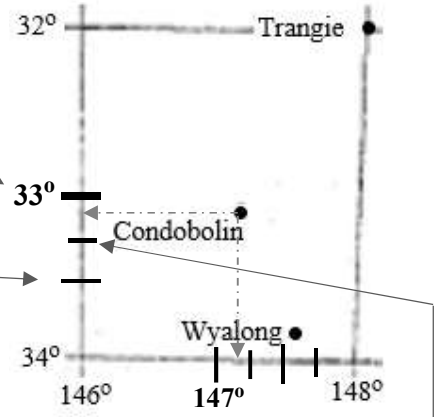
LATITUDE & LONGITUDE

Latitude and longitude are done in a grid fashion, with latitude lines being horizontal and longitude lines being vertical. You have done calculations in degrees before, and should remember that latitude in Australia is expressed in degrees South of the Equator, and longitude is expressed in degrees East of the Prime Meridian. When calculating co-ordinates, **latitude is always done first**.

However, what you may not have seen before is how to calculate co-ordinates in degrees <u>and</u> minutes. If you look at the map on page 10 and find a place called *Trangie*, you'll see it is at the intersection of the 32°S latitude line and the 148°E longitude line. This gives us its co-ordinates of 32°S 148°E, but life isn't usually this easy!

In a grid square near Trangie are two other places: Condobolin and Wyalong. Below is an enlarged snapshot of this grid square, with the degrees of latitude and longitude from the page 10 map AND some extra markings in place that we need to do ourselves. Being able to do this well involves you being able to estimate and draw **'half-way lines'** as shown below.

****1 degree of latitude or longitude is broken up into 60 minutes (60')**



Step 1: Notice that there is a step of 2 degrees between The top and bottom lines? We need to add the 33° line by finding **half way** between 32° and 34°

Step 2: As a place 'belongs to' the latitude line **<u>above</u>** it, the latitude for Condobolin begins with 33°S

Step 3: Draw in a half way line between 33° and 34°. Because there are 60 minutes in a degree, and this is half way between them, this line represents 30 minutes. It is written like this: **30'**
So, if Condobolin lined up with this mark, it would be 33° 30'S. But, unfortunately, it doesn't.

Step 4: We need to draw in another half way line, this time in between 33°S and 33°30'S
As this is half way between 33°S and 33°30'S, this line is called 15 minutes (15').
If Condobolin lined up with this mark, it would have the latitude 33°15'S. But, again, it doesn't.

Step 5: Finally, we need to estimate how many minutes the dot for Condobolin lines up with. You can see an arrow leading to the left from the Condobolin dot, and this seems to line up with about where 6 minutes would be (being closer to zero minutes than the 15 minute mark).

SO: **The latitude co-ordinate for Condobolin would be approx. 33°06'S.**
(In a test, minute numbers close to this, from about 2 mins to 10 mins would be accepted)

WHAT ABOUT LONGITUDE? Other marks have been drawn at the bottom of the grid square in a similar fashion. As a place 'belongs to' the longitude line on its **<u>left</u>**, Condobolin's longitude co-ordinate would be about **147°11'E**.

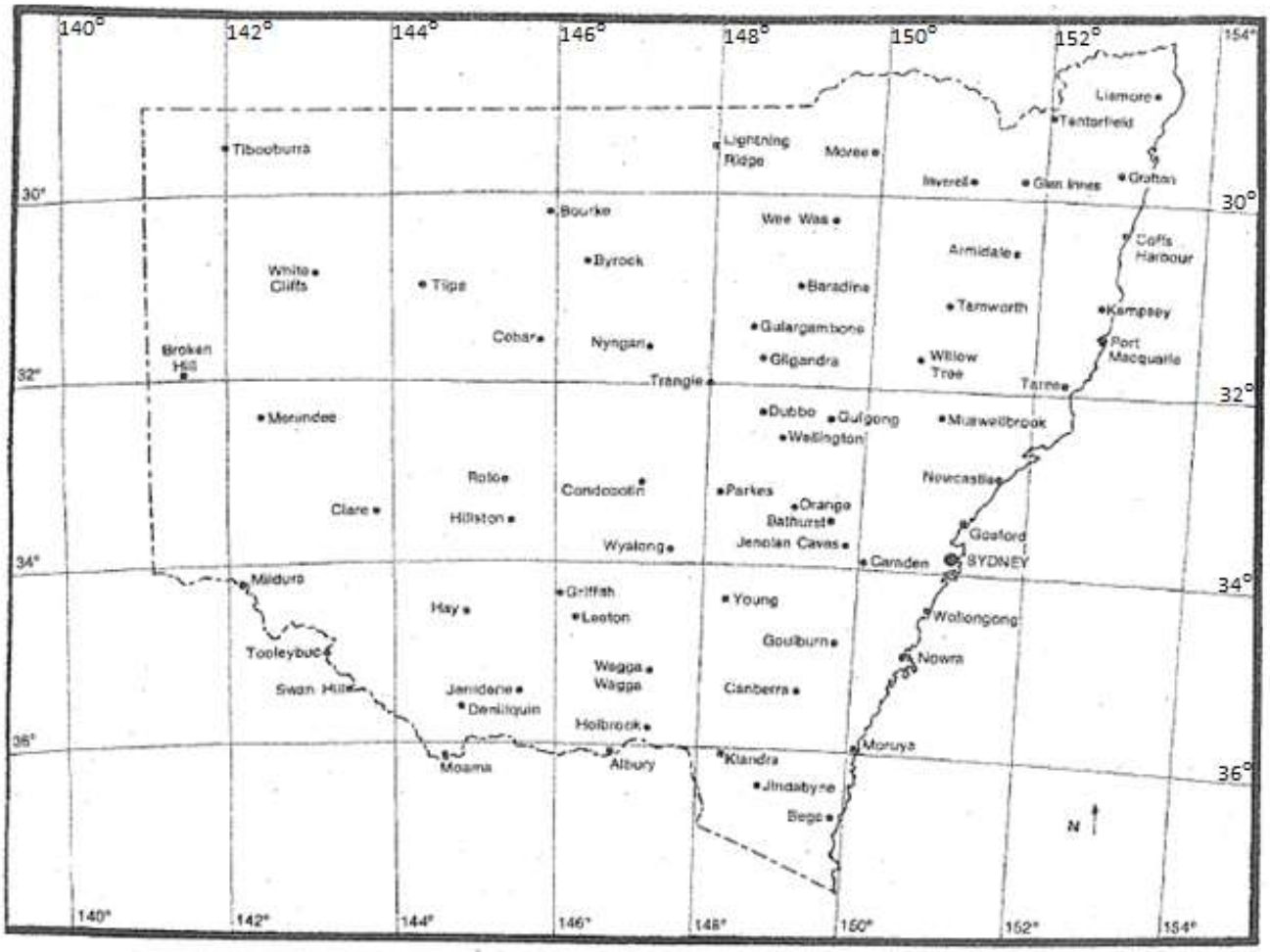
FINALLY: We put the two together and come up with the full co-ordinates for Condobolin:
33°06'S 147°11'E

Q: Which of these would be the co-ordinates for Wyalong?

a) 34°15'S 148°26'E (b) 33°49'E 147°34'S (c) 33°49'S 147°34'E

EXERCISE 5

Map of NSW



1. Provide latitude and longitude co-ordinates for these places :

- Armidale : _____
- Trangie : _____
- Camden : _____
- Coffs Harbour : _____

2. Name the place that is closest to these co-ordinates :

- 32°26'S 142°23'E : _____
- 30°12'S 145°58'E : _____
- 31°43'S 150°33'E : _____
- 34°12'S 142°11'E : _____

GRADIENT, ASPECT & RELIEF

These concepts are all related to topographic maps. In order to calculate gradient or relief, or to state the aspect of a slope, an examination of **contour lines** is needed.

CONTOUR LINES

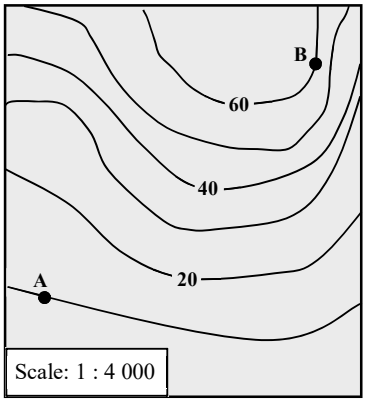
These are the lines drawn on topographic maps to indicate height above sea level (a.s.l.). Any point along the same contour line is equal in height. You can see from the map on this page that not all contour lines are labelled, but you should be able to work out that there is **10m** in height between each of the contour lines. This difference is known as the **contour interval**. It is **sometimes** shown in the key, but it is **not** the same for all maps.

The height of point B on the map is clear, as it is on the line labelled **60**, which means 60m a.s.l.
The height of point A is not labelled, but it should be clear that it is **10m** a.s.l.

GRADIENT

Another term for gradient is 'steepness'. Gradient is a measure of how steep a slope is between two points. Look at the map below:

If you were asked to calculate the gradient between point A and point B, you need to:



i) Calculate the difference in height between the two points (the **rise**) in metres

ii) Measure the distance between the two points (the **run**) in metres

iii) Express as:

$$\textbf{Gradient} = \frac{\textbf{Rise}}{\textbf{Run}}$$

Make sure both measurements are in metres

So, in the example on the right:

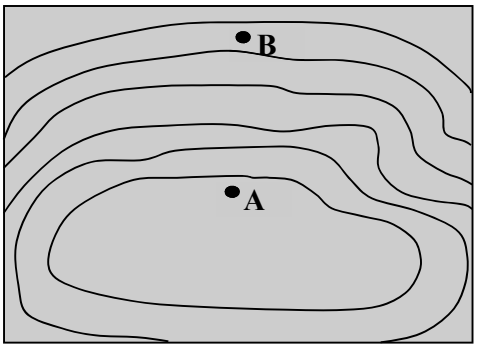
i) Difference in height = 60m – 10m = **50m** (**rise**)

ii) Distance between points = 5 cm. Scale = 1 : 4000, meaning 1cm = 40m
Therefore distance = 5 x 40m = **200m** (**run**)

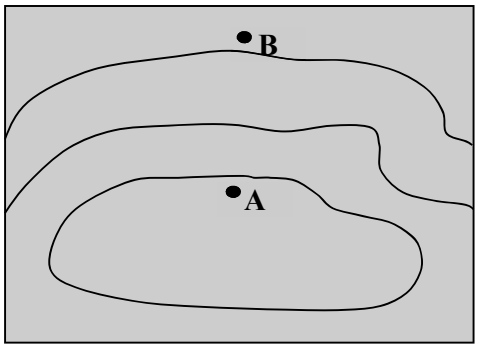
iii) The gradient = $\frac{50}{200} = \frac{1}{4}$ The answer can be expressed this way (as a fraction), **OR**:

- As a ratio (gradient = 1:4)
- In words (a rise of 1 metre in every 4 metres along the ground)

Another important thing to remember is the relationship between gradient/steepness and the closeness of the contour lines. The closer they are together, the steeper the slope:



Even though the contours aren't marked, the fact that they are close together tells you that the gradient of the slope between A and B is quite steep



Here, the space between the contour lines tells you that the gradient of the slope between A and B is much more gentle.

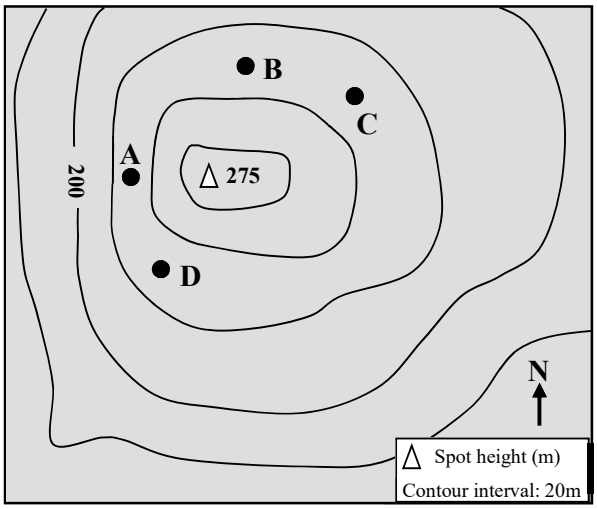
ASPECT

Aspect refers to the direction that a slope faces. A good way to understand is to ask:

"If I was standing on that slope, facing downhill, in which direction would I be looking?"

In order to answer an aspect question, you need to find the direction indicator on the map (similar to that shown on the right) to check where north is. Usually it is straight up, but it's best to check anyway.

Once you have established where north is, aspect can be calculated. For example:



The north indicator on this map shows that north is straight up. Looking at the contour lines, you can see that this area is a hill top that slopes down on all sides.

If you were standing at point A, and facing downhill (that is, away from the peak), you would be facing towards the left of the map. This is west.

Therefore, the aspect of the slope at point A is west. This can also be expressed as: "The slope at point A has a westerly aspect".

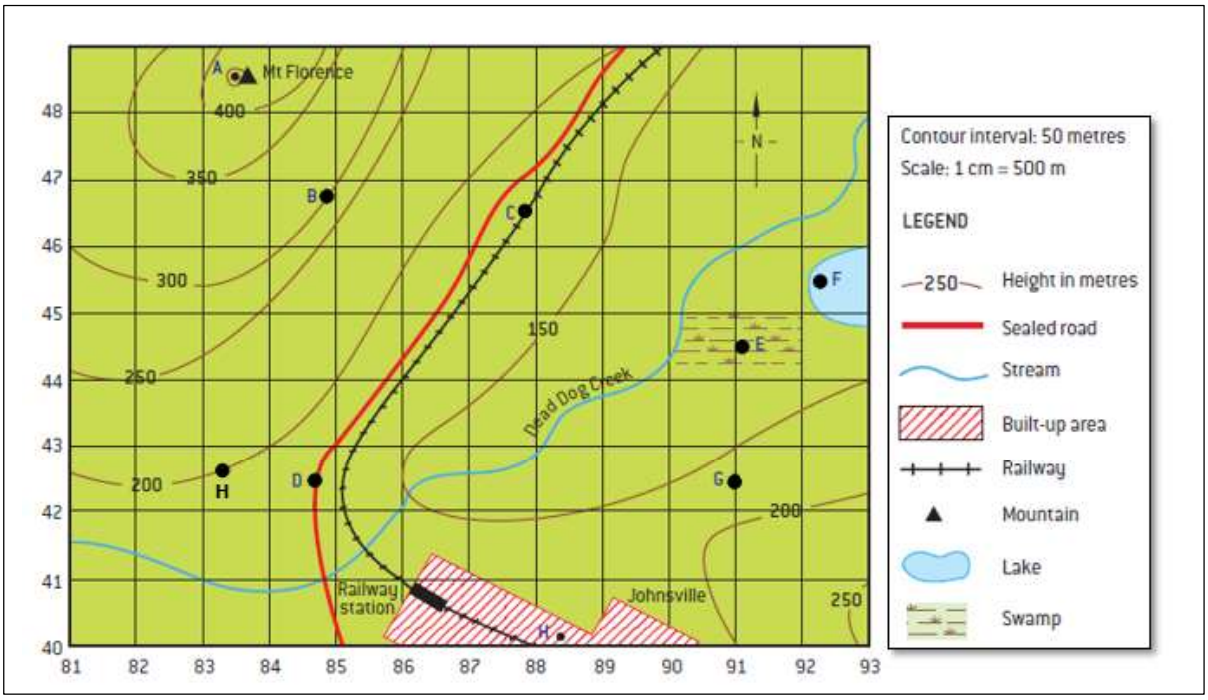
Following the same method, you should be able to see that:

- The slope at point B has a northerly aspect
- The slope at point C has a north-easterly aspect
- The slope at point D has a south-westerly aspect

RELIEF

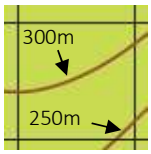
The relief of an area is the variation in height of the land. This can be looked at over the whole map, or by looking at specific points or areas.

Look at the map below and consider the points underneath:



Example 1: *What is the relief in AR 8345 ?*

This area on the map has two contour lines going through it:



To calculate relief, we take the highest height shown and subtract the lowest height shown.

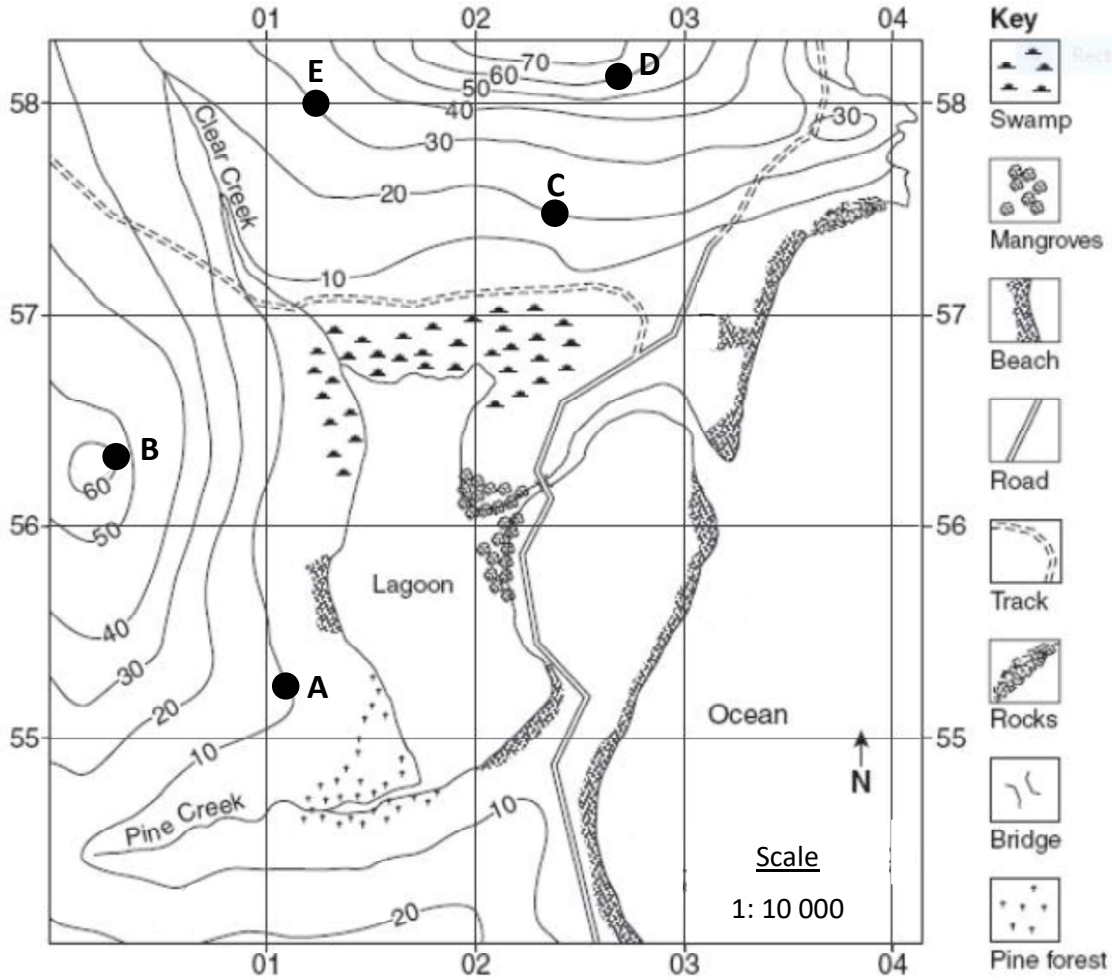
In AR 8345, the relief would be 50m. (300m – 250m = 50m).

Example 2: *What is the relief between points B and H ?*

You can see on the map that point B is on the contour line labelled *300*.
Its height is 300 m a.s.l.
Point H is on the contour line labelled *200*.
Its height is 200 m a.s.l.

The relief between the two points is therefore 100m. (300m – 200m = 100m).

EXERCISE 6



1. Calculate the gradient between points A and B. Show your working.

2. What is the contour interval on this map? _____

3. Give a Grid Reference for Point C: _____

4. State the relief in AR 0257: _____

5. Which would have the steeper slope: Point C or Point D? Explain your answer.

_____

6. State the aspect at Point D: _____

7. In which general direction does Clear Creek flow? _____

8. Without using a protractor, estimate the bearing from Point B to Point A: _____

GRAPHING

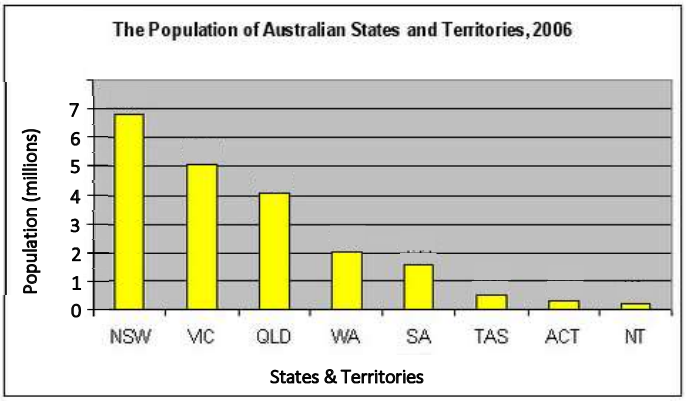
In Geography, a wide range of graphs can be used. However, all graphs should have the following features:

- A **title**
- A **scale** of some kind (note that this can be done using numbers, the size or area of each section of the graph, or possibly the size of the graph itself)
- **Labels** (these will vary according to the type of graph)

Graphs are usually drawn using information from a table. The first two graph types shown in this section are drawn using information from the table shown here:

State / Territory	Approx. population (2006)
NSW	6,820,000
VIC	5,080,000
QLD	4,040,000
WA	2,050,000
SA	1,550,000
TAS	400,000
ACT	330,000
NT	210,000

COLUMN GRAPHS



These graphs are very common. You can see these features on the column graph shown:

- A title
- A scale (from 0 to 7)
- A label on the vertical axis telling us what the scale means. In this case, for example, 3 actually means 3 *million*
- A label under each column (NSW, VIC etc)
- A label on the horizontal axis telling us what is shown (states and territories in this case)
- The columns drawn to the correct height using the information from the table.

Two problems often arise when drawing these graphs:

- *What scale should I use?*
  This will be determined by the numbers that you have to graph (eg. whether they are big numbers or small numbers).
- *Where exactly do I draw the line to show the top of each column?*
  This is especially hard when the numbers you are using are difficult. For example, if the population of NSW was exactly 7 million, this would be easy to graph. But, because it is 6,820,000 it is harder.

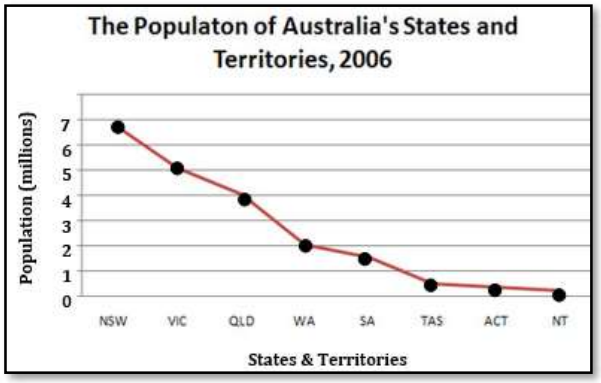
This shows one of the weaknesses of column graphs (and of most graphs): the need to **estimate**. In the case of NSW, you would draw the top of your column *just under* the 7 million line. In the case of Victoria, you would draw the top of your column *just above* the 5 million line, and so on. **Don't worry** about not being exact, but do the best job you can. In most cases, the graphs you will draw will use numbers much easier than these.

LINE GRAPHS

Again, the same information is shown in this graph, and you can also see that the basic structure is the same as the column graph.

This time, though, we draw a dot that lines up with each state's population number, then we join the dots.

When using grid paper, the dot is drawn **in the middle of the box** when going from left to right.



CLIMATE GRAPHS

Climate is the conditions in the atmosphere over long periods of time (usually a year). A climatic graph is a **combination** of a column graph and a line graph (it is actually two graphs drawn in the same space).

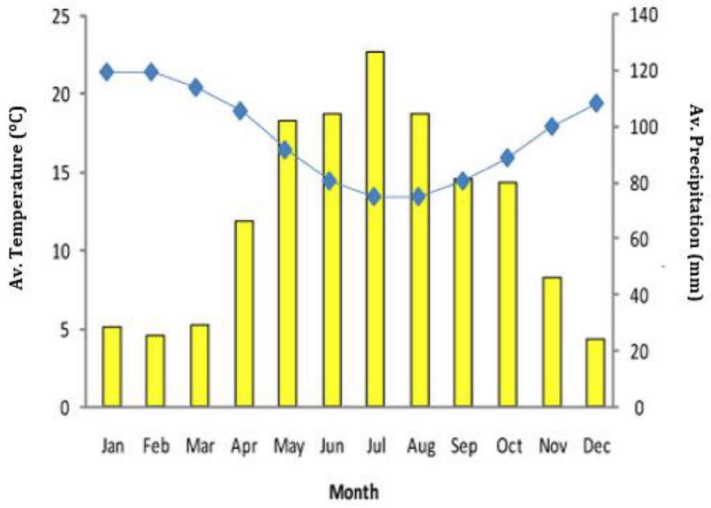
Climate data is used to draw climate graphs. Climate data involves average temperature (measured in degrees Celsius) and average rainfall (also known as precipitation, measured in millimetres).

Below is a table of climate data and the graph that goes with it:

Climate data for Albany WA

Month	J	F	M	A	M	J	J	A	S	O	N	D
Av. Temp °C	21.5	21.5	20.5	19	16.5	14.5	14	14	15	17	18.5	19
Av. Precip mm	28	25	29	66	102	104	126	104	81	80	46	24

Climate Graph for Albany WA



You can see a few things here:

- This has **two separate graphs** that use **two different scales.**
- The line graph is for temperature. It uses the scale on the left hand side.
- The column graph is for precipitation. It uses the scale on the right hand side.

When you draw a climate graph, you draw one of the graphs first, then the other. It doesn't really matter which one you draw first. **It is important**, though, to make sure you use the scale from the correct side when graphing each one. It is easy to mix them up.

EXERCISE 11

CLIMATE GRAPH ACTIVITY

Using the grid sheet supplied by your teacher, construct a climate graph using the information below:

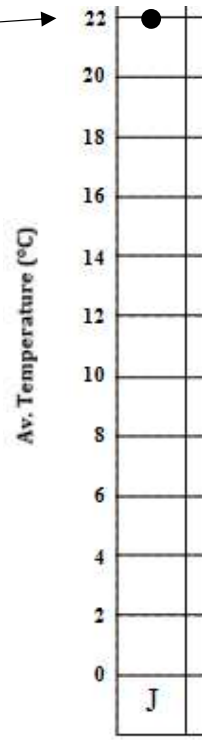
Climate data for Bulli NSW

Month	J	F	M	A	M	J	J	A	S	O	N	D
Av. Temp °C	22	22	21.5	19	16.5	14	13	14	16.5	18	19	21
Av. Precip mm	57	137	85	99	95	101	91	88	58	81	93	68

Points to remember

- Use PENCIL, as it is easy to make a mistake.
- **BEFORE** you begin, have a discussion about the best scales to use for the temperature and precipitation sides of the graph.
- When placing a dot for your line graph (temperature), place the dot in the middle of the box when going from left to right. For example:

  The dot for January's temperature would go here



- Be careful to use the correct scale for each of your graphs. Temperature is graphed using the scale on the left, and precipitation is graphed using the scale on the right.
- It is common for the two graphs to overlap each other. For this reason, it is best to shade in your column graphs using light colours.
- Don't forget to label your axes properly. See the graph on p.23 if you're unsure.
- Take your time. Get it right.

WHEN YOU'RE DONE AND SURE IT'S CORRECT, PASTE IT ONTO PAGE 25 OF THIS BOOK.