattern means. In a report, you write it down as part of telling.

Here is real temperature data for Melbourne, the kind of graph part 4 of a report can hold.



Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean maximum temperature 2013–2026, bom.gov.au — retrieved 2026-08-15.

A column graph of the mean maximum temperature for Melbourne (Olympic Park), 2013–2026. January is the hottest month at 27, and June and July are the coldest at 15. A source line sits under the graph.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean maximum temperature (maximum means the hottest) 2013–2026, in whole numbers, bom.gov.au — retrieved 2026-08-15.

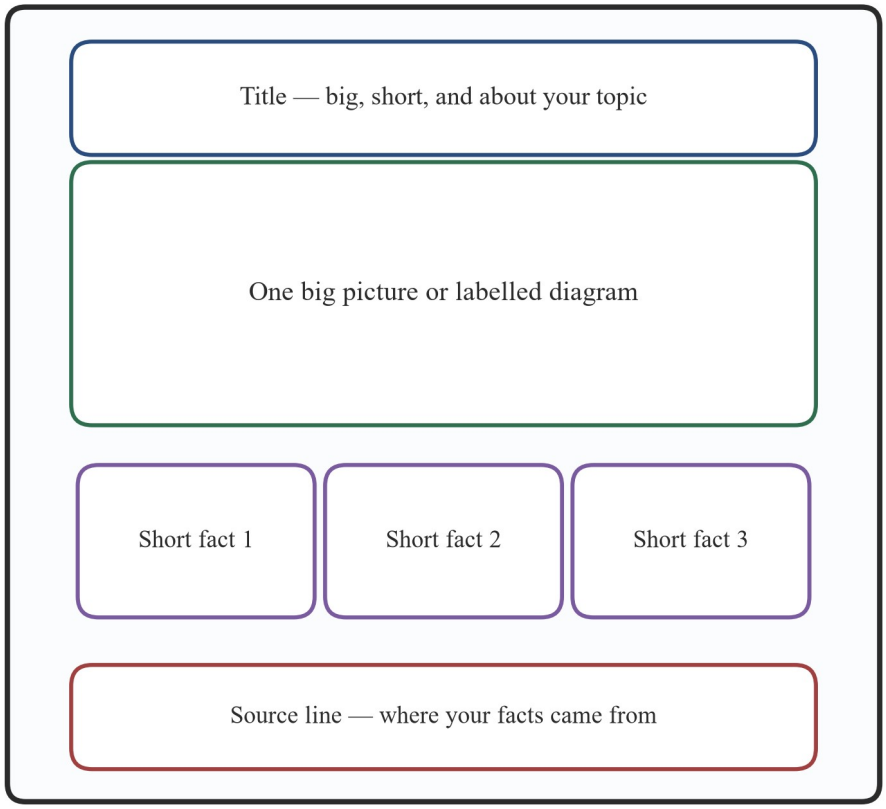
Read the bars. January is the hottest month (27 °C). June and July are the coldest (15 °C). A conclusion for the report could be: *Melbourne is much hotter in summer than in winter.* And notice the source line under the graph. It says where the numbers came from, so anyone can check them. Your graphs do the same.

Posters, stories and advertisements

A report is not the only shape a message can take. Three more shapes you will use:

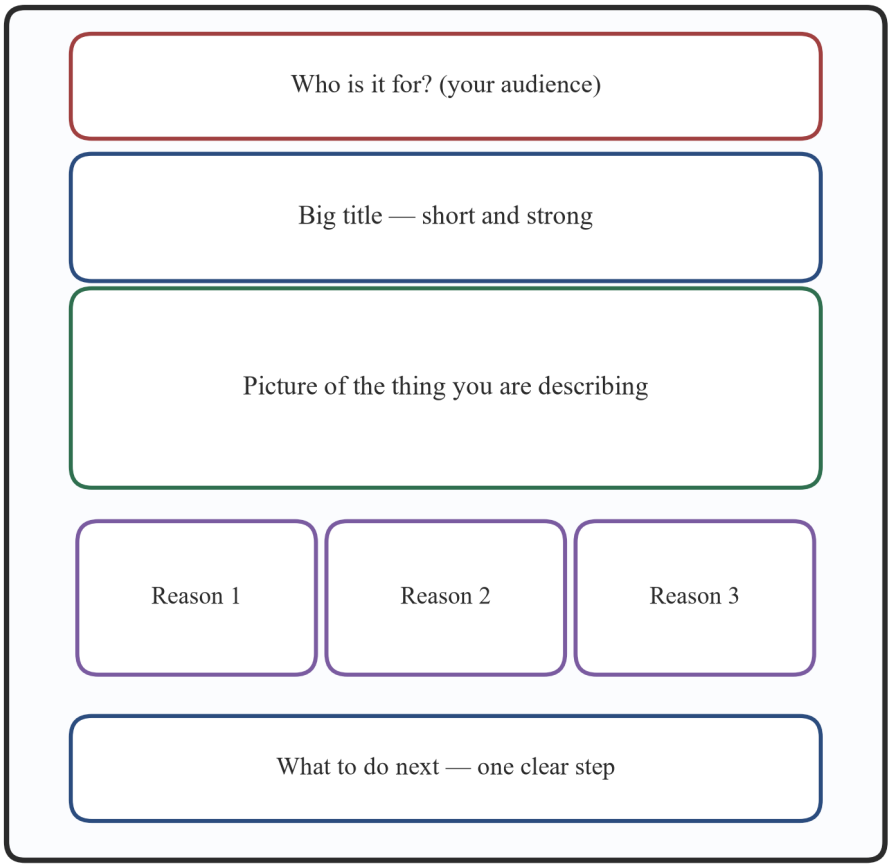
- A **poster** tells a finding in a big, quick way: a short title, one big picture or labelled diagram, and a few short facts.
- A **story** tells science from the inside — later in this book you will tell the story of a life cycle as if you were the living thing (Chapter 3).
- An **advertisement** gets someone to act: it names its audience, gives reasons, and ends with one clear step.

A poster plan



A poster plan: a big short title at the top, one big picture or labelled diagram in the middle, three short fact boxes, and a source line at the bottom.

An advertisement plan



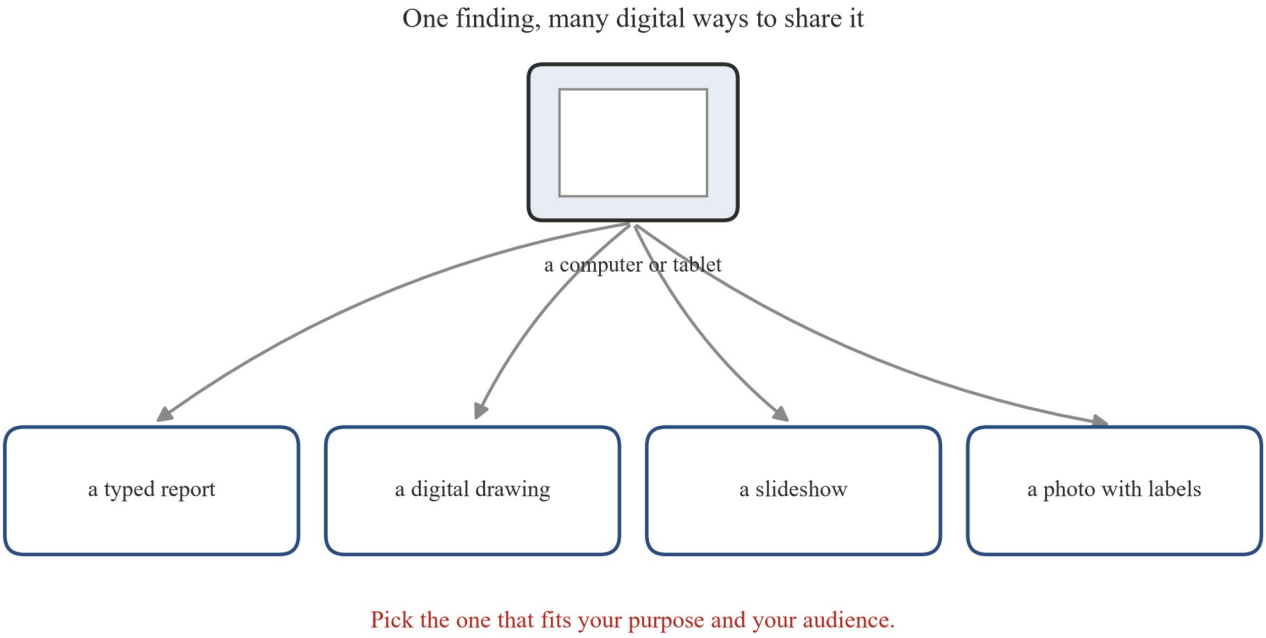
An advertisement plan: who it is for (your audience) at the top, then a big title that is short and strong, a picture of the thing you are describing, three reason boxes, and one clear step for what to do next.

These shapes meet real science later in the book. In Chapter 6 you will learn about friction and about heat moving from hot things to cool things. In Chapter 5 you will learn about soils. Then the shapes get their turn:

- an **advertisement** can tell families why a grippy floor near the pool is a safe choice (friction, Chapter 6);
- an **advertisement** can tell your family why an insulated lunchbox keeps food cool for longer — insulated means made so heat moves slowly in or out (Chapter 6);
- a **story** can tell a butterfly's life cycle from the butterfly's side (Chapter 3);
- a **poster** can share short facts about soil erosion — your teacher hands you the facts, and your job is the poster: title, one labelled diagram, short facts, source line (soils, Chapter 5).

Digital tools

A **digital tool** is a computer or tablet you use to share your science. The same finding can go out four ways.

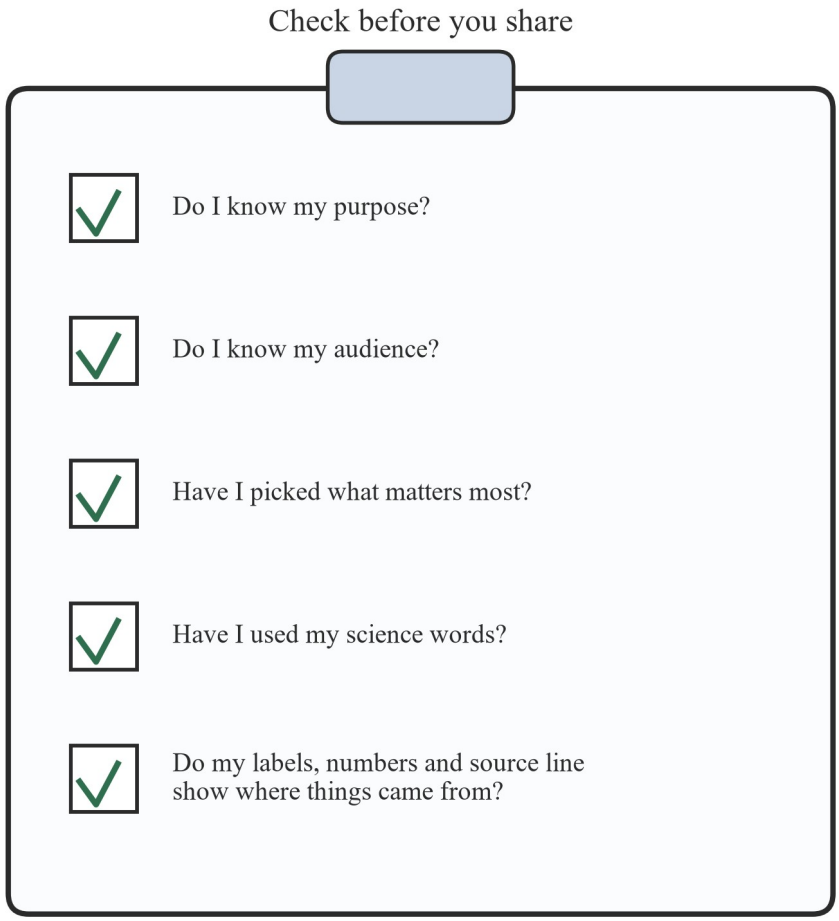


A diagram with a computer or tablet at the top and four arrows down to four boxes: a typed report, a digital drawing, a slideshow, and a photo with labels. Under the boxes: pick the one that fits your purpose and your audience.

The tool does not pick itself. You pick the one that fits your purpose and your audience — the same choice as before, now with a screen. A slideshow fits a talk to your class. A photo with labels fits the hall, where people walk by quickly. A typed report fits a reader who wants the facts in order.

Check before you share

Before you hand any message to its audience, run the five checks.



A checklist with five ticks: Do I know my purpose? Do I know my audience? Have I picked what matters most? Have I used my science words? Do my labels, numbers and source line show where things came from?

Five ticks means five yes answers. If one is a no, fix that one, then share.

Words to know in 2C

Word	What it means here
communicate	to share what you observed and found out, so others can understand it
purpose	your reason for sharing: to tell, to explain, to warn, or to get someone to act
audience	the people you are sharing with
labelled diagram	a drawing with a title, labels, lines and units, so anyone can read it
report	short writing that tells your findings in order, ending with a conclusion
conclusion	what your results mean
poster	a big, quick message: a short title, one big picture or diagram, a few short facts
advertisement	a message that gets someone to act, with reasons and one clear step
digital tool	a computer or tablet used to share your science
source line	the line that says where your facts or numbers came from
maximum	the highest — the maximum temperature is the hottest

Word	What it means here
	reading
observe, record, predict (from 1A)	to look carefully; to write or draw what you noticed; to say what will happen, based on what you observed

Worked examples

Example 1 — guided

Leo tested the class magnet. It picked up 3 paper clips. He wants his class to know what he found out, so they can check his work. Build Leo's share: the purpose, the audience, the words, and a readable diagram.

Working	Comment
Purpose: to tell — Leo wants his class to know what he found out.	Sharing so others can check your work is the to-tell purpose in science.
Audience: his class — they are the ones who will check the work.	The audience is whoever the message is for. Here it is the class, not the teacher, not a Prep buddy.
Words: "I observed that the magnet picked up 3 paper clips."	*Observed* is the science word for looked carefully and found out. It says more exactly than *looked at*.
Diagram: add a title, labels and lines to the drawing.	Like the after picture in the Ideas: title *A magnet picking up paper clips*, labels *magnet* and *paper clips*, lines joining each label to its part.
Check: purpose yes, audience yes, what matters most yes, science words yes, labels and numbers yes.	Five ticks before sharing.

Example 2 — guided

At lunch, Mia touches the metal slide and jumps: it is very hot. A Prep class plays near the slide at lunchtime. Mia wants the Prep class to be safe. Build Mia's warning.

Working	Comment
Purpose: to warn (keep safe).	A hot slide can hurt. Mia's message is about safety, so it is a warning.
Audience: the Prep class — they are the ones who play near the slide.	A warning has to reach the people who are near the hazard.
Shape: a sign with a picture and a short sentence: "Hot! Check with your teacher first."	Prep readers cannot read long sentences. A picture and a few words carry the warning.
Words: hot, metal, safe — short words that are true.	The sign says what is hot and what to do. The science word *metal* tells the teacher what the sign is about.

Example 3 — on your own

Ava's class has the temperature graph from the Ideas. Her teacher asks her to share one finding two ways: in a report for her class, and in a drawing for her Prep buddy. Show both, and say what changed.

For the class: *In Melbourne, January is the hottest month (27 °C), and June and July are the coldest (15 °C).* Numbers and units fit a class that can read a graph.

For the Prep buddy: a drawing of the bars with a big sun over January, and the words *January is the hottest month*. A picture and short words fit a reader who is not ready for those numbers yet.

What changed? The finding did not change — the shape did. The class got numbers and units; the Prep buddy got a picture and short words. Same science, two audiences.

So the audience decides the shape of the message, while the purpose (to tell) stayed the same both times.

Example 4 — on your own

Your teacher hands you three short facts about soil erosion for a poster for the school hall. Plan the poster with the poster plan, and say how two of the five checks are met.

Plan. Title: big, short, and about soil. One labelled diagram: the picture of soil and plants your teacher showed you, with labels. Short facts 1–3: the three facts your teacher gave you, kept short, keeping the science words. Source line: *facts from our teacher* — the source line says where the facts came from, and here they came from your teacher.

Checks. *Do I know my purpose?* Yes — to tell the school what happens to soil. *Have I used my science words?* Yes — soil, water, wind and plants, the words your teacher used.

So the facts were given, and your job was the sharing: fitting the facts to the purpose and the audience. That is what a poster is for.

Practice questions

Guided

Q1. Here are four messages. 1. We counted 9 magpies on the oval on Monday morning. 2. The tall bar on our graph is April, so April has the most rain. 3. The metal slide gets very hot on sunny days — check it first. 4. Water the new plants before the bell! Say the purpose of each message: to tell, to explain, to warn (keep safe), or to get someone to act.

Q2. Your class counted magpies: *9 magpies on the oval on Monday morning.* Here are three audiences and three messages. Audiences: **A.** your class; **B.** your Prep buddy; **C.** the principal, who is picking a spot for a whole-school bird-watch morning. Messages: **1.** I drew 9 magpies for you! **2.** Monday's count: 9 magpies on the oval. February's count so far: 9 on Monday. The oval is a good spot for the bird-watch morning. **3.** We counted 9 magpies on the oval on Monday morning. We will count again next Monday. (a) Match each message to its audience. The first one is done for you: 1–B. (b) Say why message 2 fits the principal.

Q3. Rewrite each sentence using science words, like the matching diagram in the Ideas. (a) We looked carefully at the puddles every day. (b) We wrote down what we noticed. (c) We said what would happen, using what we saw.

Q4. A drawing becomes a labelled diagram when anyone can read it. (a) Name the four things that do the work. (b) Leo's first magnet drawing (in the Ideas) was missing three of them. Name the three he added.

Q5. A simple report has five parts. (a) Put these in the right order: Our conclusion / Our question / Title / What we did, and our results / What we predicted. (b) Which part says what the results mean?

Q6. Look at the temperature graph in the Ideas. (a) Which month is the hottest, and what is its number? (b) Which months are the coldest, and what is their number? (c) Write one sentence that **tells** this finding for a class report.

On your own

Q7. Sort these six messages into the four purposes, and say why for each. 1. Our ice in the Sun melted before our ice in the shade. 2. Worms came to the top of the soil after the rain — here is our table of counts. 3. The path by the taps is slippery — walk, do not run. 4. Come to the worm farm at lunch — we need two more helpers this week. 5. The bars show our worm counts went up after rain. 6. Our graph of lunchbox materials has a tall bar for plastic.

Q8. Your finding: *after rain, the puddle on the oval was gone by lunchtime, but the puddle under the big tree was still there.* (a) Write the finding for your class, in one sentence, using science words. (b) Write the finding for your Prep buddy, in one sentence, with no numbers. (c) Say what changed between your two sentences, and what stayed the same.

Q9. Priya draws the school garden for her report: a bed of soil, three plants, and the watering can. She hands it in with no title, no labels and no lines. (a) What three things should she add? (b) Say how each one helps a reader who was not in the garden.

Q10. The soup in the canteen is very hot at lunchtime. The Prep class eats first. (a) What is the purpose of a warning sign for the Prep class? (b) Write the sign: a picture in words, and up to six words of text. (c) Say why the words on the sign must stay short.

Q11. Tom's class tested ice: one cube in the Sun, one cube in the shade. Write parts 2 and 3 of the report — *Our question* and *What we predicted* — for that test.

Q12. Look at the temperature graph in the Ideas. Write part 5 of the report — *Our conclusion* — in one sentence.

Q13. Here is a poster plan for the hall: title *April is our wettest month*; one big column graph of the rain; three short facts; and a source line naming the Bureau of Meteorology. (a) Match each part of the poster to the poster plan (title / big picture or diagram / short facts / source line). (b) Which of the four purposes does the poster serve? (c) Who could its audience be? Name one, and say which part of the poster fits that audience.

Q14. Your teacher hands you three short facts about soil erosion for a poster. (a) Plan the poster: write what you would put in the title, the labelled diagram, and the source line. (b) Your friend says you should make up one more fact to fill the poster. Say why you should not, using the words *source line*.

Q15. Your family is choosing a lunchbox. An insulated one keeps food cool for longer. (a) Who is the audience for your advertisement? (b) Write its big title. (c) Give one reason, using the word *insulated*. (d) Write the one clear step at the end.

Q16. A class has one finding: *the closer the magnets were, the stronger the pull.* (a) Which shape fits the purpose *to tell the class*: a report, or an advertisement? Say why. (b) Which shape fits the purpose *to get families to try it at home*: a report, or an advertisement? Say why.

Q17. Pick a digital tool for each job, and say why it fits. (a) A talk to your class about your magpie counts. (b) A message for your Prep buddy about the tallest bar on your graph. (c) A note for the principal with this month's counts in order.

Q18. Zia hangs her jumper on the line each morning. On windy days it is dry by home time; on still days it is still damp. (a) Pick a purpose for sharing this, and an audience. (b) Pick a shape (report, labelled diagram, poster, story, advertisement, or a digital tool). (c) Write the message in two sentences, using at least two science words from this book. (d) Run two of the five checks on your message, and show they pass.

Answers

Q1. 1 to tell; 2 to explain; 3 to warn (keep safe); 4 to get someone to act. **Q2.** (a) 1–B, 2–C, 3–A; (b) it gives the principal the count and the fact the principal needs — the oval is a good spot — in a short note. **Q3.** (a) We observed the puddles every day. (b) We recorded our observations. (c) We predicted. **Q4.** (a) a title, labels, lines and units; (b) a title, labels and lines. **Q5.** (a) Title / Our question / What we predicted / What we did, and our results / Our conclusion; (b) Our conclusion. **Q6.** (a) January, 27 °C; (b) June and July, 15 °C; (c) e.g. In Melbourne, January is the hottest month and June and July are the coldest. **Q7.** 1 to tell (shares a result); 2 to tell (shares observations and a table); 3 to warn (keeps people safe on a slippery path); 4 to get someone to act (asks for helpers); 5 to explain (the bars help you understand the counts); 6 to tell (shares what the graph shows). **Q8.** e.g. (a) We observed that the puddle on the oval was gone by lunchtime, but the puddle under the tree was still there. (b) The sun puddle went away; the tree puddle stayed! (c) the words changed to fit the reader; the finding stayed the same. **Q9.** (a) a title, labels and lines; (b) the title says what the drawing shows; the labels name the parts; the lines join each label to its part, so a reader who was not there can still read it. **Q10.** (a) to warn (keep safe) — the Prep class must know the soup can hurt; (b) e.g. a picture of a steaming bowl, and the words "Hot! Wait for a grown-up."; (c) Prep readers cannot read long sentences, so a few words and a picture carry the warning. **Q11.** e.g. Our question: does being in the Sun change how fast an ice cube melts? What we predicted: we predicted the ice cube in the Sun would melt faster than the one in the shade. **Q12.** e.g. Melbourne is much hotter in summer than in winter. **Q13.** (a) *April is our wettest month* is the title; the column graph is the big picture or diagram; the three short facts are the short facts; the Bureau of Meteorology line is the source line; (b) to tell (and to explain); (c) e.g. the class — the column graph fits readers who can read a graph. **Q14.** (a) e.g. title *Hold on to our soil*; labelled diagram of plants holding soil, with labels roots, plants, soil; source line *facts from our teacher*; (b) a made-up fact has no source, so it does not belong in science sharing — the source line must be true. **Q15.** e.g. (a) my family; (b) *Keep it cool!*; (c) an insulated lunchbox is made so heat moves slowly in, so the food stays cool for longer; (d) try the insulated one this week. **Q16.** (a) a report — the class needs the finding in order, with the question, the steps and the results; (b) an advertisement — it gets someone to act, with reasons and one clear step. **Q17.** e.g. (a) a slideshow — it fits a talk, one picture at a time; (b) a digital drawing or a photo with labels — a picture fits a Prep buddy; (c) a typed report — it keeps the facts in order for a reader. **Q18.** e.g. (a) purpose: to tell; audience: my class; (b) a report; (c) We observed that the jumper dries faster on windy days than on still days. We predict the same thing will happen next week. (d) *Do I know my purpose?* yes — to tell my class what I found out; *Have I used my science words?* yes — observed and predict.

Worked answers

Q1. Ask of each message: *what does it want to do?* 1 shares a count — **to tell**. 2 uses the graph to help you understand the rain — **to explain**. 3 names a hazard and keeps people safe — **to warn (keep safe)**. 4 asks you to do something — **to get someone to act**.

Q2. (a) Message 1 is a drawing with short words: it fits the Prep buddy — **1–B** (given). Message 2 ends with the fact the principal needs (the oval is a good spot for the bird-watch morning): it fits the principal — **2–C**. Message 3 tells the count and the next count, for readers who will check the work: it fits the class — **3–A**. (b) Message 2 fits the principal because it is short, carries the count, and ends with the one fact the principal has to act on — a good spot for the bird-watch morning.

Q3. The matching diagram in the Ideas does this work. (a) *looked carefully* becomes **observed**: *We observed the puddles every day.* (b) *wrote down what we noticed* becomes **recorded our observations**: *We recorded our observations.* (c) *said what would happen, using what we saw* becomes **predicted**: *We predicted.*

Q4. (a) The four things are a **title**, **labels**, **lines** and **units**. (b) Leo's first drawing did not have any of these; the after picture added a **title** (*A magnet picking up paper clips*), **labels** (*magnet*, *paper clips*) and **lines** joining each label to its part. (Units belong to readings like 21 °C; Leo's drawing had no numbers, so the three he added were title, labels and lines.)

Q5. (a) The order is the order of the stack in the Ideas: **Title**, **Our question**, **What we predicted**, **What we did, and our results**, **Our conclusion**. (b) **Our conclusion** — it says what the results mean.

Q6. (a) The tallest bar is January at **27 °C**. (b) The shortest bars are June and July at **15 °C**. (c) A telling sentence carries the finding and the numbers: *In Melbourne, January is the hottest month (27 °C), and June and July are the coldest (15 °C).* Any sentence that tells the finding with its numbers and units passes.

Q7. Apply the purpose question to each. 1 shares a result — **to tell**. 2 shares observations with a table — **to tell**. 3 names a hazard (a slippery path) to keep people safe — **to warn (keep safe)**. 4 asks for helpers — **to get someone to act**. 5 uses the bars to help you understand how the counts changed — **to explain**. 6 shares what the graph shows — **to tell**. (Telling and explaining are close: if the message only hands over a result it tells; if it helps you understand a why or a pattern it explains.)

Q8. (a) For the class, use the science words: *We observed that the puddle on the oval was gone by lunchtime, but the puddle under the big tree was still there.* (b) For the Prep buddy, short words and no numbers: *The sun puddle went away; the tree puddle stayed!* (c) What changed: the words and the shape, to fit the reader. What stayed the same: the finding. Same science, two audiences.

Q9. (a) A **title**, **labels** and **lines**. (b) The title says what the drawing shows (*our school garden*). The labels name the parts (*soil bed*, *plants*, *watering can*). The lines join each label to its part. With all three, a reader who was never in the garden can still read the drawing — that is the whole point of labelling.

Q10. (a) The purpose is **to warn (keep safe)**: the Prep class must know the soup can hurt, before they are near it. (b) A picture of a steaming bowl, and words such as *Hot! Wait for a grown-up.* (c) Prep readers cannot read long sentences. A picture and a few words carry the warning; a long sentence would not be read, and a warning that is not read does not keep anyone safe.

Q11. Part 2 names the question the test answers: *Our question: does being in the Sun change how fast an ice cube melts?* Part 3 says what was thought would happen, and why: *What we predicted: we predicted the ice cube in the Sun would melt faster than the cube in the shade, because the Sun side is hotter.* Any question the test can answer, and any predictions based on an observation, pass.

Q12. Part 5 says what the results mean. The bars show a hot summer and a cold winter, so: *Our conclusion: Melbourne is much hotter in summer than in winter.* A conclusion that follows from the bars passes.

Q13. (a) *April is our wettest month* is the **title** — big, short, about the topic. The column graph is the **one big picture or labelled diagram**. The three short facts are the **short facts**. The line naming the Bureau of Meteorology is the **source line** — it says where the numbers came from. (b) The poster **tells** a finding (and explains the rain through the year). (c) Any audience that the poster fits, with the part that fits: e.g. the class, because the column graph fits readers who can read a graph; or the whole school, because the big title and the tall April bar can be read from far away.

Q14. (a) A passing plan names all four parts: e.g. title *Hold on to our soil*; labelled diagram of plants holding soil in place, with the labels *roots*, *plants* and *soil*; short facts kept to the three your teacher gave you; source line *facts from our teacher*. (b) A made-up fact has no source. The source line has to be true, because sharing in science means your readers can check where things came from — so the fourth fact stays out, and the poster keeps three facts and a true source line.

Q15. (a) The audience is **your family** — they are the ones choosing the lunchbox. (b) A title that is short and strong: *Keep it cool!* (c) A reason with the science word: *An insulated lunchbox is made so heat moves slowly in, so the food stays cool for longer.* (d) One clear step: *Try the insulated one this week.* The advertisement names its audience, gives a reason, and ends with one step — the plan from the Ideas, filled in.

Q16. (a) The **report**. The purpose is to tell the class a finding, and a report tells a finding in order — the question, what was predicted, the steps, the results, the conclusion. (b) The **advertisement**. The purpose is to get someone to act, and an advertisement is built for that: audience, reasons, one clear step (*check the bread bin at home*). The shape follows the purpose.

Q17. (a) A **slideshow** fits a talk: one picture at a time, while you say the finding out loud. (b) A **digital drawing** or a **photo with labels** fits a Prep buddy: a picture carries the finding, and the words stay short. (c) A **typed report** fits the principal: it keeps this month's counts in order for a reader who wants the facts. In each case the tool was picked to fit the purpose and the audience — the tool never picks itself.

Q18. (a) A passing pick states both: purpose **to tell**, audience **my class**. (b) A **report** fits: it tells a finding in order. (c) Two sentences with science words: *We observed that the jumper dries faster on windy days than on still days. We predict the same thing will happen next week.* (d) Two checks, shown passing: *Do I know my purpose?* yes — to tell my class what I found out. *Have I used my science words?* yes — *observed* and *predict*. Any purpose, audience, shape and message that fit together, with two checks that pass, is right.

Chapter 2 Check-up

This check-up shows what you have learned in Chapter 2. It is a school instrument: your teacher sets it and your teacher marks it. It is not a VCAA exam. There is no time limit — take all the time you need. Your teacher can read any word or question out loud if you ask. Your reading is not being marked — the marks are for your science.

About this check-up

Covers	Chapter 2 — subtopics 2A, 2B and 2C
Content descriptions	VC2S4I04 (2A), VC2S4I05 (2B), VC2S4I06 (2C)
Total marks	**15** — Part A: 8 items × 1 mark · Part B: 2 + 3 + 2 marks
Administration	School instrument — set and marked by the school, not by the VCAA, and not an examination. Untimed completion is permitted. Reading support is permitted — any item may be read aloud to a student on request; reading itself is not assessed.
Recording	Marks are evidence for reporting against the Victorian Curriculum Levels 3–4 Science achievement standard. They are not used to rank students.

data and information can be organised and represented to identify patterns and simple relationships by constructing tables, graphs and visual or physical models — VC2S4I04

findings can be compared to those of others, including, as appropriate, whether a test was fair or not, to enable conclusions to be drawn, and may lead to the identification of further questions for investigation — VC2S4I05

observations, findings and ideas can be communicated for an identified purpose and audience by using scientific vocabulary and digital tools as appropriate — VC2S4I06

Part A — 8 marks

Answer every item. Each item is worth 1 mark.

The data for Items 1 and 2

The table holds real data. It shows the mean rainfall in each month from July to December at Laverton, near Melbourne. Each number is the mean rain for that month, worked out over 85 years of records, and rounded to the nearest mm.

Month	Mean rainfall (mm)
July	38
August	44
September	47
October	56
November	55
December	46

Source: Bureau of Meteorology, Laverton station 087031, mean monthly rainfall 1941–2026, bom.gov.au — retrieved 2026-08-20 (saved copy at _sources/cw_087031.html); figures checked against the saved copy 2026-08-22.

Item 1. *(VC2S4I04 · 1 mark)* Look at the Laverton table. Identify the wettest month and its mean rainfall.

Item 2. *(VC2S4I04 · 1 mark)* Your class draws a column graph of the Laverton table. Write the label for each axis. Put the unit in the label on the vertical axis.

Item 3. *(VC2S4I04 · 1 mark)* Classify each way of setting data out. Write one of: *table · column graph · model*.

1. The class sets the rainy-day counts out in rows and columns, in order.
2. Each number becomes a column of that height, so you can see the pattern at a look.
3. The shoebox stands in for a habitat, so the class can point to where things live.

Item 4. *(VC2S4I05 · 1 mark)* Read the test, then classify it: *fair* or *not fair*. (In this book, a test is fair when the things you compare are different in only one way — the one thing you are testing — and everything else is kept the same.)

The class asks: *does a puddle dry up faster in the Sun or in the shade?* They make two puddles of the same size, side by side on the same ground — one in the Sun and one in the shade — and they time each puddle.

Item 5. *(VC2S4I05 · 1 mark)* The test is finished. The class writes its answer to the question, made from the findings. Name the word this book uses for that answer.

Item 6. *(VC2S4I06 · 1 mark)* Read this message: *The soup is very hot today — wait for it to cool before you eat it.* Identify its purpose: *to tell*, *to explain*, *to warn (keep safe)*, or *to get someone to act*.

Item 7. *(VC2S4I06 · 1 mark)* Leo makes a poster of the class's magpie counts. The poster is going up in the school hall for the whole school to see. Name the audience of the poster.

Item 8. *(VC2S4I06 · 1 mark)* The class looked carefully at the worms after the rain. Identify the science word from this book that means *looked carefully*.

Part B — 7 marks

Answer every item. The marks for each part are shown.

Item 9. *(VC2S4I04 · 2 marks)* The table holds real data. It shows the mean rainfall in each season at Laverton, near Melbourne. The numbers are means worked out over 85 years of records. The seasons: summer is December, January and February; autumn is March, April and May; winter is June, July and August; spring is September, October and November.

Season	Mean rainfall (mm)
Summer	130
Autumn	125
Winter	120
Spring	158

Source: Bureau of Meteorology, Laverton station 087031, mean monthly rainfall 1941–2026, bom.gov.au — retrieved 2026-08-20 (saved copy at _sources/cw_087031.html); figures checked against the saved copy 2026-08-22. Season totals: add the three monthly means, then round.

Use a ruler for your graph.

(a) Construct a column graph of the data. Include a title, labelled axes, a scale that fits, and one column for each season at the right height. (1 mark)

(b) Write one pattern your graph shows. (1 mark)

Item 10. *(VC2S4I05 · 3 marks)* Two groups ask the same question: *which season is the wettest?* Each group uses real Bureau of Meteorology data for a different place.

- **Group A** uses the data for Mount Buller, a mountain in Victoria. Group A's finding: *winter is the wettest season, with 485 mm of rain. Summer is the driest, with 253 mm.*
- **Group B** uses the data for Melbourne (Olympic Park). Group B's finding: *spring is the wettest season, with 171 mm of rain.*

Source: Bureau of Meteorology, Mount Buller station 083024, mean monthly rainfall 1948–2026, bom.gov.au — retrieved 2026-08-20 (saved copy at _sources/cw_083024.html); figures checked against the saved copy 2026-08-22. Season totals: add the three monthly means, then round.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean monthly rainfall 2013–2026, bom.gov.au — retrieved 2026-08-20 (saved copy at _sources/cw_086338.html); figures checked against the saved copy 2026-08-22. Season totals: add the three monthly means, then round.

(a) Compare the two groups' findings. Are they the same or different, and how? (1 mark)

(b) Both groups worked carefully, and both findings are right. Give one reason the findings can differ. (1 mark)

(c) Write one further question that these findings raise. Your question must be one you could investigate. (1 mark)

Item 11. *(VC2S4I06 · 2 marks)* Group A's finding in Item 10 can be said like this: *Mount Buller gets much more rain in winter than in summer.* The numbers: 485 mm of rain in winter, and 253 mm in summer.

(a) Write this finding two ways: once for your class, and once for your Prep buddy. Use the numbers where they fit, and keep the words short where they need to be. (1 mark)

(b) Explain what you changed between the two messages, and why. Say what stayed the same. (1 mark)

Marking guide

Written for the classroom teacher. No science background is needed — every acceptable response is set out below. This check-up is a school instrument, set and marked by the school; it is not a VCAA examination. Completion is untimed, and reading support is permitted (any item may be read aloud to a student on request); reading itself is not assessed.

How to mark

- Part A: each item is worth 1 mark. There are no part marks inside Part A.
- Part B: part marks are shown on each part.
- Mark for meaning. Any response that means the same as an acceptable response earns the mark, even when the words are different.
- Spelling: accept a science word the student clearly means (for example *conclushion* for *conclusion*). The science is being marked, not the spelling.
- A mark is a record that evidence was seen.

Teacher record sheet

Code	Subtopic	Items	Marks available	Marks
VC2S4I04	2A — Tables, graphs and models	1, 2, 3, 9	5	
VC2S4I05	2B — Comparing findings and judging fairness	4, 5, 10	5	
VC2S4I06	2C — Communicating for a purpose and an audience	6, 7, 8, 11	5	
Total			**15**	

Part A — acceptable responses

Item 1 (1 mark) — October, 56 mm. Both parts are needed for the mark.

Item 2 (1 mark) — the horizontal axis is labelled *Month*; the vertical axis is labelled *Mean rainfall (mm)* — the unit must sit in the label. Both labels are needed for the mark. Accept *Rainfall (mm)* on the vertical axis.

Item 3 (1 mark) — 1 table; 2 column graph; 3 model. All three are needed for the mark.

Item 4 (1 mark) — *fair*. The only difference between the two puddles is the spot — Sun or shade — and the spot is the thing being tested; everything else (puddle size, ground, timing) is kept the same. Award the mark for the classification *fair*; a reason in the student's own words is welcome but not required. *Not fair* does not earn the mark.

Item 5 (1 mark) — *conclusion*.

Item 6 (1 mark) — *to warn (keep safe)*. Accept *to warn*.

Item 7 (1 mark) — the whole school. Accept equivalents such as *everyone at the school* or *the students and teachers at the assembly*.

Item 8 (1 mark) — *observed* (or *observe*).

Part B — acceptable responses

Item 9 (2 marks)

(a) 1 mark for a finished column graph that has all of these: a title (for example *Mean rainfall in each season at Laverton*); a horizontal axis labelled *Season*; a vertical axis labelled *Mean rainfall (mm)*, with the unit; a scale that fits every number (for example counting by 10s or by 20s up to at least 160); and one column for each

season at the right height — summer 130, autumn 125, winter 120, spring 158. Accept a column that sits within half a square of its height, as long as the scale is consistent.

(b) 1 mark for any pattern the data really shows. Examples: *Spring is the wettest season and winter is the driest.* · *The columns get taller from winter to spring.* · *Laverton gets 158 − 120 = 38 mm more rain in spring than in winter.* Do not award the mark for a claim the data does not show.

Item 10 (3 marks)

(a) 1 mark for a comparison that says the findings are different, and says how: Group A found winter is the wettest season, and Group B found spring is the wettest season. *Different* with no *how* earns no mark — the item asks for both.

(b) 1 mark for any one honest reason. Accept, in the student's own words: the groups looked at different places — Mount Buller is high in the mountains, and Melbourne (Olympic Park) is in the city; or the two records counted different numbers of years — 44 years at Mount Buller against 13 years at Melbourne (Olympic Park); or *different places in Victoria get their rain in different seasons*. The point to look for: different findings do not mean a group got it wrong.

(c) 1 mark for any further question the findings raise that the student could investigate. Examples: *Which season is wettest at our school this year, if we keep a rain gauge?* · *Is winter the wettest season at other mountains too?* · *Which season is the driest at Melbourne (Olympic Park)?* Do not award the mark for a question that cannot be investigated, such as *why does rain exist?*

Item 11 (2 marks)

(a) 1 mark for two messages, each fitting its audience. For the class: the numbers and units fit — for example *Mount Buller gets about 485 mm of rain in winter and about 253 mm in summer.* For the Prep buddy: short words and no numbers; a drawing is fine — for example *Lots of rain on the mountain in winter — much more than in summer!*

(b) 1 mark for an explanation that names both halves: what changed — the words and the shape changed to fit the reader, because the class can read numbers and the Prep buddy cannot read them yet; and what stayed the same — the finding. Accept *same finding, two shapes to fit two audiences* and equivalents.

Where each item traces

Every item traces to the achievement-standard extract of a Chapter 2 subtopic, as carried in the series plan (§3).

Item	Marks	Subtopic	Code	Achievement-standard extract
1, 2, 3	3	2A — Tables, graphs and models	VC2S4I04	"Students construct representations to organise data and information, and identify patterns and simple relationships."
9	2	2A — Tables, graphs and models	VC2S4I04	as above
4, 5	2	2B — Comparing findings and judging fairness	VC2S4I05	"They compare their findings with those of others, assess the fairness of their investigations, propose further questions for investigation and draw conclusions."

Item	Marks	Subtopic	Code	Achievement-standard extract
10	3	2B — Comparing findings and judging fairness	VC2S4I05	as above
6, 7, 8	3	2C — Communicating for a purpose and an audience	VC2S4I06	"They communicate observations, findings and ideas for an identified purpose and audience, using scientific vocabulary and digital tools where appropriate."
11	2	2C — Communicating for a purpose and an audience	VC2S4I06	as above
Total	**15**			