

GRADE 7

SOCIAL SCIENCE

SKILLS

PROJECT 3

SUB STRAND 1: TABLES AND GRAPHS

SUB STRAND 2: DISTANCE, SCALE AND DIRECTION

SUB STRAND 3: GRID REFERENCE, TIME AND MAP

SUB STRAND 4: LOCATING FEATURES AND READING MAPS

Acknowledgements

We acknowledge the contributions of all Secondary and Upper Primary Teachers who in one way or another helped to develop this Course.

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MR. DEMAS TONGOGO
Principal-FODE



Flexible Open and Distance Education
Papua New Guinea

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SECRETARY'S MESSAGE

Achieving a better future by individual students and their families, communities or the nation as a whole, depends on the kind of curriculum and the way it is delivered.

This course is part and parcel of the new reformed curriculum. The learning outcomes are student-centred with demonstrations and activities that can be assessed.

It maintains the rationale, goals, aims and principles of the national curriculum and identifies the knowledge, skills, attitudes and values that students should achieve.

This is a provision by Flexible, Open and Distance Education as an alternative pathway of formal education.

The course promotes Papua New Guinea values and beliefs which are found in our Constitution and Government Policies. It is developed in line with the National Education Plans and addresses an increase in the number of school leavers as a result of lack of access to secondary and higher educational institutions.

Flexible, Open and Distance Education curriculum is guided by the Department of Education's Mission which is fivefold:

- To facilitate and promote the integral development of every individual
- To develop and encourage an education system that satisfies the requirements of Papua New Guinea and its people
- To establish, preserve and improve standards of education throughout Papua New Guinea
- To make the benefits of such education available as widely as possible to all of the people
- To make the education accessible to the poor and physically, mentally and socially handicapped as well as to those who are educationally disadvantaged.

The college is enhanced through this course to provide alternative and comparable pathways for students and adults to complete their education through a one system, two pathways and same outcomes.

It is our vision that Papua New Guineans' harness all appropriate and affordable technologies to pursue this program.

I commend all the teachers, curriculum writers and instructional designers who have contributed towards the development of this course.



DR. UKE KOMBRA, PhD
Secretary

STRAND INTRODUCTION



Welcome to Project 3 of the Skills course. This Project will discuss skills in Social Science that were covered in the other course books S1, S2, and S4.

There are four Sub-strands in this Skills course.

In **Sub-strand 1**, you will learn how to read information from tables and graphs and how to interpret correctly. You will also learn how to create graphs.

In **Sub-strand 2**, you will learn how to read scales, calculate distance, and you will also learn about directions. These skills you learn will help you work out the correct distance, scale and direction on maps. You will also learn how to read and interpret flow maps.

In **Sub-strand 3**, you will learn how to read map features using key symbols, 4 figure grid references and calculating time in the different time zones in the world.

In **Sub-strand 4**, you will learn how to locate features on a map using lines of latitude and longitude. This will help you locate features. You will also learn how to read and interpret information from flow and weather maps.

Each Sub-strand has **Lessons** with **Practice Exercises** and **Answers**. You must read each lesson and work through the Practice Exercises. You will have to correct your own answers. The answers to the Practice Exercises are given at the end of each Sub-strand. When you complete a Sub-strand, you will then complete the **Sub-strand Test** in the **Assignment Booklet**. You will repeat the same process until you complete the Strand.

We hope you enjoy studying this Skills Project!

STUDY GUIDE

Follow the steps given below and work through the lessons.

- Step 1** Start with Sub-strand 1 and work through it in order.
Step 2 When you complete Lesson 1, you must do Practice Exercise 1.
Step 3 After you have completed the exercise, you must correct your work.
 The answers are given at the end of each Sub-strand.
Step 4 Then, revise well and correct your mistakes, if any.
Step 5 When you have completed all these steps, tick the check-box for Lesson 1, on the content page, like this:



Lesson 1: Tables

Then go on to the next lesson. You are to repeat the same procedure until you complete all the lessons in a Sub-strand.

As you complete each lesson, tick the box for that lesson on the content page, like this
 This will help you check your progress.



Assignment: Sub- strand Test

When you have completed all the lessons in a Sub-strand, do the Sub-strand Test for that Sub-strand, in your Assignment Booklet. The Strand book tells you when to do this.

Marking:

The Sub-strand Tests in each **Assignment** will be marked by your **Distance Teacher**. The marks you score in each Assignment will count towards the final result. If you score less than 50%, you will have to repeat that Assignment.

Remember, if you score less than 50% in three (3) Assignments, your enrolment will be cancelled. So, you are encouraged to do your work carefully and make sure that you pass all Assignments.

Here is a sample Study Timetable to use as a guide. Refer to it as a reminder of your study times. A timetable will help you to remember when you should be doing some of your FODE work each day.

TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00 a.m –10:00 a.m	FODE STUDY TIME				
10:00a.m–11:00 a.m					
1:00 p.m – 2:00 p.m					
2:00 p.m – 4:00 p.m					
6:00 p.m – 7:00 p.m					
7.00 p.m – 9:00 p.m	Listen to or watch current affairs programmes. Write your diary, read a book.				

Course Materials

Here is a list of resource materials that you will need for this course.

- Grade 7 Social Science Project 3 Skills Book
- Project 3 Assignment Book

Other materials to help you in your learning:

- Ruler
- Pair of dividers
- Blank sheets of paper
- Piece of cotton or string
- Pencil, eraser
- Exercise book

Other References

- Papua New Guinea School Atlas
- World Jacaranda Atlas

SUB STRAND 1: TABLES AND GRAPHS

In This Sub-Strand, You Will Learn About:

- **Tables**
- **Line graph**
- **Column, Bar and Pie graph**

SUB-STRAND 1: INTRODUCTION



In this Sub-strand you will learn about:

- Tables
- Line graph
- Column, Bar and Pie graphs

Graphs are pictorial representation of information. They are used to display information and make it easier to look up data. Graphs also show relationships more clearly.

Many different types of graphs are used by all sorts of people to present information. In this Sub-strand you will study some common types of graphs that will help you interpret information in your other courses.

The graph skills that you will learn should help you:



- choose the right type of graph to present a particular set of data
- draw a graph accurately and neatly
- read and interpret a graph

Lesson 1: Tables



Welcome to lesson 1 of the Skills Project 3. In this lesson you will study information given in tables. It is important to be able to interpret information given in a table. This will help you to understand what type of information it is about and be able to correctly answer questions.



Your Aims:

- define table
 - identify features in a table
 - read and interpret information in a table
-

What is a Table?

A table is an **arrangement of information in columns**: it is an arrangement of information or data into columns and rows. In a table you will find all sorts of information for you to read and interpret. Information from a table is sometimes plotted on graphs.

Year	Percentage of Population born in Australia
1861	37
1871	53
1881	63
1891	68
1901	77

Source: Australians: Historical Statistics, Fairfax, Syme & Weldon Ass., N.S.W., 1987

A table presents groups of numbers and information or (facts and figures) displayed in rows and columns. A table has a purpose of giving out data or facts and figures so that it can be drawn into graphs and diagrams. The numbers presented in a table are usually a result of someone:

- counting things and,
- measuring things

When we talk about tables, the important feature is **statistics**. This makes it easier to understand and use information quickly. You would be surprised at how much information you can get from numbers written as statistics

Features

A table should have the following features:

- a title – what the table is about
- it can have time, for example, one month, one year or five year periods of quantities
- an origin or source
- information or facts
- Unit of measurement

Now, you can see below a sample table, Table 1. Each feature of a table is given in Table 2. Study these examples of features given in Table 2.

Table 1: PERCENTAGE OF POPULATION BORN IN AUSTRALIA

Year	Percentage of population born in Australia
1861	37
1871	53
1881	63
1891	68
1901	77

Source: Australians: Historical Statistics, Fairfax, Syme & Weldon Ass. N.S.W., 1987

Table 2: AN EXAMPLE SHOWING FEATURES OF A PIE GRAPH

Feature	Example
Title	Percentage of population born in Australia
Year	Starting from 1861 to 1901
Source	Australians: Historical Statistics, Fairfax, Syme & Weldon Ass., N.S.W., 1987
Information/Facts	The percentage of population born in Australia: 37, 53, 63, 68 and 77
Unit of measurement	Percentage, that is, the population of people born in Australia every ten years is measured in percentage (%) or a number out of a 100.

Interpreting a Table

It is important that you are able to read and understand information or statistics given in a table. If you understand this information it will help you work out the answer quickly. There are several ways of presenting most data. Data can be presented in a table and graph form. Sometimes diagrams can be used.

Take a look at Tables 1 and 2. Spend a few minutes to study Table 1. What do you think Table 1 is all about? What information does it present? Study the title given and see if you can explain what it means. You are correct if you say climate. It presents information about climate figures for Madang Province. This information is provided in the climate graph below.

Table 3: AVERAGE CLIMATE FIGURES FOR MADANG

Climate Figures for Madang												
	J	F	M	A	M	J	J	A	S	O	N	D
Rainfall (mm)	359	292	344	443	337	209	166	128	144	301	387	379
Temperature (°C)	27	27	27	27	27	26	26	26	26	26	27	27

If you look at the Table 1, the climate figures are for one whole year starting from January through to December. The climate figures refer to the average rainfall in millimetres (mm) and temperature in degrees Celsius (°C). Secondly, each month shows a measure of rainfall in millimetres, and temperature for the whole year. These set of information are going to be plotted onto a climate graph. A climate graph is a graph that shows the rainfall and the temperature of a place. In Strand 1 you learnt about climate graphs.

Now do Activity.



Activity

1.

(a) What is the title of the table? _____

(b) Which month had the highest rainfall in millimetres? _____

(c) Which month had the lowest rainfall in millimetres? _____

(d) Between which months were the highest temperatures? _____

(e) Which months were the lowest temperatures? _____

The table below shows different information. How is the information different to that of Table 1?

CREEK TOWN'S POPULATION, 1921 – 2001

Year	Population (thousands)
1921	5 500
1931	6 500
1941	7 100
1951	8 400
1961	10 500
1971	12 900
1981	14 800
1991	16 500
2001	18 100

First of all, the table shows information about Creek Town's population between the years 1921 and 2001. The period of time between those years is eighty years. This means between the years 1921 and 2001. Secondly, it has about the same number of information as Table 1. It shows the title of table, the year, and population which is measured in thousands. Both tables have three sets of information.

Now that you have completed 1 a-e, do 2a-e.

2.

- (a) What is the title of the table? _____
- (b) What source was this information taken from? _____
- (c) What was the population of Australia in 2011? _____
- (d) How many years altogether does the information show? _____
- (e) What unit of measurement is used to measure population? _____

Check your answers after the summary.

Now read the summary.



Summary

You have come to the end of Lesson 1. In this Lesson, you have learnt that:

- a table presents groups of numbers and information that are displayed in rows and columns.
- numbers presented in a table are usually a result of someone counting things or measuring things.
- a table gives a variety of facts and figures.

Answers to Activity

1.

- (a) Climate figures for Madang
- (b) April
- (c) August
- (d) Between the months of November and May
- (e) Between the months of June and October

2.

- (a) Creek Town's Population, 1921-2001
- (b) Traditional Stories & Folktales
- (c) 19 600 thousand people
- (d) A period of eighty years
- (e) Thousands of people

NOW DO PRACTICE EXERCISE 1 ON THE NEXT PAGE
--



Practice Exercise 1

Study the table below and answer the questions.

WORLD POPULATION GROWTH (Population est. Millions)

Region/Continent	Year					
	1650	1750	1850	1900	1950	1995
North America	5	5	39	106	203	41
South America	8	7	20	38	112	320
Europe	100	140	265	400	572	805
Asia	335	476	754	932	1368	3408
Africa	100	95	95	118	281	744
Oceania	2	2	2	6	12	29
World	550	725	1175	1600	2564	5759

Source: Year Book Australia, 1983

1. What is the title of the table? _____
2. What unit of measurement is used? _____
3. What was the population of Asia in 1850? _____
4. What is the total world population by 1995? _____
5. Which region in the world had the smallest number of populations?

6. Which region does Papua New Guinea come under?

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 1

Lesson 2: Line Graph



In Lesson 1 you learnt about reading information given in a table. In this lesson you will study line graphs. You will also learn about the importance and basic features of a line graph.



Your Aims:

- define line graph
 - discuss the purpose of a line graph
 - identify features of a line graph
 - read and interpret information on a line graph
-

What is a Graph?

A **graph** is a diagram used to show a relationship between two or more things that are able to change. The quantities (number or amount of something) are usually measured along two axes set at right angles to each other.

A graph is a drawing of statistics. Graphs can show us the important facts at a glance. It is usually drawn to present facts and figures in such a way that trends are easy to understand. A trend refers to movement or development of something. Graphs are sometimes referred as charts however there are some charts that always are called charts, for example, the chord chart that contains musical notes or nautical chart, which displays navigational direction to seafarers.

Line graphs should always be drawn on grid paper or on a ruled grid, that is, a pattern of small squares ruled on a paper.

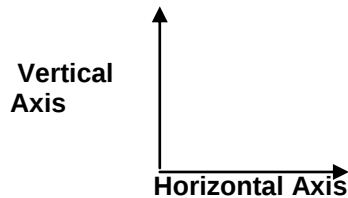
There are a number of important features that you must be able to recognize and 'read' or understand. Line graphs have these features:

- title or heading
- the source or where the information has been taken from
- a horizontal axis: a straight line running *across* the bottom of the graph with numbers or words on it
- a vertical axis: a straight line running up the left side of the graph with numbers or words on it
- the unit of measurement used on the vertical and horizontal axis
- by what amount the number on the vertical axis go up each time

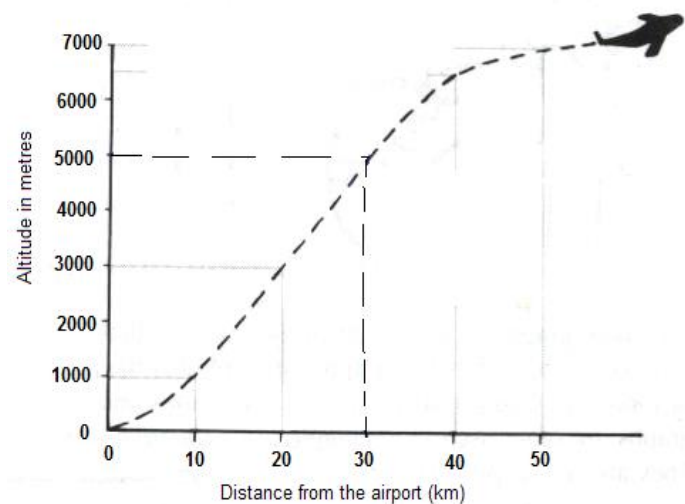
One of the most important skills you must learn in graph work is reading a scale on a graph. The scale is the number-line along the vertical or horizontal axis that tells: *how*

much, how many, how big, how far, and how long something is. One very important part of reading a scale is that you must know the *unit of measurement* used. Line graphs have a scale on the vertical axis. The horizontal axis also has a scale on it. This axis may either be at the *top* or the *bottom* of the graph.

Here below is a sketch diagram showing the vertical and horizontal axes of a Line Graph.



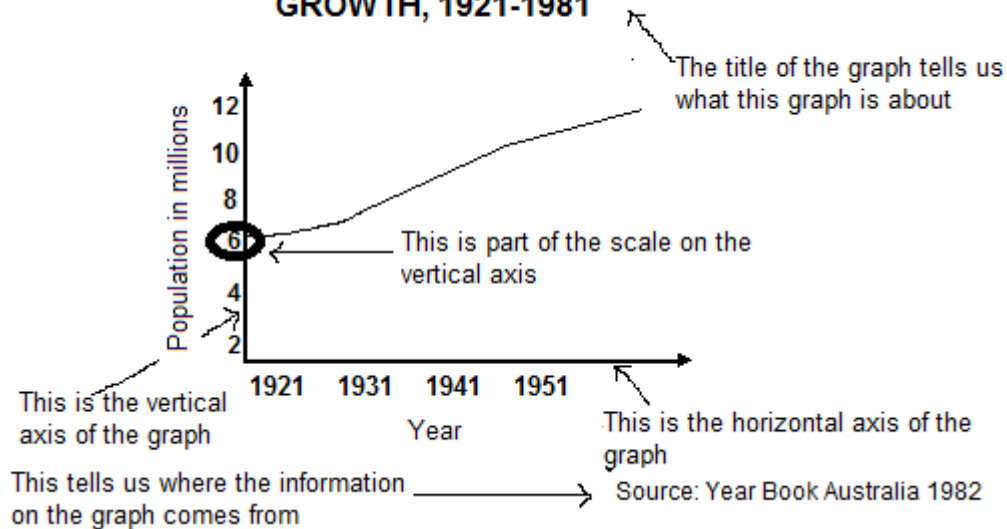
AEROPLANE FLIGHT PATH



There are some line graphs that have both a vertical and horizontal scale. The graph on the right shows the altitude (height) that a plane reaches at different distances away from the airport. In this graph you must read both the vertical and horizontal scale. For example, the line on the graph shows that at a distance of 30 kilometers from the airport, the plane was at a height of 5000 meters.

Now that you have studied the important features of a line graph, let us look at an example below showing each of these important features.

AUSTRALIA'S POPULATION GROWTH, 1921-1981



Interpret means to read and understand a text or diagram correctly before working out the answer.

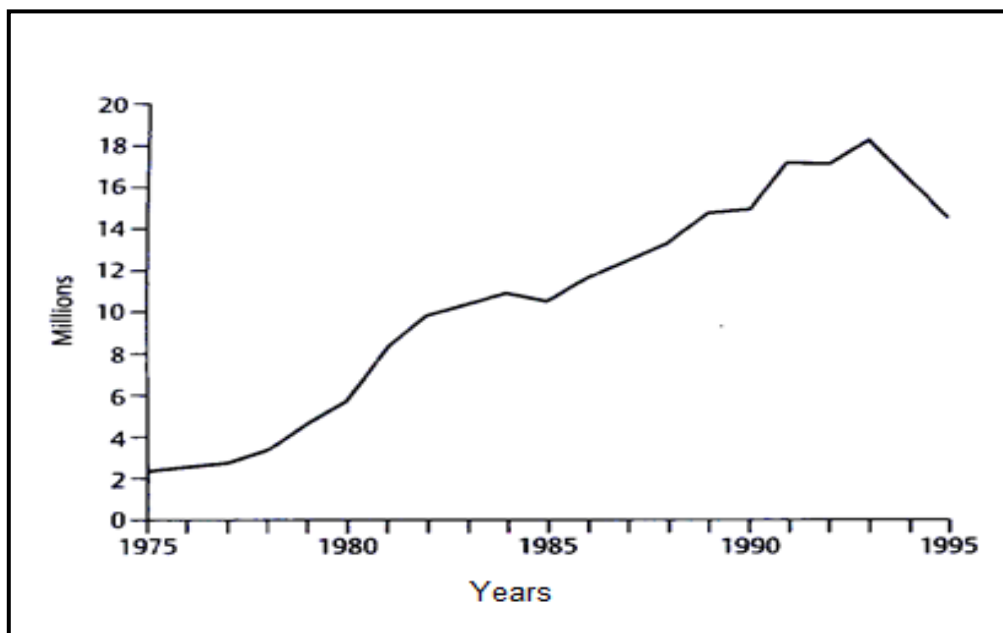
Now do Activity.



Activity

Use the line graph on *World Refugee Population* on the previous page to answer the questions. *Each question has a clue to help you work out your answer. Some definitions of words used on the graph are provided in the box below.*

WORLD REFUGEE POPULATION



Refugee means somebody looking for safe place, especially to avoid war or persecution.

Persecution means the unfair treatment of a group or race of people because of where they come from or their religious belief.

1. Between which years does the graph show the world refugee population? *Look at the horizontal axis showing the years. According to the graph when did the refugee trend start and when did it end?*

2. What does the vertical axis show? *Look at the vertical axis. Find the unit of measurement used.*

3. What does the horizontal axis show? *Look at the horizontal axis. Find the unit of measurement used.*

4. (a) What is the highest number of refugees to have moved between 1975 and 1995? *Look at the highest point on the line graph. Read off the vertical axis.*

- (b) Between which two years did this highest number of refugees have left their countries? *Look at the highest point on the graph. Read off the horizontal axis.*

5. Can you think of any province or place in Papua New Guinea that has refugees?

6. According to the graph, what year(s) did the refugee trend drop considerably?

Advantages and Disadvantages of line graph

Advantages

- (a) Can compare multiple continuous data sets easily

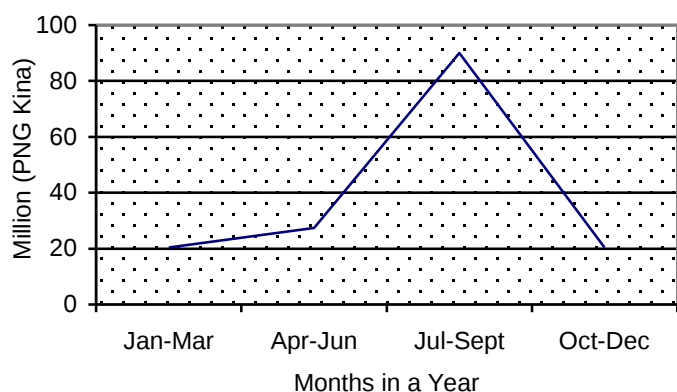
Disadvantages

- (a) Use only with continuous data

Line graphs may have one or more lines running across it from left to right. A line graph shows information on a series of points that are joined up to form a line.

There are two types of line graphs: single and multiple line graphs. However, in this lesson you will focus on the basic line graph that has only one line running across it from left to right. This one line graph shows changes over a period of time of a single piece of information. A graph may come in different forms. It can be of a line joining points plotted between

**2001 PROVINCIAL HIGH SCHOOL
GOVERNMENT SUBSIDIES**



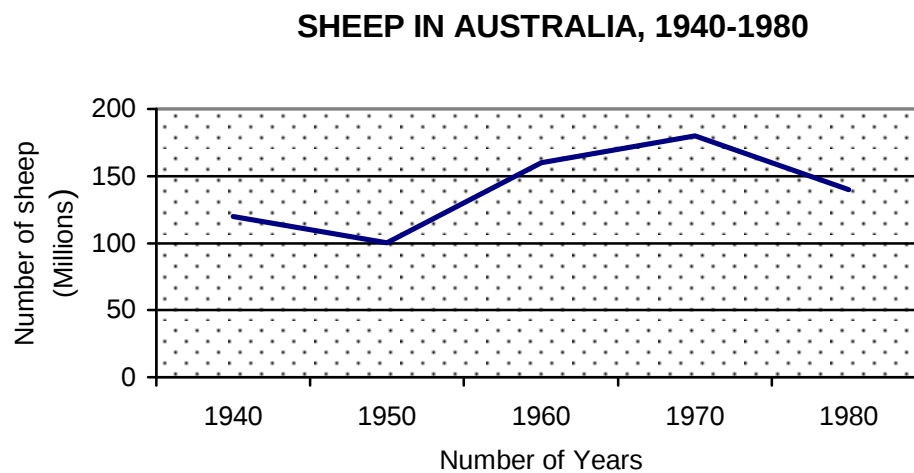
coordinates, or a series of parallel bars or boxes as shown on the graph *right*.

A line graph shows:

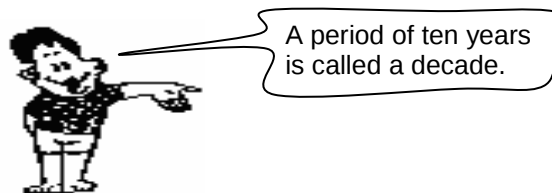
- rises and falls over a period of time
- differences between a place and another over a period of time
- Changes from one period of time to the next.

Here below is a graph showing the production of Sheep in Australia between 1940 and 1980.

Study it.



The rise and fall of sheep breeding occurs over a period of ten years according to the Graph of Sheep in Australia, 1940-1980. Every ten years showed a different figure of sheep production that is shown in the line going up or coming down.



Steps in how to read a line graph

1. Read the vertical axis across
2. Read the horizontal axis upward
3. Where these two lines meet or intersect is the point you take your reading from

Now read the summary.

**Summary**

You have come to the end of Lesson 2. In this Lesson, you have learnt that:

- a line graph is a graph which has one or more lines running across it from left to right. It shows information as a series of points that are joined up to form a line.
- a graph is a drawing of statistics that shows us the important facts at a glance to present facts and figures.
- a line graph must always have the following features: a *Title*, *vertical axis*, *horizontal axis*, a *scale*, and *the source*.
- always use the correct unit of measurement for the horizontal and vertical axis.

Answers to Activity

1. Between 1975 and 1995
2. The population of the people in Millions
3. The years from 1975 to 1995
4. (a) 18 million
(b) between the years 1992 and 1993
5. Refugees from Irian Jaya in Indonesia cross the border and come into Papua New Guinea particularly into the areas of Sandaun Province that are along the border.
6. By 1992, the world refugee started to drop.

NOW DO PRACTICE EXERCISE 2 ON THE NEXT PAGE
--



Practice Exercise 2

Study the information given in the table below and draw a simple line graph. This line graph is called a temperature graph. You have studied temperature and rainfall graphs in detail in grade 7 Strand 1.

Temperature Patterns

Study the data and decide on suitable scales for the vertical and horizontal axis. But in this case a scale for both the vertical and horizontal axis has been done for you.

Data

Average Monthly Temperatures (Melbourne) °C

Jan 21	Apr 15	July 9	Oct 14
Feb 20	May 12	Aug 11	Nov 16
Mar 18	June 10	Sept 12	Dec 18

Remember that when you are drawing the scale for the vertical axis the highest temperature is 21°C. Therefore your scale should be rounded off to 25°C with the lowest starting from 0°C. The scale for the vertical axis is: 1 cm represents 5°C. The scale for the horizontal axis: 5 mm represents 1 month. You have been given a scale to help you draw your line graph.

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 1
--

Lesson 3: Column and Bar Graph



In the last lesson, you learnt about the Line Graph, its uses and features. In this lesson, you will study yet another type of graph called the **column graph**.



Your Aims:

- distinguish between a column and bar graph
- discuss the uses of a column and bar graph
- identify features of a column and bar graph
- read and interpret information on a column and bar graph

Column and Bar Graph

A column graph is different from a bar graph. A column graph has columns that run up and down it from top to bottom. A bar graph has one or more bars running across it from left to right. These graphs are used to present information. They are often used in geography to compare things. We will look at the purpose of these graphs.

Let us now look at the purpose of these graphs. These graphs are important because they show:

- the difference between two or more things at a particular time
- the change in one thing over a period of time.

Remember! The skills that you will need to understand column graphs are the same as those you will need for bar graphs.



Below are advantages and disadvantages of bar graphs.

Bar Graph

A bar graph displays discrete data in separate columns. A double bar graph can be used to compare two data sets. Categories are considered unordered and can be rearranged alphabetically, by size, etc.

Advantages

- (a) easily seen
- (b) Can easily compare two or three sets of information

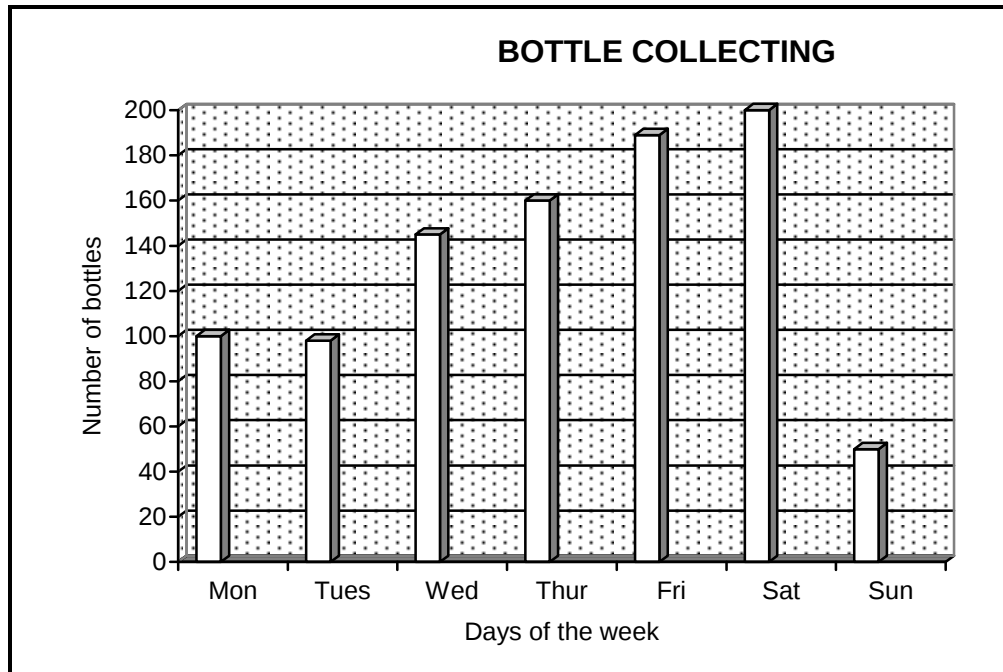
Disadvantages

- (a) Graph categories can be reorganised to show certain effects

Now that you know what column and bar graphs are used for, let us identify the features of these graphs. These features are:

- title or heading
- the source of the information
- what is shown on the horizontal axis
- what is shown on the vertical axis
- how much the number on the vertical scale go up each time
- the unit of measurement used on the vertical and horizontal axis

Here is an example of a column graph. Spend some time to study it.



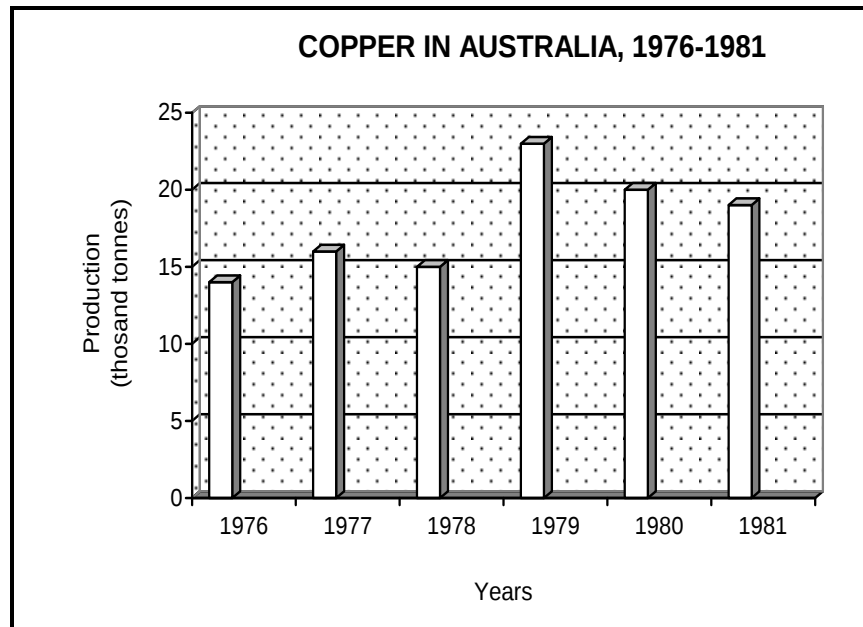
Source: Sunday Chronicles PNG 2010

Now do Activity 1.



Activity 1

Now take this time to study the following graph. It shows the amount of copper produced in Australia between 1975 and 1980. Study the graph on the following page and answer questions.



Source: Year Book Australia 1983

- (a) In what year was the largest amount of copper produced? *Look for the highest column on the graph that should have the greatest production.*
- _____
- (b) How much copper was produced in that year? *Look across to the vertical scale. Read off the amount.*
- _____
- (c) In what year was the lowest amount of copper produced? *Look for the shortest column on the graph that should have the lowest production.*
- _____
- (d) By how much did copper production increase between 1978 and 1979? *Find out how much was produced in 1978 and 1979. Work out the difference between them.*
- _____
- (e) Which years was production over 17 tonnes? *Look for any columns that go above 17 (tonnes) on the vertical scale.*
- _____

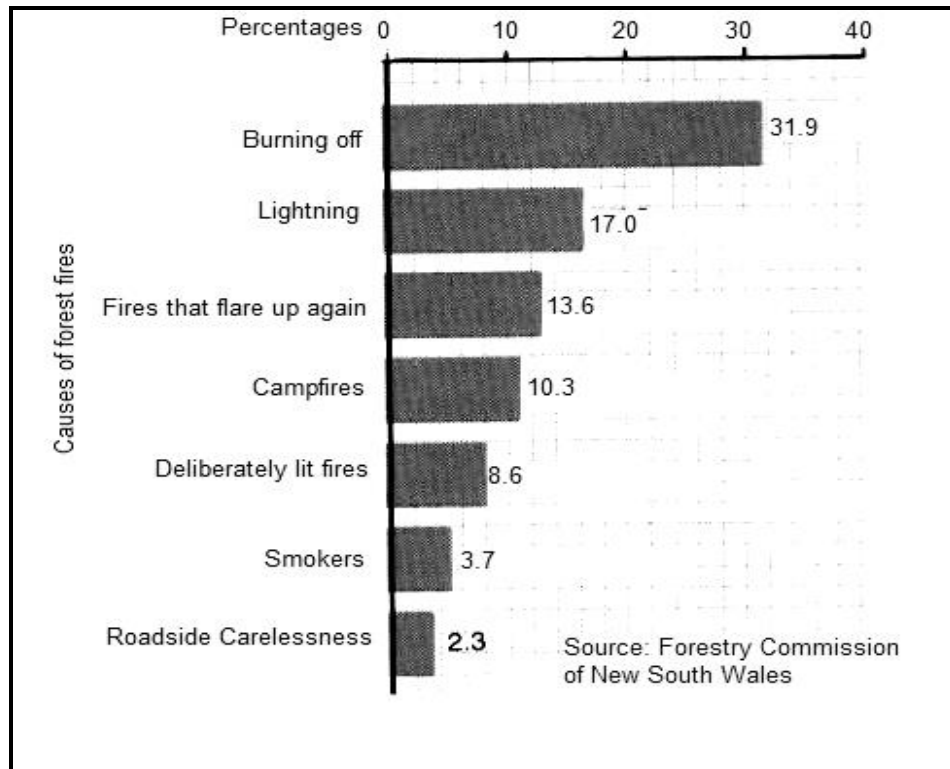
Check your answer after the summary.

Now that you have interpreted a column graph you can go on to studying a bar graph. You will now interpret a bar graph, and answer questions in Activity 2. A bar graph has bars running across it. These bars run horizontally to that of a column graph that has columns

running vertically up and down it. As a result of this, there are differences in the way the bar graph is drawn.

You will see such differences in the graph, “The Causes of Forest Fires”. Try to make sure you understand those points well so that when you are asked to draw a column or bar graph you will know exactly what type of graph to draw.

**THE CAUSES OF FORESTS FIRES IN NEW SOUTH WALES:
1972-1973**



The following points differentiate a column from a bar graph. In a bar graph you see the following features:

- scale must now be placed on the horizontal axis.
- horizontal axis is drawn above or below the bars on the graph.
- vertical axis will now have other information on it.
- The bars are usually drawn in order from the biggest to the smallest.

You must study these points well so you know the difference between a column and bar graph.

Now do Activity 2.



Activity 2

- (a) What was the main cause of forest fire between 1972 and 1973? *Look at the vertical scale. Find the longest bar across the graph.*
- _____
- (b) What activity caused most of the forest fires? *Find the longest bar across the graph. Read off the horizontal axis.*
- _____
- (c) Which cause of forest fire had the least percentage? *Find the shortest bar across the graph.*
- _____
- (d) Which of these causes of forest fire were caused naturally? Look at the vertical scale. *Read the top three causes of forest fire.*
- _____

Check your answers after the summary.

Now read the summary.



Summary

You have come to the end of Lesson 3. In this Lesson, you have learnt that:

- a column graph is a graph which has columns that run up and down on it.
- column graphs are used to compare things.
- column graphs are good at showing: two or more things at a particular time; and change in one thing over a period of time.
- bar graphs look a lot like column graphs but the bars run across the graph from left to right. As a result, there are changes to the way the graph is drawn.

Answers to Activity 1

1.

- (a) 1979
(b) About 23, 000 tonnes
(c) 1978

- (d) By 8 000 tonnes
- (e) 1979, 1980, 1981

Answers to Activity 2

1.

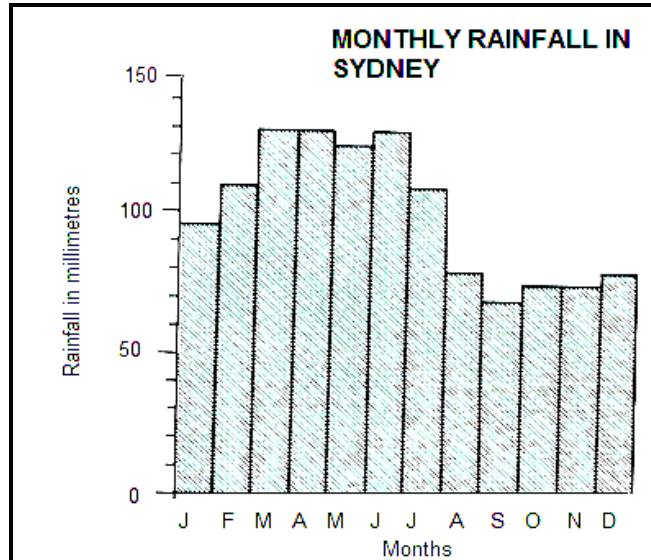
- (a) Burning off
- (b) Burning off
- (c) Roadside Carelessness
- (d) Burning off, lightning, fires that flare up again

NOW DO PRACTICE EXERCISE 3 ON THE NEXT PAGE
--



Practice Exercise 3

Study the column graph below to answer questions.



1. Which three months had the highest rainfall?

(a) _____ (b) _____

(c) _____

2. What is the highest rainfall in millimetres in that year?

3. Which two months had a rainfall of 80mm?

(a) _____ (b) _____

4. When was the least amount of rainfall recorded?

5. Around which month does the dry season start and finish?

6. What unit of measurement is used to measure the rainfall?

CHECK YOUR ANSWERS AT THE END OF THE SUB-STRAND

Lesson 4: Pie Graph



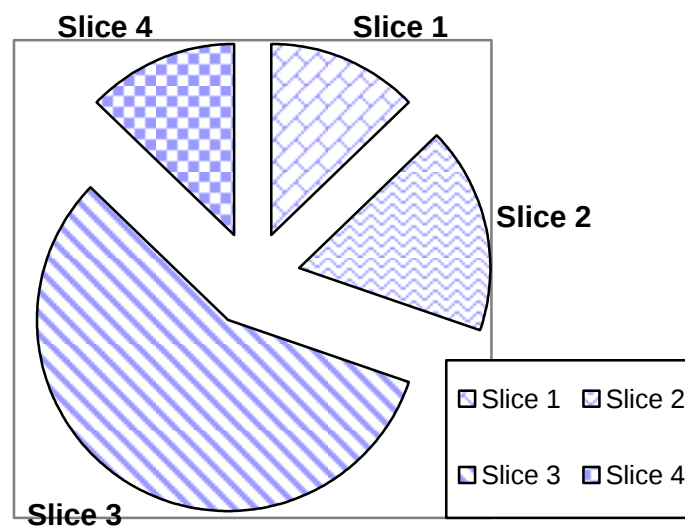
In Lesson 3, you learnt about the column and bar graphs. In this lesson, you will study pie graphs. A pie graph is a graph that is in a circle shape.



Your Aims:

- define pie graph
- discuss the uses of a pie graph
- identify features of a pie graph
- read and interpret information on a pie graph

A pie graph is as important as any other graphs because it shows facts and figures in a *circle*. It is a circle that is divided into a number of parts or segments. It is sometimes referred to as a *pie chart*. Each segment or part in the circle looks like a slice from a pie. All the parts or slices put together make up a complete or whole 'pie' graph. See below a sample pie graph divided into parts. Here is an example of a pie graph.



You can ask why it is important for information to be written in a pie graph. Why cannot this information be read off straight from a table or written using other forms or diagrams?

Pie graphs show at a glance how something is divided into different parts. This makes it easy to compare the actual sizes of the parts. Pie graphs are always divided up from the center. And each 'piece' or part of this circle is called a *sector*. The sectors must all fit together to form a complete circle with an angle of 360° .

Here are advantages and disadvantages of pie graphs. Read them.

Advantages

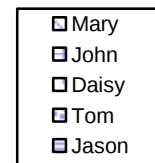
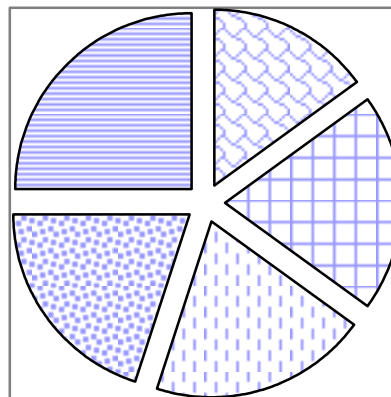
- (a) easy to see and read
- (b) Shows percent of total for each sector

Disadvantages

- (a) No exact numerical data
- (b) Total unknown unless specified
- (c) Best for 3 to 7 categories

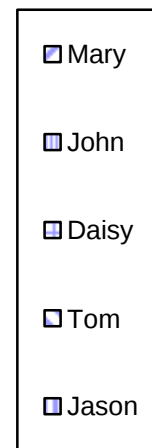
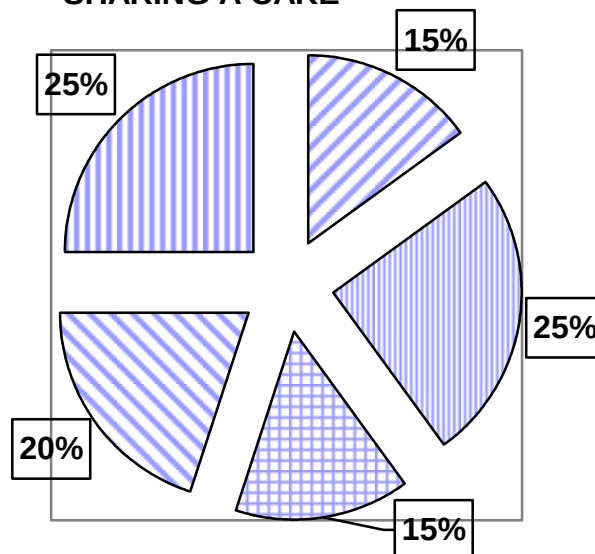
Pie graphs may be different from one another. This means that they may show different values and units of measurements. Some pie graphs display or show *quantity*. This means each segment of the graph is marked with how much or what amount it represents.

See the first graph on your right. It shows a quantity of cake shared but not the actual amount.

SHARING A CAKE

Sometimes others may show percentages only. In this type of graph each segment is shown as a percentage of the whole. Each pie section should have a label and percentage. A total data number should be included.

The second graph on your right shows the parts of cake shared in percentages. Each part is a percentage of the whole cake. Mary has the smallest piece which is 15 percent while John and Daisy have the largest piece each which is 25 percent. A per cent (%) is *always* out of a hundred.

SHARING A CAKE

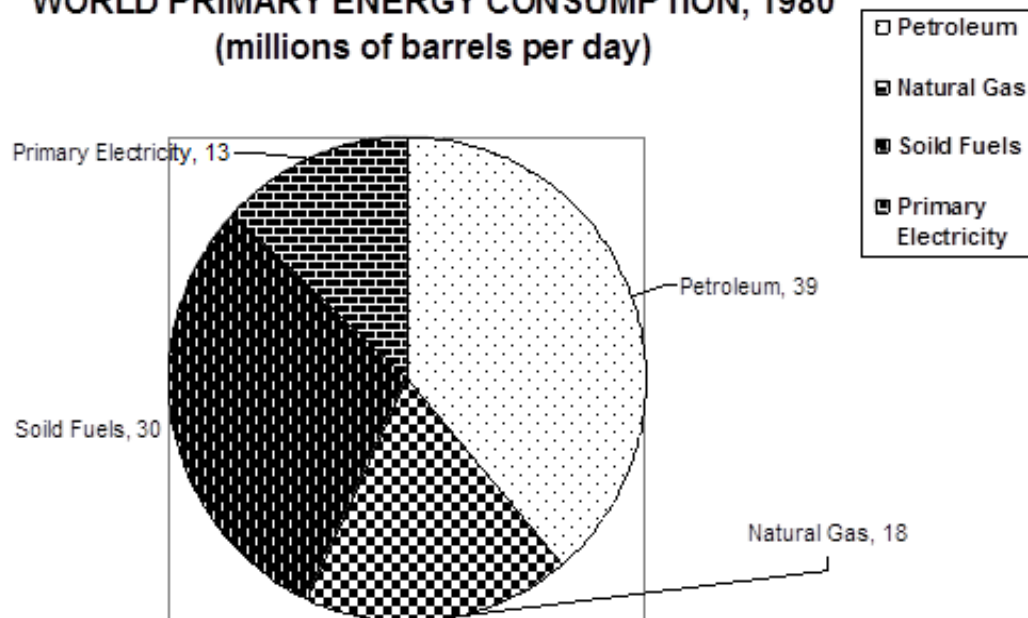
Like any other graphs, a pie graph must have the following features:

- a title or heading
- Know whether it is a quantity (number) or percentage (%)
- the source of where the information has come from
- key and the unit of measurement



See if you can recognize these features in the graph showing 'World Primary Energy Consumption'.

WORLD PRIMARY ENERGY CONSUMPTION, 1980
(millions of barrels per day)



Source: World Development Report, 1990

Now do Activity.



Activity

Refer to the pie graph on 'World Energy Consumption, 1980' and answer questions.

- (a) What does the graph show? _____
- (b) State the percentage of primary electricity in 1980? _____
- (c) What amount of solid fuel was consumed in 1980? _____
- (d) What unit of measurement was used to measure the amount of primary energy consumed in 1980?

- (e) What types of energy were consumed worldwide in 1980?

Check your answers after the summary.

Now read the summary.



Summary

You have come to the end of Lesson 4. In this Lesson, you have learnt that:

- a pie graph is a circle that is divided into a number of parts.
- pie graphs are always divided up from the center.
- each piece of a pie graph is called a sector.
- a complete circle of a pie graph must add up to form an angle of 360° .
- pie graphs show information in quantity (amount) or percentages.
- pie graphs must have a title, show quantity or percentage, source and key or legend and the, unit of measurement.

Answers to Activity

- (a) The pie graph shows the World Primary Energy Consumption in 1980.
- (b) 13 million barrels per day
- (c) 30 million barrels per day
- (d) in millions of barrel per day
- (d) Primary electricity, Petroleum, Solid fuels, and Natural gases

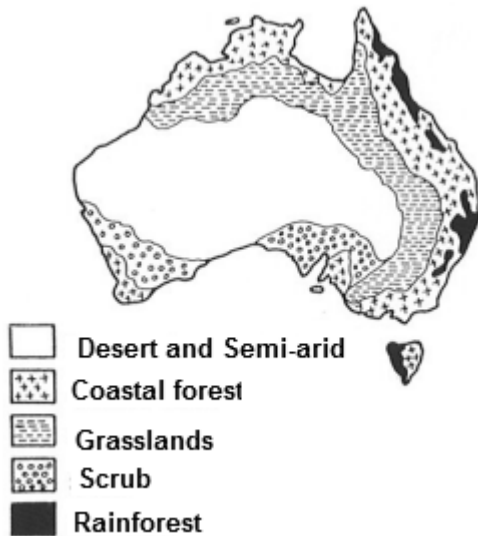
NOW DO PRACTICE EXERCISE 4 ON THE NEXT PAGE
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Practice Exercise 4

Below is a map and pie graph showing the vegetation of Australia. Study the map and see how this particular information is written on a pie graph. Then you can use both the map and pie graph to answer questions.

VEGETATION MAP OF AUSTRALIA



Vegetation	%
Coastal forest	18
Desert & semi-and	45
Grassland	26
Scrub	6
Rainforest	5
Total	100

1. What type of vegetation is semi-arid? _____
2. Which vegetation is common along the eastern coast? _____
3. According to the map, what vegetation is mainly found in Australia?

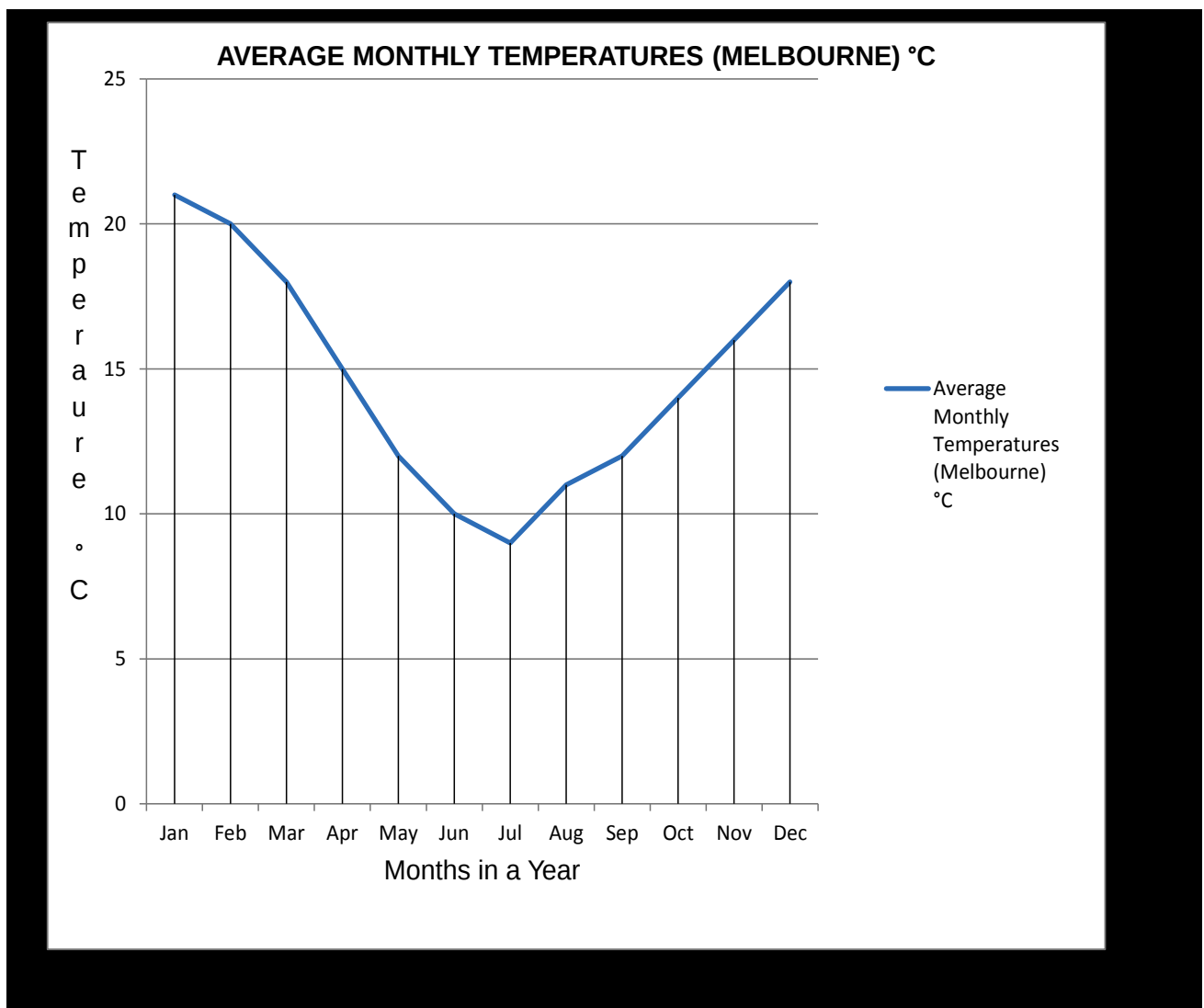
4. Why do you think central Australia is very dry compared to the eastern coast?

5. Which vegetation's common in the northern, southern and south-western coast of Australia?

NOW CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 1

ANSWERS TO PRACTICE EXERCISES 1-4**Answers to Practice Exercise 1**

1. World Population Growth
2. millions
3. 754 million
4. 5759 million
5. Oceania region
6. The Oceania Region

Answers to Practice Exercise 2

Answers to Practice Exercise 3

1. March, April, June
2. 130 millimetres
3. August, December
4. September
5. around August to December
6. Millimetres (mm)

Answers to Practice Exercise 4

1. A very dry area, becoming desert-like
 2. Grassland, coastal forest, rainforest
 3. Desert, and semi-arid areas
 4. This is due to very little or no rain at all in central Australia for long periods of time compared to the eastern coast.
 5. On the northern coast there is a lot of the coastal forest; on the south and south-western coastal areas there is mainly the scrub vegetation.
-

END OF ANSWERS TO PRACTICE EXERCISES 1-4

SUB-STRAND 2: DISTANCE, SCALE AND DIRECTIONS

In This Sub-Strand, You Will Learn About:

- **calculating distance**
- **scale**
- **finding Directions**
- **flow Diagram**

SUB-STRAND 2: INTRODUCTION

In this Sub Strand, you will learn about:

- calculating Distance
- scale
- finding Direction
- flow Diagram

In the first part of this Sub Strand you will define, measure and calculate distances on maps. You will use different methods or ways to measure and calculate long and short distances on maps.

Scale is another skill you will learn. You will define and identify the three types of scale used on maps. A scale of a map determines the real distance on the ground. Accurate calculations of distances on maps depend on the different ways of measurement and the scale used. In this lesson alone a variety of materials and aids will be used. The materials that you will need are outlined in the section for Materials needed.

In the second part of this Sub Strand you will define and learn about the different directions of a compass. This skill will particularly equip you with the knowledge in knowing your location in relation to others, something, or a thing.

In studying flow diagrams, you will define and identify its uses and basic features. Learning about flow diagrams is necessary because they shorten lengthy ideas and processes into a step by step summary.

We hope you enjoy this Sub Strand!

Lesson 5: Calculating Distance



In Lesson 4, you learnt about pie graphs. In this lesson, you will learn how to calculate the distance in different ways using a map. You will find out that real life distances are so vast and hard to imagine and are therefore 'scaled down' or drawn smaller to fit onto a page.



Your Aims:

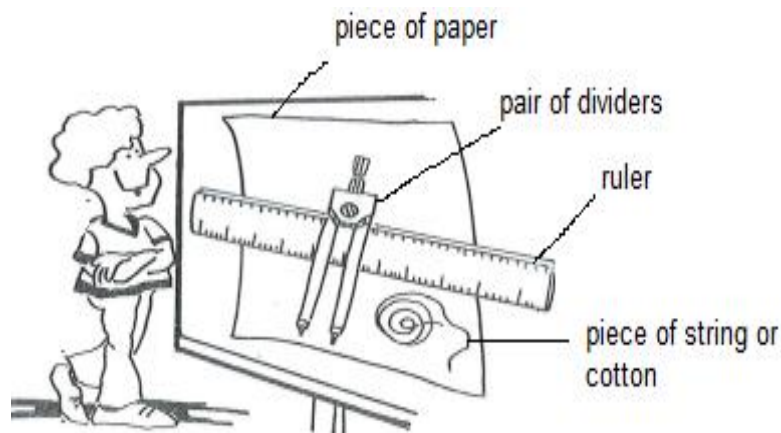
- define distance
- measure distances accurately using paper and line scales, and using string or cotton
- measure distances between two places

What is Distance?

A distance is the *amount of space* between two points. To calculate a distance is to measure the amount of space between two points or places. Some maps have the distance between one place and the next clearly printed on them while some maps do not. For this very reason measuring and calculating distances uses different ways.

There are many other maps, however, which do not give us this information. When a map does not tell us how far it is from one place to another, you must then use the scale to work it out. To be able to measure distances on maps you will need tools. The types of tool needed to measure straight line distances or curves include: a ruler, a sheet of paper, a pair of dividers, and a piece of cotton or string.

Look at the cartoon below showing the type of tools.



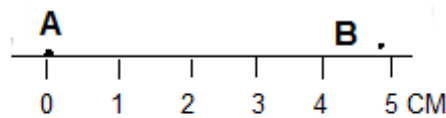
I do not think everyone will have a pair of dividers. Do not worry because you can always use other tools to measure distances. But if you do have a pair of dividers, keep it and use it whenever you need to.

There are different ways as well as tools can be used to measure distances. The easiest way for measuring distances is using the line or linear scale.

(a) Measuring distances using a ruler

It is better to use a clear plastic ruler as you can see the map through the plastic as you work.

- (i) You are to measure the distance on the map between two places or points. You can see in the example below.
- (ii) You then compare, this distance with the line scale on the map.

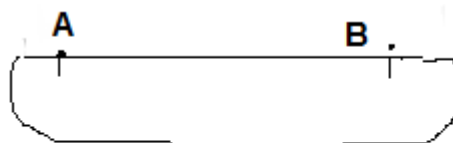


Measuring the distance between points A and B using a straight-edged ruler

(b) When measuring distances with a sheet of paper, you must;

- (i) Line up the two places along the edge of the paper (straight-edged paper).
- (ii) Mark off the distance between the two points onto your paper.
- (iii) Compare this distance with the line scale.

You can see these steps in the diagram below.

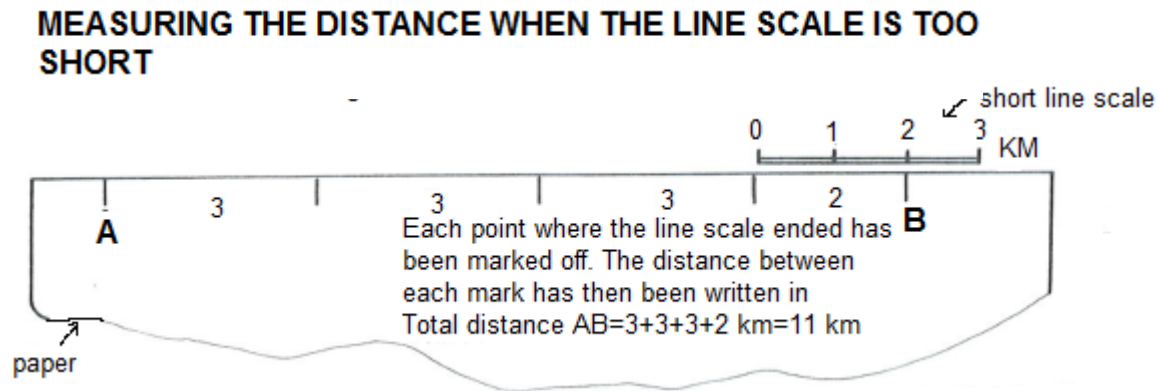


Measuring the distance between points A and B using straight-edged sheet of paper

- (c)** Not always will you find the line scale to be sufficient or long enough to measure distances. Sometimes **when the line scale is too short**, this is what you must do;
- (i) Line up the edge of the paper and mark off the distances as before (step 1).
 - (ii) Place the paper along the line scale and mark off where the line scale finishes on your paper (Step 2).
 - (iii) Write down beside this mark what distance this was (step 3).

- (iv) Now, move the paper across so that you can mark off the next line scale distance onto your paper (step 4).
- (v) Continue with steps 2, 3 and 4 until the last mark on your paper is reached (Step 5).
- (vi) Now, add up the distances you have written down (step 6).

The diagram below shows how you can do this.

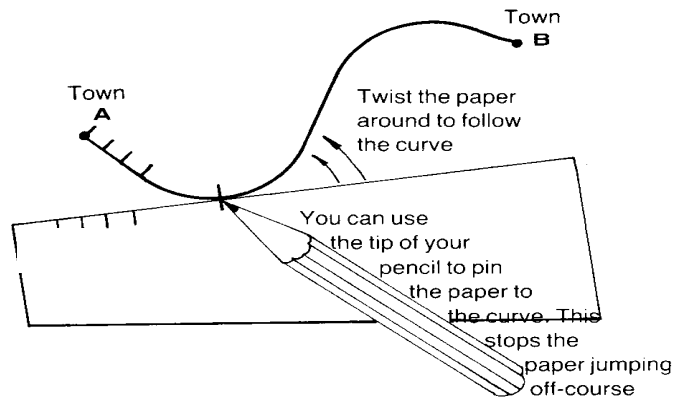


- (d) You must also know how to measure distances around a curve. The curve could be a winding river or along a road that twists and turns. You know that a ruler is a straight line tool and cannot be used very well to measure distances around curves and bends, therefore you must use:
 - a piece of string or cotton, or
 - a sheet of paper, or
 - a pair of dividers
- (i) Measuring distances around a curve is quite easy when using a piece of string. The following points show you how to do this:
 - lay out the string so that it closely follows the curve that must be measured
 - the distance must be marked off by pinching the string with your fingers
 - compare the distance on the string with the distance on the line scale
- (ii) The steps below show how you can use the edge of a sheet of paper to measure distances around curves:
 - the sheet of paper must be placed on the map. Mark off the start point (Point A)
 - now twists or turn the paper, following the curves on the map.

- mark off the finish (Point B).
- compare the distance on the string with the distance on the line scale

The diagram below shows how you can use the edge of a sheet of paper to measure a distance around a curve.

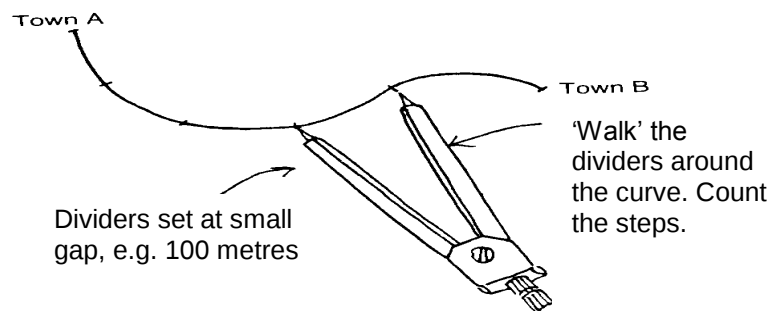
USING A SHEET OF PAPER AROUND A CURVE



- (iii) When measuring the straight-line distance between two places with a pair of dividers, you must;
- open out the dividers to the distance to be measured, then
 - compare this distance with the line scale

Follow these steps in the diagram below.

USING DIVIDERS AROUND A CURVE



Now read summary.

**Summary**

You have come to the end of Lesson 5. In this Lesson, you have learnt that:

- distance is the amount of space between two points.
- these tools are needed in measuring distances: a sheet of paper, pair of dividers, ruler, a piece of string or cotton, pencil and eraser.
- there are a number of ways to measure distance between two points. These are:
 - measuring using a straight-line ruler,
 - Straight-edged paper, and mark-off the distance, if the line scale is too short.
 - A piece of paper or cotton can be used to measure distance around curves or bends.
- a pair of dividers can be used to measure both straight line distances and curves.
- measuring distance using the linear scale is the easiest and fastest way to a result.

NOW DO PRACTICE EXERCISE 5 ON THE NEXT PAGE
--



Practice Exercise 5

1. Write down at least five tools needed to measure a distance.

(a) _____

(b) _____

(c) _____

(d) _____

2. Define distance.

3. Explain what you would do when a map does not show distance on it?

4. What tools would you use when trying to measure curved distances?

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 2
--

Lesson 6: Scale



In the last lesson, you learnt about calculating distances on a map. In this lesson you will study the scale on maps. You will also learn how a scale helps work out the real life distances between two places.



Your Aims:

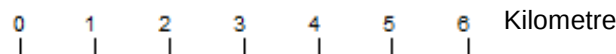
- define scale, in map reading
 - differentiate between scales as words, representative ratios and line scales
 - read and interpret a scale correctly.
-

What is a Scale?



A **scale** is a measuring system based on a series of marks laid down at regular intervals and representing numerical values. Scale is defined as the *relation* between a distance on a map and the actual distance on the earth's surface.

The word scale can mean other things too but the scale that we are talking about is the type found on maps. Look at a simple diagram of a line scale below.



A scale is used to

- calculate the distance between two points or places.
- decide on the detail of the features of the earth's surface which can be shown on the map.

A scale makes it easy to find out the size of an area shown on a particular map. It helps to compare the short distances on the map with real-life distances on the ground. Real-life drawings of places and features get “scaled down” so they become a smaller version. It is therefore important to make maps smaller than they really are so that they can fit onto the page of atlases and other resource books. Maps must be drawn as accurately as possible.

As well, the land must also be “scaled down” to fit onto a piece of paper. How much area and detail shown on a map will depend on the scale that has been used to draw it.

REMEMBER: Small scale maps show big areas of land and water. Large scale maps show small areas in a lot more detail.

The scale tells us the relationship between distances on the map and distances in real life. It is the ratio of map distance to actual distance on the ground. Ratio can mean the relation or proportion of the distance on the map to the actual distance, for example, Points A to B on the map is 1 cm, but the actual distance on the ground is 100 metres. The scale therefore is every 1 centimetre on the map represents 100 metres on the ground.

A scale is shown in three ways:

- (a) by writing it in words
- (b) by showing it in numbers as a representative fraction or ratio
- (c) by drawing it as a line scale

Scale written in words

The scale of a map may sometimes be written in words. An example is “1 centimetre to 1 kilometre”. This means that 1 centimetre on the map represents 1 kilometre in real life on the ground. Other examples of the scale in words are;

- ‘1 centimetre to 1 metre’
- ‘1 centimetre to 10 metres’
- ‘1 centimetre to 100 metres’

Now let us look at scale written as a representative ratio.

(a) Scale written as a Representative Fraction or Ratio

The scale of a map can also be shown in numbers. This type of scale is shown as either a representative fraction, for example, $1/100$, or a ratio, for example 1:100. Here are some examples of representative fractions and ratios.

Representative fraction	Ratio	Representative fraction	Ratio
(a) $1/10$	1:10	(e) $1/5$	
(b) $1/25\ 000$	1:25 000	(f) $1/20$	
(c) $1/50\ 000$	1:50 000	(g) $1/50$	
(d) $1/100\ 000$	1:100 000	(h) $1/100$	

Can you think of some more examples of your own? You can complete the rest in your workbook.

If you have finished then take out your ruler and count the number of:

- (i) millimetres in 1 centimetre _____
- (ii) centimetres in 1 metre _____

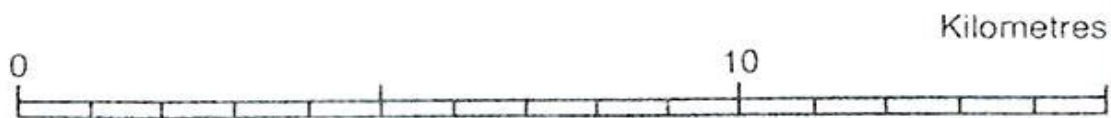
If a map has a scale of 1:1000, then one distance on the map is one thousand times bigger in real life. A scale of 1:1000 means that:

- 1 millimetre on the map represents 1000 millimetres (or 1 metre) in real life.
- 1 centimetre on the map represents 1000 centimetres (10 metres) in real life.
- 1 metre on the map represents 1000 metres (1 kilometre) in real life.

(b) Line or linear scale

The scale of a map can also be shown by a numbered line known as a line or linear scale. This type of scale is the most popular way of showing scale on a map. It is also the easiest to understand and use. Given below is an example of a simple line scale.

- Every 1 centimetre (cm) on the map represents 1 kilometre (km) on the ground.



Study the simple line scale and do the following short exercise from (a) to (c).

What is the distance on this line scale if the distance on the map is?

- (a) 2 cm
(b) 5 cm
(c) 1 cm

Write your answers here.

- (a) 1 cm = _____
(b) 5 cm = _____
(c) 1 cm = _____

Now do Activity.



Activity

1. Write ratios for the following representative fractions.

- (a) $\frac{1}{35\ 000}$ = _____
(b) $\frac{1}{100\ 000}$ = _____
(c) $\frac{1}{200\ 000}$ = _____

2. Write the following scales in words.

- (a) 1: 25 000 = _____
(b) 1: 50 000 = _____
(c) 1:100 000 = _____

Check your answers after the summary.

Now read the summary.



Summary

You have come to the end of Lesson 6. In this Lesson, you have learnt that:

- a map scale shows how distance on a map relates to distance on the ground in real life.
- small scale maps show big areas of land and water while large scale maps show smaller areas in a lot more detail.
- maps are drawn as accurately as possible therefore scales given are almost accurate.
- how much area and detail shown on a map will depend on the scale that has been used to draw it.
- there are three main types of scale: Scale in words, scale as representative fraction or ratio and line or linear scale.
- The first number (map distance) in a representative fraction or ratio is always 1 while the second number (ground distance) is different for each scale.

Answers to Activity

1.

- (a) 1 : 35 000
(b) 1 : 100 000
(c) 1 : 200 000

2.

- (a) 1 centimetre to 25 000 centimetres
(b) 1 centimetre to 50 000 centimetres
(c) 1 centimetre to 100 000 centimetres

NOW DO PRACTICE EXERCISE 6 ON THE NEXT PAGE



Practice Exercise 6

1. Define scale.

2. List the three main types of scale.

- (a) _____
- (b) _____
- (c) _____

3. Complete the following table by putting these scales into words.

Scale	Meaning in Words
1:10	1 centimetre to centimetres
1:1000	1 centimetre to centimetres
1:1000	1 centimetre to metres
1:50 000	1 centimetre to 1 kilometre

4. Complete these statements about scale. A scale of 1:100 means that

- (a) 1 millimetre on the map represents millimetres in real life
- (b) 1 centimetre on the map represents centimetres in real life
- (c) 1 metre on the map represents metres in real life

5. A scale of 1:1000 means that:

- (a) 1 centimetre on the map represents centimetres on the ground
- (b) 2 centimetres on the map represents centimetres on the ground
- (c) 10 centimetres on the map represents centimetres on the ground

CHECK YOUR ANSWERS AT THE BACK OF SUB STRAND 2

Lesson 7: Finding Direction



In Lesson 6, you learnt about the scale. In this lesson, you will learn about the different Compass directions. A compass shows different directions. A compass becomes very useful if you are particularly in a new place, jungle, or on top of a high mountain, for instance and do not know which direction you are in.



Your Aims:

- define direction and compass point
- identify the different compass points
- locate places using compass points

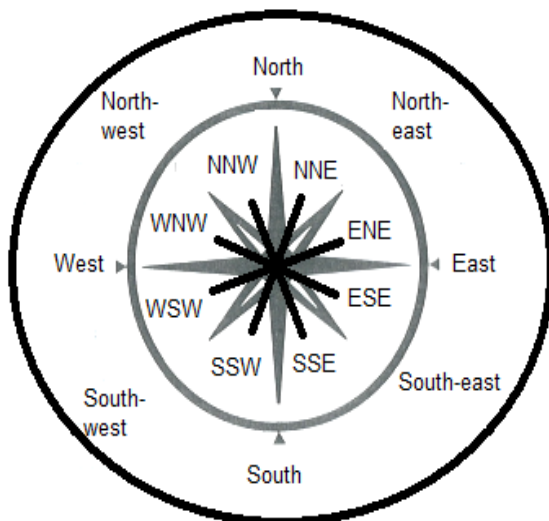
Let us find out about **direction** and **compass** points.

What is direction?

A direction is a *course* or *route* in which something or someone is in or has taken. Direction helps find the location of features and places on maps and in real life situations. A compass is an instrument that shows the different directions. The four main cardinal directions are North, South, East and West.

Compass points show direction on a map. Almost all the maps have certain features on them. North is toward the top of most maps. But to make sure, look for an arrow on the map showing one or more cardinal directions (north, south, east, and west).

THE POINTS OF THE COMPASS

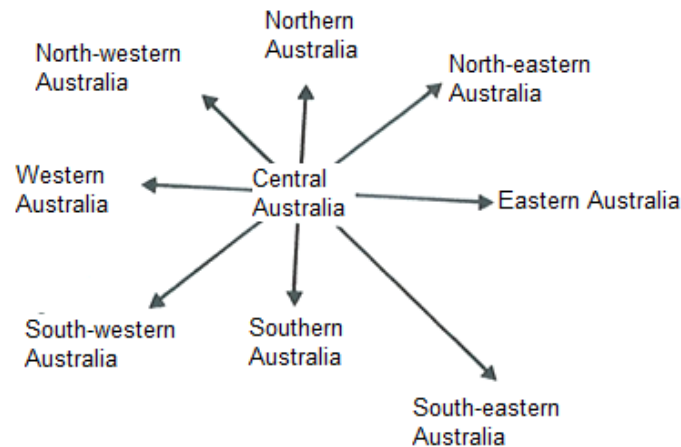


The easiest way of explaining the direction of one place from another either on a map or on the ground, is to use the point of the compass shown on the left.

To give a more exact indication of direction, there are twelve **intermediate** or **inter-cardinal** points that can be used. Thus there is a total of sixteen compass points altogether. These are shown in the diagram on the left.

The points of the compass are a very useful way of describing parts of a country or state. See the example on the next page.

PLACES AND THEIR LOCATION FROM CENTRAL AUSTRALIA



Every good map should have a north point clearly marked on it. The north point shows which way north is on the map.

If you know where north is on your map, then you will also know where south, east and west are as well. This then allows you to state the direction of one place from another, using the points on the compass. The different states of Australia as shown above perfectly match the eight directions of the compass point. It is easier to tell which direction a state is in just from looking at the map.

A sixteen-point compass is more accurate than the eight-point. However sometimes a sixteen point may not be very accurate so people prefer to use what is called the **compass bearings**. This gives a compass direction in degrees and is the most accurate. You will learn more about compass bearings in grade 8.

Now do Activity.



Activity

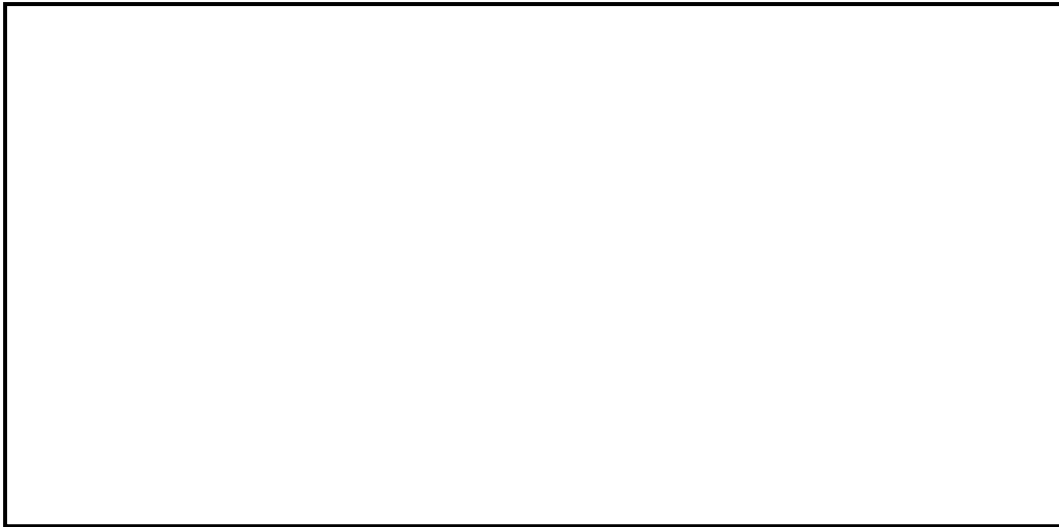
Answer the questions in your work book.

1. What do you call the four main compass points?

2. What do you call the other compass points in between the cardinal points?

3. What do compass points show on a map?

4. Draw an eight point compass in the box.



Check your answers after the summary.

Now read the summary.



Summary

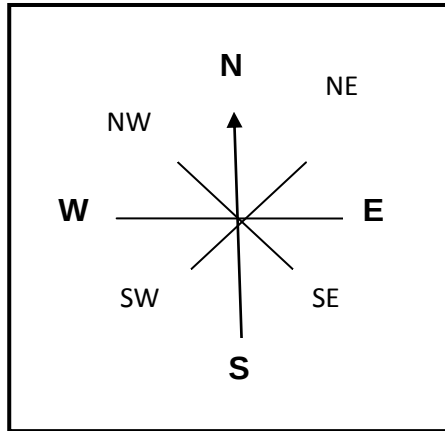
You have come to the end of Lesson 7. In this Lesson, you have learnt that:

- a compass has four main cardinal points which are North, South, East and West.
- the intermediate or inter-cardinal points lie in between each of these cardinal points making a total of sixteen compass points altogether.
- direction refers to the position of place or features in relation to another.
- wherever a compass is, its needle will always point to the North Pole.

Answers to Activity

1. Cardinal points
2. Intermediate or inter-cardinal points
3. The different directions

4.



NOW DO PRACTICE EXERCISE 7 ON THE NEXT PAGE



Practice Exercise 7

1. Define direction and compass point.

2. Write down the four main compass points.

(i) _____ (iii) _____

(ii) _____ (iv) _____

3. What do you call the other points in-between the cardinal points?

Refer to the compass directions to answer the questions below.

4. What direction is the opposite of east? _____

5. What direction is halfway between North and East? _____

6. What direction is opposite of North West? _____
-

CHECK YOUR ANSWERS AT THE BACK OF SUB-STRAND 2

Lesson 8: Flow Diagram



In Lesson 7, you learnt about finding the different directions using the compass. In this lesson you will study a type of flow diagram.



Your Aims:

- define flow diagram
 - discuss the uses of flow diagrams
 - read and interpret information on a flow diagram
-

Flow diagram is a way of clearly organising information about a process that occurs in order or sequence. There are many types of flow diagrams, like pictures, timelines, maps and comic strips etc. However in this lesson we will discuss only one type of flow diagram. We will use this type to describe the important points in the counting of election votes in the National Elections of Papua New Guinea.

Flow diagrams cut or minimize long stories short and simplify its meaning or make it simple and easy to understand. Certain processes involving an order in which something happens can sometimes be explained in very long paragraphs and shown by difficult diagrams about its processes.

Therefore one way of writing this long process or story short is to put together or write a summary of this information in a format such as a flow diagram. A flow diagram or chart as sometimes called arranges information in the order of happening. This refers to a process or event taking place in steps.

Processes can range from manufacturing and processing of goods to how something works or how electricity is being produced using hydro power. These are some examples of processes but there are many more that you can think of. We will briefly discuss Papua New Guinea's style of voting and counting in the National Elections. Then you will study the steps involved in the counting of votes in the National Elections. There are two types of voting and counting. The first system of voting called "First Past the Post" was from the first National Elections starting 1977 up until 2002. The new system of voting and counting called "Limited Preferential Voting" started in the 2007 National Election. We will discuss these differences now.

Example of the Election Process in Papua New Guinea

One example of a process that occurs in sequence or in order is voting. Voting in any country or place involves a sequence of steps. The Limited Preferential Voting (LPV) is another voting method being introduced in the 2012 National Election. Each voter chooses three candidates preferences or choices in the order of first, second and third. Whereas in the old election

system of “First Past the Post” a voter chose only one candidate out of many for each electorate. The winner was the candidate with the highest number of votes in the electorate. There are many steps involved in voting before a winner is declared. I am sure you have learnt about the Limited Preferential Voting in *Strand 2: Organization*.

Voting in democracies like Papua New Guinea is very important because it is a democratic right. People have the right to vote and change leaders in elections. A democracy is a form of government whereby there is rule by the people. People choose their leaders through voting to represent and make decisions for them in Parliament.

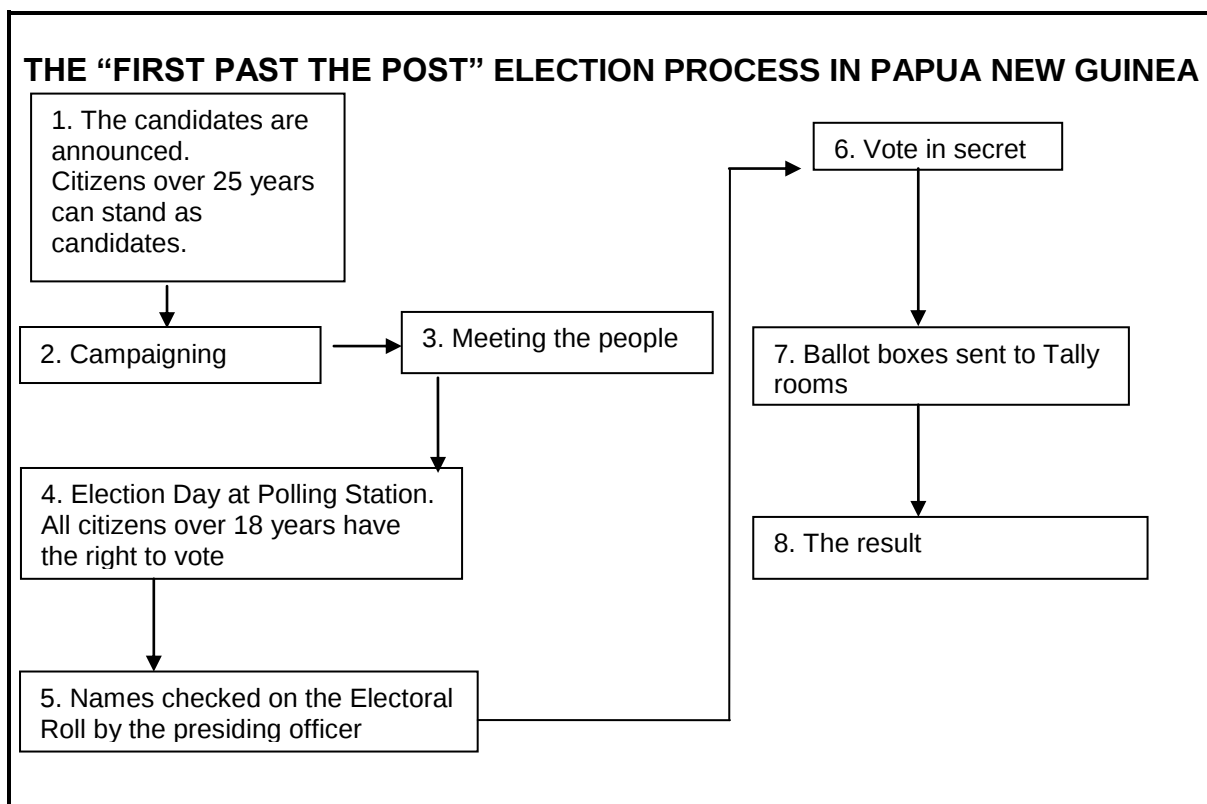
You will see the flow diagram below showing the previous election process in Papua New Guinea. This process of election ceased in 2002.

Given below are four questions for you to answer in your work book. Study the “First Past the Post” election processes and answer questions.

Now do Activity.



Activity



(a) How do people choose members of parliament?

(b) What is a democracy?

(c) Who is qualified to vote during Election Day?

(d) Who checks the names on the Election Roll?

(e) Why is it important for candidates to campaign and meet people?

(f) What is a Tally room?

(g) Why are voters above the age of 18 years and older?

(h) Why does one have to be a citizen and over the age of 25 to stand for elections?

Check your answers after the summary.

Now read the summary.



Summary

You have come to the end of Lesson 8. In this Lesson, you have learnt that:

- a flow diagram is an arrangement of information showing a process in a sequence or order.
- there are different types of flow diagrams or charts.
- a flow diagram is very useful in that it explains a long process in a short few steps.
- it shortens the explanation of a long process into a diagram that is simple and easy to understand.
- it shows and explains a process from its beginning to the end step by step or in order of happening.
- the information in a flow diagram 'flows' from one point or step to another.

Answers to Activity

- (a) through voting
- (b) democracy is a system of government in which there is rule by the people for the people. The members of Parliament are representatives whom are voted by the people to represent their electorates in government.
- (c) citizens over 18 years of age
- (d) the Presiding Officer in the Electoral Commission
- (e) It is important that candidates campaign and meet the people in their electorates because;
 - (i) the people must know who is standing for election and what policies he will push for in Parliament.
 - (ii) by knowing the intending candidates the people can choose and make wise choices when voting.
- (f) A Tally room is a room where votes are kept and counted.
- (g) This is because young people under 18 may not make sound judgments on their choice of candidates and secondly may not fully understand the processes of voting and its importance.
- (h) This is because running for office involves big responsibilities and sound judgments on issues affecting people in the individual electorates and the country as a whole. Therefore a person wanting to run for election must be of a certain age of maturity and a citizen because the decisions he/she makes will be in the best interest of the people and the country.

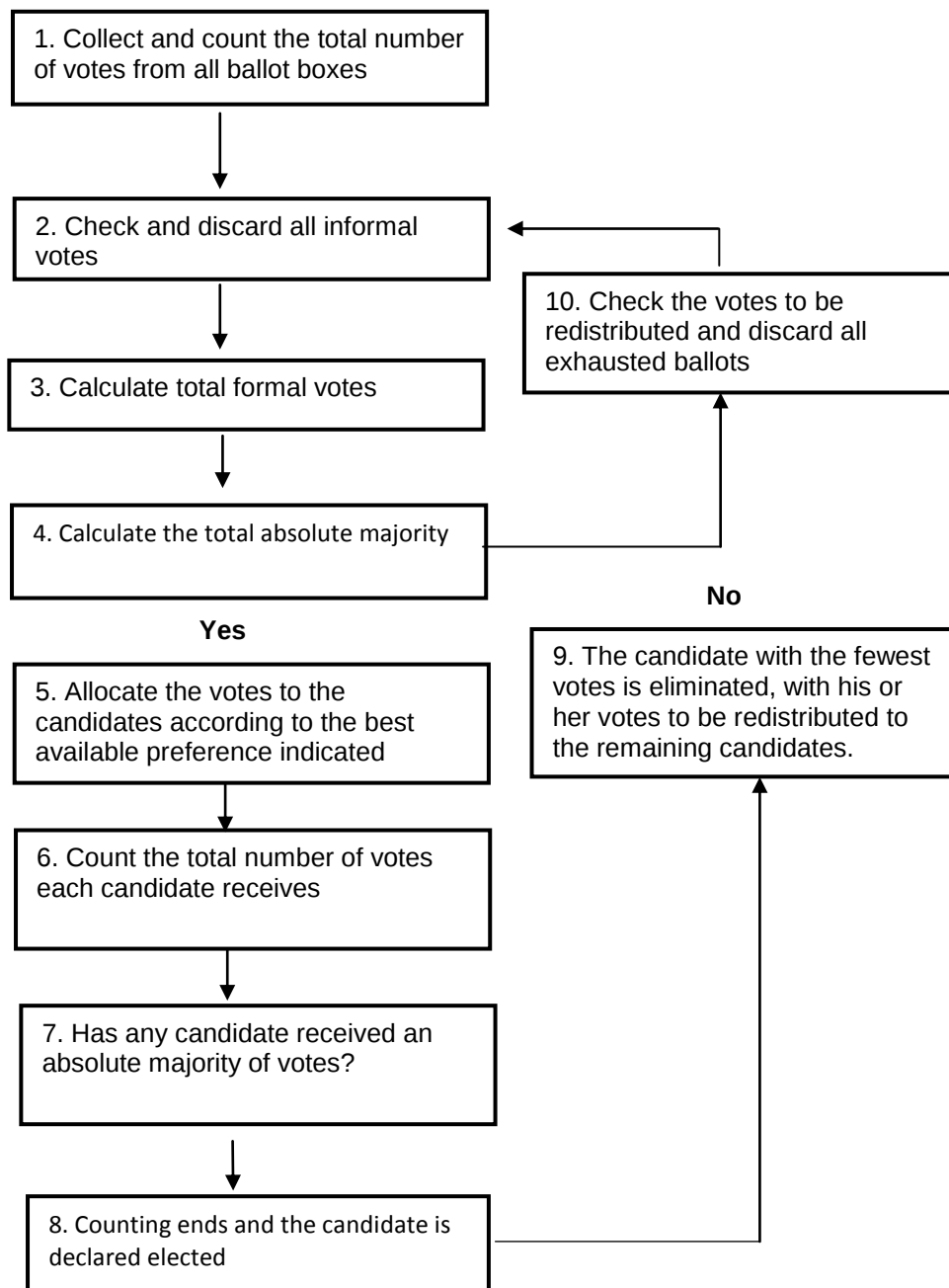
NOW DO PRACTICE EXERCISE 8 ON THE NEXT PAGE
--



Practice Exercise 8

Study the flow diagram below showing the Limited Preferential Voting or LPV system of Election in Papua New Guinea.

LIMITED PREFERENTIAL VOTING: COUNTING OF BALLOT PAPERS



1. Define flow diagram.

2. What is one advantage of a flow diagram?

3. What is the first step in the LPV counting of votes?

4. What occurs when a candidate receives more than half of the votes?

5. What is the end result of the candidate with the fewest votes?

6. What steps are taken to deal with all the formal and informal votes in the LPV system of counting?

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 2
--

ANSWERS TO PRACTICE EXERCISES 5-8**Answers to Practice Exercise 5**

1. Paper, dividers, piece of string/cotton, plastic ruler and pencil.
2. A distance is the *amount of space* between two points.
3. Use the scale given on the map to measure and calculate the distance.
4. a piece of string or sheet of paper

Answers to Practice Exercise 6

1. The word scale is defined as the *relation* between a distance on a map and the actual distance on the earth's surface.
2. (a) statement or word scale
(b) as representative ratio
(c) line or linear scale
3. Scale in words
Ten centimeters
One thousand centimeters
One thousand metres
Fifty thousand kilometres
4. (a) 10, 000 millimetres
(b) 100 centimetres
(c) 100 metres
5. (a) 1, 000 centimetres
(b) 2,000 centimetres
(c) 10, 000 centimetres

Answers to Practice Exercise 7

1. Direction means the position of a place or feature in relation to another.
Compass Point refers to the points on a compass showing direction.
2. (i) North (iii) east
(ii) South (iv) west
3. Intermediate or inter-cardinal points
4. west
5. north east
6. south east

Answers to Practice Exercise 8

1. A flow diagram is an arrangement of information showing a process in a sequence or order.
2. A flow diagram is very useful in that it explains a long process in a short few steps.
3. The total number of votes are collected and counted from all the ballot boxes.
4. The counting ends and the candidate is declared elected or winner.
5. The candidate with the fewest votes is eliminated and his or her votes are redistributed to the remaining candidates.
6. All the informal votes are checked and thrown out, and the total formal votes are calculated.

SUB-STRAND 3: GRID REFERENCE, TIME AND MAP

In This Sub-Strand, You Will Learn About:

- **Grid Reference (4 Figure)**
- **Time Zone**
- **What is a Map?**
- **Map Reading**

SUB-STRAND 3: INTRODUCTION

In this Sub Strand, you will learn these skills:

- Grid Reference (4 figure)
- Time Zone
- What is a Map?
- Map reading

In the first part of this Sub Strand you will study the four figure reference. The four figure reference is an important skill because it will help you with the knowledge to locate places and features correctly on maps. This is the basic in grid reference the six figure reference will be covered in grade 8.

Learning the different time zones is important because it will help you to learn and locate the time zones. You will be able to correctly calculate the times in the 24 different time zones. This lesson will be an introduction to lines of longitude in locating features on maps.

Reading a grid and calculating time in the different time zones depend on maps. Many of the skills use maps therefore a map is a very important 'tool' in learning. In the later part of this Sub Strand you will define what a map is, its purpose, and identify the basic features.

There are many types of maps that will require a variety of skills to interpret. In map reading you will define the term, identify its uses and basic features.

We hope you enjoy this Sub Strand!

Lesson 9: Grid Reference



In Lesson 8, you learnt about the flow diagram, and its uses. In this lesson you will learn about how to locate features on maps using the four-figure grid reference.



Your Aims:

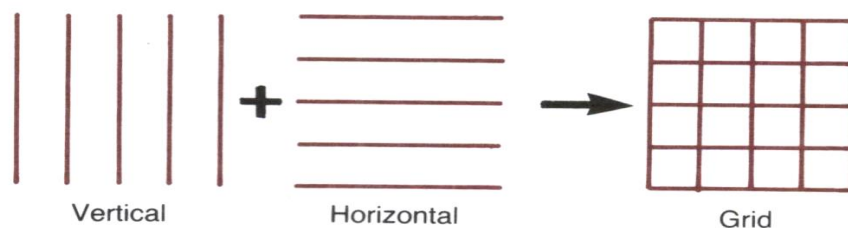
- define grid and grid reference
- define four figure grid reference
- locate features on maps using four figure grid reference
- read and interpret four figure grid references of certain features of the map

In the study of Social Science, a number of tools such as maps, tables and graphs are usually used. If you know how to use these tools, you can obtain a lot of information which will help you work out many of the answers you need. To use these tools, you must have certain skills. Grid referencing is one such skill that you need, to help you interpret maps. A map is of little use unless you can easily locate features on it. A simple and accurate method for finding features on a map is to use a grid reference.

What is a Grid?

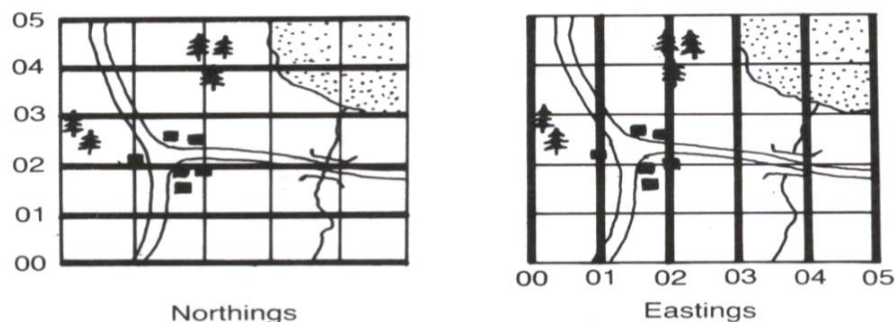
A *grid* is a network of intersecting parallel lines. One set of lines is horizontal and the other set is vertical.

Diagram 1



When a grid is drawn on a map, the horizontal lines are called *northing* and the vertical lines are called *easting*.

Diagram 2

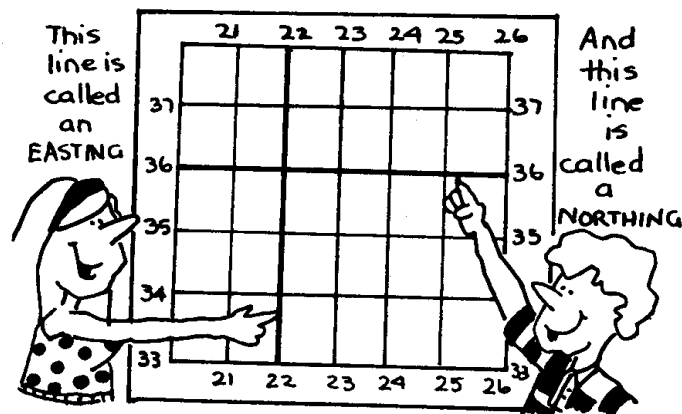


A grid map is read using eastings and northings. These are two sets of numbers one on the vertical axis and the other on the horizontal.

Eastings are numbered from west to east (left to right). See, for example, in diagram 2 above, how easting 04 is further east than easting 02. Northings are numbered from south to north (bottom to top). In the example above, northing 03 is further north than northing 01.

A **grid reference** refers to reading a feature using the grid numbers of eastings and northings. A feature on a map is located by reading the grid numbers. These are a set of either four or six numbers. In this lesson you will learn how to locate features using the **four-figure**. The cartoon below shows how you can locate features using the four-figure reference.

Diagram 3



The fine black lines shown on a topographic map are known as grid lines. When put together they form a *pattern* of squares called grid squares. The lines that run up and down are called **easting**, while the lines that run across are called **northing**. Each easting and northing has a *number*.

The vertical lines that run up and down are called easting. These lines divide the map into parts from west to east. They are numbered from west to east. The horizontal lines that run across the map are called northing. They divide the map from north to south and are numbered from south to north. Each easting and northing has a number.

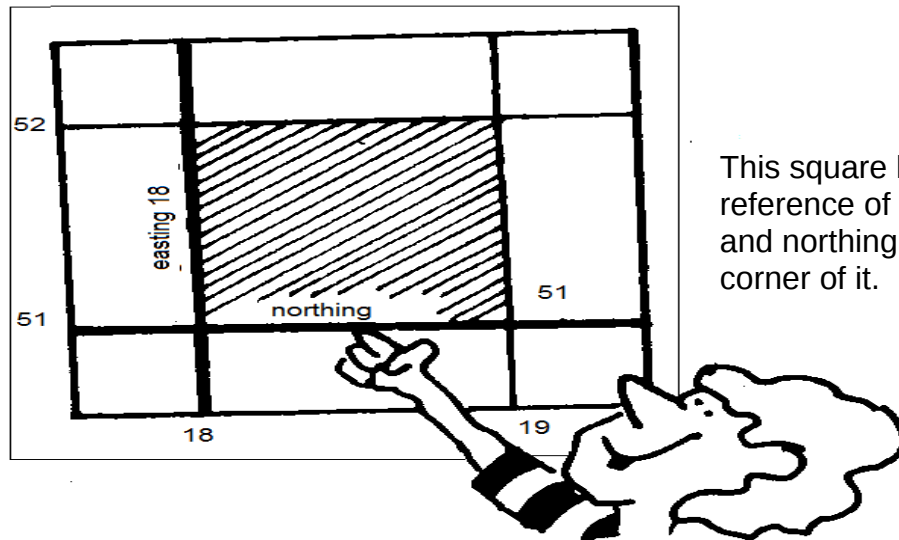
In six-figure referencing, the grid reference will be accurate to within 100 metres. There are times when it is not necessary to give such an exact position to describe the location of a feature. For example, a large area of forest may nearly fill one or more grid squares. Certainly no one point would give the forest's location. In this case a four-figure area reference should be used, rather than the standard six-figure reference.

A *four-figure* grid reference is used when we want to describe the *general location* of a place on the map. The four-figure area reference refers to a complete grid square and not just one particular point within the square. A four-figure grid is called Area Reference. An area reference is shortened to AR.

Diagram 4 shows a four-figure reference that has *four numbers*. To give a four-figure reference for a grid square you give the numbers of the easting and the number of the northing which meet at the bottom left-hand corner of the square. The first two numbers are an easting. You will find out which one it is by looking across the *bottom* of the map. The

second two numbers are a northing. This will be found by looking up the *side* of the map. This easting and northing form the *bottom left-hand corner* of the square you are trying to find.

Diagram 4



The following example in Diagram 5 shows how a four-figure reference can be used to identify a *grid square*.

Diagram 5

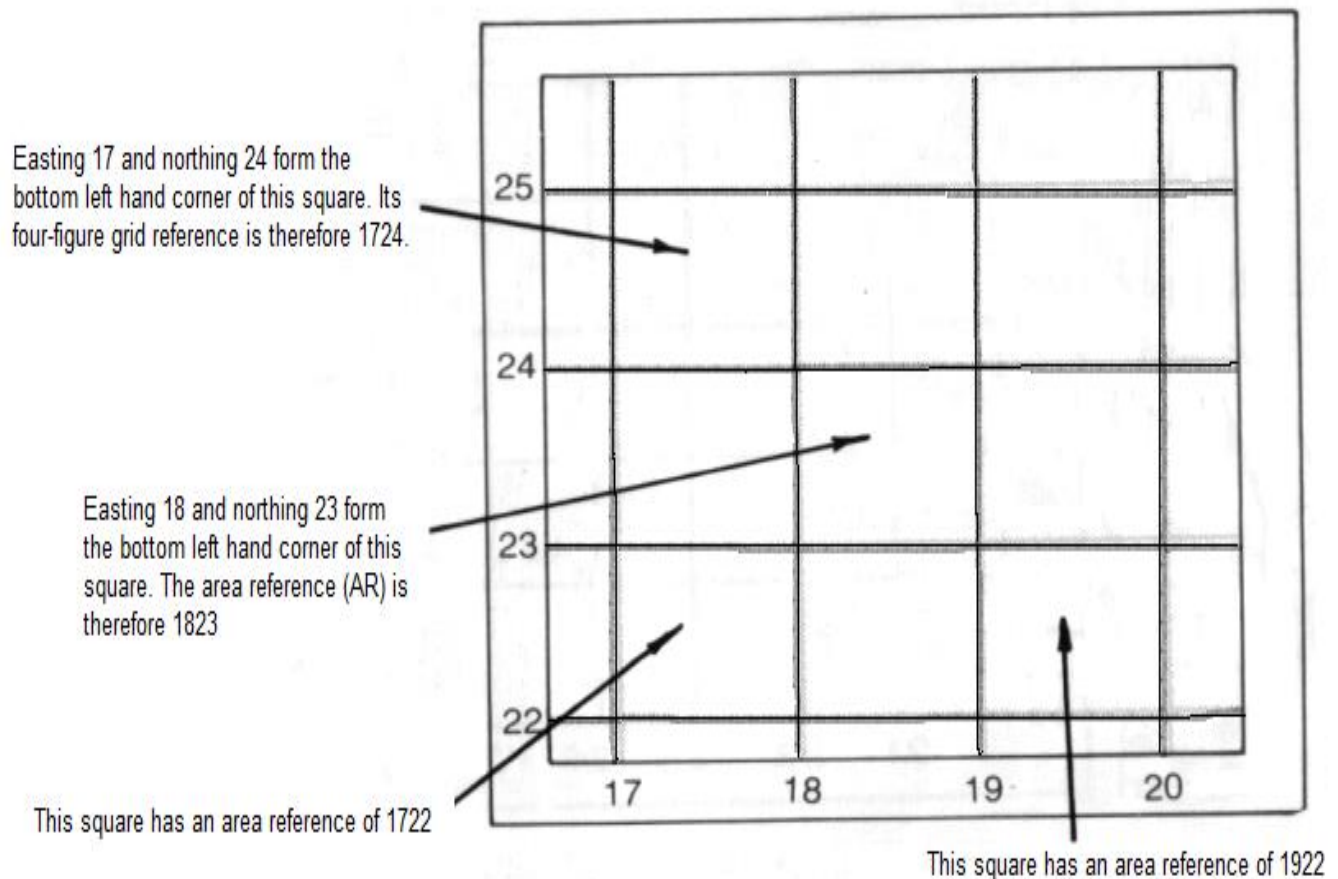
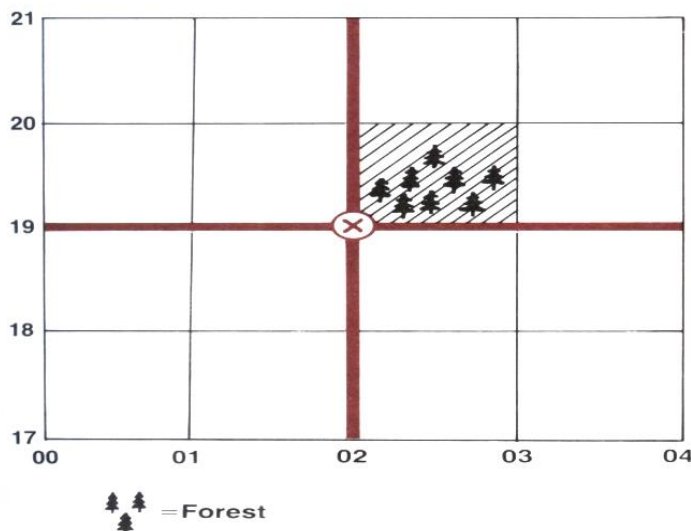


Diagram 6



A four figure is used to give a general location of a particular feature on the map. Thus the grid square of 02 easting and 19 northing above gives the location of the forest in the whole grid square and not in a particular point in the grid.

Now read the summary.



Summary

You have come to the end of Lesson 9. In this Lesson, you have learnt that:

- a grid reference is a set of four figures that can be used to locate features on a Topographic map.
- a four figure grid reference is used to describe the general location of a place on a map.
- four- figure grid reference is also referred to as AR which means Area Reference.
- a six-figure reference is used to pinpoint the exact location of a feature on the grid map.
- eastings are vertical lines running from top to bottom. The lines are numbered from left to right.
- northings are horizontal lines running from left to right. These lines are numbered bottom to top.
- always start from the bottom left-hand corner of the map.
- the easting always comes before the northing when reading a grid reference.

NOW DO PRACTICE EXERCISE 9 ON THE NEXT PAGE



Practice Exercise 9

1. Use this simple map to answer the following questions.

23			P			Q	
22		A		B			R
21	C			D			
20			E		F	G	
19		H				I	
18			J	K			L
17	M		N	O			S
16	31	32	33	34	35	36	37

1. What letter is found in the following squares?

- (i) 3218 _____ (ii) 3721 _____
 (iii) 3120 _____ (iv) 3717 _____
 (v) 3619 _____ (vi) 3322 _____

2. What is the area reference of the following letters?

- (i) N _____
 (ii) K _____
 (iii) G _____
 (iv) P _____
 (v) M _____
 (vi) O _____

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 3

Lesson 10: Time Zones



In the last lesson, you have learnt about the four-figure grid reference. In this lesson, you will study the lines of longitude and how they will help to work out the different times around the world.



Your Aims:

- define time and time zone
 - discuss the importance of longitude in relation to telling the different times around the world
 - define and differentiate between Greenwich Mean Time and the International Date Line
 - briefly discuss the steps involved in calculating the time in different places around the world
-

Define Time and Time Zone

People say that time flies. They ask where the time went. They say that time marches on. Now, what about you? If there was no time how do you think our world will be like? I think that if there was no time at all things would be very different here on earth. It is funny but the twelve hours of day and night is **time**! You look at a clock or your watch to tell time. Do you ever wonder what time really is?

Time is not something you can see or touch. You can only tell that time passes because other things change. Change, such as how tall you are, tells you that there is a past, present, and future. The past, present and future is time. And time is not something that you can hold back, time is definitely like a big clock that slowly and at its own pace ticks away.

You know when your Christmas holiday is over. The time of last Christmas holiday is past. Time that is present is happening right now. As you are sitting reading this, you are in the present. The future is time that has not happened yet. You know when you are looking forward to your birthday. That time is in the future.

Time means all the years of the past, present and future. It is a particular point or moment of something.

Let us now look at the meaning of time zone. We know what a time means. And a zone would refer to an area or region. Therefore if we put these two words together what does it mean? A time zone is an area in the world with its own time.

How did people learn to tell the time?

Ancient Babylonians in the Middle East may have been the first people to divide a day into 24 hours. They invented the sundial around 2000 BC to tell the passing of the hours during daylight. A sundial is a disk with a triangle-shaped piece sticking up in the middle. The triangle casts a shadow that moves around the sundial's disk as the Sun moves across the sky. The Babylonians put markings on the disk to show where the shadow would be each hour. A well-constructed sundial can measure local solar time with reasonable accuracy. Sundials continue to be used to monitor the performance of clocks until the modern era. Candle clocks and sticks of incense that burn down at approximately predictable speeds have also been used to estimate the passing of time.

There are many types of sundials but each one has one common use which is to tell the time. Given below are two examples.



Illustration 7.3.10a: Sundial, Northern Europe

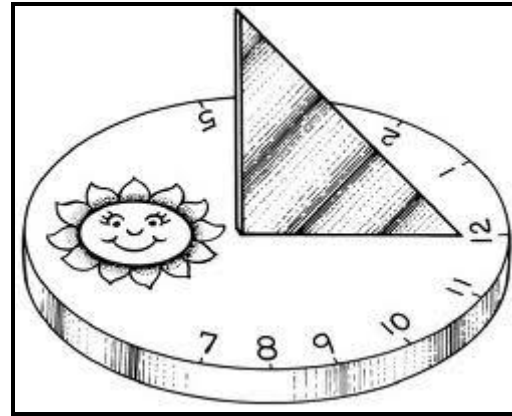


Illustration 7.3.10b: Sketch of a sundial

People also used hourglasses to tell time. An hourglass has two containers with a narrow connection between them. In an hourglass, fine sand pours through a tiny hole at a constant rate and shows a certain passage of a random period of time. They watched how long it took for water or sand to pour from one container to another. Below is a picture of an hourglass.



Illustration 7.3.10c: An hourglass compared to an alarm clock

People learned to divide hours into minutes. There are 60 minutes in an hour. Eventually, they divided minutes into seconds. There are 60 seconds in 1 minute. And eventually time came to be or rather was invented!

Lines of longitude divide the time into 24 different Times

You may be reading these notes during the day or doing an assignment at night by a lamp or electric lighting. But think about what time it is on the other side of the Earth or around the world in the major cities. What is the time in another part of the world? Think about it.

From the **Prime Meridian** if you go east from London through to Europe, Asia and into the Pacific an hour is added onto your watch every time you go past a time zone. But if you are travelling west that is from London across the Atlantic and over to America and then across the Pacific one hour is taken off your watch every time you go pass a time zone. Therefore places in the west are one hour behind those in the east. If you are in the east you are ahead by one hour.

Illustration 7.3.10d shows the globe being divided by imaginary lines of longitude running from the north to the south poles. These lines divide the globe into 24 zones. Each of these zones has its own local time. Study the illustration below.

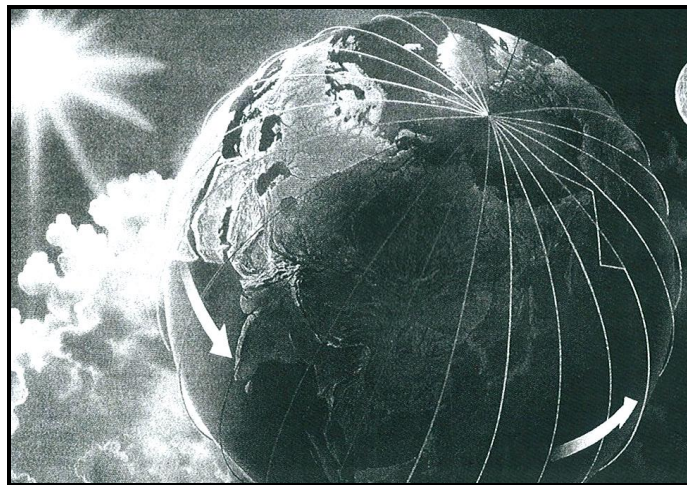


Illustration 7.3.10d: Imaginary lines of longitudes meeting at the North Pole.

Hours, minutes, and seconds are the same amount of time anywhere on earth. But the earth is divided into 24 time zones. The time zones look like slices on a beach ball. There is a one-hour difference between each time zone and the one next to it. In the time zone east of the one you live in, it is one hour later. In the time zone to the west, it is one hour earlier.

The 15° longitudes represent a one hour time difference, but these time zones are often moved slightly so they are in the same place with international or regional border.

Greenwich Mean Time (GMT)

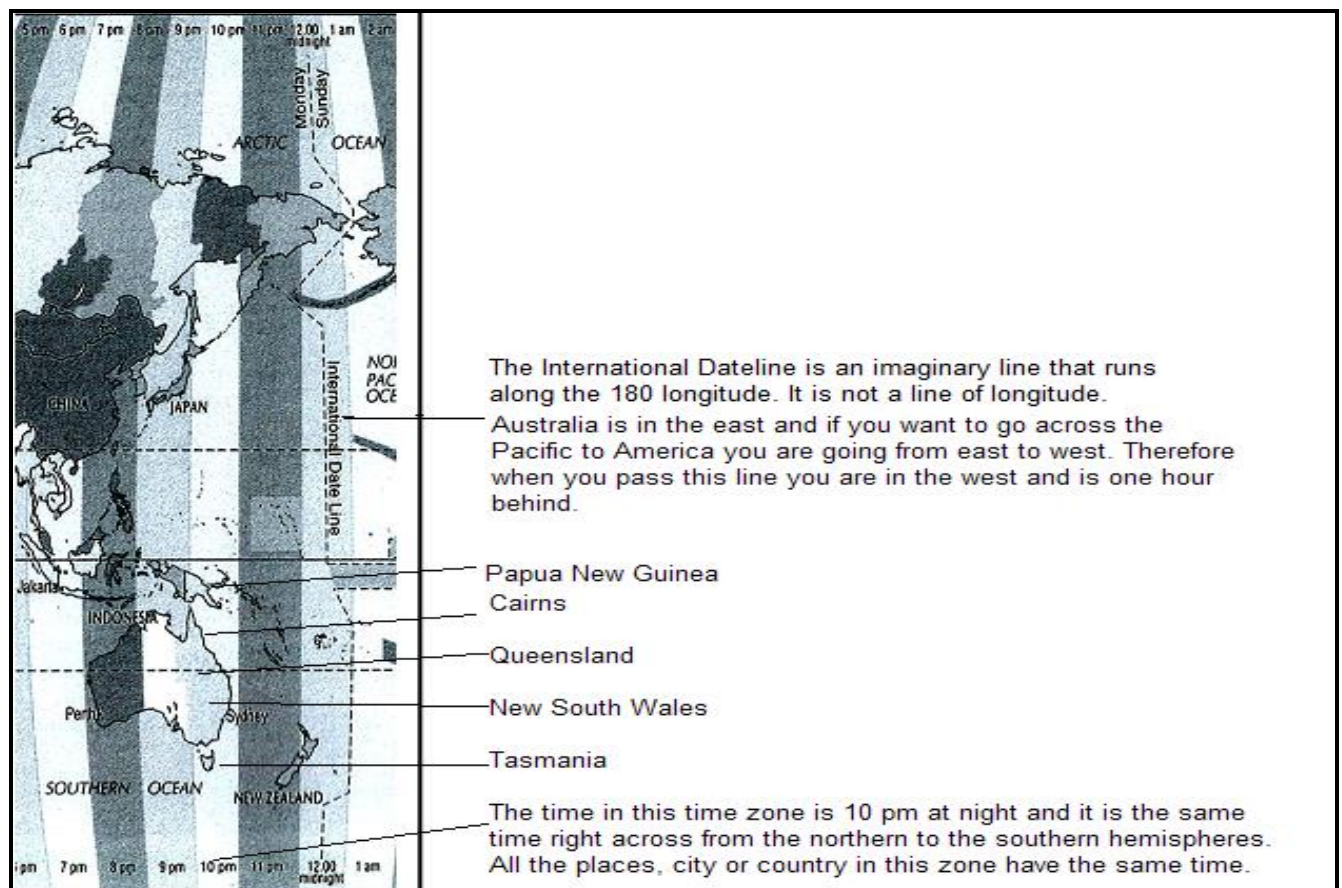
The Earth is divided into 24 time zones. When the sun is directly over the Prime Meridian (longitude 0°), the time is 12 noon Greenwich Mean Time (GMT). The GMT is also referred to as the *Universal Time*. While locations to the east of Greenwich are experiencing afternoon or evening, those to the west of Greenwich have their morning. For example, when it is noon in Greenwich it is 10pm in Sydney.

The 15° longitudes represent a one hour time difference, but these time zones are often moved slightly so they are in the same place with international or regional borders.

International Date Line

The International Date Line is a line that **runs along** longitude 180°. It is both 180° East and West of the Prime Meridian, so E or W is not necessary. It is neither east nor west because it is central. The line has been 'bent' so it does not pass through land.

The International Date Line represents not only the point at which the time zone changes one hour, but also a change of one day. If you are travelling from the west to the east across the International Date Line, you gain one day. If you are travelling from east to west, you are behind by one day, for example, at 10am Monday in Sydney it will be 4 pm Sunday in Los Angeles.

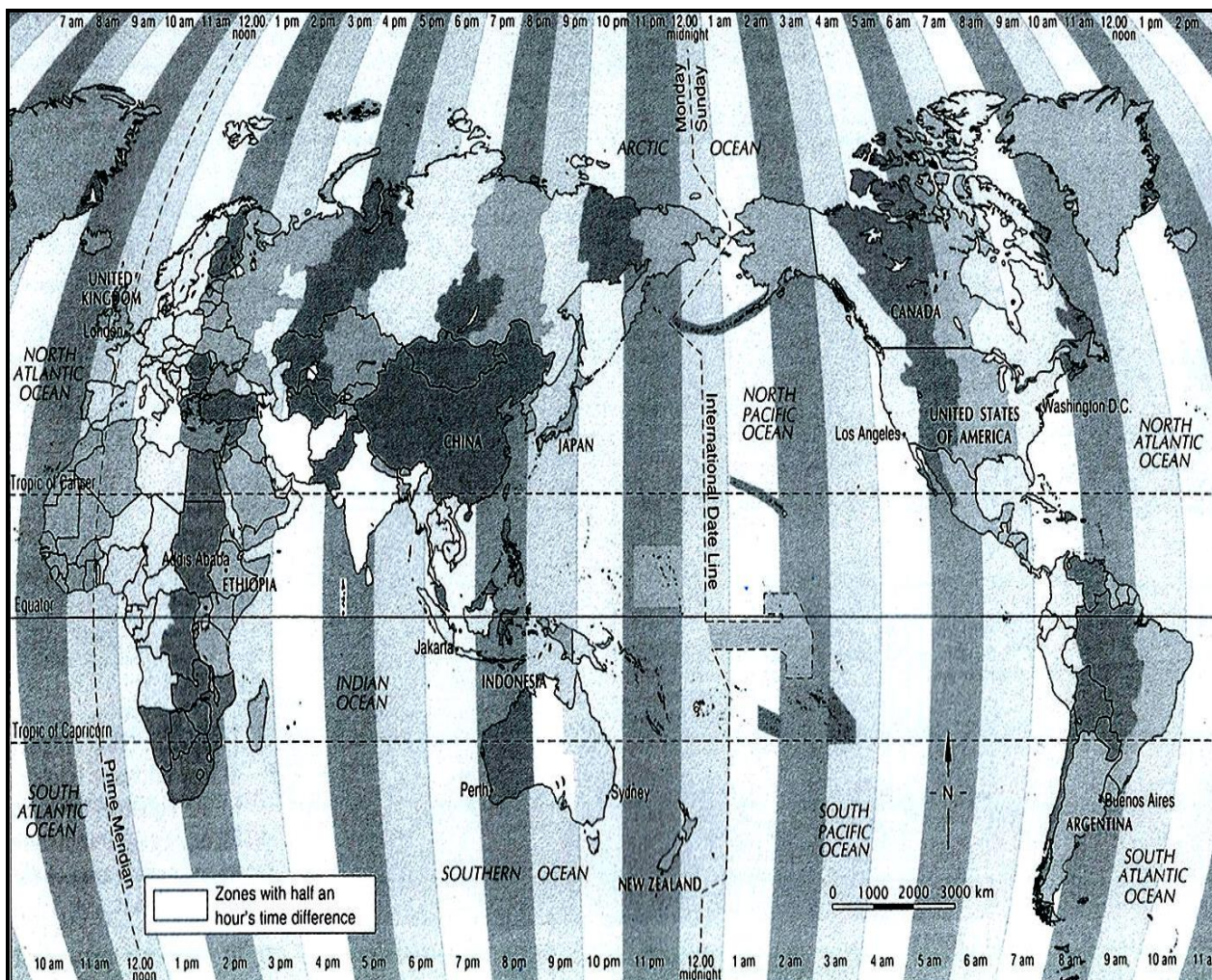


Map illustration 7.3.10e: Places in the same time zone

Why does a day last 24 hours?

The Earth spins on an axis, creating night and day as you can see in the globe below. It takes one day (24 hours), for the Earth to complete one rotation of 360° . For every hour, the Earth turns 15° . The globe shows lines of longitude spaced at intervals of 15° . Every hour, a different line of longitude is directly opposite the sun. Places on the same longitude see sunrise and sunset at the same time. That is why these places have the same time because they are in the same time zone. An example of places in the same time zone is eastern Australia which is Cairns, Queensland, New South Wales and Tasmania, and the whole of PNG, as our country's land area is smaller than Australia and fits very well within one time zone only.

Study the world map showing the 24 time zones here below. Use it to help work out the time in each zone.



Map illustration 7.3.10f: World Time Zones

Calculate time for the different Time Zones

You will use an example to calculate time. Let us say it is 10 p. m. in Port Moresby. Luckily the land area of Papua New Guinea is not vast like countries such as Australia with 3 time zones. Papua New Guinea has only 1 time zone which means that the whole country has only one and the same time throughout night and day.

Remember, some time zones do not represent an hour, for example, South Australia is nine hours thirty minutes ahead of GMT.

So let us now refer to the time zone map above to do this simple activity. Start counting towards right from Port Moresby. For every time zone you pass add an hour until you reach the International Dateline at 180° . Then once you cross the International Dateline you are now in the west, so start subtracting 1 hour for every time zone you pass until you reach the Prime Meridian at 0° .

Now do Activity.



Activity

Now if it is 7 p. m. in Djakarta:

- (a) What time is it in?
- (i) Los Angeles (ii) London

Check your answers after the summary.

Now read the summary.



Summary

You have come to the end of Lesson 10. In this Lesson, you have learnt that:

- earth is divided into 24 Time Zones.
- the local time of the central meridians for each time zone is called standard time.
- the first people to divide the day into 24 hours were Ancient Babylonians.
- hours, minutes and seconds are the same amount of time anywhere on earth.
- earth spins on its axis creating night and day.
- it takes the Earth one day (24 hours) to make a complete rotation of 360° .
- each 15° of longitude represent a one hour difference between each time zone.
- An hour is added to your time if you are in the east. But if you are in the west subtract an hour every time you past or cross a zone.

Answers to Activity

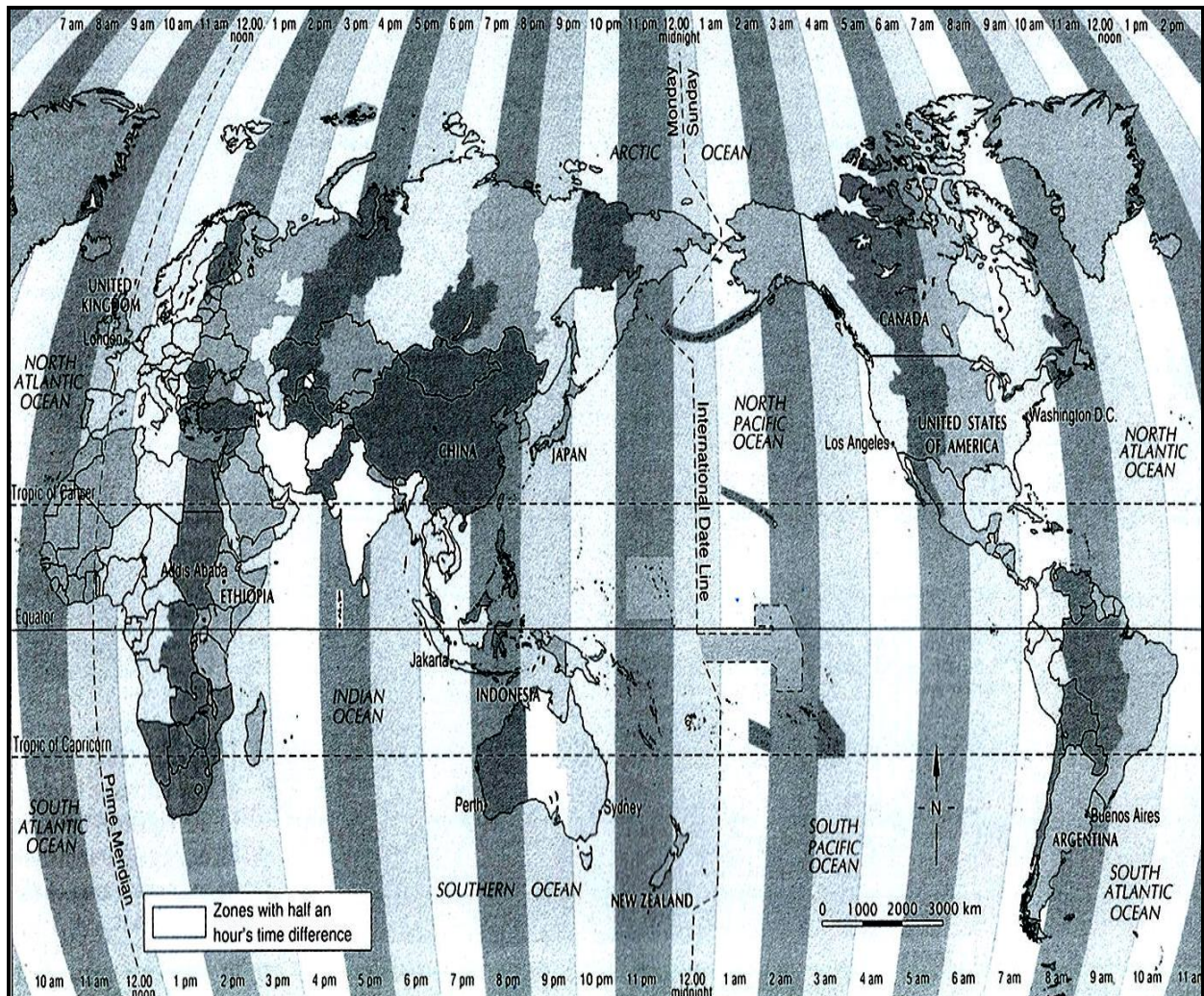
- (i) 4 am in Los Angeles (ii) 12 noon in London
-

NOW DO PRACTICE EXERCISE 10 ON THE NEXT PAGE



Practice Exercise 10

Study the map below and answer questions.



1. How many time zones does Australia have?

2. Study the world time zone map on the previous page and answer the following questions.
 - a) If it is 8p.m. in Perth, what is the time in the following places?
 - (i) Sydney _____
 - (ii) New Zealand _____

- b) You have a friend living in Los Angeles in United States. You want to telephone her just before she leaves for school at 8 am on Monday.

What time should you telephone? _____

3. Find the International Date Line on the Time Zone map. Rewrite the following statement, filling in the missing words from the list below. There are more words than is needed. Choose only the most correct word for your answer.

Cook Islands	New Zealand	China
water	Wednesday	Kiribati
USA	land	West
Prime Meridian	W	longitude
East		

The International Date Line runs on a line of **(a)** _____. It is neither **(b)** _____ nor **(c)** _____. The International Date Line does not pass through any **(d)** _____. In fact, the line is deliberately 'moved' so it passes only through **(e)** _____. If you travel across the International Dateline, you must change not only the time but also the day and date. To the east of the International Dateline are time zones that are one day behind. So if it is Thursday in New Zealand, it will be **(f)** _____ in Argentina.

CHECK YOUR ANSWERS AT THE BACK OF SUB-STRAND 3

Lesson 11: What is a Map?



In Lesson 10, you learnt about the 24 time zones in the world. In this lesson you will study maps. You will define a map; identify its uses and basic features.



Your Aims:

- define what a map is
- read and discuss the purpose of maps
- identify the basic features on simple maps.

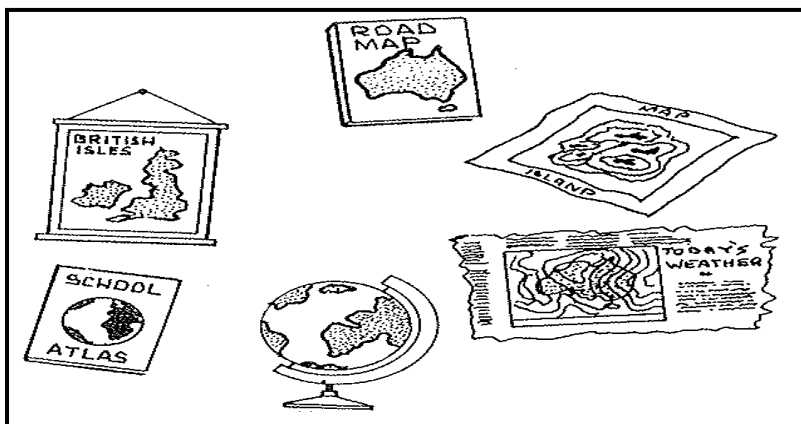
What is a Map?

A map is an accurate drawing of the surface of the earth, looking down from above. Bushwalkers need a map to find out how to reach their destination. The map would also show other features found along the way. It can be defined as a visual representation that shows all or part of the Earth's surface with geographic features, urban areas, roads, and other details. People use maps every day. There are many types of maps and two of the most used are the street directory and the road map. These are cultural maps because they show peoples activities.

There are three main groups of maps. Each map is used by a different person for a different purpose. Each tells us something new about the world we live in. Maps come in all sorts of shapes, sizes and colours and are used by all kinds of people, for many different purposes. Good maps should have two things. They show a 'bird's eye' view of a feature and secondly, all its features are 'drawn to scale'. A 'bird's eye' view means to look or watch something from above. And 'drawn to scale' means to *reduce* the actual size of a feature so that it can be represented using a scale on the map.

The picture below shows some examples of maps.

TYPES OF MAPS

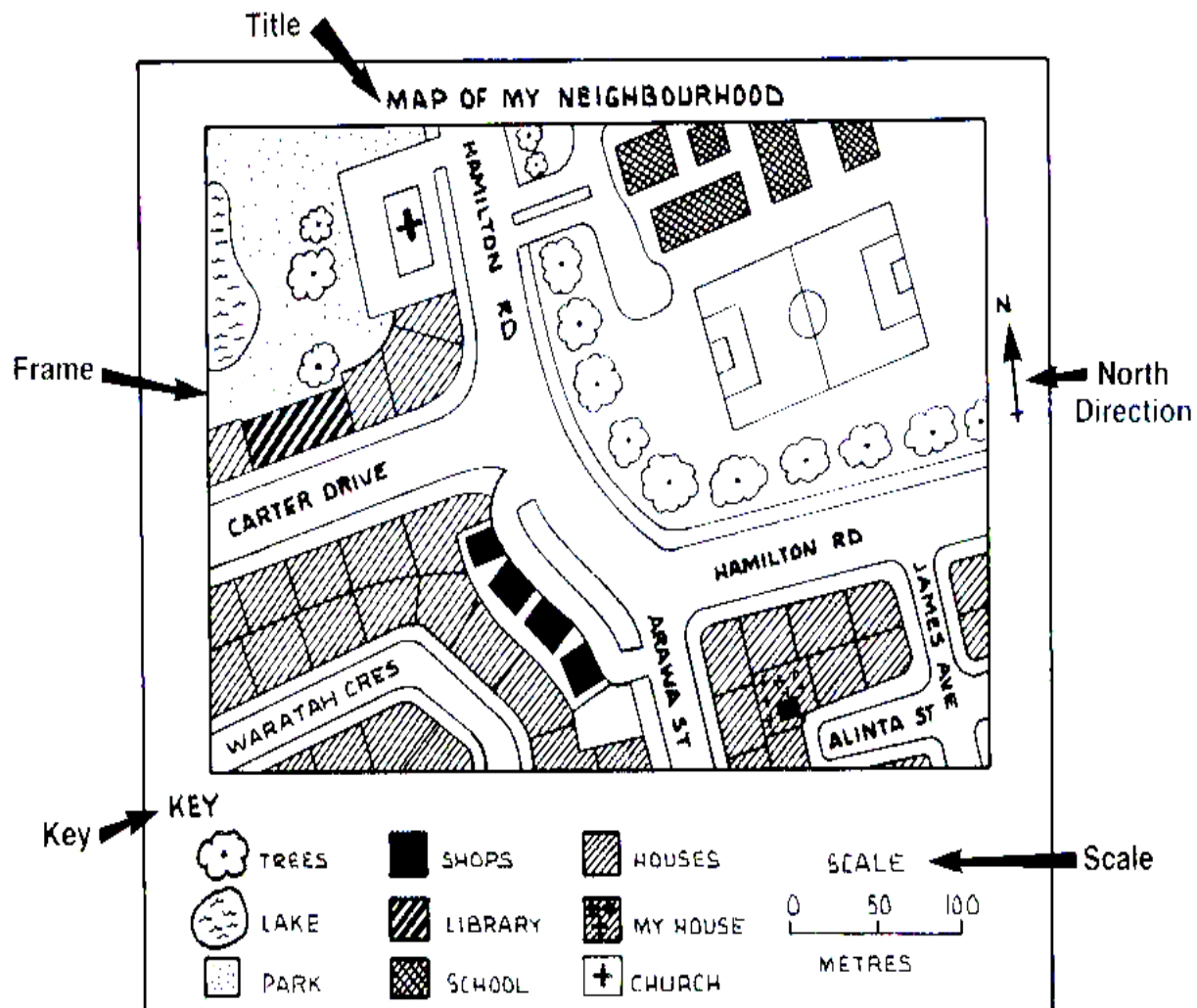


The five important features of a map are:

- heading or title that tells us what part of the Earth is being shown and what information is on the map.
- scale shows the real distance on the ground.
- key shows what the colours and shapes represent.
- compass point shows the direction on a map. Usually, maps show North pointing to the top of the page and the border or sometimes called the frame.

Study the map below and you will find these five features.

The five basic features of a map



Now read the summary.

**Summary**

You have come to the end of Lesson 11. In this Lesson, you have learnt that:

- a map is an accurate drawing of the surface of the earth, looking down from above.
- people use maps every day and for many different purposes.
- a map tells about the different natural and constructed features of a place.
- two most used maps are the street directory and the road map.
- there are many types of maps. The main groups are the natural and cultural environments and general maps.
- maps have different sizes and shapes and are also written in different colours.
- maps have symbols that are explained in the legend or the key found often at the bottom of the map.
- there are five basic features of a map: heading, key, scale, compass point (N), and border.

NOW DO PRACTICE EXERCISE 11 ON THE NEXT PAGE



Practice Exercise 11

1. Explain in your own words what a map is.

2. A good map should have five features. Write down each one of them.

(a) _____

(b) _____

(c) _____

(d) _____

(e) _____

3. (a) What are the three types of maps?

(i) _____

(ii) _____

(iii) _____

- (b) Which of these maps

- (i) is the most useful?

- (ii) Give your reason

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 3
--

Lesson 12: Map Reading



In Lesson 11, you learnt about what a map is. In this lesson, you will learn how to locate the basic features of a map. You will identify and use map skills to locate basic features on a map.



Your Aims:

- define and identify geographical features on a map
 - define map reading
 - read and interpret information of signs or symbols on a map
 - read and discuss features on a map
-

Geographical features

In order for you to learn about skills that will help you in map reading first of all let us discuss what geography is and the geographical features on a map. **Geography** is the study of the physical features of the earth and human activity on the environment. There are two parts to this environment, the natural or the physical environment and the human or man-made environments.

The natural environment is made up of all the things or features found in nature such as mountains, rivers, clouds, air, soil, sea, etc. The human environment is made up of all the things or features being changed or made by man, for example, roads, buildings, towns, schools, and many more that you can think of. Many maps will show both the natural and human environmental features represented by signs or symbols. These symbols show the type of natural or human features on the map.

A key or legend is found on just about all the maps. A legend is a list of the symbols used on the map, along with each symbol's meaning. A legend helps you figure out what the dots, circles, colors, and squiggly lines on a map stand for. A dot might, for example, represent a city, museum, group of people, or something else entirely. Many maps use a number of special **signs** or **symbols**.

The signs or symbols are like a key that opens the door of the map so that we can read and understand the map.

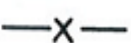
Symbols are used on the map so that the map does not have too many words spread out all over the place. These symbols show the location of natural features such as mountains, rivers, towns, roads, railway lines (for trains) and bridges. Where possible, the symbols are drawn so they look like the things that they stand for. You will often find the key at the bottom of the map.

Diagrams 1 and 2 below, display some examples of symbols that can be found on a map. There are many features found on maps that are represented by different symbols.



There are many features found on maps that are represented by different symbols

Symbol	Meaning
	Lighthouse
	Aeroplane
	Forest
	Mountain
	Walking track
	Camping area
	Church

KEY:	
Main road	
Suburban street	
Traffic lights	
State route number	
Name of suburb	
Distance by road from GPO	
Local government boundary	
Railway line	
Railway station	
Railway station showing distance from Central Railway Station	
Railway line with level crossing	
Police Station	
Post office	

Map reading means studying a map and interpreting it using the signs and symbols given. It can be time consuming and confusing if you do not have the necessary skill to interpret a map. There are many different skills to learn in map reading.

Here is an example of why it is important that two different people know how to read their 'type' of map.

For instance, in order for a bushwalker or a soldier doing practice drills in the bush find their way home each of them ought to have map reading skills. This is because each of these people needs a special map to suit their purpose. A bushwalker would need a type of map that shows where the trek starts, where it ends, and what natural and man-made features to

find on the way. You covered what natural and man-made features are in your last lesson. Whereas a soldier doing practice drills in the bush would need a map that shows the natural and man-made features surrounding their practice site. The features on the map could also include check points for them to report to before proceeding on to the next.

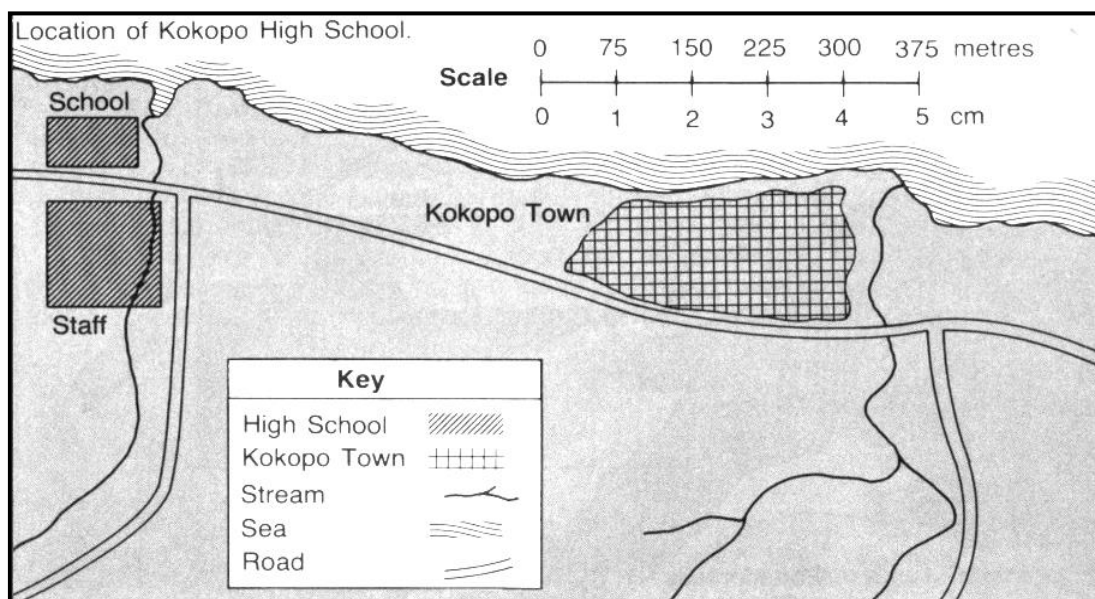
Therefore in order for the bushwalker and the soldier to find their way home to their destination they ought to know how to read their maps.

The most important point here is that both these people must be able to interpret the features on their maps using the signs or symbols. Only then can each find their way home or to their destination. If not then it means they are likely to get lost or end up in the wrong place.

When you are reading a map you are trying to locate and identify each of the different features.

Location is the description of where a place or thing is.

Use the map illustration below to read the symbols given in the key to locate Kokopo High School in relation to its nearby surrounding or environment.



Map illustration 7.3.12a: Kokopo High School

By studying the features on the map we can be able to work out where exactly Kokopo High School is located. It is located about 600 metres to the west of Kokopo town. A road separates the school in two parts. The part to the South is the staff area, and the part to the north is the teaching area. The teaching area is less than 100 metres from the sea.

We have now found the location of Kokopo High School. May be you could ask yourself this question, Where Kokopo is located in East New Britain Province? Followed by, Where is East New Britain located in Papua New Guinea? And finally, Where is Papua New Guinea located in the world? These questions are asked to help broaden your mind not only of where Kokopo High School is in the town of Kokopo but of Kokopo as part of a bigger community.

If you think about the location of a small school in Kokopo in relation to the world as a big community it can make you wonder that wherever you are, you are part of a community that is part of a bigger community and so forth.

Now we can read any map at all! It's easy. All we have to do is interpret the symbols given in the Key.



Now read the summary.



Summary

You have come to the end of Lesson 12. In this Lesson, you have learnt that:

- the location of a feature can be described using signs and symbols on a map.
- maps tell us about the size of the place, and how far from one place to another (scale)
- maps describe what features are in place (key)
- the direction of one place from another (direction marker); and the shape of a place.
- the most basic skill in map reading is reading signs or symbols.
- signs or symbols are drawn to represent natural and man-made features on maps.
- every important feature on the map is represented by a symbol found in the key.
- the key or legend is often found at the bottom of the map.

NOW DO PRACTICE EXERCISE 12 ON THE NEXT PAGE



Practice Exercise 12

Here is an example of a key from an atlas.

MINERALS

Bauxite	⊗	Lead	▼
Coal	●	Oil	○
Copper	■	Silver	⊠
Diamonds	◇	Tin	T
Gold	+	Uranium	U
Iron Ore	⌘	Zinc	Z

What do the symbols stand for?

		Answers			Answers
(a)	•		(f)	■	
(b)	◇		(g)	⊗	
(c)	⌘		(h)	Z	
(d)	T		(i)	O	
(e)	▼		(j)	+	

CHECK YOUR ANSWERS AT THE BACK OF SUB-STRAND 3

ANSWERS TO PRACTICE EXERCISES 9-12

Answers to Practice Exercise 9

- | | |
|---|---|
| 1. (i) H
(ii) R
(iii) C
(iv) L
(v) G
(vi) P | 2. (i) 3316
(ii) 3417
(iii) 3619
(iv) 3322
(v) 3116
(vi) 3416 |
|---|---|

Answers to Practice Exercise 10

1. 3 time zones
2. (a)
 - (i) Sydney 10 p.m.
 - (ii) Washington 7 a. m
 (b) 2 p. m on Tuesday
3. (a) longitude
 (b) East
 (c) West
 (d) land
 (e) water
 (f) Wednesday

Answers to Practice Exercise 11

1. A map is an accurate drawing of the surface of the earth.
2. (a) Title/ heading (d) North Point
 (b) key (e) border
 (c) scale
3. (a)
 - (i) maps showing the natural environment
 - (ii) maps showing the cultural environment
 - (iii) general maps
 (b)
 - (i) the general map
 - (ii) general maps are the most useful because they are a combination of cultural and natural features.

Answers to Practice Exercise 12

- | | | | |
|----------------|--------------|---------------|------------|
| (a) coal | (d) tin | (g) bauxite | (j) gold |
| (b) diamonds | (e) lead | (h) zinc | |
| (c) iron ore | (f) copper | (i) oil | |

SUB-STRAND 4: LOCATING FEATURES AND READING MAPS

In This Sub-Strand, You Will Learn About:

- **Locating features**
- **Longitude and Latitude**
- **Reading Weather Maps**
- **Flow Map**

SUB-STRAND 4 : INTRODUCTION

In the first part of Sub-strand 4, you will revise four of the main skills covered in the Strand.

We will revise the following topics on locating features on a map, four-figure and map reference; and the lines of longitude and latitude.

In the second part of this Sub Strand you will study weather maps and flow charts. You will define; identify their uses and basic features.

We hope you enjoy this Sub strand!

Lesson 13: Locating Features



In Lesson 12, you learnt about map reading. In this lesson you will revise the 4 figure reference, compass and directions; signs and symbols and latitude and longitude.



Your Aims:

- define geographical features on a map
- identify different geographical features
- discuss how to locate these basic features
- read and interpret some basic features on a map

Geographical features are the components of the Earth. The word geographical comes from geography which means the study of the earth. The two types of geographical features are **physical** or natural and **human** or man-made.

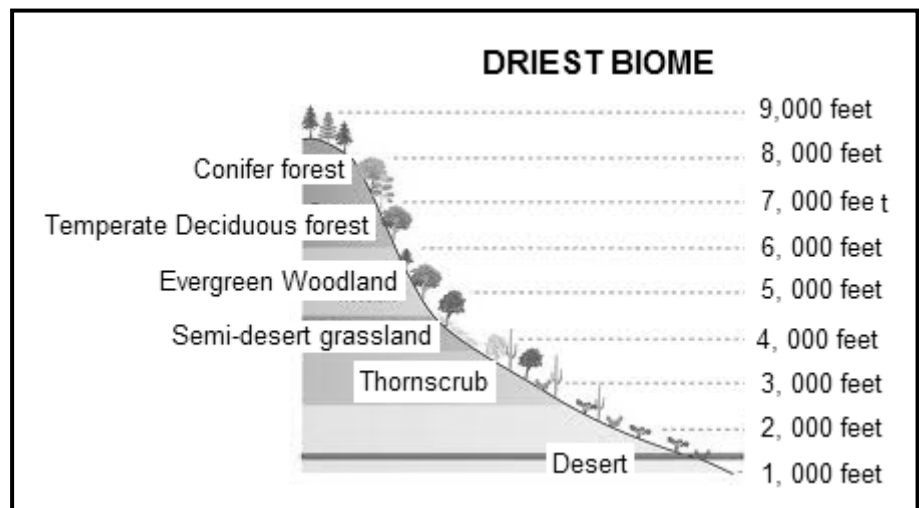
Physical geographers study the physical or natural features on Earth. Examples of natural geographical features are landforms and ecosystems. Landform features include terrain types, i.e., mountain, valley, lake, sea; and the ecosystems refer to plants and animals, and all living organisms in a **biome**.

Biome is a community of similar plants and animals living and interacting with each other and their physical environment. A biome is often referred to as ecosystem.

You can see the following pictures of the different types of biomes in the world.



Montane Woodland forest



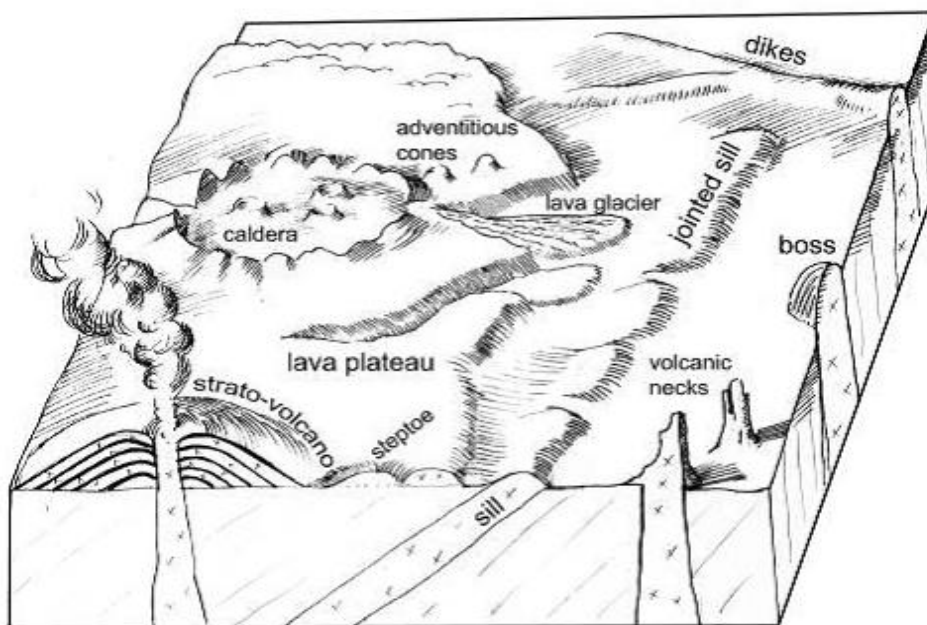


Polar Desert biome



Grassland biome

Some types of landforms are shown in the drawing and photographs below.



Landform and terrain



Look at the different types of landforms and terrain!



Mountain range



Landform affect weather

Human geography is the study of man-made features on Earth. The human geographical or man-made features include features such as political boundaries, houses, bridges and roads etc. I am sure you can think of many more and mentally make a note of them or write the answers in your activity book.

Human geographers are a group of people who study man-made features and how they affect the Earth's environment. They study how the land, people and man-made features are organised on Earth and the impact on the environment.

Illustration 7.3.10a shows man-made features and their interactions and dependence on one another and the impact on Earth's environment.



Illustration 7.3.13a: Human impact on the environment

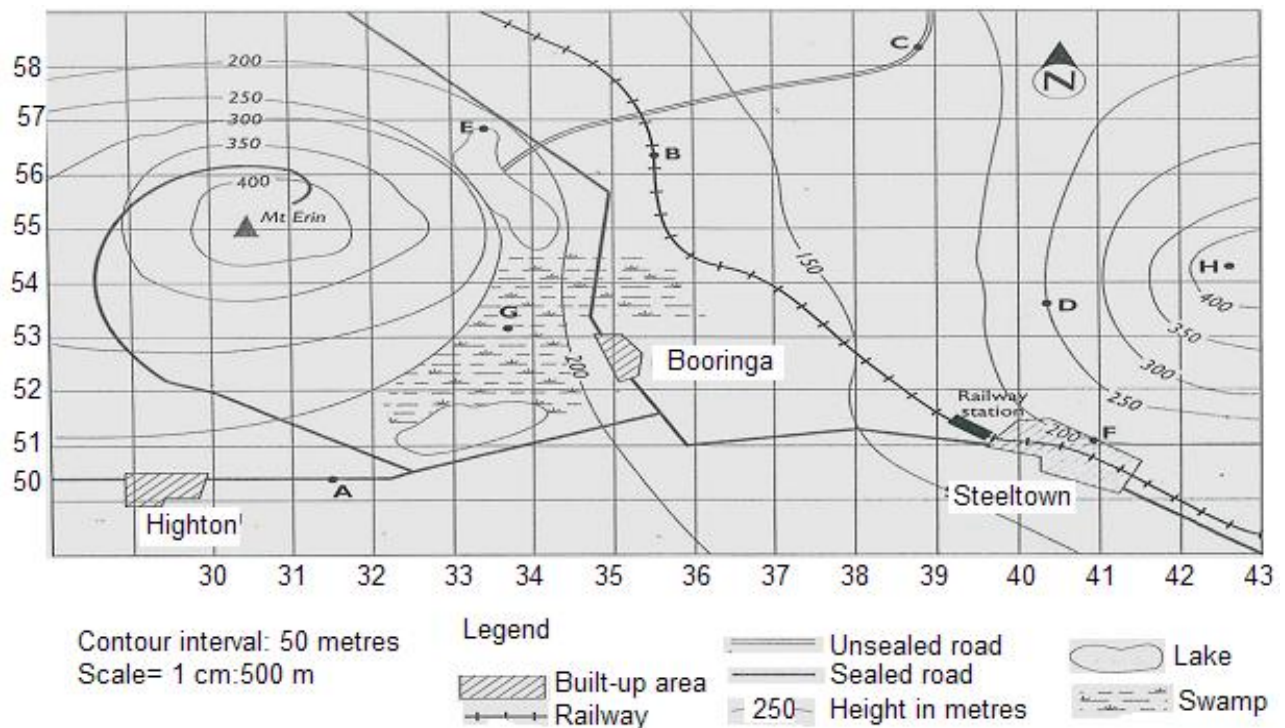


Illustration 7.3.13b: An astronaut in space



Wow! Human beings have not only changed the Earth's environment but also the atmosphere surrounding the Earth.... Look at that American astronaut in a spacesuit

The map on Booringa on the following page shows some natural and man-made geographical features. Study and identify these geographical features.

MAP OF BOORINGA

The features on the map are divided into natural features and man-made.

Here are the features.

Natural features	Man-made features
Lake	Railway
swamp	Roads
mountains	Railway station

Study the map carefully. Can you see straight lines drawn from top to bottom and side to side? A grid is made up of horizontal and vertical lines that meet together and form a grid or square. You have studied the four-figure reference in Sub strand 3. A grid however is not the same as lines of latitude and longitude. Grid lines are drawn on maps to locate geographical features. Lines of latitude and longitude are drawn mainly to locate places. For example to locate countries around the world grid lines are not used but lines of latitude and longitude because places are located more accurately and quickly.

There are many ways in which features on a map can be located. Geographical features refer to the physical and human features in which continents, towns and cities are a part of. All these features and places can be located using the different skills.

These are

- signs and symbols in the key
- lines of latitude and longitude
- compass point and directions

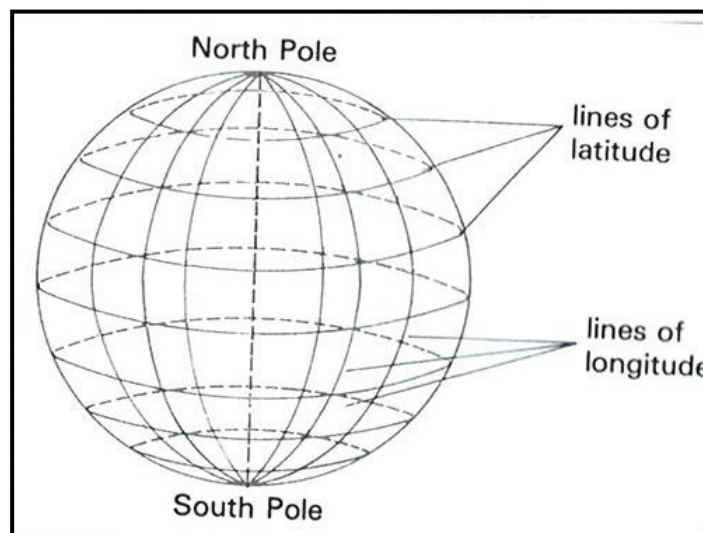
- map reference and grid reference

Signs or Symbols

Signs or symbols represent features on maps. Each feature on the map is represented by a sign or symbol which is found in the key at the bottom of the map. You can refer back to Lesson 12 in Sub Strand 3 of this Strand to revise this skill. The signs or symbols make it easy for people to interpret maps and get the information they want from a map.

Lines of latitude and longitude

Features of a map such as places that is towns and cities can be located using lines of latitude and longitude. A line of latitude is an imaginary line that runs parallel across the globe from east to west or left to right. The equator is latitude at 0° and separates the globe into north and south or the northern and southern hemispheres. Lines of longitude are also imaginary lines that run from top to bottom or north to south of the globe and intersect or meet at the north and south poles.



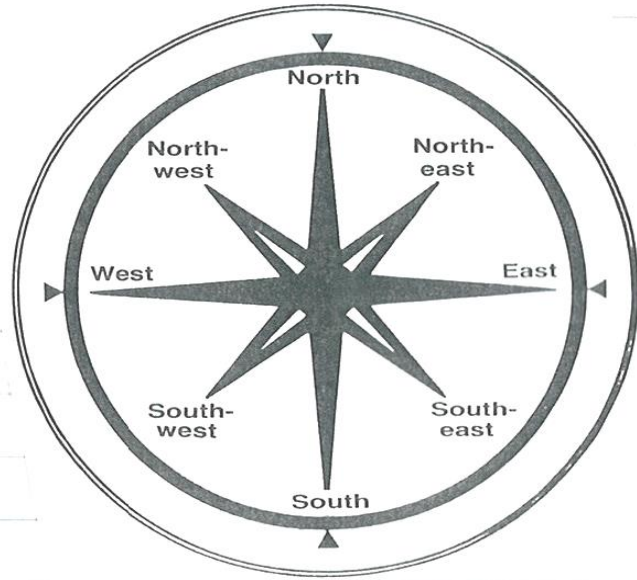
The starting point of the lines of longitude is the Prime Meridian at 0° that separates the globe into East and West. Lines of latitude and longitude also help you to read a map. Lines of latitude are imaginary lines that run around Earth from east to west. Lines of longitude are imaginary lines that circle Earth from north to south. Lines of longitude pass through the North Pole and the South Pole. Together lines of latitude and longitude create a grid on maps that allows you to describe precisely any spot on Earth.

The unit used to measure the lines of latitude and longitude is called degrees and is represented by the symbol $^{\circ}$. A smaller unit than a degree called minutes is also used. This occurs when a feature is not located directly on the lines of latitude and longitude but between two lines of latitude and longitude.

Compass

Features on maps can also be located using the compass points of North, South, East and West. A direction is defined as the location of a feature in relation to another. Shown on the compass above are four main directions of North, south, east and west called cardinal points. You will find the intermediate or inter-cardinal points in-between these points and they are north-east, south-east, south-west and north-west.

You can refer back to Lesson 7 to read the notes before going on with the rest of this lesson.

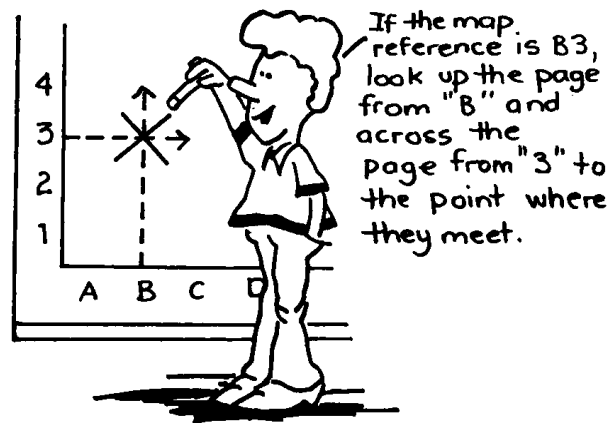


Learning the directions is an important skill in map reading. If you are going to locate features on a map you must also know the direction each feature is in relation to another.

Map and Grid Referencing

There are other skills such as the map and grid reference to locate features on a map. These skills are similar in idea. Let us now discuss map reference. This is a skill used in street directories and road maps. Many road and street maps use a combination of letters and numbers, so that there can be no mistake. Most maps have a set of numbers or letters around the border.

The number and letter which gives the location of a particular place on the map is called a **map reference**. You can refer to the cartoon below showing how to do map referencing.



To be able to read a map using this skill you ought to know which reference or number comes before the other. Is the *letter* supposed to be read before or after the *number*?

The letters that run horizontally and at the bottom starting from A or any others are to be read first. The numbers that run vertically and upward starting from 1 or any others are to be read second.

If you are using a telephone directory to find a particular feature, then follow the example given below to help you.

- Place a finger on the letter that runs horizontally at the bottom from left to right and move up with it. For example, letter 'B'.
- Secondly, place a finger on the number that runs vertically from bottom to top and move across with it. For example, number '3'.
- The point where the letter 'B' and number '3' meet is the location of that particular feature.

A four figure reference gives a general location of features on maps. It is another map reading skill that you must learn so that you can be able to locate features correctly on a map. Luckily this is another skill that you have covered in Lesson 9 in Sub Strand 3 of this Strand. You must refer back to your notes and study them again.

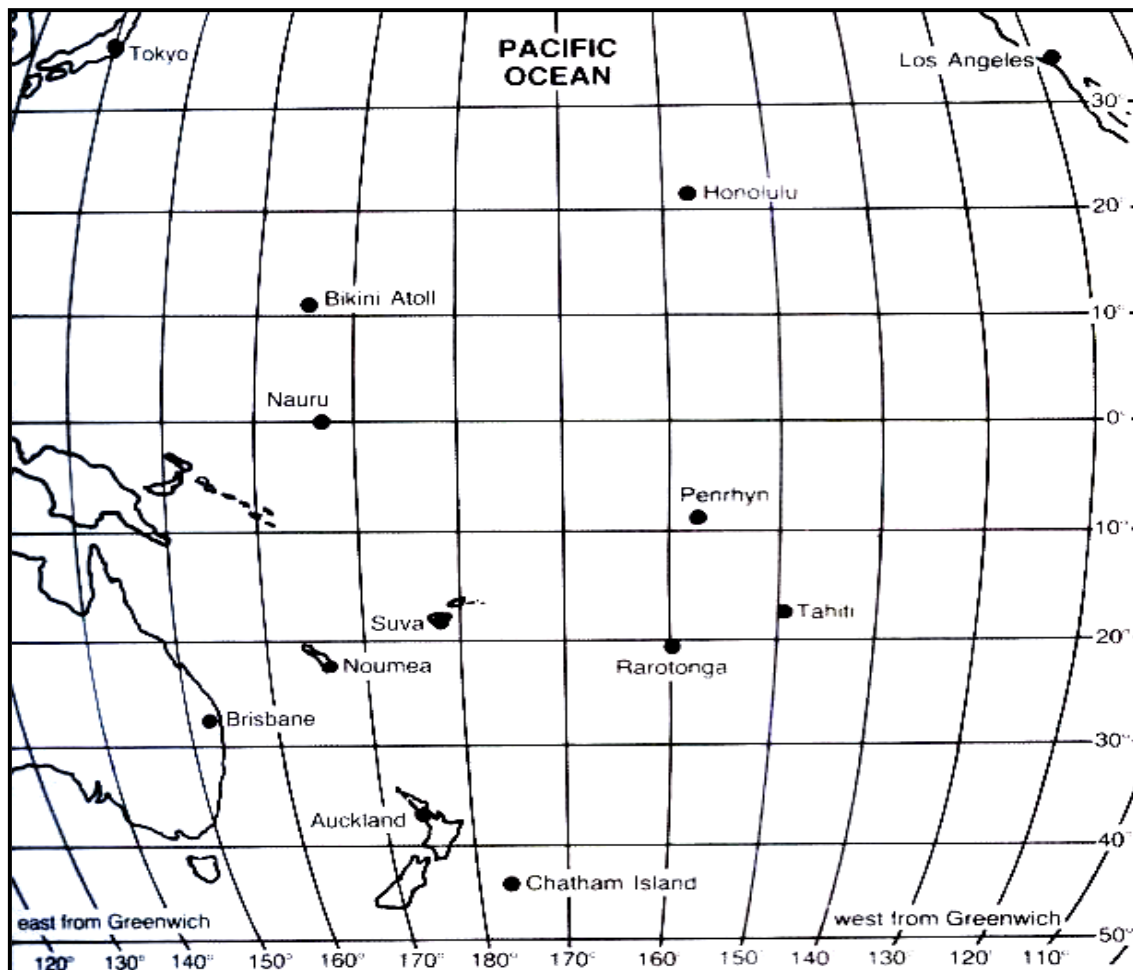
On the map below you will find the International Dateline at 180° . This line of longitude separates places east and west of the Prime Meridian.

Now do Activity.



Activity

Find the latitude and longitude of the following places on the map and answer questions.



1. What particular feature are you trying to locate on the map? _____
2. Find the latitude and longitude of these following places. Try to give the closest estimates of location for each place.

(a) Rarotonga _____

(b) Tahiti

(c) Nauru _____

(d) Brisbane

(e) Honolulu _____

Check your answers after the summary.

Now read the summary.



Summary

You have come to the end of Lesson 13. In this Lesson, you have learnt that:

- geography is the study of the Earth and its environment.
- geographical features are physical and human.
- physical or natural features include all living and non-living things found in nature.
- human or man-made features include all things made or changed by man.
- geographical features can be located using these map skills:
 - Signs or symbols
 - Lines of latitudes and longitudes
 - Compass directions
 - Map and grid referencing
- biome is a natural feature. It is a community of similar plants and animals living and interacting with each other and their physical environment.
- human geography is the study of man-made features and how they affect the Earth's environment.
- physical geography is the study of the natural features and how they affect the people and environment.

Answers to Activity

1. Places, towns or cities
2.

(a)	RAROTONGA=	21°S	160°W
(b)	TAHITI=	17°S	150°W
(c)	NAURU=	0°	166°E
(d)	BRISBANE=	27°S	153°E
(e)	HONOLULU=	22°N	158°W

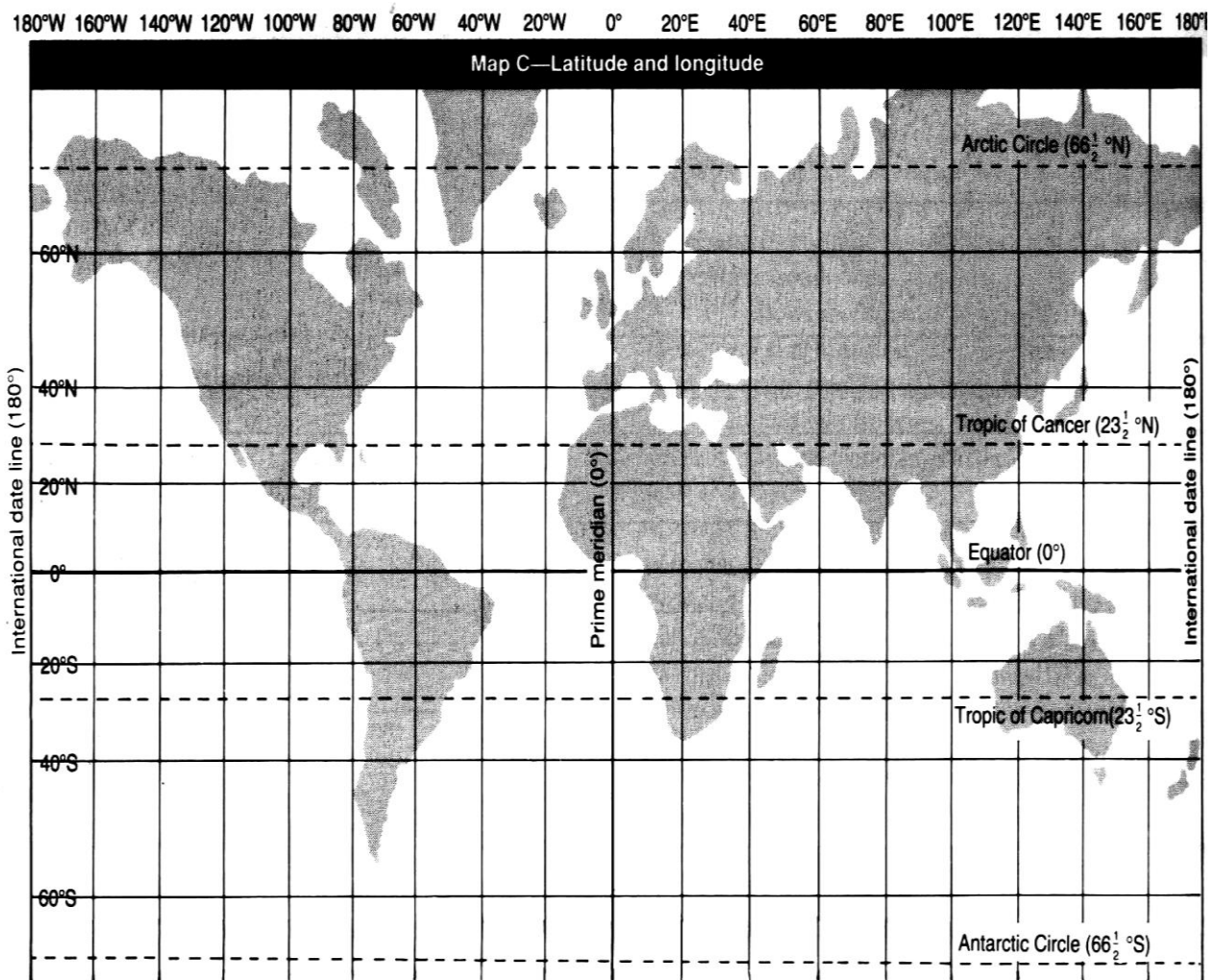
NOW DO PRACTICE EXERCISE 13 ON THE NEXT PAGE



Practice Exercise 13

- Write down at least four ways of locating features using maps.
 - _____
 - _____
 - _____
 - _____
- Which of these methods of locating features on maps is more accurate and quick?

Study the map below and answer questions.



3. Which latitude runs at 0° ? _____
 4. What is the Prime Meridian? _____
 5. Which map reading skill uses letters and numbers to locate places on a map?

 6. Which longitude does the International Dateline follow? _____
 7. If the numbers of longitude increase from left to right to 180° , you are in the

 8. If the numbers of longitude decrease from left to right from 180° , you are in the

-

CHECK YOUR ANSWERS AT THE END OF THE SUB-STRAND 4
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Lesson 14: Latitude and Longitude



In Lesson 13, you learnt about locating the different features on a map, using different skills. In this lesson you will study the lines of latitude and longitude. These lines are used to locate places on maps.



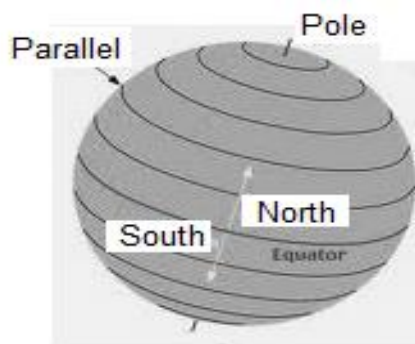
Your Aims:

- differentiate between latitude and longitude
- locate places on a map using lines of latitude and longitude
- state the location of places on a map using lines of latitude and longitude

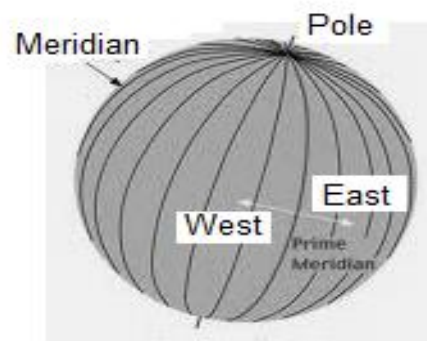
You were introduced to the topic on lines of latitude and longitude in the last lesson. You will study it in more detail in this lesson and by the end of the lesson you will be able to distinguish correctly between a line of latitude and longitude and give an example of each.



What do the diagrams below show?
They show the difference between a line of latitude and longitude.



Latitude



Longitude

Lines of latitude are imaginary lines that are parallel and run across the globe from left to right or east to west. Lines of longitude are imaginary lines that run from top to bottom or north to south and intersect or meet at the north and south poles.

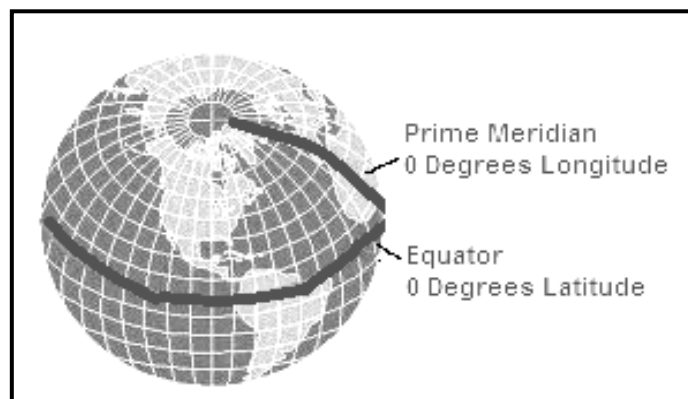
Latitude and longitude are used to locate places anywhere in the world. The world map shows the main lines of latitude and longitude. The latitudes are shown on the left or right side of the map. *The Arctic Circle is at $66\frac{1}{2}^{\circ}$ N, Tropic of Cancer $23\frac{1}{2}^{\circ}$ N, the Equator at 0° , Tropic of Capricorn $23\frac{1}{2}^{\circ}$ S, and the Antarctic Circle at $66\frac{1}{2}^{\circ}$ S.*

The lines of latitude run parallel from east to west. They show locations north and south of the equator. Each line (or parallel) of latitude is given a number between 0° and 90° .

Lines of longitude run around the earth from north to south. These lines meet or intersect at both the north and south poles. They show locations east and west of the Prime Meridian.

The lines of longitude start from the Prime Meridian at 0° . When longitudes increase between 0° and 180° going from left to right you are in the East. The International Dateline is 180° and is neither east nor west. It is in the middle as the Prime Meridian. However if longitudes decrease between 180° and 0° going from left to right you are in the West.

Study the diagram here.

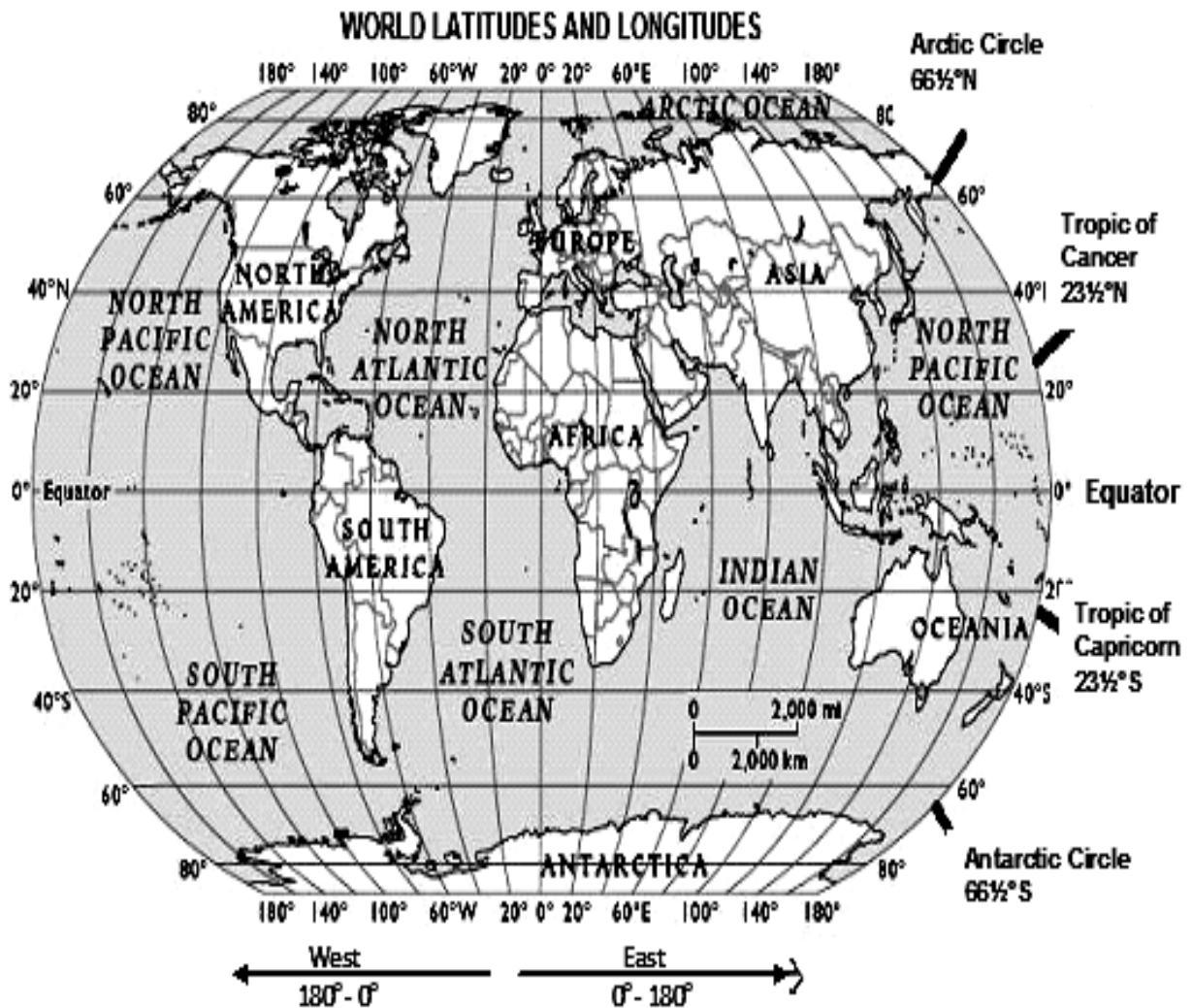


Remember:

The longitude 180° refers to the International Dateline. The International Dateline= 180° .

A meridian is a line of longitude. The Prime Meridian refers to longitude 0° . The Prime Meridian is the starting point of the longitudes.

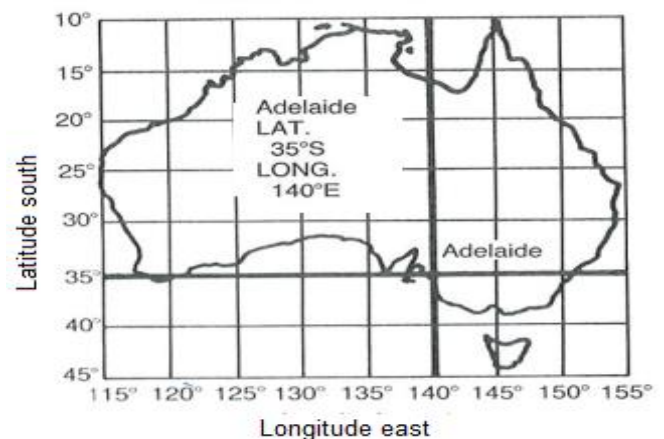
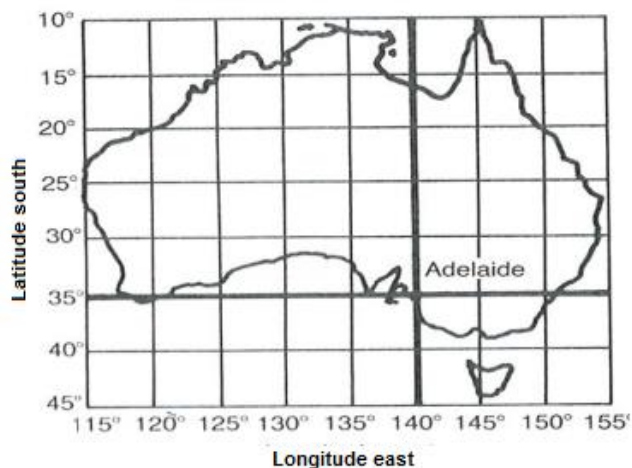
A parallel is a line of latitude. The Equator refers to latitude 0° . The Equator is the central line of latitude that divides the Earth into two halves, the northern and southern hemispheres. Places located above 0° are in the North and places below it are in the south.



When locating places using lines of latitude and longitude always remember to read first the latitude (across) then the line of longitude (top or bottom).

For example: If you want to locate the city of Adelaide in Australia, you must read the latitude which is 35° South then the longitude which is 140° East.

When you use lines of latitude and longitude in locating places write the north or south directions before the east or west. The location of Adelaide is 35°S and 140°E.



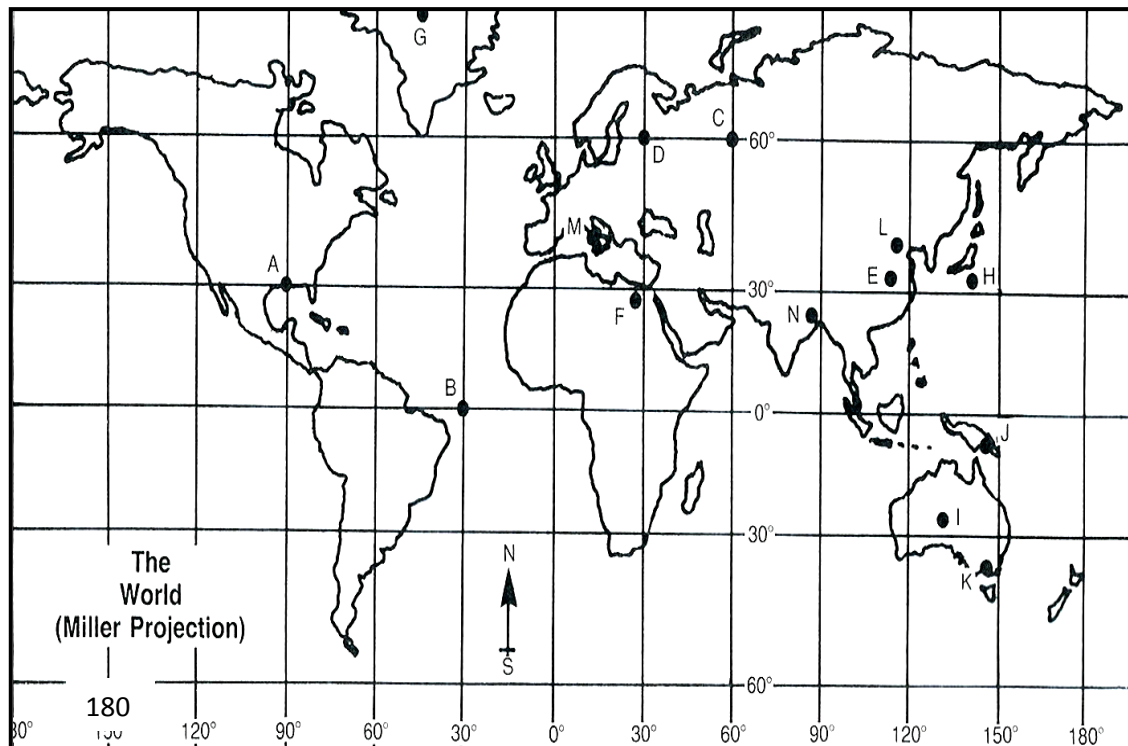
Now do Activity.



Activity

Study the world map below and answer questions.

Here is an example. The latitude for 'J' is 8°S and longitude 145°E.



Locate these places using latitude and longitude.

K _____
L _____
M _____
N _____

Check your answers after the summary.

Now read the summary.

**Summary**

You have come to the end of Lesson 14. In this Lesson, you have learnt that:

- lines of latitude and longitude are used to work out locations.
- lines of latitude run parallel to each other from east to west and lines of longitude from north to south and meet at the North and South Poles.
- location of places is measured in degrees.
- places between two lines of latitudes and longitudes are also measured in minutes to pin-point exact locations.
- Prime Meridian is the longitude at 0° that runs through Greenwich in London.
- International Dateline runs on the longitude 180° .
- equator is the latitude at 0° that divides the Earth into the northern and southern hemispheres.

Answers to Activity

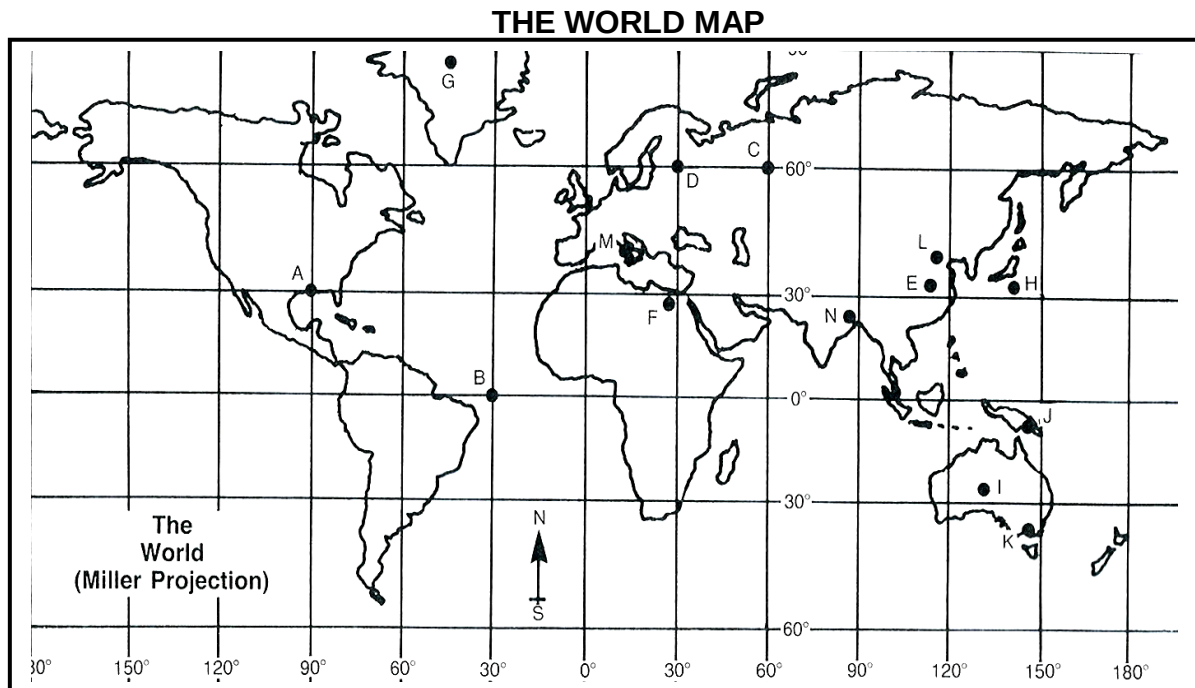
Places	Latitude	Longitude
K	34°S	146°E
L	40°N	117°E
M	40°N	14°E
N	26°N	88°E

NOW DO PRACTICE EXERCISE 14 ON THE NEXT PAGE



Practice Exercise 14

- Differentiate between latitude and longitude.
 - Latitude _____
 - Longitude _____
- Study the map below and complete the table by giving the latitude and longitude of the letters marked on the map.



Places	Latitude	Longitude
A	30° N	90°W
B		
C		
D		

- | | | | |
|---|-------|---|-------|
| A | _____ | H | _____ |
| B | _____ | I | _____ |
| C | _____ | J | _____ |
| D | _____ | K | _____ |
| E | _____ | L | _____ |

F _____

M _____

G _____

N _____

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 4
--

Lesson 15: Reading Weather Maps



In Lesson 14, you learnt about lines of latitude and longitude. In this lesson, you will study weather maps, discuss the uses of weather maps and identify the basic features.



Your Aims:

- define weather map
 - discuss the uses of these maps
 - identify some basic features on these maps
 - read and interpret a weather map
-

You know what today's weather is like. It may be bright and sunny; dull and cloudy or worse of all it may be raining outside this moment.

Weather affects us in one way or another. It is defined as the day to day recording of temperature, rainfall, wind speed and direction; humidity, air pressure, and cloud cover.

A weather map is just like any other map that we might use. It has useful information about weather patterns of a particular area over a period of time. A weather map is useful for these reasons:

- it provides us with information about an area's day to day amount of rainfall, cloud, sunshine, wind and temperature.
- it has a number of special symbols. These symbols represent rainfall, wind, sunshine, cloud and temperature, and are explained at the bottom of the map

There are six important weather elements. These are temperature, humidity, and rainfall, clouds, wind and air pressure.

It is very important for us to learn how to read weather maps because every day the weather elements change causing the weather to change suddenly! A change in the weather affects our daily lives. Thus weather maps are drawn so that you can learn about the weather patterns of an area over a period of time and plan your activities. For instance, sometimes we want to go to the beach during the weekend but because of bad weather such as rain and strong winds we tend to stay at home.

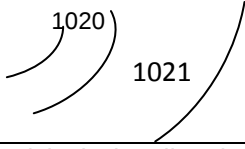
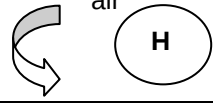
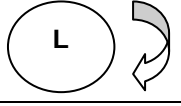
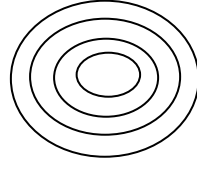
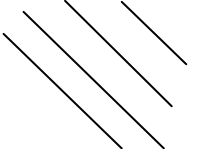
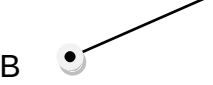
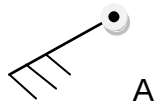
A weather map shows different features. You will study the most basic features to help you understand weather in an area at a given time. The features are represented by symbols of rain, air pressure and wind.



A weather map has many symbols. I will read and find out about these symbols.

Rain is the water droplets falling from the clouds. Air pressure is the downward pressure created by the weight of the air above. There is high and low pressure. High pressure is when air sinks over an area adding weight is represented by 'H'. Low pressure is when air rises and is represented by 'L'. The line that joins places with the same air pressure is called isobar. The speed and direction of the wind are also common features on weather maps.

The common symbols of rain, air pressure, wind speed and direction are shown in the table below.

Symbol	Name	What does it mean?	
	Isobars	Join places of equal air pressure. (The closer together these lines, the stronger the wind).	
anticlockwise direction of air 	High pressure system	Sinking air. (Generally fine weather. Winds rotate around these systems anticlockwise and outwards.)	
clockwise direction of air 	Low pressure system	Rising air. (Generally unsettled weather, rain. Winds rotate around these systems clockwise and inwards.)	
	Tropical cyclone	Rapidly spinning and rising air. (Strong winds, torrential rain.)	
	Rain	Rain in the last 24 hours.	
	NE direction. Wind blowing between speed of 14 and 23 km per hour.	SW direction. Strong wind blowing between speed of 52 and 60 km per hour.	

You can see the common weather symbols above. The stem for 'A' is pointing in the NE direction. It is not a very strong wind and is travelling between the speed of 14 and 23 kilometres every hour. 'B' shows a stronger wind blowing from the SW at a speed between 52 and 60 kilometres every hour. There may be strong winds expected when a cyclone is

near or just thunderstorms. The symbol for a tropical cyclone is also common on weather maps. Papua New Guinea is in the tropics where cyclones are often expected.

The symbol for rain is easy to tell by short strokes coming down left or right. Air pressure is shown by isobars and the directions of high and low pressure air.

There may be other symbols given but these are the common ones you must learn to read to help you understand the weather.

It is important to learn to read the weather so that you are aware of bad weather and take precaution when planning your activities or move to a safe location in case of a cyclone. If you are in the temperate to cold regions of the world, for example, Switzerland or Canada, the temperatures can drop very quickly to below zero degrees in winter, and if you are going skiing or mountain climbing you must know the weather before going out, particularly the temperature, wind speed and direction. Sometimes people get lost and die in the mountains because the temperatures drop very quickly and the winds pick up speed covering their tracks with ice and obstructing their visibility thus they remain in the cold out on the mountains and if no help comes quickly they die from cold and frost bite.

You may have seen on television documentaries such as 'I Survived'. Sometimes it showed how people did or did not learn about the weather before heading out and got caught up in very bad cold weather conditions particularly in the U.S and Canada. Their experiences were real and sometimes it made one want to cry too all because of bad weather!

Now read the summary.



Summary

You have come to the end of Lesson 15. In this Lesson, you have learnt that:

- elements of weather are: temperature, humidity, rainfall, clouds, and the wind and air pressure.
- weather maps have a number of special symbols to represent rainfall, wind direction and speed, and air pressure.
- lines that show air pressure are called isobars.
- the stem of each arrow tells us which direction the wind is blowing. Winds are named according to the direction they blow in.
- the feathers on each arrow tell us the speed of the wind. These are explained in the key at the bottom of the weather map.

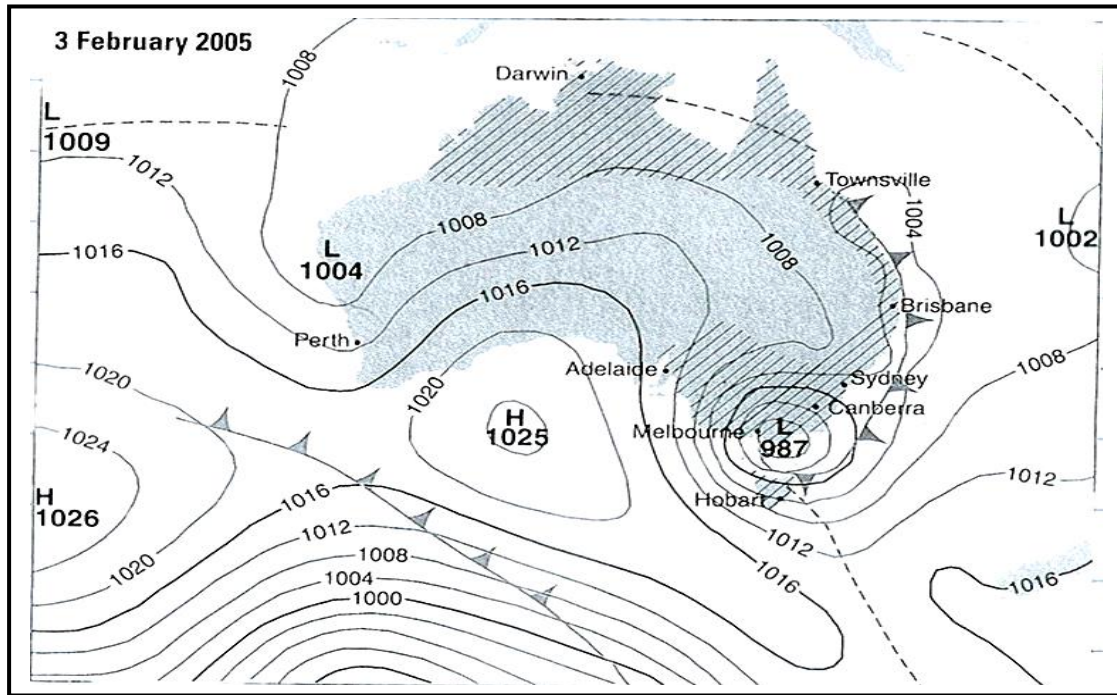
NOW DO PRACTICE EXERCISE 15 ON THE NEXT PAGE



Practice Exercise 15

Study the weather map below and answer questions.

WEATHER MAP OF AUSTRALIA



1. What day was the map for? _____
2. How many areas of high pressure occurred on that day? _____
3. How many areas of low pressure occurred on that day? _____
4. Name at least three cities that had rain on that day.
 (a) _____ (b) _____ (c) _____
5. What is an isobar?

6. Did the following cities of Melbourne, Hobart, Canberra and Sydney experience high or low pressure?

7. What do the 'L' and 'H' stand for? _____

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 4

Lesson 16: Flow Map



In Lesson 15, you learnt how to read weather maps using the different weather symbols. In this lesson, you will learn how to read a flow map.



Your Aims:

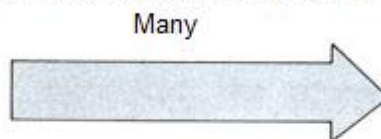
- define flow map
- discuss the purpose of flow maps
- identify some basic features of flow maps
- read and interpret information on flow maps

A **flow map** is used to show movement of people or things from one place to another. It shows this movement by use of arrows in a certain direction. The thicker the arrow the more people or things are moving in the direction of the arrow. The movement of a small number of people or things is shown by a thin arrow pointing in that direction. The start of the arrow shows the *source* of the people or things. The end or point of the arrow shows their *destination*. You can see this in the following diagram.

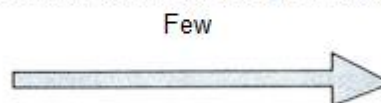
The diagram here shows the basic features of a flow map.



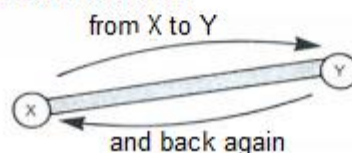
A thick arrow means that many people or things are moving.



A thin arrow means that a few people or things are moving.



If the movement is in both directions, the arrow points are often left out.



Below are some uses of a flow map. It is useful because it shows the

- flow of traffic
- river discharge
- movement of population
- flow of different goods, services or products

In a flow map, you will find that a line or arrow is used to show

- the direction of the flow
- the actual path of the movement and
- changes in the volume of flow

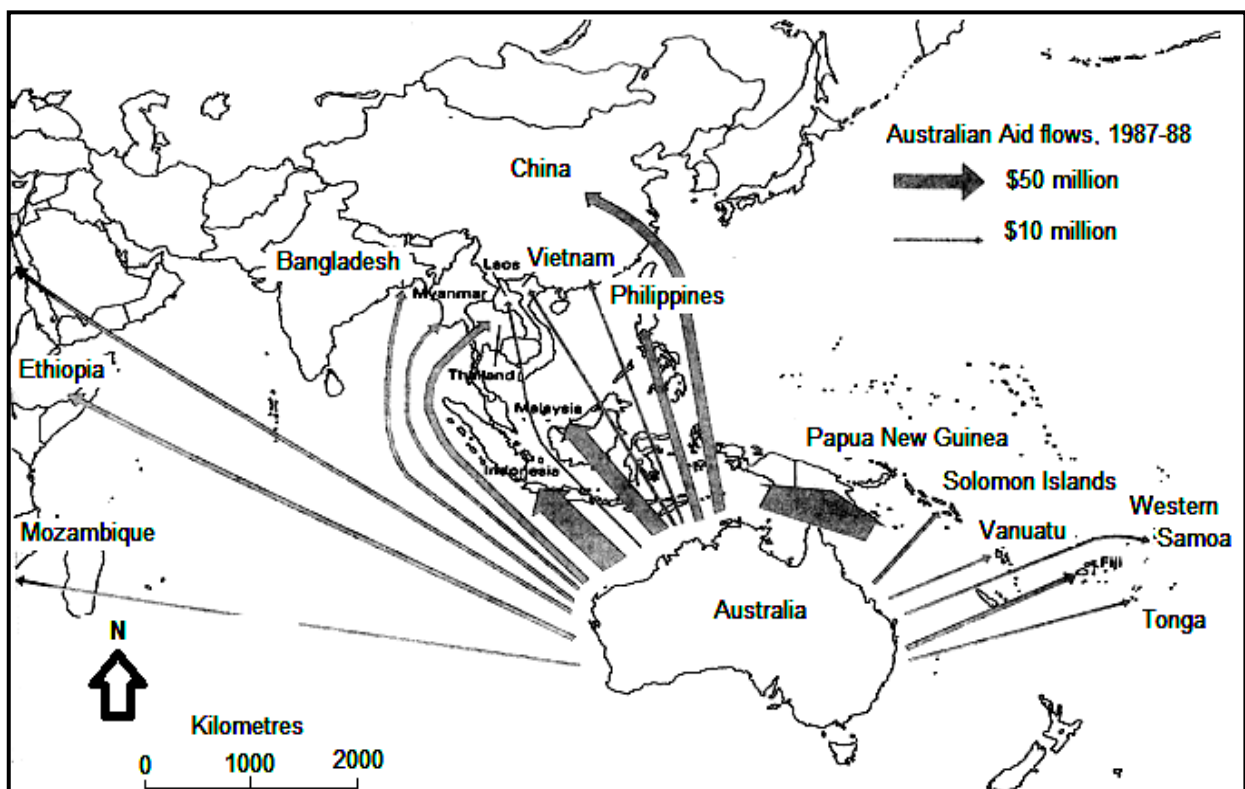
You will interpret a flow map and answer questions based on a flow map.

Now do Activity.



Activity

Study the flow map and table to answer questions.



Map illustration 7.4.16a: Australian Aid flow to major recipients from 1987-88

AUSTRALIAN AID FLOW 1987 – 88			
Country	Aid (\$ millions)	Country	Aid (\$ millions)
Laos	6.9	Malaysia	53.7
Mozambique	10.5	Philippines	27.4
Bangladesh	14.0	Solomon Islands	11.8
Burma	11.6	Thailand	25.4
China	33.8	Tonga	10.1
Ethiopia	18.3	Vanuatu	11.1
Egypt	14.0	Vietnam	9.0
Fiji	18.4	Western Samoa	9.8
Hong Kong	9.5	Papua New Guinea	306.3
Indonesia	83.5		

- Which country received the biggest aid flow from Australia?

- Which countries received more than \$50 million in aid from Australia?
(a) _____ (b) _____ (c) _____
- How many countries in the South Pacific received aid from Australia including Papua New Guinea?

- How much in aid did Hong Kong receive? _____
- Which country received the least aid?

Check your answers after the summary.

Now read the summary.



Summary

You have come to the end of Lesson 16. In this Lesson, you have learnt that:

- a flow map is used to show movement of people or things from one place to another.
- lines of arrow are used to show the direction of the flow, the actual path of the movement and the changes in the volume of the flow.
- start of an arrow shows the source of the people or things. The end or point of the arrow shows their destination.
- a thick arrow show that many people or things are moving in that direction.

- a thin arrow show that a few or small number of people or things are moving in that direction.
- if the movement is in both directions, the arrow points are often left out.

Answers to Activity

1. Papua New Guinea
2. Indonesia, Malaysia and Papua New Guinea
3. Fiji, Solomon Islands, Tonga, Vanuatu, Western Samoa
4. \$9.5 million
5. Laos

NOW DO PRACTICE EXERCISE 16 ON THE NEXT PAGE



Practice Exercise 16

1. Define a flow map.

2. What is the main feature of a flow map?

3. Explain the difference between a thick and thin arrow shown on the map.

4. List some uses of a flow map.

- (a) _____
- (b) _____
- (c) _____
- (d) _____

5. What does a line or arrow show on a flow map?

CHECK YOUR ANSWERS AT THE END OF SUB-STRAND 4
--

ANSWERS TO PRACTICE EXERCISES 13-16

Answers to Practice Exercise 13

1.
 - (a) signs and symbols
 - (b) grid and map reference
 - (c) using lines of latitude and longitude
 - (d) using a compass to tell directions
2. using lines of latitude and longitude to locate features on maps is quicker and more accurate.
3. equator
4. The Prime Meridian is an imaginary line or meridian of longitude that runs through Greenwich in London at 0°.
5. Longitude 180°
6. East
7. West

Answers to Practice Exercise 14

1.
 - (i) Latitudes are imaginary lines drawn around the earth from east to west.
 - (ii) Longitudes are imaginary lines which run from north to south.
- 2.

Letter	Latitude	Longitude
A	30°N	90°W
B	0°	30°W
C	60°N	60°E
D	60°N	30°E
E	33°N	113°E
F	28°N	28°E
G	89°N	45°W
H	33°N	140°E
I	27°S	130°E

Answers to Practice Exercise 15

1. 3 February 2005
2. 2 areas of high pressure
3. 4 areas of low pressure
4. Any three of these cities:
 - (i) Darwin
 - (ii) Townsville
 - (iii) Sydney
 - (iv) Canberra

- (v) Melbourne
 - (vi) Adelaide
5. An isobar is a line that joins areas that have the same air pressure.
 6. Low pressure
 7. L=Low Pressure, and H=High Pressure

Answers to Practice Exercise 16

1. Flow maps show movement of people or things from one place to another.
 2. The main feature of a flow map is an arrow showing movements.
 3. A thick arrow shows many people or things moving and a thin arrow show a few people or things moving.
 4. The uses of a flow map is to show the
 - (a) flow of traffic
 - (b) river discharge
 - (c) movement of population
 - (d) flow of different goods, services or products
 5. A line or arrow on a flow map shows
 - (a) the direction of the flow
 - (b) the actual path of the movement and
 - (c) changes in the volume of flow
-

END OF STRAND 4 SKILLS

Glossary

Bar (graph)	Line bars that run from left to right or across
Cardinal points	The four main directions of East, West, North and South
Column (graph)	Line columns that run from top to bottom or upwards
Latitude	Imaginary lines that run from east to west or across the globe
Longitude	Imaginary lines that run from north to south or North to the South poles
Pie (graph)	A circular graph that represents a part of a whole.
Prime Meridian	The Prime Meridian is the line of longitude that runs at 0° through Greenwich in London, and is where time is measured from.
Scale	relationship between distances on the map and distances in real life
Statistics	refer to groups of numbers set out in columns in a table
Temperature	how hot or cold something is

References

Scot, L. & Laws, K. (1991). *Mapping and Statistical Skills for Secondary Students*. Second Edition, Queensland: Jacaranda Press

Kekeya L, J. (2007). *Voting in Papua New Guinea-Grades 6-8*, University of Oxford: Oxford

Syme & Weldon Ass., (1987). *Australians: Historical Statistics*, N.S.W: Fairfax

FODE PROVINCIAL CENTRES CONTACTS

PC NO	FODE PROVINCIAL CENTRE	ADDRESS	PHONE/FAX	CUG PHONES	CONTACT PERSON		CUG PHONE
1	DARU	P. O. Box 68, Daru	6459033	72228146	The Coordinator	Senior Clerk	72229047
2	KEREMA	P. O. Box 86, Kerema	6481303	72228124	The Coordinator	Senior Clerk	72229049
3	CENTRAL	C/- FODE HQ	3419228	72228110	The Coordinator	Senior Clerk	72229050
4	ALOTAU	P. O. Box 822, Alotau	6411343 / 6419195	72228130	The Coordinator	Senior Clerk	72229051
5	POPONDETTA	P. O. Box 71, Popondetta	6297160 / 6297678	72228138	The Coordinator	Senior Clerk	72229052
6	MENDI	P. O. Box 237, Mendi	5491264 / 72895095	72228142	The Coordinator	Senior Clerk	72229053
7	GOROKA	P. O. Box 990, Goroka	5322085 / 5322321	72228116	The Coordinator	Senior Clerk	72229054
8	KUNDIAWA	P. O. Box 95, Kundiawa	5351612	72228144	The Coordinator	Senior Clerk	72229056
9	MT HAGEN	P. O. Box 418, Mt. Hagen	5421194 / 5423332	72228148	The Coordinator	Senior Clerk	72229057
10	VANIMO	P. O. Box 38, Vanimo	4571175 / 4571438	72228140	The Coordinator	Senior Clerk	72229060
11	WEWAK	P. O. Box 583, Wewak	4562231/ 4561114	72228122	The Coordinator	Senior Clerk	72229062
12	MADANG	P. O. Box 2071, Madang	4222418	72228126	The Coordinator	Senior Clerk	72229063
13	LAE	P. O. Box 4969, Lae	4725508 / 4721162	72228132	The Coordinator	Senior Clerk	72229064
14	KIMBE	P. O. Box 328, Kimbe	9835110	72228150	The Coordinator	Senior Clerk	72229065
15	RABAU	P. O. Box 83, Kokopo	9400314	72228118	The Coordinator	Senior Clerk	72229067
16	KAVIENG	P. O. Box 284, Kavieng	9842183	72228136	The Coordinator	Senior Clerk	72229069
17	BUKA	P. O. Box 154, Buka	9739838	72228108	The Coordinator	Senior Clerk	72229073
18	MANUS	P. O. Box 41, Lorengau	9709251	72228128	The Coordinator	Senior Clerk	72229080
19	NCD	C/- FODE HQ	3230299 Ext 26	72228134	The Coordinator	Senior Clerk	72229081
20	WABAG	P. O. Box 259, Wabag	5471114	72228120	The Coordinator	Senior Clerk	72229082
21	HELA	P. O. Box 63, Tari	73197115	72228141	The Coordinator	Senior Clerk	72229083
22	JIWAKA	c/- FODE Hagen		72228143	The Coordinator	Senior Clerk	72229085

SUBJECT AND GRADE TO STUDY

GRADE LEVELS	SUBJECTS/COURSES
Grades 7 and 8	1. English
	2. Mathematics
	3. Personal Development
	4. Social Science
	5. Science
	6. Making a Living
Grades 9 and 10	1. English
	2. Mathematics
	3. Personal Development
	4. Science
	5. Social Science
	6. Business Studies
	7. Design and Technology- Computing
Grades 11 and 12	1. English – Applied English/Language& Literature
	2. Mathematics - Mathematics A / Mathematics B
	3. Science – Biology/Chemistry/Physics
	4. Social Science – History/Geography/Economics
	5. Personal Development
	6. Business Studies
	7. Information & Communication Technology

REMEMBER:

- For Grades 7 and 8, you are required to do all six (6) courses.
- For Grades 9 and 10, you must study English, Mathematics, Science, Personal Development, Social Science and Commerce. Design and Technology-Computing is optional.
- For Grades 11 and 12, you are required to complete seven (7) out of thirteen (13) courses to be certified.

GRADES 11 & 12 COURSE PROGRAMMES

No	Science	Humanities	Business
1	Applied English	Language & Literature	Language & Literature/Applied English
2	Mathematics A/B	Mathematics A/B	Mathematics A/B
3	Personal Development	Personal Development	Personal Development
4	Biology	Biology/Physics/Chemistry	Biology/Physics/Chemistry
5	Chemistry/ Physics	Geography	Economics/Geography/History
6	Geography/History/Economics	History / Economics	Business Studies
7	ICT	ICT	ICT

Notes: You must seek advice from your Provincial Coordinator regarding the recommended courses in each stream. Options should be discussed carefully before choosing the stream when enrolling into Grade 11. FODE will certify for the successful completion of seven subjects in Grade 12.

CERTIFICATE IN MATRICULATION STUDIES		
No	Compulsory Courses	Optional Courses
1	English 1	Science Stream: Biology, Chemistry, Physics
2	English 2	Social Science Stream: Geography, Intro to Economics and Asia and the Modern World
3	Mathematics 1	
4	Mathematics 2	
5	History of Science & Technology	

REMEMBER:

You must successfully complete 8 courses: 5 compulsory and 3 optional.

