# ADULT EDUCATION

## book 2

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*NATURAL SCIENCE*

# English Language

## UNIT 1

### ON EDUCATION

"One of the things which affects me most is coming to school when I'm tired. As a little girl, when my mother sent me to school I did not want to go. I used to cry. She couldn't send me everyday. Perhaps in one month I would go three or four times. Now I cannot write my name, cannot speak, cannot write. Then one of my sisters got married. My mother took me out of school and sent me to live with her. It was only when my sister did not have to go to town or in the garden that she used to send me to school. When she realized that I was not learning anything, she removed me from school to baby sit for her."

*Theresa Emmanuel*

"What affects me most is the children who make me talk a lot when it comes to going to school. And my mother did not even send me to school. If she had, I know that I would have been a headmistress. I know that because I feel I would learn well.

Now I want to learn but nothing stays in my head. I remember something now but by the time I reach outside I've forgotten it."

*Mary Deterville*

**These two passages are taken from a Reader made by literacy teachers and students in an Adult Education Programme in the village of Monchy — St. Lucia.**

COMPREHENSION

1. What affects both speakers most about education?
2. Why didn't Theresa go to school more often?
3. How did this affect them later as adults?

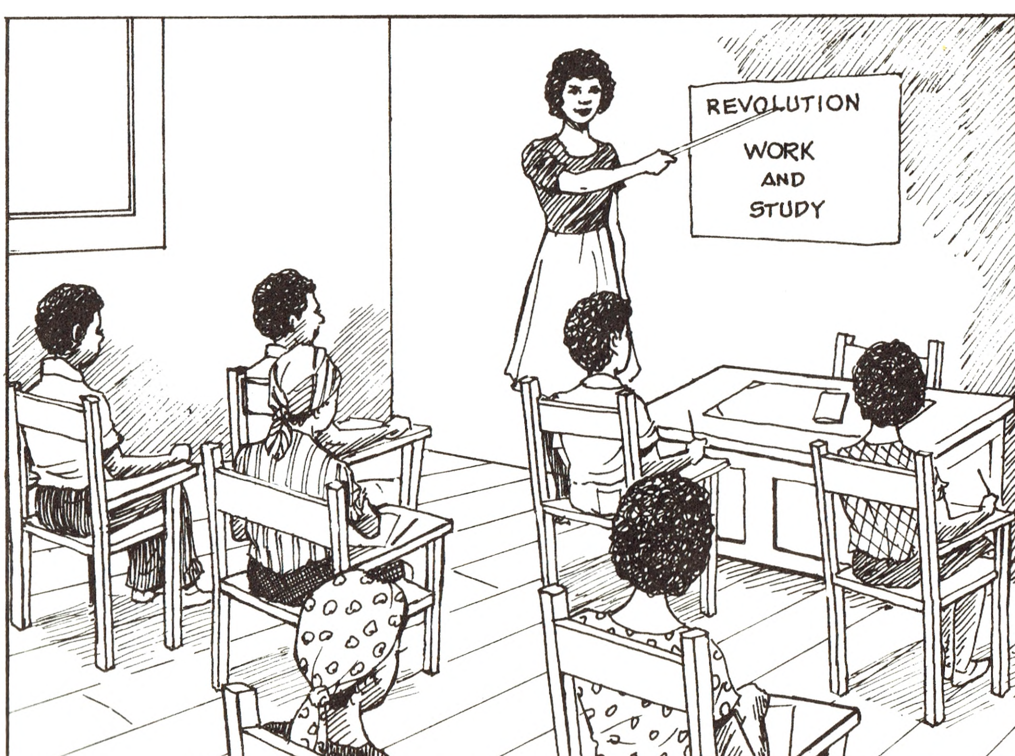


Fig. 1

## DISCUSSION

What are some of the problems which prevent people from getting a full education?

Discuss some of the home problems, the work problems and other difficulties.

How can some of these be solved?

What can we do to make sure that all our children go to school regularly?

| EVERY CHILD IN SCHOOL<br>EDUCATION IS A MUST |
|---|

## GRAMMATICAL PRINCIPLE

Review of *The Sentence.*

Notice: The children cried.

This is a *sentence* because it contains a subject *children* and a verb *cried*. It is a complete idea which makes sense. It tells us what the children did.

in the garden.

This is *not* a sentence because it contains *NO* subject and *NO* verb.

It does not express a complete idea. It is called a *phrase.*

- *A sentence is a group of words which expresses a complete and sensible idea. Every sentence contains a subject and a verb.*

## EXERCISES

1. Which of these are *sentences* and which are *phrases?*

   He writes many letters.

   For training.

   We work together in our communities.

   We share our experiences.

   The doctors.

2. Complete these sentences:

   ----------------------- very hard.

   ----------------------- the nets.

   ----------------------- football.

   The road ---------------------- .

   Meat and fish -------------- .

3. Make complete sentences using these words:

   struggle daughter CPE seine

   people studying pot bus

4. Use these phrases to make complete sentences:

   in the moonlight,

   community centres are,

   by the heavy rains,

   of our country,

   for many months.

5. What is the main problem in your village? Write five sentences on it and then say how it could be solved.

UNIT 2

# DISCOVERY AND INVENTION

The words *to discover* and *to invent* are two terms which are widely used nowadays thanks to the great contribution made by Science in the life of Man.

With the launching of artificial satellites and the journey to the Moon, man has made a series of discoveries and inventions which will make life easier in the future.

To discover is not the same as to invent. *To discover* is to remove a veil that hides something already existing although unknown.

For example, our island Grenada existed long before Columbus "discovered" it. *To invent* is to construct or make something which never existed before. The most valuable inventions are those which serve to improve and upgrade the quality of our lives.

Throughout history many significant discoveries and inventions have been made. Man has discovered many lands, new laws of Science and life. There is no aspect of life which has not been under examination and every discovery leads to even greater discoveries. Applying and using the understanding which has been gained from discoveries, man has made great inventions. Many of these great invention become everyday objects which help to shape and better our life, for example the wheel, the electric bulb, the car, the radio, etcétera.

The inventions and discoveries of the great minds of all age become the common property of all mankind.

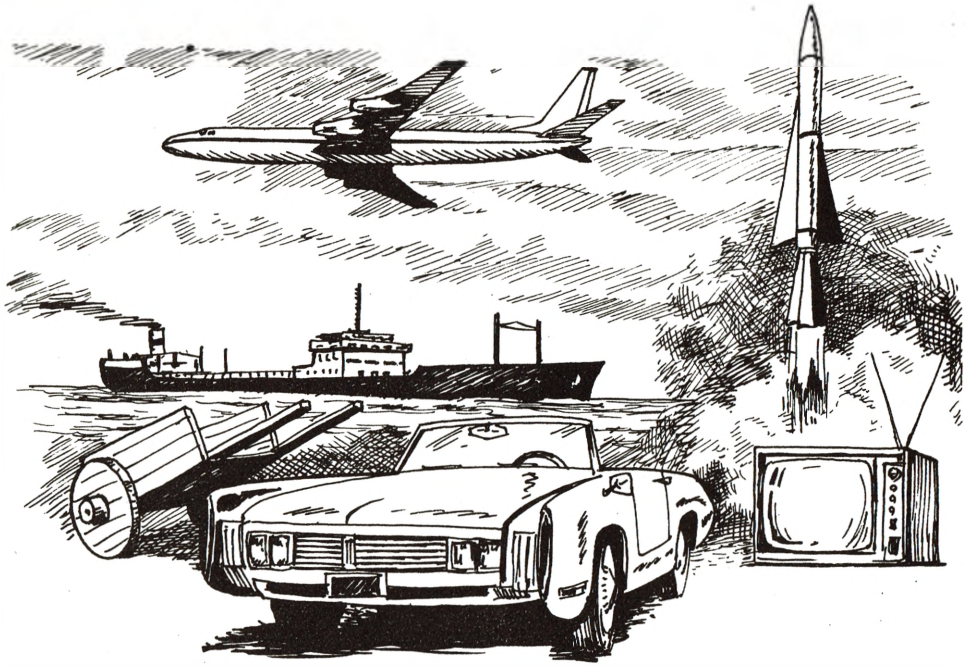

Fig. 2

### VOCABULARY

artificial satellites — objects sent into space by man.

series — a number of.

construct — build or make.

significant — important.

### COMPREHENSION

1. What does the term *discover* mean?
2. What does the term *invent* mean?
3. Name some of the great discoveries of Man?
4. What is the value of a discovery?
5. Name some of the great inventions made by Man?
6. Do you know of any discoveries or inventions made by Grenadians?

### DISCUSSION

What are the discoveries and inventions which we make use of in our everyday lives?, in our work?

How do people discover and invent things?

How can we discover and invent things which can contribute to the development of our country?

### GRAMMATICAL PRINCIPLE

Using *capital letters*

Read these words:

Victoria, York House, Agnes,

Wednesday, May, Free West Indian.

All of these words are specific names, they are the names of particular people, places or things. They all begin with a *capital letter.*

- *Capital letters are used when writing the names of particular people, places or things.*

Agatha, Harbour View, Dash.

1. We use capital letters when we are writing our names, the names of other persons and the names of places and pets.
2. We use capital letters when we are writing the days of the week, months of the year and the names of special holidays.

   Friday, April, Easter, March 13 th.

3. We use capital letters when we are writing the names of islands, towns, names of places (geographical names).

   Grenada, Carriacou, The Great River.

4. We write the names of books, poems, songs with capital letters.
5. We write the names of languages with capital letters.
6. When the letter i stands alone it is always written with a capital I.
7. The first word in every sentence begins with a capital letter.

### EXERCISES

1. Rewrite all the words from this list which should begin with a capital letter:

   oranges newspaper flag

| | | |
|---|---|---|
| book | tuesday | andrew |
| sea | i | free |
| parish | radio | grenada |

2. Do the following:

   Write your name.

   Name a river in Grenada.

   Name a beach in Grenada.

   Give the name of any building.

   Name one of our festivals.

3. Rewrite these sentences using capital letters where necessary:

   iwent to the rally at queen's park in st. george's on friday march 13.

   grand etang is a lake in grenada.

   the bus "sweet roses" collected the people.

   where is marie going?

   sea fortress sails from st. george's to port-of-spain on tuesdays.

   he lost his dog carlo

   the people of the caribbean speak english, french, spanish, dutch and creole.

4. Put or remove capitals where necessary in this short passage: may day is the day when workers all over the world remember their struggles and Celebrate their gains. it Began with a strike in the united States in 1886. workers were struGGling for a shorter working day. Hundreds were arrested and Jailed, dozens were Killed when the police moVed in. workers all over the world met to protest the treatment of their Brother workers in the U.S. from that time may 1 has been celebrated as international Workers day.

## UNIT 3

## SOME USEFUL PLANTS

Everyday we make use of many different plants for all kinds of reasons. Some plants are used for food, others are used to make useful household things or for medicinal purposes.

The leaves of many plants are useful. Dasheen leaves are used to make calaloo, a highly nutritious soup. Lime leaves, Santa Maria, Christmas bush leaves, lemon grass are used for bush tea medicine. Leaves such as the banana and paw-paw have useful household applications. The banana leaf makes a good umbrella when you are caught in a sudden shower and forms a good wrapper for baking bread. Paw-paw leaf is one of the best meat tenderisers. Brooms are made from bamboo and palm leaves.

Seeds and fruits of many plants are also widely used.

Fig. 3

Some of the more commonly used are ground nuts, cashew, peas, beans and sorrel. The shell of the calabash fruit is used as containers and cups. We scrub our clothes with a corn stick and our houses with a coconut husk.

Knowing and understanding the uses of our local plants is important because it will enable us to make more efficient use of what we have. This knowledge enables us to set up small industries to make local products. The perfume factory in St. George's wich uses local flowers and grasses to make perfume is a good example of this.

**VOCABULARY**

husk — hard, outer shell.

medicinal — as medicine.

tenderiser — softener.

**COMPREHENSION**

1. List three main uses of plants.
2. What are some of the leaves which are used and for what purposes?
3. What are some of the more commonly used seeds?
4. Why is it important to understand the use of local plants?

**DISCUSSION**

Make a list of all local plants that you know and their uses.

How can better use be made of these local plants.

**GRAMMATICAL PRINCIPLE**

*Punctuation:* the full stop, the question mark and the exclamation.

Read these sentences carefully:

1. The fishermen pull the net.
2. Did they catch fish?
3. Watch! Here comes a shark.

The first sentence *The fishermen pulled the net* is a statement. At the end of every statement we put a dot like this called a *full stop*. The *full stop* indicates the end of a statement.

The second sentence *Did they catch fish?* is a question. At the end of every question we put a mark like this ? called a *question mark.*

The *question mark* indicates that a sentence is a question. It shows that we are asking something.

The third sentence *"Watch! Here comes a shark.* is an exclamation. It is a sentence that emphasizes something or expresses surprise. At the end of every exclamation we put a mark like this ! called an *exclamation mark.*

| ● | ? | ! |
|---|---|---|
| full stop | question mark | exclamation mark |

**EXERCISES**

1. Put the correct punctuation mark after each sentence:

   The heavy rains washed away much soil

   Were you at the International Airport Rally

   Watch that show was the hardest

   That man could work hard

   It cost money to produce pipe-water

   Do you know that Grenada has its own plane

2. Write three statements and three questions.
3. There are many words and phrases which we use everyday as exclamations, e.g. Watch! , Ah way!
4. Punctuate this passage:

   the other day i went to a shop to buy a few groceries the cashier gave me a bill for forty five dollars forty five dollars are you mad i asked him like you want to kill a poor man

**UNIT 4**

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## OUR PEOPLE STAND FIRM

On Sunday April 12, 1981, 20 000 patriotic Grenadians gathered together at our International Airport site at Point Salines. They came together in answer to the call of the PRG for our people to demonstrate to the world our support for the building of our airport and our deep unity. The presence of such a massive section of our people at Point Salines was the best answer to the attempts by Imperialism to stop the building of our airport.

At that rally our Comrade Prime Minister said:

"This rally is also important because once again it demonstrates the political style and form of our Revolution. That nothing must be done unless the people are fully involved. That no step must

Fig. 4

ever be made unless our people are fully participating. That no progress is possible unless we continue to keep our people together, always keep them at the centre and focus of all of the activities of the country.

## WE ARE NOT ALONE

"The 61 countries that belong to the African Pacific Group passed a strong resolution in Belgium condemning America's interference and supporting the right of our free people to develop our economy and our country. In Venezuela, the 27 countries belonging to the Economic System of Latin America passed a firm resolution of support for our country and our right to develop. We have also had firm support from several international organizations, from several countries, from Grenadians living abroad, from Grenadian Friendship organizations overseas, from the friends of Grenada throughout the world. We have received tremendous support over these last few days."

### VOCABULARY

patriotic — loving your country.

demonstrate — to show.

participating — taking part.

### COMPREHENSION

1. What happened on Sunday April 12, 1981?
2. Why did this happen?
3. How can progress be made?
4. What kind of support did Grenada get?

### DISCUSSION

Why was the International Airport Solidarity Rally so important?

### GRAMMATICAL PRINCIPLE

*The article*

Read these words:

a revolution  the police  an army  a worker

*a*, *an* and *the* are called *articles*

The *articles* are words which come before *singular* nouns.

*an* comes before words which begin with a vowel.

Observe:

an egg  an okra  an umbrella  an aim  an island

*a* is used before words beginning with a consonant. For example:

a teacher  a fisherman
a key  a radio

Plural nouns do not use the articles *a* or *an.*

*The* is used with words beginning with either a vowel or a consonant.

For example:

the office  the eye
the land  the floor

**EXERCISES**

1. Put in the article *a* or *an* in each space:

| | |
|---|---|
| ___ blanket | ___ onion |
| ___ organ | ___ rock |
| ___ parcel | ___ shoe |
| ___ injury | ___ echo |
| ___ chain | ___ banana |

2. When do you use *a* and when do you use *an?*
3. Make these nouns plural:

| | | |
|---|---|---|
| a soldier | a bus | a house |
| an orange | the radio | the airport |
| the student | an egg | a worker |

**UNIT 5**

## FERTILIZERS AND INSECTICIDES

Fig. 5

Plants like all other living things need nutrients to live. Through their leaves they take in nutrients from the air. Through their roots they absorb nutrients from the soil.

The main nutrients which are absorbed are Carbon Dioxide from the air, sunlight, water and mineral substances from the soil. At certain times the soil requires a supply or replacement of substances in order to feed the plants.

Farmers use natural or artificial fertilizers and manure to enrich the soil. The best natural manure is animal waste or pen manure. This contains all of the three primary nutrients required by plants: nitrogen, phosphorus and potassium.

Artificial manures are those made by man using chemicals. There are four main types: phosphates, nitrates, potash and calcium. If properly applied, manure helps to increase the output of the soil.

Manure is not the only thing needed to bring about a good crop. There are other things which affect plants. Sometimes they suffer from diseases caused by pests or harmful weeds. Most of these diseases and weeds can be destroyed by using special chemicals called pesticides and herbicides. Information on which types to use and how to use them can be obtained from any of the Propagating stations or the Agronomy division of the Ministry of Agriculture. Agricultural officers help by visiting farms, detecting diseases and giving demonstrations of how to destroy them.

### VOCABULARY

absorb — take in.

primary — main, most important.

output — what is produced.

### COMPREHENSION

1. How do plants take in nutrients?
2. What are the main nutrients used by plants?
3. What is the best natural manure?
4. Why is it the best natural manure?
5. Name the main types of artificial manure?

### DISCUSSION

Invite an Agricultural Extension Officer to discuss Fertilizers and Insecticides with the class.

### GRAMMATICAL PRINCIPLE

*Review of Sentences: the statement, question and command*

| | | |
|---|---|---|
| Rain fell yesterday. | *a statement*) | |
| | ) | all |
| Have you any more fruit? | *a question* ) | sentences |
| | ) | |
| Go to your home! | *a command*) | |

A sentence can be a statement. That is, it can merely say something.

For example:

The coconut is a very nutritious drink.

A sentence could ask a question. For example:

How many people live in your community?

A sentence could give a command. For example:

Close the tap! Don't waste water!

- Every sentence begins with a capital letter. Statements end with a full stop.

  Questions end with a question mark: ?

  Commands and exclamations end with an exclamation mark: !

### EXERCISES

1. Which of these sentences are commands and which are questions?

   Have you been to the International Airport site?

   Get out of the road.

   Grenville is our second largest town.

   Our children must be educated to ask questions.

   Why are you here?

   Bon Joy! He nearly had an accident.

2. Punctuate this short passage:

   People of free Grenada the long night of terror has ended the new day of justice peace and equality has now come the struggle to build the new society is many times harder than the struggle for freedom what part are you playing in this struggle

3. Make questions for these statements:

   Television Free Grenada (TFG) is located at Sans Souci.

   Grenada is the 1981 Lawn Tennis champion.

   Marryshow House is the Extra-Mural department of the University.

   The Grenada Planned Parenthood Association's headquarters is on Scott Street in St. George's.

## UNIT 6

## THE COCONUT TREE

One of the most common and useful trees we have is the coconut tree. This tree is widely cultivated in many parts of Grenada. Nobody knows for sure from where it came.

The coconut tree is a kind of palm tree which bears a large green nut. The nut is covered by a hard smooth shell or husk which is green but slowly turns brown as the nut ripens. Inside the husk is a thick white layer which becomes dry and fibrous when the nuts are ripe. The true nut is found inside and contains a white meat on the inside and water or "milk".

Coconut water or milk is a very refreshing and popular drink. The white meat or kernel is often referred to as coconut jelly. When the nut is green, this jelly is eaten. When the nut is ripe, the kernel becomes hard. Copra is the dried kernel and is used to make oil used for cooking or in preparing make-up.

The nut itself can be polished and used to make cups and ornaments. The fibre surrounding the nut is beaten to soften it and used to make mattresses. Besides the great value of the coconut itself, the tree has many uses. Both the dried fibre and leaves make very good firewood. The

Fig. 6

leaves of the coconut tree can be woven to make beautiful baskets, mats and screens. The wood of the tree, if handled by a skillful wood-worker, makes attractive furniture.

The coconut tree is one of our natural resources because of its many uses. In our struggle to develop our country we should make even greater use of such local resources.

## VOCABULARY

cultivated — grown.

husk — the hard, outer covering of the coconut.

fibrous — stringy.

kernel — meat or jelly inside the nut.

ornaments — decorations.

## COMPREHENSION

1. What kind of tree is the coconut tree?
2. What happens to the husk of the coconut as it ripens?
3. What is copra?
4. List all the uses of the coconut husk.
5. What is the coconut kernel?
6. How is the coconut kernel used?
7. Make a list of all the things which you know could be made from some part of the coconut tree.

## DISCUSSION

Discuss the various ways in which members of the class make use of the coconut tree.

How can we make better use of the coconut tree and how will this benefit Grenada?

## GRAMMATICAL PRINCIPLE

*Agreement of subject and verb*

The subject of a sentence must agree with its verb.

- *A singular subject requires a singular verb.*

  The *woman washes* in the river every Saturday.

  she washes

  The *boy plays* cricket every Sunday.

  he plays

- *A plural subject requires a plural verb.*

  The *women wash* in the river.

  they wash

  The *boys play* cricket.

  they play

- We use a plural verb when two singular nouns in the subject are joined by "and".

  Joan *and* Francis *work* on the farm.

  they work

*SINGULAR AND PLURAL VERBS*

| *Singular* | *Plural* | *Singular* | *Plural* |
|---|---|---|---|
| Does | Do | Sells | Sell |
| Works | Work | Walks | Walk |
| Goes | Go | Makes | Make |
| Gives | Give | Puts | Put |
| Comes | Come | Says | Say |
| Is | Are | Was | Were |
| Has | Have | Takes | Take |

Always use a singular verb with these words:

| | | | |
|---|---|---|---|
| **each** | **nobody** | **everyone** | **either** |
| **anybody** | **everybody** | **no one** | **neither** |

## EXERCISES

1. Choose the correct verb from the bracket to complete the sentence:

   Men and women ______ out to do community work. (turn, turns)

   Workers at the Airport site ______ a lot of work daily. (does, do)

   Everyday the struggle ______ harder. (get, gets)

   Our friends ______ us the help we need. (give, gives)

Grenadians ______ a proud and patriotic people. (is, are)

2. Which of these sentences are incorrect:

   The people stands up for freedom.

   St. David's salute African Liberation Day.

   My children tries hard at school.

   We have made progress.

   Workers are the salt of the earth.

   Limes are good for the cold.

3. Write the corrected sentence(s).

4. Choose the correct verb from the bracket to complete the sentence:

   Neither of these mangoes ______ good. (is, are)

   Everybody ______ jeans. (wear, wears)

   Anybody ______ the right to education. (have, has)

   No one ______ that nonsense. (believe, believes)

   Each sentence corrected ______ a small victory. (is, are)

## UNIT 7

## GRENADA

Grenada our beautiful island
The sand, the sun, the sea.
With glowing hearts we see the rise
Of a nation strong and free.

********

On 13 March before the dawn
Those noble sons and daughters rose
Went out to face their destiny
Went out to set the people free.

********

A land so glorious and free
A land with spice and sunshine sea
A land of hope for all who toil
A land blessed with so rich a soil.

********

A land beneath the shiny skies
A land where gentle maidens rise
To keep the steadfast through the years
A nation ever free.

*Iona Braveboy*

Fig. 7

## VOCABULARY

glowing — warm.

destiny — fate, the aim of a life.

steadfast — the brave and the strong.

## GRAMMATICAL PRINCIPLE

*Review — Common Nouns*

Jacks, fowls, goats and trees are all living things.

*Jacks, fowls, goats, trees* are common nouns in the sentence above.

- *A common noun is the name given to all people, places or things of the same kind.*

Alice and Lennox are teachers.

In this sentence *teachers* is a common noun. Alice is the name of one teacher and Lennox is the name of another. Both belong to the same occupation.

## EXERCISES

1. Underline the nouns in the following sentences:

   The army was put on alert.

   The carpenter used nails, hammer and screws.

   On a clear night, many stars and some planets can be seen.

   She grows plantain, dasheen, cabbages and tomatoes.

2. List five common nouns in each column below:

| Local fruits | Fish | Local foods | Imported food |
|---|---|---|---|
| | | | |

## UNIT 8

# YOUR BODY

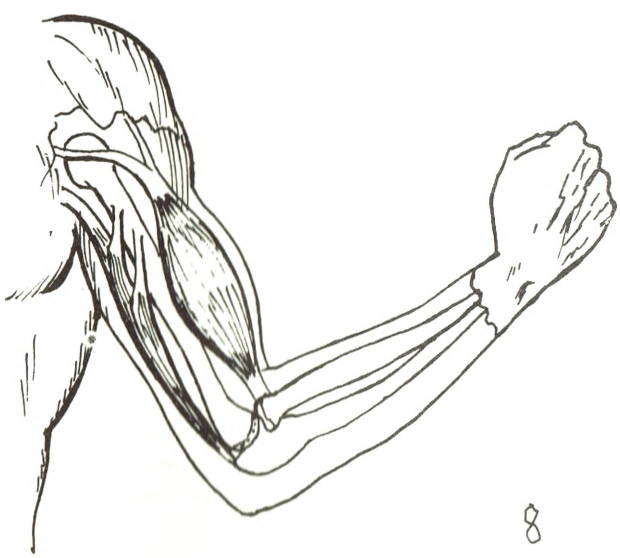



Fig. 8

Your body is made up of bones, muscles and many different organs. Inside there are a number of bones. These bones make up the *skeleton*. The skeleton has four main purposes. It supports the soft parts of our body and gives the body its shape. It protects important organs. It forms an attachment for muscles and blood cells are formed in the marrow of the bones.

The muscles cover the bones of the skeleton and control the movement of the body. There are two kinds of muscles: *voluntary* and *involuntary* muscles. Voluntary muscles are those over which we have conscious control. Our leg, arm and hand muscles are examples of this. Involuntary muscles are those over which we have no control. Our heart and stomach muscles are good examples of involuntary muscles.

Some of the most important organs in the body are the heart, the brain and the stomach. Each one of these has a special function to perform. The heart pumps blood to every part of the body. The brain controls the nervous system. The brain is like the control room of the body. All the activities of the body are controlled by the brain. The stomach is one of the organs of *digestion*. When we eat, the food goes into the stomach where it is broken up by special juices. After it is broken up, the stomach absorbs all the substances from the food which the body needs.

## VOCABULARY

organs — parts.

function — role or task.

to perform — to do.

digestion — dissolving of food in the stomach.

## COMPREHENSION

1. What are the main parts of the body?
2. List three functions of the skeleton.
3. What are voluntary muscles?
4. What are involuntary muscles?
5. Name three of the most important organs of the body.

## GRAMMATICAL PRINCIPLE

*Collective Nouns*

The *crowd* danced in the street.

The word *crowd* refers to many people, to a number of people.

- *A collective noun is a word which is used for a group or collection of people, animals or things.*

A collection of sheep is a *flock.*

*Flock* is a *collective noun* because it stands for *many sheep.*

A collection of books is a *library.*

*Library* is a *collective noun.* It stands for *many books.*

Some collective nouns:

| | |
|---|---|
| A *catch* of fish | A *hard* of cattle |
| A *bunch* of bananas | A *panel* of judges |
| The *crew* of the ship | A *swarm* of flies |
| A *bouquet* of flowers | A *choir* of singers |
| A *staff* of teachers | A *clump* of bushes |

In Grenadian English we have many collective nouns:

| | |
|---|---|
| A cricket *side* | A football *side* |
| A *set* of people | A *pile* of clothes |
| A *grap* of coconut | The *amount* of water |

## EXERCISES

1. Write down five collective nouns besides those already given.
2. Make five sentences using the collective nouns which you have written.
3. Write the missing words:

| | |
|---|---|
| A side of ______ | A pair of ______ |
| A crew of ______ | A flock of ______ |
| A herd of ______ | A set of ______ |

4. Complete these sentences with the correct collective noun:

| | | | |
|---|---|---|---|
| crowd | choir | bouquet | swarm |
| staff | bunch | catch | side |

A ________ of bees buzzed around the hive.

The singers in the ________ won the Cultural competition.

The ________ of St. Dominic's R.C. School are dedicated teachers.

There was a ________ of people at the Airport Rally.

Our new fishing fleet has made several ________ of fish.

A ________ of fellas were liming on the block.

Every ________ of bananas must be of the best quality.

Give your woman a ________ of flowers.

## UNIT 9

# NACDA

The National Co-operative Development Agency (NACDA for short) was established by Peoples Law No. 18 of 1980 and was launched on April 21, 1980. NACDA has three main functions:

a) to stimulate the development of co-operatives;

b) to provide the facilities needed to establish co-operatives;

c) to advise the government on all matters concerning co-operatives.

NACDA plays an important role in encouraging and assisting those who want to form co-operatives. NACDA helps people to help each other and themselves. Unemployed people now have new opportunities through NACDA. Any serious group of people wanting to form a co-operative can get advice and assistance from this Agency.

Fig. 9

If their idea looks as if it could work, they might even get a loan to start the co-operative. Or the group may receive the equipment that they need.

NACDA is also responsible for registering co-operatives. Registration makes a co-operative recognized by law and so makes it easy for the co-op to enter into business deals and other legal arrangements. This also protects the rights and interests of individual members. Sometimes people hesitate to join a co-op because they do not understand what it involves or because they are not trained to do a certain kind of work. NACDA can help by explaining all what we need to know about co-ops and by training people to set up and run them.

The whole idea is that if we are prepared to work together we can do something to improve our own lives and build our country.

## VOCABULARY

**established** — set up.

**functions** — roles.

**to stimulate** — to encourage.

**opportunity** — new "chance".

## COMPREHENSION

1. What are the functions of NACDA?
2. How can NACDA help you to form a co-operative?
3. Why should co-operatives be registered with NACDA?

## DISCUSSION

Invite an officer from NACDA to speak to the class on co-operatives.

********

What kinds of co-operatives are needed in your area? Discuss the main problems involved in setting up co-operatives.

How can we overcome them?

## GRAMMATICAL PRINCIPLE

*Review of Proper Nouns*

Bernadette, Laurice and Lorraine are young martyrs of our Revolution.

Pomme Rose is a village in St. David's.

Monday was a rainy day.

The words *Bernadette, Laurice, Lorraine, Pomme Rose, St. David's* and *Monday* are special names. They are proper nouns.

- *Proper nouns are the names of special people, places or things and begin with a capital letter.*

The days of the week and the months of the year are proper nouns.

## EXERCISES

1. Give five proper nouns for each of these:
   - people
   - places
   - animals
   - things
2. Which of these are common and which are proper nouns?

| | |
|---|---|
| Fork ____________ | Monday ____________ |
| Cow ____________ | Beans ____________ |
| Joseph ____________ | Perseverence ____________ |
| September ____________ | Bees ____________ |
| Clock ____________ | Pearls ____________ |
| Mountain ____________ | Charlo ____________ |

3. Make sentences using these proper nouns:

| | |
|---|---|
| July | Carriacou |
| Christmas | Sparrow |
| Grenada | Nicaragua |

## SPORTS

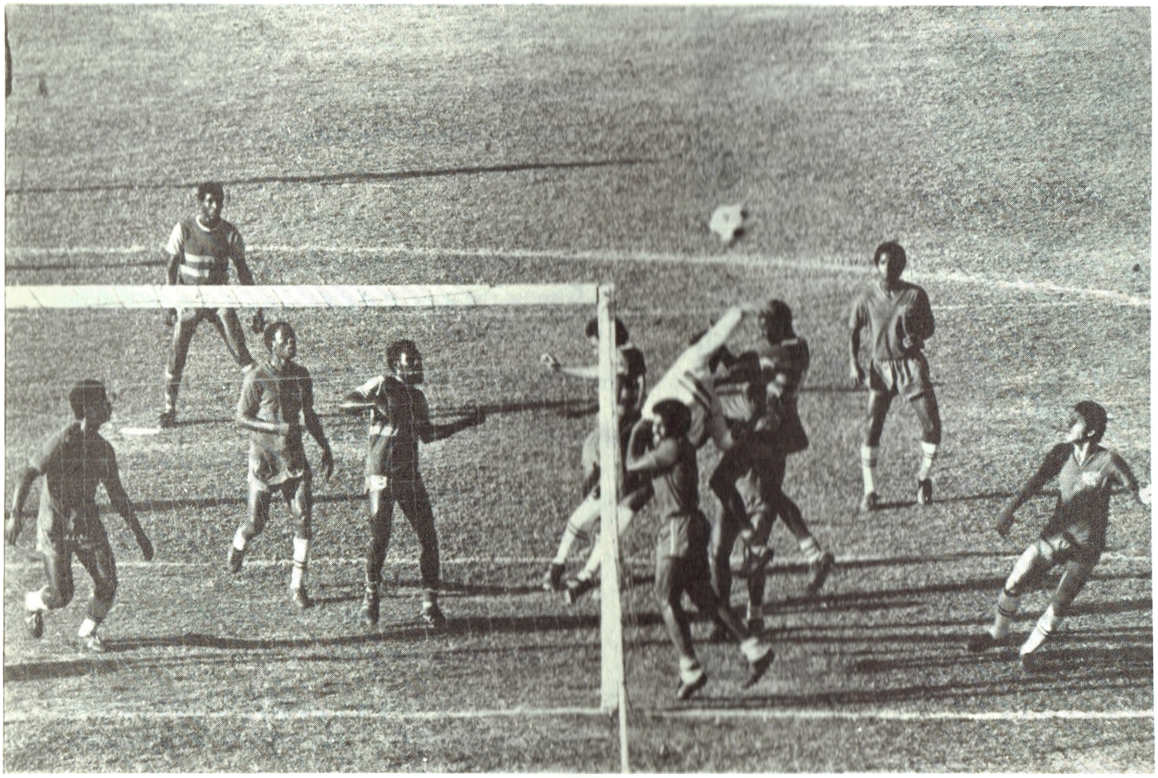


Fig. 10

Sports is a form of recreation which not only helps to keep us fit but also develops a team spirit and understanding. Sports also helps us to develop socially and mentally.

There are hundreds of Sports. Almost any recreational activity in which many people participate can be considered to be a sport. The sports which are popular and are played in a country form an important part of the culture of the people. Some kinds of sport are so popular in a country that they are considered national sports. For example, football is the national sport in Brazil because of its popularity and also because Brazil was a world champion in this sport. Table tennis is the Chinese national sport and karate is the Japanese national sport.

Grenada was a leading champion of cricket, football and athletics among the Windward Islands. We have always been a sporting people but the lack of proper sporting facilities has prevented the full development of our talent. Since the Revolution, the Ministry of Sports and the National Youth Organization have been pushing the idea of "Sports For All". The aim is to get more people involved in all kinds of sports. To achieve this existing sporting facilities are being improved, plans have been made for building new facilities, sports seminars and competitions have been organized in every parish and Grenada is taking part in many International Sports Competitions.

We should all get involved in some form of sport as a means of recreation and exercise. If we understand that a sporting people is an active and healthy people, then we can see the importance of the slogan "Sports For All".

### VOCABULARY

recreation — relaxation.

sporting facilities — places and equipment for playing sports.

existing — already built.

### COMPREHENSION

1. What do Sports do for us?
2. How does a sport become a national sport?
3. In which sports was Grenada leading?
4. Which slogan expresses the aim of the Ministry of Sports?
5. What has been done to improve sports in Grenada?

### DISCUSSION

List all of the sports which are played in Grenada.

Which sports are most popular in your area?

What are the sporting facilities in your area?

There are many sports which can be played in any area. These do not require expensive equipment or specially prepared grounds, for example, jogging and draught competitions. Discuss what can be done to introduce these in your community.

Invite one of the Parish Sports Co-ordinators to speak to the class about the development of sports in the parish.

Find out about the history of Sports in your parish or community. Write a short history and send it to the Ministry of Sport.

## GRAMMATICAL PRINCIPLE

*Personal Pronouns*

John came home and John went away.

John came home and *he* went away.

Instead of repeating *John* twice in the same sentence *he* is used.

The people of Grenada won their freedom and the people of Grenada will defend this freedom.

The people of Grenada won their freedom and *we* will defend *it*.

Instead of repeating *the people of Grenada*, *we* is used and instead of repeating *freedom* we use *it*.

- *He, we* and *it* are called pronouns because they replace the nouns *John, people of Grenada* and *freedom*.
- *A word which is used instead of a noun is called a pronoun.*

Here are some pronouns:

| | |
|---|---|
| I | Me |
| You | You |
| He | Him |
| She | Her |
| It | It |
| We | Us |
| They | Them |

Some pronouns are singular (one); others are plural (more than one).

| *Singular* | *Plural* |
|---|---|
| I | We |
| Me | Us |
| It, She, He | They |
| You | You |
| Him, Her | Them |

## EXERCISES

1. Rewrite these sentences using pronouns in place of the underlined words:

   The doctor promised that the *doctor* will return.

   Peter and John said that *Peter and John* will leave soon.

   Ann-Marie tries hard to improve *Ann-Marie's* typing.

   The boys took the books and placed *the books* in *the boys'* bags.

   The small farmer grows a lot of food on *the small farmer's* land.

   The road workers cooked *the road workers* food on a coal pot.

2. Which are the pronouns in these sentences:

   The fisherman pulled up his line.

   We went with them to the party.

   You can take us to her farm.

   Andrew's mother gave him some bluggo.

   I went to the airport with him.

3. Write sentences using these pronouns:

   | | | | |
   |---|---|---|---|
   | Him | Them | You | It |
   | I | They | She | We |

4. What pronouns would you use for these nouns?

   | | | |
   |---|---|---|
   | Bernard | Merle and Lennox | Hillsborough |
   | Carol | The house | The mansion |
   | Books | The children | Houses |

UNIT 11

# WORKING THE COCOA

Long ago, people would be awakened by the sound of conch shell very early in the morning. The workers were being called to the cocoa fields. The men and women took up their cutlasses and cocoa knives and headed for the fields.

With care, they cut off the cocoa pods from the tree. Pods which could not easily be reached by the cutlass were

Fig. 11

picked using the cocoa knife. They took great care not to damage the eye on the tree where the pod grew. If this happened, no pod would ever grow on that spot again.

While some picked the cocoa, some collected the pods and other workers broke the cocoa to remove the beans. Each pod contains about forty beans which are pink and bitter. The beans were taken to the cocoa house and placed in sweat boxes. After a few days, they turned from pink to brown and lost their bitter taste.

The brown beans were placed on boucans – large drying trays– to be dried by the sun. Long ago, the beans were polished after drying by women dancing on flat trays heaped with cocoa beans. They sang special songs and danced to the beat of the drums in the Cocoa Dance.

These songs and dances, the call of the lambie shell, are part of the culture of our people. They are habits and styles which came out of the way we made our living.

### VOCABULARY

contains – has.

conch shell – lambie shell.

### COMPREHENSION

1. How were workers called to work long ago?
2. Why did they cut the pods carefully?
3. What happened to the cocoa after it was picked?
4. How were beans polished long ago?
5. From what does our culture come?

### GRAMMATICAL PRINCIPLE

*The Relative Pronoun*

The nurse who helped the man fell down.

The word *who* refers to the nurse. It tells us that the nurse who fell down was the same nurse who helped the man. In other words:

The nurse fell down.

Which nurse? – The nurse who helped the man.

The chair which was bought was broken.

*Which* refers to the chair. It tells us that which was broken is the same chair that we bought.

The woman took the bucket thas was full.

*That* refers to the bucket. It tells us that the bucket which the woman took was the full bucket.

- *Who, which, that* are relative pronouns. They refer to nouns.
- *A relative pronoun is a word which joins two parts of a sentence and refers to a noun or pronoun already used in the sentence.*

  I read the book *which* you gave me.

  I read the book. You gave me the book (the same one I read).
- The relative pronouns are who, whose, whom, which, that, what, as.

There are also some more difficult relative pronouns.

| | | |
|---|---|---|
| whoever | whichever | whatever |
| whosoever | whichsoever | whatsoever |

| Using Relative Pronouns |
|---|
| **1. *Who* refers to people only.** |
| **2. *Which* refers to animal and things.** |
| **3. *That* refers to persons, animals and things.** |

**EXERCISES**

1. Fill in the blanks with one of the relative pronouns.

| who | which | that | whom |
|---|---|---|---|

The man to _____ I spoke is very short.

The gardener picked the fruits ______ were ripe.

He is the man ______ all Grenadians love.

That boat ______ carried bananas is very big.

We found the child ______ was lost.

The house ______ we built is in St. Mark's.

I met the man ______ sailed the boat.

2. Point out the relative pronouns in these sentences and say to what noun they refer:

He never saw mangoes like these.

The man who helped the nurse fell down.

The sheep that I bought from you was young.

He who hesitates is lost.

I saw a mongoose whose fur was white.

The car which you drive uses endless gas.

3. Two simple sentence can be made into one sentence by using relative pronouns. For example:

The woman took the basket. It was a full basket.

The woman took the basket that was full.

Change these sentences using relative pronouns:

I read a book. It was very interesting.

The farmer planted vegetables. Vegetables are profitable.

I saw the man. His leg was broken.

Stanisclaus and Courtney were murdered by Counters. Stanisclaus and Courtney were from St. Patrick's.

I know the artist. She made this carving.

He hesitates. He is lost.

The hen laid this egg. The hen is healthy.

UNIT 12

## COCOA AND CHOCOLATE

Most of the cocoa produced in Grenada, other parts of the West Indies and Africa is sent to Europe and America. It is bought by giant companies who own large factories in which chocolate and other cocoa products are made. They buy our cocoa at very low prices and sell us the things that they make from "we cocoa" at high prices. We do not have a say in the prices which we get for our cocoa beans because we are too divided. The poor countries which produce cocoa can only have a bigger say if we come together in a Cocoa Producers Association. In this way we can struggle together for just prices for what we produce. At the same time we are moving to free ourselves from dependence by producing our own chocolates and cocoa products.

What is done to the cocoa beans to make chocolate? At the factory, the cocoa beans are cleaned properly, then they are cracked and the shells removed. The bits of cocoa are parched at a special temperature to bring out their flavour. After parching they are ground to a thick paste. When it is ground fine, the cocoa becomes a thick paste because of the cocoa fat in it.

When making cocoa powder some of the cocoa fat is removed. This leaves the cocoa in firm, dry cakes which are broken and ground again. The ground powder is passed through silk sieves to collect the fine cocoa powder. When chocolate is being made, the cocoa fat is not removed. Instead the thick cocoa paste is mixed with sugar, put into moulds and passed through a machine where the bars of chocolate are hardened.

With the development of Agro-industries, Grenada is setting up factories to process agricultural crops. Already we are producing our own coffee and tinned juices made from local fruits. We are moving to make full use of our agricultural crops so that we can make more money for our country, provide more jobs for our people and as comrade Maurice Bishop says: "sell them Smilo instead of buying their Milo".

**VOCABULARY**

produced — made in.

ground — crushed.

sieves — strainers.

moulds — a special pattern in which things are put to harden.

to process — to make.

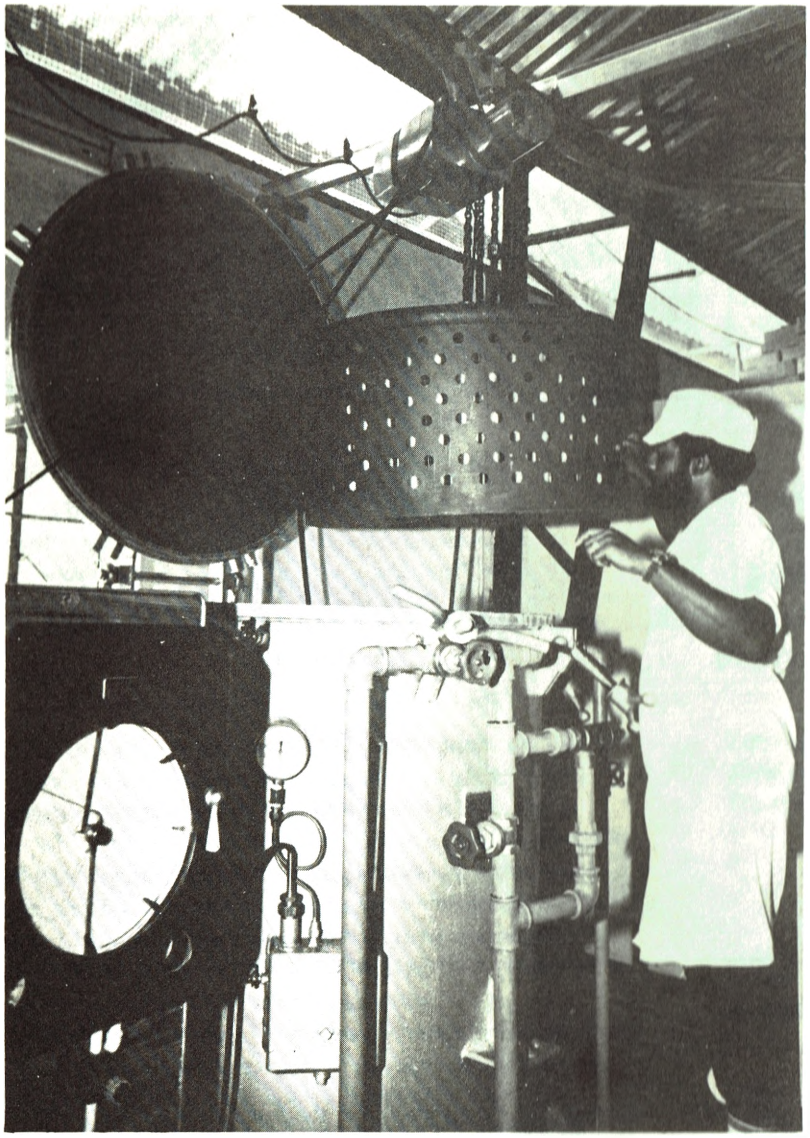


Fig. 12

## COMPREHENSION

1. Who buys Grenada's cocoa?
2. How can we get better prices for our cocoa?
3. Describe the main steps involved in making cocoa.
4. What has been done to develop Agro-industry in Grenada?
5. Why is it necessary to develop Agro-industries?

## DISCUSSION

Invite an officer from the Grenada Cocoa Association to speak to the class on the struggle for better prices for our cocoa.
An officer of the Ministry of Agriculture can also be invited to speak on the development of Agro-industries. The class should examine the possibility of visiting one of the Agro-industrial factories, e.g. the Coffee Processing Plant or the Canning Factory.

## GRAMMATICAL PRINCIPLE

*Gender of Pronouns*

She is busy at work.

*She* is a pronoun because it stands for a noun, it stands for a feminine noun. *She* refers to Marie or Carol or Ann-Marie. It refers to a woman. The pronoun *she* therefore is *feminine gender.*

He ran to his brother.

*He* is a pronoun which refers to a man. The pronoun *he* is *masculine gender.*

In 1974 we marched daily in the streets.

The pronoun *we* refers to the people who marched every day in 1974. It does not say that only men or only women marched.
It means that both men and women marched. *We* is *common gender.*

- Pronouns have gender. Pronouns, like *he* have *masculine gender.* Pronouns like *she* have *feminine* *gender.* Pronouns like *we* have *common gender.* Pronouns like *it* have *neuter gender.*

**DO YOU REMEMBER?**

Masculine gender — male.

Feminine gender — female.

Common gender — either male or female.

Neuter gender — no sex — not male and not female.

**EXERCISES**

1. Underline the pronouns in these sentences and say what is their gender:

   He brought them to visit the tourist ship.

   They helped him to build his boat.

   Bring the boy to her.

   I remember when we used to study together.

   She gave them some oil-down.

2. Write six sentences using pronouns of common gender.

3. Write three sentences using pronouns of masculine gender and three using pronouns of feminine gender.

4. Choose a story in this week's copy of THE FREE WEST INDIAN. Pick out all of the pronouns from a paragraph and give their gender.

## UNIT 13

### BIG DRUM DANCING


Fig. 13

If you have any doubts about our African heritage and the richness of our culture you should see the Big Drum Dancers from Carriacou perform. The Big Drum Dance shows the historical link between Africa and the Caribbean. This is clear in the movements of the dance, the style of the music and the use of the drum. It is an exciting and unforgettable experience. Wherever the Carriacou Big Drum Dancers perform they always impress everyone who sees them.

The Big Drum Dance is a highly organized one. The Dance itself is not one dance but several dances done in a particular style. The Dances are done by a Big Drum Dance Troupe consisting of about thirty five members. There is an equal number of men and women dancers called "sets". Besides the dancers there are singers who sing along with the drummers. The songs are sung in English or patois and sometimes in a language which no one understands, an African language which has long been forgotten, only the time and rhythm of Africa remain. The drummers play drums made of tightly stretched goat skin. There are four main Big Drum Dances: the Alaycurd, the Ajuba, the Ebo and the Callender. All are intricate and beautiful dances which are not easy to describe.

The Big Drum Tradition, like all the other parts of our culture, tell us who we are as a people. Where we have come from is clear in our dance movements, our patterns of song and music. Who we are is clear in the messages of our culture but above all our culture reminds us of what we would like to be.

## VOCABULARY

heritage -- background, history

particular -- special.

consists -- made up of.

intricate -- complicated.

## COMPREHENSION

1. What elements of the Big Drum Dance show our African background?
2. What is the size of the Big Drum Dance Troupe and what is the troupe comprised of?
3. In what languages are the songs of the Big Drum sung?
4. Name the four main dances of the Big Drum?
5. What does our culture say?

## GRAMMATICAL PRINCIPLE

*Review of Gender*

Read these groups of words:

| *Group A* | *Group B* | *Group C* |
|---|---|---|
| he | she | people |
| husband | wife | crowd |
| policeman | aunt | crew |

What makes the words in each group similar?

The words in Group A represent males. They are *masculine gender*.

The words in Group B represent females. They are *feminine gender*.

The words in Group C represent things which can be either male or female. They are *common gender*.

The *nurse* took care of the *patient*.

Sometimes it is difficult to tell whether nouns or pronouns are masculine or feminine. For example, in the sentence above, *nurse* and *patient*. There are male nurses and female nurses. There are also male and female patients. *Nurse* and *patient* are *common gender*.

The *car* ran off the *road*.

In the sentence above, the nouns *car* and *road* are neither masculine nor feminine. They are *neuter gender*

## EXERCISES

1. Write in the correct word for the missing gender

| *Masculine* | *Feminine* |
|---|---|
| ________ | Daughter |
| ________ | Cow |
| Cock | ________ |
| ________ | Sister |
| Uncle | ________ |
| ________ | Actress |
| He | ________ |
| His | ________ |

2. Rewrite the following sentences changing the genders of the underlined words:

The *sow* pig got away.

The *policewoman* directed the traffic.

My *father* raises *bulls* in the country.

My *brother* and my *aunt* work hard in the shop.

| *Masculine* | *Feminine* |
|---|---|
| Bullock | Heifer (cow) |
| Bridegroom | Bride |
| Dog | Bitch |
| Hero | Heroine |
| Bachelor | Spinster (maid) |
| Ram-goat | Ewe (goat) |
| Jack-ass | Jenny-ass (donkey) |
| Buck | Doe (rabbit) |

3. Underline the nouns which are *common gender*.

Men, women and children, the people of Grenada marched in the streets in 1974.

An adult is a grown up person.

She never gave up the care of the sick.

Mothers who have babies should breast feed them.

4. Pick out the nouns and pronouns of common gender from the list and make sentences using them:

| | | |
|---|---|---|
| cousin | villages | workers |
| lady | us | them |
| children | student | bull |
| sheep | we | woman |

## OUR INTERNATIONAL AIRPORT

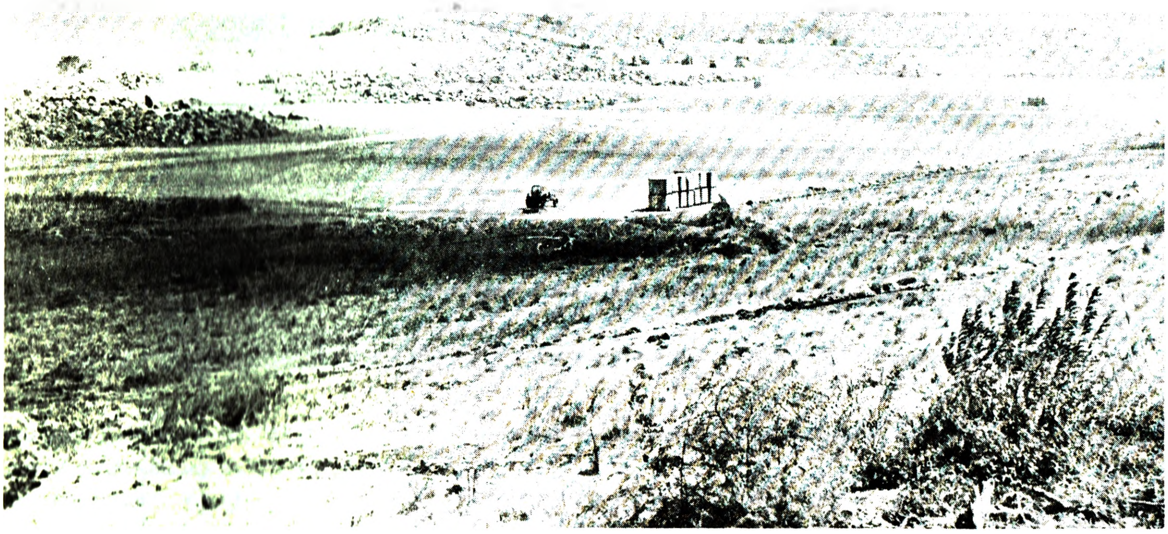


Fig. 14

One of the things that Grenada needs most if it is to develop its Tourist Industry and to become more independent, is an International Airport. Our people and country have suffered in the past because we did not have such an airport. Any country which does not have a proper link (like an International Airport or Deep-water harbour) with the rest of the world is not able to develop itself properly. It stays like an unfixed back road, out of the way and without any traffic of its own. It remains dependent on other countries to allow it access to the bigger world.

We have been depending on the neighbouring islands to connect us to the big countries. Many times relatives and visitors find it difficult to get here. When we did not have an International Airport our trade with other countries suffered. There are good markets for fresh fruits and vegetables in Europe. Our farmers can only sell on these markets if we have reliable and direct links with these countries. The hundreds of tons of fresh and frozen fish which our fishing industry will produce can also be sold in this way. The increase in tourists will help to bring more jobs and benefits because our whole tourist industry will expand.

At a certain point in the history of every country, there are certain things which must be done if that country is to develop further. These things are necessary because too many other things depend on this getting done. In Grenada, the building of an International Airport is this must.

### VOCABULARY

independent – free to have your own say.

neighbouring – next door, nearby.

to overnight – to spend a night in one place.

### COMPREHENSION

1. What does Grenada need most now to develop itself
2. What are the disadvantages of not having an International Airport?
3. What will our International Airport do for our country?

### GRAMMATICAL PRINCIPLE

*Compound Words*

Have you noticed that there are some words which are made up of two smaller words joined together?

postman = post + man

- *Words which consist of two smaller words joined together are called compound words.*

  Sometimes a compound word is written with a hyphen or a small bar between the two words.

  tooth-brush

**EXERCISES**

1. Match the words in Column A with the correct word in Column B to make compound words:

| *Column A* | *Column B* |
|---|---|
| House | Brush |
| Shirt | Lap |
| Wind | Case |
| Tooth | Jack |
| Pig | Mill |
| Water | Top |
| Book | Sty |

2. Separate these compound words and then write sentences using the words which you have made:

| | |
|---|---|
| Roadside | Playground |
| Steamship | Armhole |
| Watermelon | Parent-teacher |

3. Try this crossword puzzle. All of the words in it are compound words.

*DOWN*

(1) A special room in the house that makes us fresh.

(2) An insect which produces a sweet, sticky liquid that we drink.

(3) Closed shelves.

*ACROSS*

(1) To protect us from the rain.

(2) We use it everyday to prevent decay.

(3) "We are in nobody's ...........".

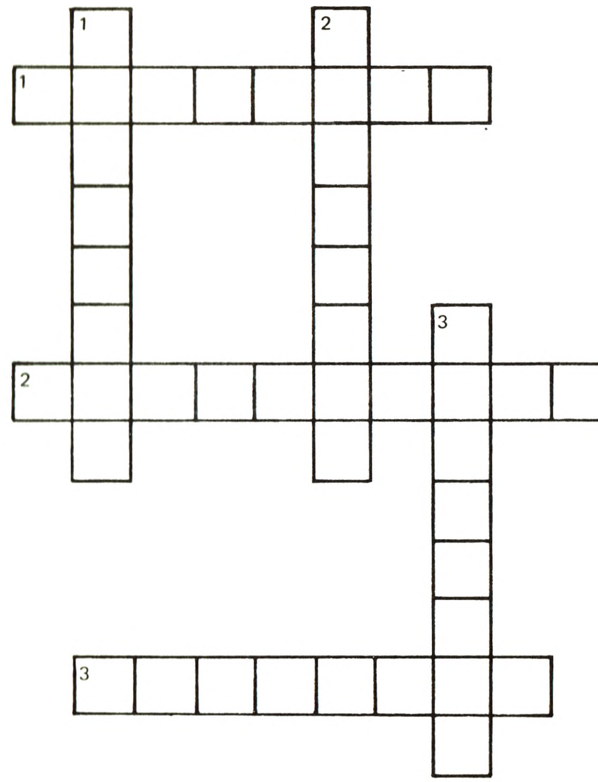


Fig. 15

**UNIT 15**

## BOAT BUILDING IN CARRIACOU

Our sister island of Carriacou is well known for its traditions and many talents. Carriacou has been making a valuable contribution to the development of our national culture, through its music and dance. Another tradition for which Carriacou is recognized is boat-building. During the early 19$^{th}$ Century Carriacou and the other Grenadine islands were the centre of a thriving whaling industry. The whaling industry stimulated boat-building in the Grenadines and soon Carriacou became the main boat builder. Another activity which later encouraged boat building on the island was the Annual Carriacou Regatta. Started over ten years ago, the Regatta is a big, popular event in Carriacou. Boats come from many other islands to take part in the races. Some come from as far away as the Virgin Islands. Many of the local boats taking part are built in Carriacou.

Of all the boat building villages in Carriacou, the most famous is Windward. This village is found on the east coast of the island and many of the villagers are descendants of Scottish people who came to Carriacou long, long ago.

One of the leading *shipwrights* or boat-builders in Windward is Jassie Compton. Jassie is fifty-eight years and

Fig. 16

has been building boats for twenty years. Like many other boat builders he learnt the skill from his father. It is a skill that has been slowly dying but which is necessary to preserve. To build a boat takes about four months and is a process requiring patience. With modern means and the involvement of more people boat building can become a fast and thriving industry.

**VOCABULARY**

traditions — practices from long ago.

thriving — pro fitable and growing.

whaling industry — the hunting of whales and the making of whale oil.

stimulated — encouraged.

descendants — the children and grand children of.

**COMPREHENSION**

1. Name two traditions for which Carriacou is well known?
2. What industry encouraged boat building in Carriacou?
3. Which present day event is a big, popular one?
4. Which village is the leading boat building area?
5. How can boat building become a thriving industry?

**GRAMMATICAL PRINCIPLE**

**DO YOU REMEMBER?**

Review of *the verb. The Past Continuous tense*

- *Verbs are doing words or action words.*

The cow *ran* across the road.

*Ran* is the verb. It tells us what the cow did.

1. Pick out the verbs from these sentences:

   The people of El Salvador fight for Freedom and Justice.

   We clapped and chanted at the rally.

   The workers picked and cut lots of coconuts.

   Tim ate four ripe bananas and gave the rest away.

2. Name three actions which might be done by each of these persons:

   a gardener

   a cricketer

   a baby

   the tree

   your son

3. Choose the best verb from the list to complete each sentence:

   warned cooked rushed caught

   Sonia __________ her sister to the hospital.

   The man __________ the thief in his house.

   He __________ warned his son about getting in trouble.

---

We *were climbing* Grand Etang when we saw the plane.

The verb *were climbing* tells us what action *was happening* when we saw the plane. The verb *were climbing* is the *past continuous tense.*

While we *were reading,* the lights went out.

The verb *were reading* says what action was going on when the lights went out. *Were reading* is the *past continuous tense.*

- *The past continuous tense tells us what action was going on when something else happened.*

  I *was reading* They *were dancing*

- The past continuous tense is usually formed by *the past tense of the verb to be* plus *another verb ending in -ing.*

  was + read-ing were + danc-ing

EXERCISES

1. Form the past continuous tense of these verbs:

   to do to eat to walk

   to stop to cry to fight

2. Change the following sentences to the past continuous tense:

   Our friends help us.

   I opened the door.

   We sang a calypso.

   The farmer works in the field.

   The workman paints the house.

3. Change the verbs in italics in these sentences to the past continuous:

   It *rained* when we went out.

   I *ran* home when it rained.

   The bus *left* when the man arrived.

   The people *marched* with the parade.

   The green beasts *attacked* Otway House while the students hid.

## UNIT 16

## WHO REMEMBERS


Fig. 17

Who remembers Strong Man and Spanner Toe
Feeding pig and driving cart and stinking up de place
And Now— Now ring a bell roun' town
Advertising sale in Granby's store
Singing "All size posies to fit all bamsies"
Who remembers when de fus' airplane land in Pearls
Airport
How big man and woman run and bawl
And now even before me grandfather
See cyar for de fus time he always
Used to hear dat cyar does kick up a lotta cloud dust,
So anytime he see a lotta cloud and dust
He used to say "Ah tink ah see cyar pass".

Who remembers buying penny corn
And ten cents rum
And bus used to run penny a mile
And vendours leaving LaBaye on a Friday night
And walking over Grand Etang
And T. A. Marryshow going [illegible]
Wid he [illegible] behind tear [illegible] Grand Etang
[illegible]
[illegible] lying down in [illegible]
[illegible] Qua and bawling "[illegible] Time for Bonzo"
And who remembers stingy brim hat
And pointy-tip shoe
And red handkerchief in you back pocket too
And even after Mooshay got married
At the tender age of thirty-five
He mudder still hold him
And bust he tail on de warf
And college boy used to fraid to pass in front Convent
So dey had was to wait at de foot of Market Hill
To accomplish their mission
And man used to count woman for ten years
And engage them for another five
And de woman fadder still used to turn round

And ask "Young Man, what is your intention?".
And who remembers when Palmer school was on
Melville Street
And Police Boys Club used to meet in de drill yard
And who remembers when cock had teeth
And donkey was green
And two fellas tief a pig and paint it pink...
Who remembers?
You think them days could ever come back?
Joke you making!

*Chris De Riggs*

**GRAMMATICAL PRINCIPLE**

*The future tense of the verb*

I *will go* to the beach tomorrow.

In this sentence the verb *will go* tells us that the action has not been done — it is something that will happen in the future. The verb *will go* is in the *future tense*.

- *The future tense is used to describe actions that will take place in the future.*
- *The future tense is indicated by the words* will *and* shall.

I *will* defend my people and my country.

**EXERCISES**

1. Turn these sentences into the future tense:

   Ball Wizards won the match yesterday.

   Air Grenada lands at our International Airport.

   I wrote my brother last week.

   The students worked hard.

   Agricultural workers make a big leap forward.

2. Correct these sentences giving the right future tense.

   We will won the fight.

   The plane will landed at the airport.

   If I will saw him, I will tell the person.

   She will grew lettuce in her garden.

**UNIT 17**

## EL SALVADOR REVOLUTION OR DEATH!

El Salvador is one of the smaller countries of Central America. Most of the people live in the countryside, more than half of all the adults are unemployed and more than half of those working earn less than $27 a month. Babies die in large numbers from malnutrition and disease.

The poor, oppressed people of El Salvador have a long history of struggle. Much blood shed and sacrifice went into the struggle for independence from Spain. After independence the struggle of the poor for land, food and jobs continued. The handful of rich, powerful families who own more than half of the best agricultural land brutally suppressed this struggle. In 1932, an insurrection led by Farabundo Marti was crushed and 30 000 people were murdered. Although the struggle was set back by this defeat, the poor, the workers, farmers and students continued to resist the big rich landowners. The tiny, handful of powerful families who continued to control the riches of El Salvador became known as the Oligarchy.

Since 1970, when the Farabundo Marti Peoples Liberation Forces (FPL) was formed, the struggle for a new and just El Salvador grew stronger. But the reaction of the Oligarchy also became stronger. Facing the rising rebellion of the people they have been using their army to torture and murder. More than 50 000 people have disappeared or been murdered. One of the main supporters of the poor, Archbishop Oscar Romero was murdered while saying mass in Church.

Now the entire people of El Salvador united behind the Revolutionary Peoples Bloc is fighting a life or death battle for a new lift. This battle is a difficult and bloody one because US Imperialism has been giving a great deal of military help to the rulers.

No matter how long it takes and no matter how much help the oligarchy gets, the people of El Salvador will win one day. They will win because nothing can beat a united and determined people.

## VOCABULARY

suppressed — crushed.

insurrection — popular uprising.

Oligarchy — a small, powerful group of rich owners.

## COMPREHENSION

1. Where is El Salvador?
2. What are the poor struggling for in El Salvador?
3. What happened in 1932?
4. Who is the Oligarchy?
5. What organization is leading the struggle of the Salvadorian people?
6. Why has the struggle of the poor in El Salvador been difficult?
7. Why will they win?

## ENRICHMENT EXERCISE

1. Punctuate these sentences:

   dave and frank live in this house

   royston went to carriacou for his holiday

   have you ever been to coast guard in st. mark's

   woy that driver is something else

   get out of this room

2. Pick out the nouns from the following words:

| | | |
|---|---|---|
| each | horse | meat |
| PRA | baby | hard |
| eat | write | Walker |
| paper | lazy | yellow |

3. Write the names of: five persons, five places, five things.
4. Make a list of six things that you do each day and write six sentences about them.

Fig. 18

5. Underline the verbs in each sentence and say whether they are in the *past continuous tense* or the *future continuous tense:*

   We shall enjoy the beautiful moonlight.

   He will be joining the People's Army soon.

   I will write all my letters tonight.

   You were driving yesterday.

   Endless people were bathing on the beach.

6. Underline the adjectives and say whether they are adjectives of quantity or quality:

   A big revolution in a small country.

   Many people were watching the colourful rainbow.

   Strong women were picking hundreds of big oranges.

   History is the long and difficult road to freedom.

7. Rewrite these sentences inserting pronouns where necessary:

   The woman took the womans cabbages to the market.

   Fish is very good food. Fish contains proteins.

   Our people must eat what our people produce.

   When the man got home the man told us that the mas was here.

8. Complete these sentences with the correct relative pronouns from the box:

   | | | | | |
   |---|---|---|---|---|
   | **who** | **which** | **whose** | **that** | **whom** |

   We saw the fireman ________ saved these children.

   Charles was the man ________ I saw.

   ________ book do you want?

   I don't know ________ cutlass this is.

   This is the house ________ Leon built.

   I met a Grenadian ________ name was Fedon.

   Gomery cut the tree ________ was on the boundary.

9. Correct these sentences:

   The tyres wears out.

   I goes to the market often.

   Children believes in film shows.

   You uses to visit me often.

   Bogo try hard to raise his daughter properly.

10. Use one word from each column to make one compound word:

    | | |
    |---|---|
    | jam | brush |
    | back | cloth |
    | foot | jar |
    | tooth | ball |
    | table | yard |

UNIT 18

## FERTILIZERS AND THEIR USE


Fig. 19

Nitrogen, Phosporous and Potassium are called primary nutriments because they are the ones most needed by plants in large amounts. Most types of Fertilizers and Manures contain these nutrients. Among the secondary or less important nutriments we have Calcium, Magnesium and Sulphur.

Let us look at each of these nutriments to understand their role in the life of plants.

*NITROGEN:* There would be no life without the presence of this element. It plays an important role in the life blood of living things. Nitrogen is also present in many other chemical substances. It is specially important in the growth and development of plants. Without it, plants are not able to grow and bear properly.

*PHOSPOROUS:* This element is found in the soil, and in the living cell of plants. When the soil is first put into cultivation, the phosporous in it is used up by the growing crops. When most of the phosporous in the soil has been used up in this way, the development of the crops is affected.

*POTASSIUM:* It is another Primary nutriment like Nitrogen and Phosporous, the other primary nutriments, plants are unable to live without it. Lack of Potassium prevents them from growing properly. The secondary nutriments are Calcium, Magnesium and Sulphur.

*CALCIUM:* It is used to make the soil less acid and also helps the plant to develop.

Magnesium is an essential nutriment for vegetables. It helps in the making of Chlorophyll, the green substance in the leaves.

Sulphur helps to form protein in the roots of plants and enables the plant to absorbs nitrogen.

## VOCABULARY

nutriment — nourishing substance.

cultivation — the planting and growing of plants.

chlorophyll — the green substance in leaves and vegetables. It helps the plant absorbs sunlight.

## COMPREHENSION

1. What are the primary nutriments?
2. What are the secondary nutriments?
3. What does nitrogen do for the plant?
4. What is Calcium used for?

## GRAMMATICAL PRINCIPLE

- *An adjective is a word which describes a noun.*

*Green* mangoes can be eaten with salt and pepper.

The word *green* tells us what colour the mangoes are, it *describes* the mangoes. *Green* is an adjective.

- Adjectives can be formed by adding *–y* to some words.

| | | | |
|---|---|---|---|
| rust | storm | cloud | NOUN |
| rusty | stormy | cloudy | ADJECTIVE |

- When –y is added to some words, we double the last letter of the word. For example:

| | | | |
|---|---|---|---|
| skin | sun | bag | NOUN |
| skinny | sunny | baggy | ADJECTIVE |

- When –y is added to words ending with *e*, this letter is dropped:

| | | | |
|---|---|---|---|
| noise | ease | stone | NOUN |
| noisy | easy | stony | ADJECTIVE |

- Some adjectives are formed by adding *ful* to the noun (*–ful* when added to a noun means "full of"):

hope hopeful — full of hope

truth truthful — full of truth

- Some adjectives are formed by adding *–less* to the noun (*–less* when added to a word means "without"):

hope hopeless — without hope

noise noiseless — without noise

- Some adjectives are formed by adding *–ous* to the noun:

danger dangerous

fame famous

notice that the *e* in *fame* has been dropped.

## EXERCISES

1. Fill in the gaps in these sentences with an adjective ending with *–ful* made from the words in the bracket:

   The hunter took ________ aim. (care)

   The June 19th bombing was a ________ sight. (pain)

   The coconut tree is a ________ plant. (use)

   The children were very ________. (play)

2. Fill in the gaps with a word from the list below:

   powerless careless tasteless

   leafless homeless lifeless

Hurricane Allen made many people ____________.

The ____________ worker cut his foot with his cutlass.

On March 13th the greenbeasts were ________.

Water is a ____________ drink.

The ____________ body of Alister Strachan was recovered from the sea.

3. Make adjectives from these words and then use them in sentences:

| | | | |
|---|---|---|---|
| sun | skin | thank | free |
| stone | mist | shade | pain |
| sick | care | peace | rich |

## UNIT 19

# OUR FUNDAMENTAL GOAL

Our fundamental goal, as we have stated over and over, is to raise the standard of living of the Grenadian people. This means that we are committed to:

- providing more and better quality food for all our people,
- increasing the number of productive jobs which are available,
- ensuring better health care,
- better educational facilities and better housing conditions,
- all geared towards meaningful economic development of our country.

That is why we have placed so much emphasis on developing all farms including state farms, co-operative farms and private farms in order to increase our agricultural out put and grow more of our own food. That is why we are giving a lot of assistance to NACDA to increase national out put and to increase employment.

That is why we have also provided assistance to our farmers through improvements in areas like the availability of water for irrigation. That is why we have up graded health care through providing more doctors, more nurses and more medical support staff. Most importantly we have made all health care free. All this we have done in the first twenty three months of the Revolution.

**From the 1981 Budget speech of Minister of Finance Comrade Bernard Coard**

fundamental — most important, main.

standard of living — conditions of life.

productive jobs — jobs in which people produce goods.

agricultural out put — the quantity of crops which we produce.

irrigation — the watering of crops.

### COMPREHENSION

1. What is the main goal of the Revolution?
2. What does this goal mean?
3. What has the PRG done to achieve this goal?

### DISCUSSION

What has the PRG done to develop the economy?

What are the main areas in which gains have been made? Why?

Which areas still require attention and more work? Why?

### GRAMMATICAL PRINCIPLE

*Adjectives of quality and quantity*

The *rough* sea did much damage to the road.

In this sentence *rough* tells us what kind of sea it was. It is an adjective of quality because it tells us *what kind of sea.*

*Large* mangoes are not always sweet.

The adjective *large* tells us *what kind or what sort* of mangoes are not always sweet. It is an *adjective of quality.*

- *Adjectives of quality tell us what kind of something.*

There were *many* Jamaicans at Bob Marley's funeral.

The adjective *many* tells us *what number or quantity* of people were at Marley's funeral.

A *few* people were liming on the street corner.

The adjective *few* tells us *how many* people were at the street corner. *Few* is an *adjective of quantity* because it tells us *how many* or *what quantity.*

- *Adjectives of quantity tell us what number of something.*

**EXERCISES**

1. Add adjectives of quality to these words:

| | |
|---|---|
| ________ hair | ________ revolution |
| ________ farmworker | ________ day |
| ________ bridge | ________ hero |
| ________ house | ________ village |

2. Make four sentences using adjectives of quality.

3. Underline the adjectives of quantity in each sentence:

   Many militia people were on parade.

   There were ten books on the table.

   Several shots were fired.

   A large crowd came to see the new fishing boats.

   All of our rivers are narrow.

   No money was made at the bingo.

4. Underline the adjectives and say what type of adjective:

   The dark night frightened the young child.

   Every morning brings a new task and another challenge.

   Many books were lying on the brown table.

   The brave people of Vietnam won the long war.

## UNIT 20

### BREAST IS BEST

Fig. 20

Many mothers have been misled by advertisements to believe that a particular brand of powdered milk is the best milk for their babies. All of the big companies which manufacture baby food spend great sums of money to publicise their products and to make parents believe that their brand is the best. They do this because the manufacture of baby foods and milk is one of the most profitable businesses. Every year, these big companies sell $ 5.4 billion in baby food. More than $ 2.7 billion is sold to the poor countries of the world in Africa, Latin America and the Caribbean and Asia. Their milk is best because *they* make big profits from the poor with it!

The World Health Organization –the most important health association in the world– is trying to ban the advertising of baby food. Why? Mainly because medical evidence shows that *the best milk for babies is breast milk.* Breast feeding produces better and more healthy babies than bottle feeding. A study done by the United Nations Children's Fund said: "Efforts to promote the practice of breats feeding can save one million infant deaths a year in the 1980's." So many children die every year because they do not get the nutrition which they need. Often mothers cannot afford to mix as much milk powder as they should and very often the water they mix it with may be dirty or impure. This can cause babies to die.

Only in cases where mothers are very sick or suffer from some disease should they bottle feed the children. The World Health Organization (WHO) estimates that only one out of every one hundred mothers is unfit to breast feed her baby. Nature has provided the mother's milk with all of the essential substances necessary for her baby's health. Breast milk is the cleanest and most nutritious. Breast is best.

## VOCABULARY

misled — fooled.

advertisement — publicity on the radio, in the newspapers, etcetera.

manufacture — make.

products — goods made by a factory.

## COMPREHENSION

1. Why do the big baby food companies spend so much money on advertising their baby foods?
2. How much powdered milk do they sell every year to the poor countries of the world?
3. Which milk is the best milk for babies?
4. Who says so?
5. Why do one million babies die each year from bottle feeding?
6. Why is breast milk the best?

## DISCUSSION

Invite someone from the Nutrition Unit of the Ministry of Health or from the Grenada Planned Parenthood Association to speak to the class on Breast feeding or the use of local foods for babies. The community should also be invited.

## GRAMMATICAL PRINCIPLE

*Adjectives which compare*

Fig 21

Tim is a *tall* man.

Charles is a *taller* man.

John is the *tallest* man.

The adjective *tall* describes Tim's height.

The adjective *taller* describes Charles' height in comparison to Tim's. It tells us that Charles has more height than Tim. The adjective *taller* is a comparative one. It compares Charles height with Tim's.

- *The comparative degree is used for comparing two persons, places or things and is formed by adding —er to an adjective.*

John is the *tallest* man.

The adjective *tallest* describes John's height in comparison to that of both Tim and Charles. This adjective is the *superlative.*

- *The superlative degree is used when comparing more than two persons, places or things and is formed by adding —est to the adjective.*

**DO YOU REMEMBER?** A little poem which we learnt at school:

Good, better, best
Never let us rest
Until the good is better
And the better becomes the best.

To form the *comparative:* add *—er* to the end of the adjective.

To form the *superlative:* add *—est* to the end of the adjective.

**For adjectives which end in *e*, drop the *e* and add *er* or *est*.**

For example: white whiter whitest.

**For adjectives which end in *y*, change the *y* to *i* and add *er* or *est*.**

For example: noisy noisier noisest.

**Some adjectives double the last letter and then add *er* or *est*.**

For example: slim slimmer slimmest.

## EXERCISES

1. Complete the table below:

| | *Comparative* | *Superlative* |
|---|---|---|
| happy | ________ | ________ |
| blue | ________ | ________ |
| ________ | hotter | ________ |
| ________ | ________ | largest |
| big | ________ | ________ |
| ________ | heavier | ________ |
| ________ | ________ | slimmest |

2. Write sentences using these adjectives in the superlative degree:

| | | |
|---|---|---|
| flat | high | thick |
| young | full | light |
| dry | dull | blue |

3. Fit these adjectives under the correct colum in the table below:

| | | |
|---|---|---|
| brightest | duller | short |
| wealthy | roundest | soon |
| greatest | long | faster |
| good | best | better |

| Adjective | Comparative | Superlative |
|---|---|---|
| | | |

## UNIT 21

## OLD TIME EASTER CUSTOMS

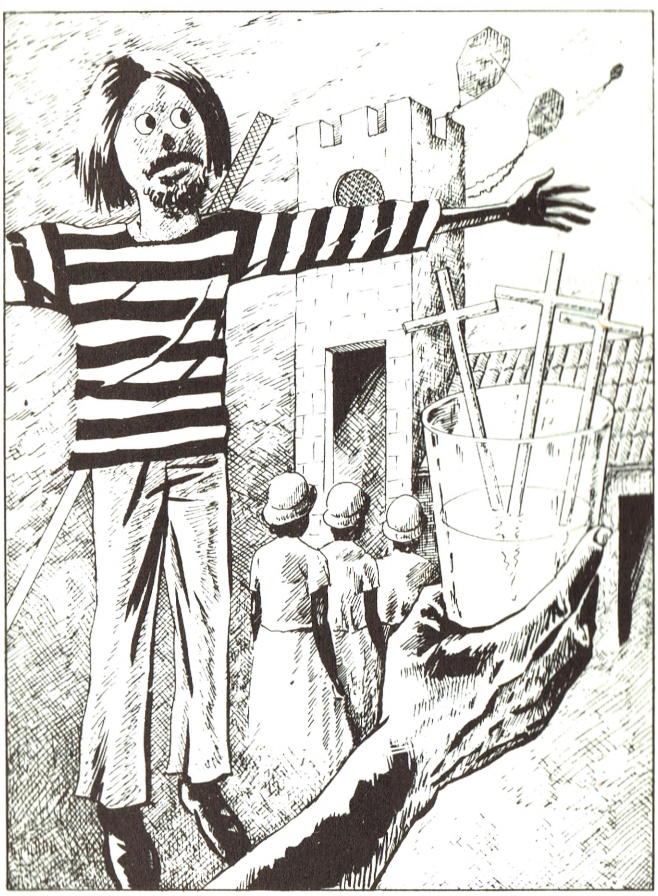


Fig. 22

Kite flying, traditionally associated with the lenten season reaches its climax at Easter. Kites of all shapes and sizes are flown in the sky and for boys, there is no greater fun. Occasionally men do participate in the fun with some man sized kites. Sometimes they enter kite flying competitions with the boys.

For the religious, the weekend is spent going to church, praying, fasting and feasting. On Good Friday devoted christians spend the greater part of the day in church praying and singing sad lenten songs suchs as "There's a green Hill Far Away". Some fast, other eat selected dishes without meat, others eat only fish.

There is also a number of superstitions associated with Easter. A Good Friday custom is to empty the albumen of an egg in a bowl of water at noon. After some time, the albumen would absorb water and takes different shapes. People claimed to predict your future according to the shape of the albumen. There was another belief that if one bathes in any natural body of water (such as a river or the sea) on Good Friday, the water will immediately turn into blood. One Good Friday I tried it, nearly drowned but the water remained crystal clear. Another custom which is dying out is the "bobolee". It is an effigy made to represent Judas, the man who betrayed Christ. The "bobolee" is placed by the road where people can pass by and take revenge by kicking, boxing and spitting on it.

The day after Good Friday is known as Gloria Saturday and is traditionally a good day for river fishing. People go fishing with lines and hooks. In my grand mother's day they used to poison the water with a particular herb which did not kill the fish but made them easier to catch.

Easter Sunday itself is a big day. Christians go to church. Many people spend part of the day on the beach or at block-o-ramas. A boat race from Trinidad to Grenada takes place every Easter Sunday.

Vivian Philher,
*Free West Indian*

## VOCABULARY

| | | |
|---|---|---|
| associated | — | linked with. |
| climax | — | height of activity. |
| traditionally | — | according to old customs. |
| occassionally | — | sometimes. |
| devoted | — | dedicated, firm. |
| selected | — | specially chosen. |
| superstitions | — | false belief. |
| albumen | — | egg white. |
| noon | — | midday, twelve o'clock in the morning. |
| effigy | — | a stuffed doll. |

## COMPREHENSION

1. Which sport reaches its climax at Easter?
2. How do many people spend Good Friday?
3. What are some of the superstitions associated with Good Friday?
4. What is the boboloe?
5. What is the day after Good Friday called?

## DISCUSSION

What other Easter customs do you know of?

Do you know any other customs (for other seasons) which are dying out? What are they and how do you think they began?

Why do superstitions die sooner or later?

## GRAMMATICAL PRINCIPLE

*The preposition*

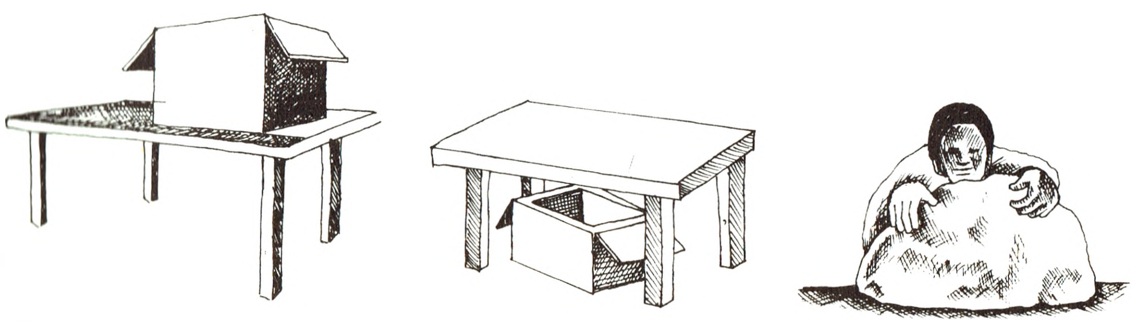


Fig. 23

The box is *under* the table. The box is *on* the table.

The man is *behind* the rock.

The words *under* and *on* tell us *when* the box is in relation to the table.

The word *behind* tells us *where* the man is in relation to the rock. It says here is the rock, where is the man? He is behind the rock.

The words *under, on* and *behind* are prepositions.

- *A preposition is a word which shows the relationship between a noun or pronoun and another word in a sentence.*

Here are some *prepositions:*

| | | | | |
|---|---|---|---|---|
| above | before | from | opposite | under |
| after | behind | for | past | up |
| among | beside | in | since | with |
| at | by | near | to | without |

Sometimes we use prepositions incorrectly. Here are some of them which are most often misused:

| | |
|---|---|
| *among* | something is shared *among several persons.* |
| *between* | something is shared only *between two persons.* |
| *from* | something is *different from* another (it is never different *to* or different *than).* |
| *in* | this word tells us that something is in one place. eg. The man was in his house. |
| *into* | something moves from one place to another, e.g. The car fell from the cliff into the sea. |

## EXERCISES

1. Pick out the prepositions from these sentences:

   There were six eggs in the box.

   The manicou hid behind the rock.

   The river flowed under the bridge.

   The bananas were shared between Joan and Maureen.

   I jumped over the fence.

2. Make sentences using these prepositions:

| | | |
|---|---|---|
| about | off | around |
| near | besides | after |
| by | except | until |

3. Fill in the blanks with a preposition:

   The money was divided ________ six of them.
   She loves to be ________ her mother.
   Rupert Bishop died ________ his people.
   This cap is different ________ that one.
   Grenada's plane took off ________ Pearl's airport.
   I took ________ my shoes.

4. Correct these sentences by changing the prepositions:

   I am going in the rain.
   Let us sit on the table to eat.
   Move in the road!
   This car is different to this one.
   Share this orange between the three of you.

## UNIT 22

## WORK STUDY: PREPARATION FOR LIFE

Fig. 24

One of the most important of the new ideas for developing education in Grenada, Carriacou and Petit Martinique is Work Study. The aim of this idea is to get our youth to become involved in productive work while they are studying. Before the Revolution, our students never had a chance to learn very practical things. All they did at school was to study from books. Work Study means that they will now have a chance *to apply* what they are learning from the books. It also means that they will learn things which no book has thaught them. It is by doing that we learn.

By working together, by sharing each other's experiences and problems, students and workers will develop greater understanding and unity. Our young people will learn to respect and value the experience of our workers. By learning in this practical way, our students will be better skilled to find work when they leave school. By getting involved in productive work, for example, agriculture, students help to increase production. Greater production means more wealth for our country which makes possible more schools, clinics, better services and free education.

The first Work Study camps were held at La Sagesse Farm an the Bocage Diamond Farm in April 1981 with almost sixty students. During the two weeks, students attended lectures on agriculture and then worked on the farms together with the farm workers. They planted over six hundred banana suckers, pruned cocoa trees, sorted mace and nutmeg and helped in banana boxing. They learnt also how to identify plant disease, how to use insecticides. Workers taught them how to make many nutritious meals like tannia log from our crops and to make jams.

One of the great men of our Caribbean, Jose Martí said that *To educate is to prepare for life.* Work Study prepares our youth for life because they learn not only from books but from doing practical things. By doing we learn and by learning we do better.

## VOCABULARY

to apply — to put into practice.

lectures — special classes.

insecticides — chemicals used to kill insect pests.

## COMPREHENSION

1. What is the aim of Work Study?
2. How does work study help our students to become better educated men and women?
3. Where and when were the first work study camps held?
4. What did students do and learn at this camp?
5. Who was José Martí and what did he say?

## DISCUSSION

What do you think about Work Study?

Write what you think, why you think so and any suggestions which you have to improve education in our schools.

**To educate is to prepare for Life.**

## GRAMMATICAL PRINCIPLE

*The comma* ,

Earlier on we saw the use of the full stop, the question mark and the exclamation mark. All of these signs play an important role in making it easy for us to read sentences.

Another very common and very important mark is *the comma.*

A full stop is like taking a half hour rest on a long journey. A comma is like stopping for only five minutes to catch your breath along the way.

Fig. 25

José Martí

Commas are used in many ways:

- When the names of three or more persons, places or things come together a comma is used to separate them.

  We grow cocoa, nutmeg, bananas and coconuts.

  (There is no comma between *bananas* and *coconuts* because we have the word *and* joining them. A comma is never used with *and* or with *or.)*

- A comma is used to separate the name of a person directly spoken to from the rest of the sentence.

  Anthony, have you joined the union?

  When are you going to join the militia, Yolande?

- A comma is used after words like *well, oh yes, no, now,* when they begin a sentence.

  Oh yes, June 19 is Butler-Strachan Day.

  Well, I never believed this would happen.

- To separate the word *please* at the end of a sentence, a comma is used.

  May I have some water, please?

## EXERCISES

1. Put commas where needed in these sentences:

   Walker Maudlyn Kenny and Judy live on the West coast.

   Terry have you fed the cow?

   Now it is time to start feeding ourselves.

   Grenada St. Lucia St. Vincent and Dominica are the Windward islands.

   Are you in the NYO Val?

Pool all your efforts
As you unite and stand
Your husband will still love you
With your strong, hard hands.

*Merle Clarke*

Fig. 27

VOCABULARY

rostrum — a stand for speakers at a big meeting.

GRAMMATICAL PRINCIPLE

*Conjunction*

Jane and Charles are in the CPE class.

This sentence above is made up of two sentences:

Jane is in the CPE class.

Charles is in the CPE class.

The word *and* makes it possible to join the sentences.

Jane is in the CPE class *and* Charles is in the CPE class.

Jane *and* Charles are in the CPE class.

The word *and* is a *conjunction* because it joins the sentences.

- *A conjunction is a word which joins two groups of words or sentences together.*

CONJUNCTIONS: **and, but, because, when, while, although, whether, so**

EXERCISES

1. Fill in the blanks with a suitable conjunction:

   The fisherman fished all day _______ caught nothing.

   They ran home _______ it was getting dark.

   He closed the door _______ went away.

   The farmer picked the cocoa _______ his wife collected fruits.

2. Make sentences using these conjunctions:

   and but when while

   so because although whether

3. Make one sentence by using conjunctions:

   He found a dollar. He looked in his pocket.

   The woman went for a walk. It was raining.

   The Revolution will advance. The people are united.

   The children stopped cussing. Their teacher entered the room.

   I did not agree. I told him what I thought.

UNIT 25

## OUR FOREST INDUSTRY

After hurricane Janet in 1955, Grenada lost sixty-five percent of its forest products. Many trees had fallen, leaving the land bare, and resulting in soil erosion. Some help was received from the Colonial Welfare Development Fund through which fifty acres of land were regulated every year. This continued for a few years until the project ended because of corruption and lack of interest.

A survey of the Grand Etang Forests carried out in 1977 showed that the forest contained at least 30 million board feet of timber. To develop the timber industry almost nine miles of new road needed to be cut in the forest

After the Revolution of March 13, the PRG brought a saw mill from Australia. This mill was set up in Grand Etang and is being used to convert crude timber into

Fig. 28

lumber. Despite difficulties caused by the weather conditions, the mill has been increasing production. For 1980 the saw mill produced 373 rolls of split fencing, 1 353 fence posts, 1 676 feet of laths, 530 house posts and three telegraphic posts.

New roads have been built in the Grand Etang forest to give access to two hundred acres of forest. Plans have been prepared to build facilities for sawing, solar drying, fence making, charcoal production, for making plywood and to preserve wood.

Experiments have also been made in growing crops at new heights in the mountains. Bananas have been grown as high up as 1 910 feet up in the Grand Etang mountains. Other crops are also planted together with young forest trees. This prevents soil erosion, makes fullest use of the land and provides shelter for the young forest trees. At the same time new and useful forest trees such as the Caribbean pine, B H Mahogany, red and white cedar, mahogany and eucalyptus are being introduced.

With all of these efforts, the future of our forest industry looks good.

## VOCABULARY

soil erosion — the washing of the soil by rain (in some cases by wind also).

board feet — measurement used for measuring wood.

timber — wood.

laths — thin slips of wood.

lumber — timber or wood cut in lengths and ready for use.

telegraphic posts — long, wooden posts used to support the electricity and telephone cable.

solar drying — a method of drying which uses the heat of the sun.

## COMPREHENSION

1. How did Hurricane Janet affect our forestry?
2. How much timber does the Grand Etang Forest have?
3. What has been done to extract this timber?
4. What are the PRG's plans for our forests?
5. Besides making wood, what other work is being done in the Grand Etang forests?

## PUNCTUATION PRACTICE

1. Try to read this passage. It is difficult because it has no punctuation:

   It was the rainy season rain was falling heavily and everyone was at home inside the house we lay on our small bed listened to the rain and felt cold will there be land slides on grand etang tomorrow i wondered

2. Now read this:

   It was the rainy season. Rain was falling heavily and everyone was at home. Inside the house we lay on our small bed, listened to the rain and felt cold. 'Will there be land slides on Grand Etang tomorrow? I wondered.

3. Punctuate this passage. Put in full stops, commas, capital letters, question marks, exclamation marks and quotation marks where needed:

FISH MARKET ON A SATURDAY

almost every town has a fish market fish markets are usually colorful noisy and smelly places

alstons father sells fish in the grenville market alston helps his father on saturdays when many people come to buy food for the week alston listens to customers bargaining for fish

bonito only two dollars a pound come and get it shouted his father

how much a pound for your big jacks asked miss mary one dollar and fifty cents a pound his father replied

before he had given his reply there was a rush of customers to buy his fish

gimme three pounds

weigh this one for me nuh

in no time all the fish was sold alston asked his father where is the fish you promised to bring home

his father bowed his head as he wondered what lay in store for him when he arrived home without fish

UNIT 26

## FIGHT VULGARITY- RISE TO NEW HEIGHTS

Our struggle to build a new and better Grenada is more than just a struggle to produce more and to bring more benefits to all of our people.

It is also a struggle to make new men and women of ourselves. It is a struggle against complacency, greed and vulgarity. The Revolution calls on us to oppose vulgarity in speech and behavior.

Vulgar speech and manner are anti-social forms of behavior. They do not show respect and consideration for others. Vulgar speech is a sign of a hasty and inconsiderate person, someone who finds it difficult to be at ease with others. A rough manner towards others prevents us from establishing warm and respectful relationships.

Our speech and manner are signs of culture. When we say that someone is cultured we mean that this person has achieved high standards of behavior and speech. This does not mean that the person is imitating foreign patterns of speech and behavior. To carry a false accent and artificial behavior is an expression of insecurity. To be cultured is to demand the best from yourself. It is to speak with clarity and consideration. It is to deal with others in a principled and respectful way. Honesty, consideration and good example are the principles of a cultured person, not the accent of your speech or the cost of your clothes.

We have a responsibility to the Revolution to demand more of ourselves, to raise higher and higher our standards of speech and behavior. In this way we help to create the New Man and Women. By doing this together we become a people of dignity and conscience.

### VOCABULARY

complacency — lackadasical, a "chou poule" attitude.
greed — selfishness.
vulgarity — lack of good manners.
anti-social — unfriendly, hostile to others.
artificial — false, not natural.

### COMPREHENSION

1. What does the struggle to build a New Grenada involve?
2. What does vulgar speech and manner represent?
3. What is a cultured person?
4. How do we make ourselves cultured people?

### DISCUSSION

What are the causes of vulgarity?

How do we fight vulgarity in ourselves?

In what way does vulgarity affect lives in our community?

How can improvements be made?

### GRAMMATICAL PRINCIPLE

*The adverb*

The crowd shouted *loudly.*

The word *Loudly* tells us *how* or the manner in wich the crowd shouted. It describes *the verb shouted. Loudly* is an *adverb.*

We went *there* to collect our wages.

*There* tells us *where* or to *what place* we went to collect our wages.

It describes the verb *went. There* is an adverb.

Yesterday we fished.

*Yesterday* tells us *when* or at *what time* we went to fish. It describes the verb *fished. Yesterday* is an adverb.

- *An adverb which describes a verb to tell how, when or where an action takes place.*

Most adverbs are formed by adding —ly to the adjective for example:

| | | |
|---|---|---|
| Adjective | — merry | kind |
| Adverb | — merrily | kindly |

- An adverb may go before or after a verb in a sentence.

e.g. *Suddenly* he left the room.

He left the room *suddenly.*

Adverbs are similar to adjectives but *there is one important difference.*

Adjectives describe nouns. Adverbs describe verbs.

**EXERCISES**

1. Form adverbs from these words by adding *ly:*

slow polite rapid
busy bad easy
calm kind sad

2. Use each of these adverbs in a sentence:

neatly boldly yesterday
suddenly there unfortunately

3. Here are some adverbs. Complete the sentences below with the correct one:

carefully gently everywhere bitterly
around when late

He searched ______ for his tools.

He breeze blew ______ .

______ are you going?

The child cried ______ .

The woman climbed the ladder ______.

My friend turned ______.

He arrived ______.

4. Link each adverb with the phrase that describes it:

| | |
|---|---|
| fortunately | on the floor below |
| carelessly | in an angry manner |
| downstairs | with an air of joy |
| angrily | full of luck |
| punctually | done anyhow |
| happily | at the correct time |

UNIT 27

## WOMEN STEP FORWARD

In societies where people are exploited, women are always the most exploited group. They do not enjoy the same benefits as the men, they do double work, raise the children, mind the kitchen and do not enjoy their full rights. Often they work to help support their families and still have to do all their housework. Even when they do the same kind of work as the men they are not paid the same wages.

In Grenada before the Revolution women were exploited in many ways. To get jobs they were sexually abused, they received less pay than men for doing the same work. Women agricultural workers for example earned about $5.50 a day while men earned $6.50. Sometimes they did work which was as strenous as the men. In some cases they lifted heavy bags of manure, nutmegs and cocoa just like the men. In the nutmeg pool they cracked and peel the nutmeg. Although this type of work does not require great strength it is very hard on the eyes.

Many changes have been made to bring equal rights and benefits to women. A women's desk in the Ministry of Education, was set up immediately after the Revolution, to handle the problems affecting women, sexual abuse and unequal pay were abolished, maternity leave, union rights, equal pay for equal work university scholarships and new opportunities were won by the women. Today women in Grenada are stepping forward in all areas. They are in the Peoples Armed Forces. They lead important programmes of the Revolution. They are playing more leading roles in the mass organizations in their communities and at a national level.

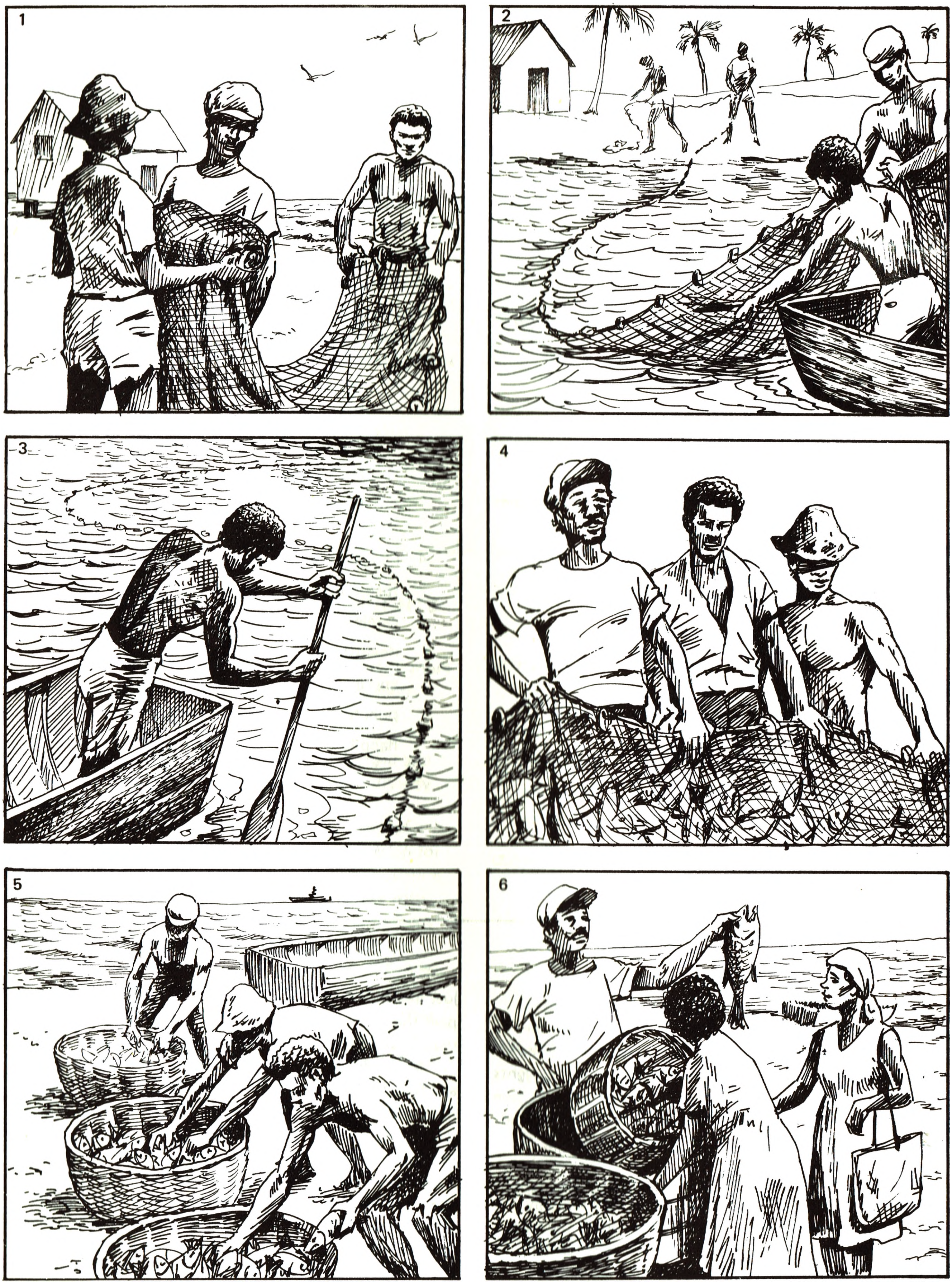



Fig. 29

Despite all these changes there is still room for even greater involvement. Every step forward that our country makes calls for more participation by the women. Women must come together in an organized way. Through their organizations, women can contribute even more to the development of our country.

## VOCABULARY

exploited — used by others for selfish purposes.

sexually abused — forced to have sex.

strenous — hard and difficult.

participation — involvement.

## COMPREHENSION

1. Why are women the most exploited group in some sections?

2. How were Grenadian women exploited before?

3. What changes were made to improve the condition of women?

4. How can women play a greater role in building Grenada?

## DISCUSSION

What are some of the main problems faced by women in your community?

What is the link between these problems and problems of our community?

What is the attitude of the men to these problems?

How can they help the women to play greater role?

Invite an official of the Womens desk or the Women Organization to speak to the class about the role of women. They should also explain the Maternity Law.

## GRAMMATICAL PRINCIPLE

*Paragraph writing*

When telling a story, your sentences must be in the correct order in other words, your sentences should give a step by step idea of what happened. If you do not do this your story will not make sense.

These sentences for exemple do not make sense because they are not in a correct order:

There was a rally at Queen's Park.

May day was International Workers Day.

They sang union songs and heard many speeches.

Long live the International Workers Day.

Hundreds of workers from all over Grenada were there.

They remembered the struggle of workers elsewhere for justice and freedom.

Instead they should read:

May Day was International Workers Day.

There was a rally at Queen's Park.

Hundred of workers from all over Grenada were there.

They sang union songs and heard many speeches.

They remembered the struggles of workers elsewhere for justice and freedom.

Long live the International Workers Day.

Read this: "To plant corn or peas the ground must be prepared. The land must be cleared and cutlassed. It may be forked or ploughed. Rows of holes are made in which the seeds must be placed. Some people sow three seeds of corn and two seeds of peas in one hole. Others sow one row of corn followed by a row of peas planting only one seed in each hole. When planting is done in this way, the yield of corn is much greater."

The passage which we just read is a *paragraph.*

Give the paragraph a name.

It is easy to do so because it talks about one thing: how to plant corn and peas.

- *A paragraph contains one main idea or theme.*
- *It is a group of sentences placed in a special order.*

The first *sentence* of a paragraph is called *the opening sentence.*

This sentence usually gives the main idea or theme. The other sentences *support* or *develop* the *main* idea.

The *last sentence* of a paragraph *ends* or *concludes* the paragraph.

## EXERCISES

1. Give the title or name for the series of pictures above. Write a paragraph about the series.

2. Put these sentences in order:

   I went to bed early.

   Rain was falling heavily so I could not go to the meeting.

   I could not sleep so I read a book.

   It said that the hurricane season really starts in August.

   The book was about hurricanes.

   On Friday morning I had to attend a NYO meeting.

3. Write a paragraph on a topic of your choice.

## UNIT 28

### SPICE ISLE PRODUCTS


Fig. 30

If you go to the supermarket you will find tins of various fresh fruit juices labled Spice Isle Products. There is Mango juice, Soursop juice, Tamarind, Guava-banana and other fruit juices. These tins of Spice Isle juice have been produced by our agro-industrial factory at True Blue.

This factory cost about one million dollars to set up and is able to produce a wide variety of agro-products, fruit juices, nectars, jams, jellies, mango chutney, nutmeg syrup and hot sauce are produced by the factory. The machines in the factory run on steam from a hug boiler and are capable of processing 1 000 pounds of fruit a day. Two or three production lines can be run together to make the juices, can them and label the cans. When it is in full swing, the factory uses up 8 000 gallons of water a day and can produce 2 400 cans of agro-plants.

Think of the hundreds of mangoes which fall from mango trees all over the country to rot on the ground. Think of all the tamarinds, soursops, guavas and cherries which used to waste on the trees. If you can imagine the thousands of pounds of fruits which have been wasted, then you will understand the value of our factory. Our farmers are selling more and more of their fruit to the factory thus getting more money from the land. Our country is selling more and more Spice Isle Products overseas and so establishing a market for things made in Grenada.

The new trade links which our International Airport will open will make it possible to sell even more Spice Isle Products to other countries.

#### VOCABULARY

| | | |
|---|---|---|
| various | – | different kinds of |
| labelled | – | marked |
| agro-industrial factory | – | a factory for making tined juices and fruits |
| variety | – | choice, many different types |
| agro-products | – | tinned goods made from Agricultural crops |

#### COMPREHENSION

1. Name some of the juices made by the Spice Island Products?
2. Where are Spice Island Products made?
3. How much did the factory cost and what can it produce?
4. What are some of the benefits of this factory?

## GRAMMATICAL PRINCIPLE

*Letter writing*

Birchgrove,
St. Andrew's,
6 May 1981

Dear Errol,

I was very sorry to hear about the damage that my animals did to your bananas and vegetable garden. Tom was the one who cared for the animals that morning. Maybe he did not tie them properly and so they broke loose.

I know what a great loss you have suffered financially. I would like to know if you will accept payment for the damage or whether you would like me to replace the banana and vegetable plants. Please let me know which you prefer.

I must also thank you for protecting the animals. I want to assure you that I will take steps to prevent this damage from happening again.

Yours truly,
Brian Thomas

This letter was written by Brian Thomas of Birchgrove to a man called Errol. The letter is about damage caused to Errol's crops by Brian's animals.

You will notice that the letter has more than one part. It has four parts:

(1) the address (2) the salutation (3) the body
(4) the end.

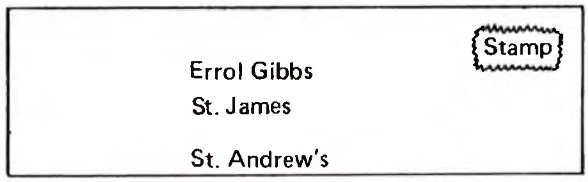
(1) *The address:* the person writing the letter must put his address at the top right hand corner of the page. If the letter is going to be sent overseas then the address should contain *Grenada* in it.

(2) *The salutation:* "Dear Errol" is the greeting to the person to whom we are writing. It is placed at the left hand corner on the line following the address.

(3) *The body:* This is the "substance" of the letter, this part is which we write what we want to say.

(4) We *end* the letter with a "farewell" and sign our name. Most letters end with words like *yours sincerely, yours truly.*

ADDRESSING THE ENVELOPE




On the envelope we put the name and address of the person to whom we are writing.

- *If the person you are writing to lives in Grenada:*
  - put their name, Eric Charles
  - the street and village where the person lives, Soubise
  - the parish where the person lives. St. Andrew's
- *If the person you are writing lives abroad:*
  - name of the person, Carol Clyne
  - street or village, 572 East Street
  - parish or province, Brooklyn N. Y.
  - country. U.S.A

UNIT 29

## OUR NATIONAL COMMERCIAL BANK

"No society can create wealth or a higher standard of living without savings." Those were the words of the General Manager of our National Commercial Bank as he explained the role of the N.C.B. in Grenada today.

The N.C.B. was set up in October 1979 and has been doing very well since then. It is very important to the people of our country for different reasons. First, is the historic importance of Grenada having its own national bank, something that we are all proud of. Secondly, it is a major step towards building our country's economic independence. Thirdly, it means a new stage of banking for our people. We can now have lower rates of interest on loans and more interest on savings. It will also be much easier for working people to get loans to help them increase and improve production.

When we save money at the N.C.B., the bank can use it to do more things that would benefit Grenadians directly. This money can be used to build more factories and hotels which will bring more jobs, to improve agriculture that would provide food for local use and for export and to provide loans for other construction purposes.

It is therefore our duty and in our interest to ensure that the N.C.B. grows from strength to strength. The three branches that were opened so far have been doing very well since and will do better as our people continue to do more and more business there. When we save at the N.C.B. we can feel sure that all Grenadians will benefit and the economy of our country will be strengthened.

BANK IN OUR BANK! BANK N.C.B!

**VOCABULARY**

interest — bonus added to money saved; extra money added on to loans to be paid by the borrower.

construction — building.

savings — money being saved in a bank.

export — sale of local goods abroad.

**COMPREHENSION**

1. Give three reasons why the National Commercial Bank is important to Grenadians.
2. How can the money saved at the N.C.B. be used to develop our country?
3. Can you tell where the three N.C.B. branches are?
4. How can you help the N.C.B. to grow?

**ENRICHMENT EXERCISE**

*Letter Writing*

Study the address on these envelopes:

| |
|---|
| **Bernard Gordon,** |
| **Mary Ann Street,** |
| **Castries,** |
| **ST. LUCIA.** |

| |
|---|
| **Lyris Charles,** |
| **32 Woolwich Road,** |
| **London East 18,** |
| **ENGLAND.** |

The address on the envelope is very important because it tells the post *to whom* and *to where* the letter must go. If there are any mistakes, or if the address is not clearly written the person will never receive our letter.

Observe these rules in addressing your letters:

1. Make sure that you have *the correct address* of the person to whom you are writing.
2. All street numbers and other codes must be correct.
3. Write the address in a clear, neat style so that it can be easily read.
4. Put your own name and address in much smaller writing on the back of the envelope (if there are any problems, the letter will be returned to you).

**EXERCISES**

1. Arrange the address below in the correct order:

   (a) Grenville, Mary Lewis, Sendall Street, West Indies, Grenada.

   (b) England, London East 18, Palistow, Ena Charles.

2. Write a letter to a friend overseas inviting him or her to come to Grenada.

   Draw an envelope and write the person's address.

**UNIT 30**

## OUR MARKET

Dasheen, yam, tannias and potatoes,
Thyme, chive, carrots and tomatoes,
Celery, lettuce, water cress
Which one do you love the best?

********

Beef, pork, chicken,
The housewife moves on, looking
Fish, sea-eggs, local mats
Lambie, lobster and straw hats
Ginger, cinnamon, tonka beans
Cloves, pigeon peas and lots that's green.

********

Oranges, grapefruit and green leaf limes
So much is found in these times
Mangoes, tangerines, manderins
Bananas, bluggoes and plantain
Tamarind, passion fruit, papaw sweet
Make your body look so fit.

********

Ochroes, corn and coconut
Cucumber, pumpkin and kola nut
Breadfruit, breadnut and pineapple
Charcoal, basket and sugar apple
People moving to and fro
As on their business they go.

********

All day long the market scene
Is a bustling hive of human beings
Till late at night when it is closed
People heading for their homes
Carts and cars, trucks and vans
Drive quickly through
As they move away from view.

*Mioni Charles*

# Mathematics

## UNIT 1

### OUR DECIMAL SYSTEM OF NUMERATION

#### REVISION OF NATURAL NUMBERS

In book one we learned to read and write some numbers. Let us just revise a little of what we learned

Let us call these numbers: 10, 20, 30, 40, 50, 60, 70, 80, 90.

Now let us call these: 100, 200, 300, 400, 500, 600, 700, 800, 900

Let us now write the words for these:

1 000 ...................................

2 000 ...................................

3 000 ...................................

4 000 ...................................

5 000 ...................................

6 000 ...................................

7 000 ...................................

8 000 ...................................

Let us build up the numbers between 40 and 50 by adding on ones:

eg. $40 + 1 = 41$

$41 + 1 = ....$

........ = ....

........ = .... etc.

Now let us now build up some numbers between 200 and 300 adding on 10ˢ each time.

eg. $200 + 10 = 210$

$200 + 20 = 220$

........ = ....

........ = .... etc.

We learned also in Book 1 that the basic digits in the numbers, had values according to their positions, for example the 2 in the number 20 really means 2 tens while the 2 in 200 really means 2 hundreds.

Let us put in digits of these numbers in their correct positions in the tables.

(See Fig. 1.1)

Ten raised to the power of 5 equals 100 000

$$10^5 = 100\ 000$$

. . . . . . . . . . . . . .

$10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1\ 000\ 000$

$10^6 = 1\ 000\ 000$

Ten raised to the power of 6 equals 1 000 000

$$10^6 = 1\ 000\ 000$$

. . . . . . . . . . . . . .

$10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10\ 000\ 000$

$10^7 = 10\ 000\ 000$

Ten raised to the power of 7 equals 10 000 000

$$10^7 = 10\ 000\ 000$$

. . . . . . . . . . . . . . .

$$10^3$$

In the example above notice that the digit 3 is written smaller than the other digits. This digit is usually called the exponent.

What does the exponent tell us?

The number 10 is called the base.

What does the base tell us?

Look at any one of the examples given above. What do you notice about the exponents and the number of zeros in the numerals?

Look at the other examples. What do you notice?

*EXERCISE A*

Let us write the numbers that these show:

(1) $10^2$ = . . . . . . . . . . . . . . . . (3) $10^3$ = . . . . . . . . . . . . . . . .

(2) $10^7$ = . . . . . . . . . . . . . . . . (4) $10^5$ = . . . . . . . . . . . . . . . .

Let us write these using powers of 10:

(1) 1 000 = . . . . . . . . . . . . . . (3) 1 000 000 = . . . . . . . . . . .

(2) 10 000 = . . . . . . . . . . . . . (4) 100 000 000 = . . . . . . . . .

In this example, $10^2$, how is the 2 called? . . . . . . . . . . . . . . . . . . . . . . . . .

How is the 10, called? . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

## MULTIPLES OF POWER OF TEN

In Book 1 we saw that when we multiplied the basic digits by 10 we got these results:

$1 \times 10 = 10$

$2 \times 10 = 20$

$3 \times 10 = 30$

$4 \times 10 = 40$

$5 \times 10 = 50$

$6 \times 10 = 60$

$7 \times 10 = 70$

$8 \times 10 = 80$

$9 \times 10 = 90$

The natural numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 were arrived at by multiplying 10 by some other number. We usually say they are multiples of 10.

Let us read and write: multiples

................,................

In the examples $2 \times 10 = 20$

20 is a multiple of 10, and also it is a multiple of 2.

2 and 10 then are usually called factors of 20.

factors

......

Using letters to represent any number:

$$a \times b = c$$

$c$ is the multiple why?

$a$ and $b$ are factors of $c$ why?

Let us write down any two multiples of 10 that we know.

Let us look now at some multiples of 100.

$1 \times 100 = 100$, $\quad 3 \times 100 = 300$,

$4 \times 100 = 400$.

We can write these using powers of 10:

$1 \times 10^2 = 100$, $3 \times 10^2 = 300$, $4 \times 10^2 = 400$

Let us write these numbers as products using powers of 10.

eg. $600 = 6 \times 10^2$

(a) 700, (b) 500, (c) 900, (d) 200.

Some multiples of 1 000 are:

2 000, 3 000, 4 000,

$2 \times 1\,000 \quad 3 \times 1\,000 \quad 4 \times 1\,000$

$4\,000 = 4 \times 1\,000$ this can be written using powers

$4\,000 = 4 \times 10^3$

Let us write these as products using powers of 10.

6 000, 7 000, 8 000, 9 000.

Let us write down some multiples of 10 000.

All the numbers we have learnt so far are built up from powers of 10, and can be written as sums of products involving powers of 10.

Because of this we usually refer to our system of numbers as a decimal system.

The word decimal means based on 10.

Let us read and write: decimal ---------, ---------.

Notice too that 10 basic digits are used.

0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

## OLD NUMBER SYSTEMS

The numbers and symbols that we use today are not the only ones that have been used by men. Long ago, the people of Egypt used other symbols to show numbers.

Here are the symbols they used and the numbers they represent.

(See Fig. 1.2)

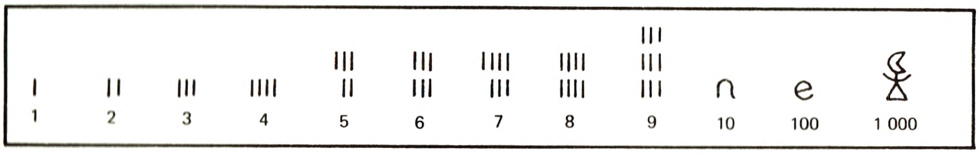



Fig. 1.2

Just for fun let us try to write the number 23 using Egyptians symbols.

The Babylonians, another ancient people, who lived in Babylon, used a different set of symbols for their numbers.

Here are these symbols together with the numbers they represent.

(See Fig. 1.3)

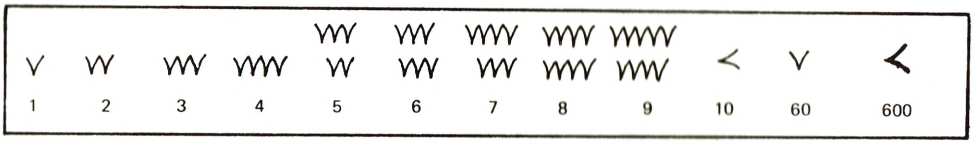



Fig. 1.3

For fun let us make up the number 67 using the Babylonians symbols.

The Romans, the people of Rome, used still another system which we still use today in certain cases.

(See Fig. 1.4)

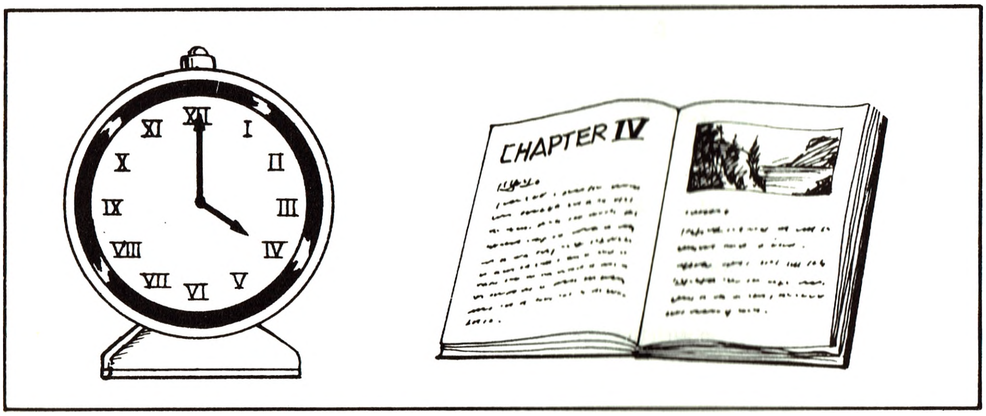



Fig. 1.4

The Romans, used letters to represent their numbers. Here are the letters together with the numbers they represent.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| I | II | III | V | X | L | C | D | M |
| 1 | 2 | 3 | 5 | 10 | 50 | 100 | 500 | 1 000 |

Numbers between like 4, 6, 7, 8, 9, etc., were shown by the position of the symbols. For example:

| | |
|---|---|
| V = 5 | X = 10 |
| IV = 5 − 1 = 4 | IX = 10 − 1 = 9 |
| VI = 5 + 1 = 6 | XI = 10 + 1 = 11 |
| VII = 5 + 2 = 7 | XII = 10 + 2 = 12 |

L = 50

LI = 51

IL = 50 − 1 = 49

Let us make up these numbers using romans numerals:

| | | |
|---|---|---|
| (1) 14 | (3) 24 | (5) 19 |
| (2) 16 | (4) 55 | (6) 500 |

**REVIEW OF ORDINALS**

In Book 1 we learnt about ordinal numbers. These are used when refering to the order or position of things. These are some that we learned:

| | |
|---|---|
| First | 1st |
| Second | 2nd |
| Third | 3rd |
| Fourth | 4th |

Let us fill in the rest up to twentieth.
Let us fill in the blank spaces with the correct words or ordinal numbers.

| *Words* | *Ordinals* |
|---|---|
| Thirtieth | ------- |
| ------- | 22nd |
| ------- | 45th |
| Two hundredth | ------- |

**CONSOLIDATORY EXERCISES**

(1) Let us write the words for these numbers:

(a) 641 (b) 1 001 (c) 43 436 (d) 50 002

(2) Let us write these numbers as sums:

(a) 3 842 (b) 61 (c) 18 (d) 48 032

eg. 2 813

$2\ 813 = 2\ 000 + 800 + 10 + 3$

(3) Let us write these numbers as powers of 10 using both numbers and words:

(a) 100 (b) 1 000 (c) 10 000 (d) 100 000 (e) 1 000 000

eg. $100 = 10^2$ ---------- ten raised to the power of 2.

(4) Let us write 5 multiples of 100.

(5) Let us write 5 multiples of 1 000.

(6) Let us write the following as sums of products using powers of 10.

(a) 6 000 (b) 7 000 (c) 8 400 (d) 3 340

eg. $5\ 500 = 5 \times 10^3 + 5 \times 10^2$

(7) Let us put in the correct numbers of our system in the blanks to match the romans numerals:

| | |
|---|---|
| V = 5 | X = ------------- |
| VI = ------ | IX = ------------- |
| IV = ------ | XIII = ------------- |
| C = ------ | D = ------------- |

# A SECOND LOOK AT THE BASIC OPERATIONS

## A SECOND LOOK AT ADDITION

In Book 1 we learned to do addition. We learned some interesting things about additions also. Here we are going to look at some more interesting things about addition. This will help us to understand the operation better.

This example is going to remind us of one of the things we dealt with:

$$4 + 3 = 7\ ,\ 3 + 4 = 7$$

We notice that we get the same sum for the both additions, although the order of the addends was changed around. We can show that the two statements would give the same answer by writing:

$$4 + 3 = 3 + 4$$

To show that this happens for all numbers we write it using letters.

$$a + b = b + a$$

Because addition behaves in this way we usually say that it is *commutative,* and we speak of the *commutative law* of addition, or the *commutativity* of addition.

A *commutor* is something that goes, or carries things to and from. A bus is a commutor because it carries people back and forth. Why do you think we used this word to describe this particular behaviour of addition?

Let us read and write the words.

commutor ............................

commutative ............................

commutativity ............................

What do you notice about all these words?

Here are some additions. First work those on the left hand side, then after looking carefully at the addends on the right side, fill in the correct answers without actually adding. (Use your knowledge of commutativity.) The first one is done as an example:

*EXERCISE A*

| | |
|---|---|
| (1) $6 + 4 =$ ...10... | • $14 + 20 =$ ........ |
| (2) $28 + 14 =$ ........ | • $30 + 14 =$ ........ |
| (3) $12 + 13 + 14 =$ ........ | • $144 + 684 + 912 =$ ........ |
| (4) $684 + 912 + 144 =$ ........ | • $14 + 12 + 13 =$ ........ |
| (5) $14 + 30 =$ ........ | • $4 + 6 =$ ...10... |

Here is another interesting thing about addition. Let us work these chain additions, working the numbers in the brackets, ( ), first then adding on those on the outside.

(a) $4 + (3 + 2) =$ .............. (b) $(4 + 3) + 2 =$ ..............

What do you notice about the answer?

(a) $5 + (4 + 3) =$ .............. (b) $(5 + 4) + 3 =$ ..............

What do you notice about the answer? Experiment using some other numbers. This means that for chain additions it does not matter which group of numbers we add first. The answers are still going to be the same.

We can show this by writing the statement: $5 + (4 + 3) = (5 + 4) + 3$. Using letters to show that it works for all numbers in chain additions.

$$a + (b + c) = (a + b) + c$$

Because addition behaves in this way we usually say it is *associative,* and we speak of the *associative law,* or the *associativity* of addition.

Let us read and write the words:

associate - - - - - - - - - - - - - - - -

associative - - - - - - - - - - - - - - - -

associativity - - - - - - - - - - - - - - - -

Here are some chain additions. Let us work those on the left first, then looking carefully at the addends on the right hand side, let us fill in the answers to them without actually adding. One is done as an example:

*EXERCISE B*

(1) $6 + (4 + 3) =$ 13     $7 + (2 + 3) =$ - - - - - - - - - -

(2) $5 + (3 + 2) =$ - - - - - - - - - -     $2 + (1 + 5) =$ - - - - - - - - - -

(3) $(2 + 1) + 5 =$ - - - - - - - - - -     $(6 + 4) + 3 =$ 13

(4) $(7 + 2) + 3 =$ - - - - - - - - - -     $(5 + 3) + 2 =$ - - - - - - - - - -

Let us write two statements to show that addition is associative.

eg. $6 + (7 + 5) = (6 + 7) + 5$

Note: This is the first time we are working with brackets ( ). We would work quite a lot with them from now. Brackets are very easy to handle. They simply tell us how to work out the numbers in the brackets first, before dealing with the numbers on the outside.

Finally, you would remember that in Book 1 we saw what happened when we added nought to any number.

This is what we saw, using 4 as an example:

$$4 + 0 = 4$$

using a letter to show any number.

$$a + 0 = a$$

Any number added to nought, remains the same number.

0 is therefore called the *identity number* for addition.

## SUMMARY OF ADDITION

We saw first that addition is commutative.

$a + b = b + a$ . . . The commutative law.

Then we saw that addition is associative.

$(a + b) + c = a + (b + c)$ . . . The associative law.

Then finally we saw that nought is the identity number for addition.

$a + 0 = a$ . . . 0 the identity number.

## A SECOND LOOK AT MULTIPLICATION

We know that multiplication is a short way of doing chain additions when all the addends are the same. We can expect therefore that multiplication would behave in a similar way to addition.

Let us see if multiplication is commutative. That is, if we can get the same product, even though the numbers are changed around.

Let us look at this diagram.

(See Fig. 2.1)

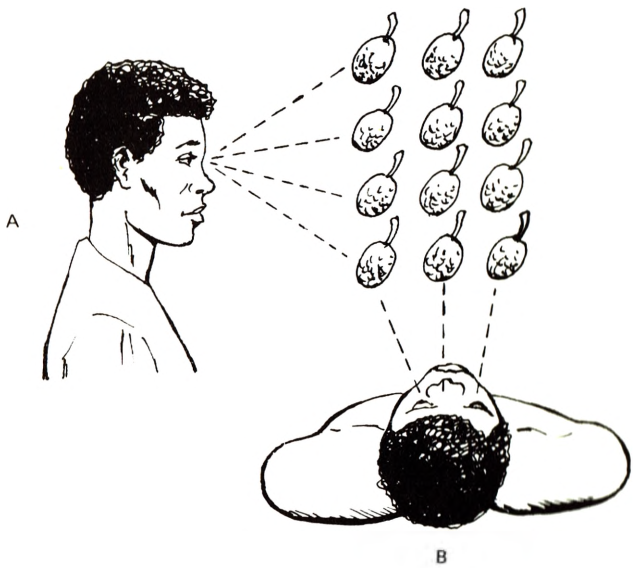



Fig. 2.1

Looking from side *A* we can say that we have 4 rows of 3 or $4 \times 3$. But looking from side *B* we can see 3 rows of 4 or $3 \times 4$.

Regardless of how we look at it though the number of fruits is the same, 12.

so then: $3 \times 4 = 12$

and: $4 \times 3 = 12$

Writing it in one statement:

$$3 \times 4 = 4 \times 3$$

We can use other pairs of numbers to see if the same thing works:

$4 \times 2 =$ . . . . . . . . . .

$2 \times 4 =$ . . . . . . . . . .

What do you notice?

We can safely say then that multiplication is commutative. Using letters for all numbers we write:

if $a \times b = c$ then $b \times a = c$ or

$a \times b = b \times a$, The commutative law.

Here are some multiplications. Let us work out those on the left side first, then looking at the numbers on the right. Let us fill in the correct products with actually multiplying. One is done as an example:

*EXERCISE C*

(1) $4 \times 5 =$ . . . . 20 . . . . • $16 \times 14 =$ . . . . . . . . . .

(2) $3 \times 6 =$ . . . . . . . . . . • $6 \times 5 =$ . . . . . . . . . .

(3) $5 \times 3 =$ . . . . . . . . . . • $6 \times 3 =$ . . . . . . . . . .

(4) $5 \times 6 =$ . . . . . . . . . . • $3 \times 5 =$ . . . . . . . . . .

(5) $14 \times 16 =$ . . . . . . . . . • $5 \times 4 =$ . . . . 20 . . . .

We have just seen that multiplication is commutative. Now let us see if multiplication is associative.

Let us work these two chain multiplication working the number in the brackets first.

(a) $(2 \times 3) \times 4 =$ ------ (b) $2 \times (3 \times 4)$------

What do you notice?

Let us try some other numbers:

(a) $(3 \times 4) \times 5 =$ ---------- (b) $3 \times (4 \times 5) =$ ----------

What do you notice?

Even if we try other numbers we are going to discover the same thing.

You can use some more numbers to make sure. What we have just discovered is that multiplication is also associative. We can write one statement using the last pair of numbers, to show that multiplication is associative.

$$3 \times (4 \times 5) = (3 \times 4) \times 5$$

Using letters to show all numbers:

$a \times (b \times c) = (a \times b) \times c$. The associative law.

*EXERCISE D*

Let us work out the multiplications on the left side and after looking at the numbers on the right side put in the correct products without actually multiplying.

(1) $7 \times (2 \times 3) =$ ---------- • $(6 \times 3) \times 4 =$ ----------

(2) $6 \times (2 \times 3) =$ ---------- • $4 \times (3 \times 1) =$ ----------

(3) $(4 \times 3) \times 1 =$ ---------- • $(7 \times 2) \times 3 =$ ----------

(4) $6 \times (3 \times 4) =$ ---------- • $(6 \times 2) \times 3 =$ ----------

We would look at a law of multiplication that we did not meet in addition. For us to understand this law fully we must use diagrams.

(See Fig. 2.2)

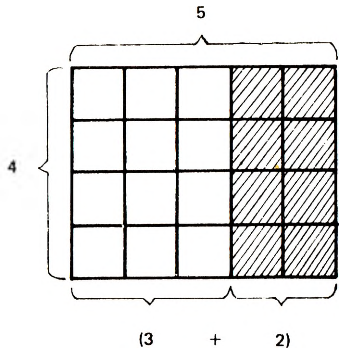



Fig. 2.2

Here we have 4 rows of 5 or $4 \times 5 = 20$ squares looking at the bottom though we notice that the 5 is really broken up into two addends 3 and 2 because $5 = 3 + 2$. We can say then that there are 4 rows of $(3 + 2)$ squares or $4 \times (3 + 2)$ squares.

If we have to find the total number of squares we can find first the number of white squares $4 \times 3$, then the number of shaded squares $4 \times 2$, then add the two products together. Let us do this:

white squares $= 4 \times 3 = 12$

shaded squares $= 4 \times 2 = 8$

total $= 12 + 8 = 20$

In one statement we can write:

$(4 \times 3) + (4 + 2) = 20$ the same number we got above.

$4 \times (3 + 2) = 20$

Therefore we can say that:

$$4 \times (3 + 2) = (4 \times 3) + (4 \times 2)$$

It is as though we spreaded or distributed the 4 over the 3 and 2.

Let us work these two statements and see if the same thing happens.

$5 \times (3 + 4) =$ ----------

$(5 \times 3) + (5 \times 4) =$ ----------

What do you notice?

We can safely say then that it works for all numbers in multiplication. This is called the *distributive law* of multiplication. We speak of the *distributivity* of multiplication. Let us use letters:

$$a \times (b + c) = \cdots\cdots\cdots\cdot$$

$$(a \times b) + (a \times c) = \cdots\cdots\cdots\cdot$$

This can be stretched much further.

Example: $4 \times (3 + 2 + 5) = (4 \times 3) + (4 \times 2) + (4 \times 5)$

The 4 is spread or distributed over all the addends (prove that the above statement is true by working out both sides). We have discovered that multiplication can be distributed over the addends in a chain addition. But can we distribute multiplications over a chain subtraction? Let us find out:

is $3 \times (6 - 4)$ equal to $(3 \times 6) - (3 \times 4)$ ?

Fill in the answers, remember to work brackets first:

$$3 \times (6 - 4) = \cdots\cdots\cdots\cdots\cdots\cdot$$

$$(3 \times 6) - (3 \times 4) = \cdots\cdots\cdots\cdot \_\_\_\_\_\_ \cdots\cdots\cdots\cdot = \cdots\cdots\cdots$$

What do you notice?

Let us try another example: $5 \times (4 - 1) = \cdots\cdots\cdots\cdot$

$$(5 \times 4) - (5 \times 1) = \cdots\cdots \_\_\_\_\_\_ \cdots\cdots = \cdots\cdots$$

So we have shown that the distributive law of multiplication also works for chain subtractions.

$$a \times (b - c) = (a \times b) - (a \times c)$$

*EXERCISE E*

Let us work the statements on the left side then, after looking at those on the right side carefully, fill in the correct answers, without actually working them out. (You are using your knowledge of the distributive law of multiplication.)

1. (a) $3 \times (2 + 1) = \cdots\cdots\cdots\cdot$ $(7 \times 6) + (7 \times 5) = \cdots\cdots\cdots\cdot$
   (b) $4 \times (2 + 3) = \cdots\cdots\cdots\cdot$ $(5 \times 3) + (5 \times 4) = \cdots\cdots\cdots\cdot$
   (c) $5 \times (3 + 4) = \cdots\cdots\cdots\cdot$ $(3 \times 2) + (3 \times 1) = \cdots\cdots\cdots\cdot$
   (d) $7 \times (6 + 5) = \cdots\cdots\cdots\cdot$ $(4 \times 2) + (4 \times 3) = \cdots\cdots\cdots\cdot$
2. (a) $6 \times (6 - 4) = \cdots\cdots\cdots\cdot$ $(7 \times 5) - (7 \times 2) = \cdots\cdots\cdots\cdot$
   (b) $5 \times (5 - 3) = \cdots\cdots\cdots\cdot$ $(6 \times 4) - (6 \times 1) = \cdots\cdots\cdots\cdot$
   (c) $6 \times (4 - 1) = \cdots\cdots\cdots\cdot$ $(5 \times 5) - (5 \times 3) = \cdots\cdots\cdots\cdot$
   (d) $7 \times (5 - 2) = \cdots\cdots\cdots\cdot$ $(6 \times 6) - (6 \times 4) = \cdots\cdots\cdots\cdot$

Finally we would remind ourselves of what happens when we multiply numbers by 1 and 0.

$6 \times 6 = 6$, $5 \times 1 = \cdots\cdots\cdots$, $4 \times 1 = \cdots\cdots\cdots$

$a \times 1 = a$

We see that any number multiplied by 1 gives a product that is equal to the number itself. We can say that 1 is the *identity* number for multiplication. We also know that any number multiplied by nought gives nought as the product.

$$a \times 0 = 0$$

**SUMMARY OF MULTIPLICATION**

Let us summarise all that we have learnt about multiplications.

We learned that multiplication was commutative changing around the numbers we are multiplying did not change the product.

if $a \times b = c$ then $b \times a = c$

or $a \times b = b \times a$ . . . Commutative law of multiplication.

We then learned that multiplication was associative.
In chain multiplications it did not matter which numbers are worked out first.

$a \times (b \times c) = (a \times b) \times c$ . . . The associative law of multiplication.

Then we learned a new law about multiplication. The distributive law. Multiplication can be spread or distributed over the addends of chain additions, and the numbers of chain subtractions.

For additions:

(1) . . . $a \times (b + c) = (a \times b) + (a \times c)$

(2) . . . $a \times (b + c + d) = (a \times b) + (a \times c) + (a \times d)$

For subtractions:

(1) $a \times (b - c) = (a \times b) - (a \times c)$

(2) $a \times (b - c - d) = (a \times b) - (a \times b) - (a \times c)$

- - - - - - - - - - *The* distributive law of multiplication.

We saw that 1 was the identity number for multiplication, . . . $a \times 1 = a$, and that, any number multiplied by nought gave nought.

$$a \times 0 = 0$$

## A SECOND LOOK AT SUBTRACTION

Again we are going to look at the operation of subtractions but this time we are going to try to see which of the laws we have met so far, works for subtractions.

Let us see if subtraction is commutative. Would changing the order of the numbers make a difference?

Let us work these statements:

(a) $6 - 4 =$ - - - - - - - - - - (b) $4 - 6 =$ - - - - - - - - - -

Could we get an answer for statement (b)? At this stage in our course we cannot, far less to say that it is equal to statement (a) - - - - - - - - - -

Let us use another example:

$8 - 3 =$ - - - - - - - -

$3 - 8 =$ - - - - - - - -

Again the answers cannot be equal.

We can say then that changing the numbers around does make a big difference, the answers are not the same and so subtraction is not commutative.

$a - b$ is not equal to $b - a$

$a - b \neq b - a$

Now we are going to try to find out if subtraction is associative.

Let us work out these 2 chain subtractions working the brackets first.

(a) $(8 - 4) - 3 =$ - - - - - - - - - - (b) $8 - (4 - 3) =$ - - - - - - - - - -

What do you notice?

This is very interesting.

$(8 - 4) - 3 = 4 - 3 = 1$ $\qquad$ $8 - (4 - 3) = 8 - 1 = 7$

Two different answers.

We see that it matters which numbers we subtract first.

Another example:

$(9 - 4) - 2 =$ - - - - - - - - - -

$9 - (4 - 2) =$ - - - - - - - - - -

Again the answers are different.

We can safely say then that subtraction is *not associative,* one has to be careful which numbers are worked first in order to get the right answer.

Here is an idea: Where there are no brackets, subtract the numbers in the order they are given. Where there are brackets subtract the numbers in the brackets first.

Next, we would find out if subtraction is distributive. Can we spread or distribute subtraction over addition. For example: is $b - (4 + 2)$ the same value as $(8 - 4) + + (8 - 2)$. Let us find out by fill in the blanks for the statements:

$$8 - (4 + 2) = \text{..........} \quad (8 - 4) + (8 - 2) = \text{..........}$$

What do you notice?

We have found out that subtraction is not distributive over addition. As a matter of fact subtraction is not distributive over any of the other operation. Finally we say then that subtraction is not distributive.

Let us look now at the identity number for subtraction.

$$6 - 0 = 6, \; 4 - 0 = 4, \; 3 - 0 = 3$$

Here we see that whenever we subtract nought from any number the answer is the same as that number.

$$a - 0 = a$$

0 is therefore the identity number for subtraction.

## SUMMARY OF SUBTRACTION

Generally we have seen that most of the laws that are true for addition and multiplication, are not true for subtraction. We saw that subtraction is not commutative; whenever the numbers were changed around, the answers also changed.

$$a - b \neq b - a$$

Then we saw that subtraction is not associative. The answers of the chain subtraction changeg according to which numbers were dealt with first.

$$a - (b - c) \neq (a - b) - c$$

We learned also that subtraction is not distributive over any of the operations; using addition as an example of one of the other operations we found that.

$$a - (b + c) \neq (a - b) + (a - c)$$

Lastly we saw that the identity number for subtraction is 0.

*EXERCISE F*

(1) Let us write subtraction statements to show that subtraction is not commutative.

(2) Let us write 3 statements to show that subtraction is not associative.

(3) Let us write 3 statements to show that subtraction is not distributive over addition.

## A SECOND LOOK AT DIVISION

We would now look at the last operation division, to see how it behaves compared to those we studied already. Seeing that division and subtraction are very similar, we should expect them to behave in almost the same way.

Is division commutative? Can we change around the dividend and divisior, and still get the same quotient?

Let us try to work these two statements:

(a) $8 \div 4 = \text{..........}$ (b) $4 \div 8 = \text{..........}$

What do you notice? Could we get an answer for statement (b)?

Another example:

(a) $6 \div 3 = \text{..........}$ (b) $3 \div 6 = \text{..........}$

Could we again get an answer for statement (b)? We couldn't get answers for the (b) statements, far less to get the same quotients as in the (a) statements? We can safely say that division is not commutative. If we change around the numbers, the quotient changes.

$$a \div b \neq b \div a$$

Note: At this stage we are not able to get an answer for statement like $3 \div 6$, where the dividend is smaller, however in unit 3 we are going to see that we can get an answer using other types of numbers apart from natural numbers which we know.

Is division associative? Does it matter which numbers are worked first in chain divisions? Let us find out by working the statements below:

(a) $(8 \div 4) \div 2 =$ ---------- (b) $8 \div (4 \div 2) =$ ----------

What do you notice? Are they equal?

Another example:

(a) $(20 \div 10) \div 5 =$ ---------- (b) $20 \div (10 \div 5) =$ ----------

What do you notice again?

Since the answers are not the same then it does matter which numbers are worked first and so division is not associative.

$$(a \div b) \div c \neq \div (b \div c)$$

Let us now find out if division is distributive over the operations of addition and subtraction. Can we spread the division over the numbers in a chain subtraction or addition?

First we will use addition. Suppose we have to share 15 fruits equally among 3 friends. What would each get? ---------- .

Now let us just suppose that those 15 fruits were really made up of 12 mangoes and 3 oranges. How would we share them? One way would be to share the mangoes first $(12 \div 3)$ then share the oranges $(3 \div 3)$ each person then gets some mangoes and an orange.

(See Fig. 2.3)

The number each person gets is $4 + 1$ or 5
that is really $(12 \div 3) + (3 \div 3)$

$$4 + 1 = 5$$

Notice the number is the same as $15 \div 3$ or, $(12 + 3) \div 3$

We can say then that:

$$(12 + 3) \div 3 = (12 \div 3) + (3 \div 3)$$

Let us work this example to see if we get equal answers.

$(12 + 4) \div 4 =$ ----------

$(12 \div 4) + (4 \div 4) =$ ----------

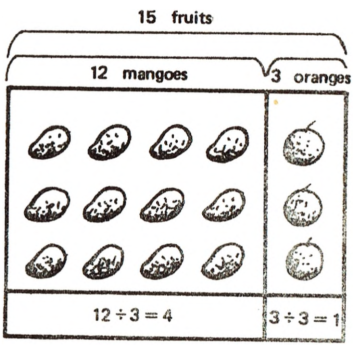



Fig. 2.3

We have just discovered that division is distributive over addition. But notice that the addition, $(12 + 3)$ in the first example, and $(12 + 4)$ in the second example, really stands for the dividend.

Let us now see what happens for subtraction.

Let us work these statements and see what happens. Notice here again that the subtraction parts really represent the dividends.

(a) $(6 - 2) \div 2 =$ ----------

(b) $(6 \div 2) - (2 \div 2) =$ ----------

What do you notice?

We can say then that division is distributive over addition and subtractions.

For addition $(a + b) \div c = (a \div c) + (b \div c)$

For subtraction $(a - b) \div c = (a \div c) - (b \div c)$

Suppose the addition and subtraction parts represent the divisor instead of the dividend, what happens, let us see.

Is $12 \div (3 + 1)$ the same as $(12 \div 3) + (12 \div 1)$

$12 \div (3 + 1) = 12 \div 4 = 3$

$(12 \div 3) + (12 \div 1) = 4 + 12 = 16$

They are not equal.

So in these cases where the addition or subtraction parts are really the divisor, the division is not distributive.

Let us look at the identity number for division.

$4 \div 1 = 4, \quad 3 \div 1 = 3, \quad 2 \div 1 = 2$ etc.

From these we can see 1 is the identity number for division. Finally we should bear in mind that any number divided by nought gives no real answer.

## SUMMARY OF DIVISION

Let us review what we learned about division here. First we learned that division was not commutative.

$a \div b \neq b \div a$ . . . commutative law

We then learned that division was not associative.

$(a \div b) \div c \neq a \div (b \div c)$ . . . associative law.

In looking at the distributive law for division we saw that division was distributive over additions and subtractions only when those additions and subtractions are really the dividends.

$(a + b) \div c = (a \div c) + (b \div c)$

but $a \div (b + c) \neq (a \div b) + (a \div c)$

- - - - - - - - - distributive law.

Finally we saw that the identity number for division was 1.

*EXERCISE H*

(1) Let us write 3 division statements to show that division is not commutative.

(2) Let us write 3 division statements to show that division is not associative.

(3) Let us write 3 division statements to show that division is distributive over its dividend

This chart summarises the behaviour of all the operations:

| Operations | Commutative | Associative | Distributive | Identity |
|---|---|---|---|---|
| Addition | Yes<br>$a + b = b + a$ | Yes<br>$(a + b) + c =$<br>$a + (b + c)$ | No<br>$(b + c) \neq (a + b)$<br>$+ (a + c)$ | 0 |
| Multiplication | Yes<br>$a \times b = b \times a$ | Yes<br>$(a \times b) \times c =$<br>$a \times (b \times c)$ | Yes<br>$a \times (b + c) =$<br>$(a \times b) + (a \times c)$<br>$a \times (b - c) =$<br>$(a \times b) - (a \times c)$ | 1 |

| | | | | |
|---|---|---|---|---|
| Subtraction | No $a - b \neq b - a$ | No $(a - b) - c \neq a -$ | No $a - (b - c) \neq$ $(a - b) - (a - c)$ | 0 |
| Division | No $a \div b \neq b \div a$ | No $(a \div b) \div c \neq a \div$ $(b \div c)$ | Yes (over its dividend) $(a + b) \div c =$ $(a \div c) + (b \div c)$ | 1 |

**LONG DIVISION**

In Book 1 we learned to handle divisions with one digit divisors and 2 digit divisors, for which the multiplication tables are known for example: 10, 11, 12.

You might have been wondering how to handle 2 digit divisors for which the multiplication tables are not known, for example 24, 56, etc. In this section we are going to learn how these are handled. But first let us refresh our minds on how to do those we met before.

What does dividing really mean?

We saw that a division statement like $10 \div 2 = 5$ could be thought of as a chain subtraction where 2 is subtracted each time: $10 - 2 - 2 - 2 - 2 - 2 = 0$, giving us 5 groups of 2; we also saw that by putting back the 5 groups together, we were able to get back the dividend 10.

$$5 \times 2 = 10$$

This relation between division and multiplication are important to us because we can use the tables to get our quotients, and then we can prove our answers are correct, by multiplying back.

*EXERCISE I*

Let us work these:

(1) $12 \div 6$ (2) $24 \div 4$ (3) $18 \div 3$ (4) $19 \div 6$

In dealing with larger dividends we learned to divide the digits according to their place value for example: $244 \div 2$ really means $(200 + 40 + 4) \div 2$, from the distributive law that we just learned this would mean $(200 \div 2) + (40 \div 2) + (4 \div 2)$ this statement gives the answer $100 + 20 + 2$ or 122.

Let us set it down and work it together as a division.

Statement: $244 \div 2$

$$\begin{array}{r|rrr} & H & T & U \\ & 1 & 2 & 2 \\ \hline 2 & 2 & 4 & 4 \\ & -2 & 0 & 0 \\ \hline & & 4 & 4 \\ & & -4 & 0 \\ \hline & & & 4 \\ & & & -4 \\ \hline & & & 0 \end{array}$$

*Steps:*

(1) $200 \div 2 = 1$ h . . . $(2 \div 2 = 1)$

Subtract the amount we shared

1 hundred $\times 2 = 200$

(2) We share 40.

$40 \div 2 = 2$ t $(4 \div 2 = 2)$

We subtract what we shared . . . 2 *t* $\times$ 2; we are left with 4 units to share.

(3) $4 \div 2 = 2$ units

Subtract $2 \times 2 = 4$

We divided everything so our remainder is nought.

These steps are very important. We must subtract the amount we shared each time from the dividend.

*EXERCISE J*

Let us work these:

(1) 464 ÷ 2   (2) 969 ÷ 3   (3) 484 ÷ 4   (4) 255 ÷ 5

(5) Let us read off the answers for these without actually dividing:

(a) 60 ÷ 10   (b) 90 ÷ 10   (c) 100 ÷ 10   (d) 300 ÷ 10

(e) 3 000 ÷ 100   (f) 8 000 ÷ 100

We would now move on to divide by 2 digit numbers greater than 12.
Let us divide: 69 ÷ 23.
We are trying to find how many groups of 23 we can get from 69.
Because we do not know multiplications tables for 23, we have to try out answers until we get the correct one. This may seem very clumsy but there are some guidelines to be followed which make our work very easy and quick. Let us use the first digit of each number as a guide 6, and 2.

*Steps:*

(1) Think of 6 *t* ÷ 2 *t* or simply 6 ÷ 2.
This gives 3;

$$\begin{array}{r|l} & \;\;3 \\ \hline 23 & \;\;69 \\ & -69 \\ \hline & \;\;00 \end{array} \qquad \begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

(2) Now we try to see if we can really get 3 groups of 23 from 69 we do this by multiplying 3 by 23 on the side we get 69 so it works out exactly, 3 is correct and so we use 3 and go ahead working the rest of the division. We are left with 3 as our answer and no remainder.

Let us try these: (1) 48 ÷ 24   (2) 84 ÷ 21   (3) 66 ÷ 33
Let us do one that gives a remainder.

48 ÷ 22

Following the usual steps:

$$\begin{array}{r|l} & \;\;2 \\ \hline 22 & \;\;48 \\ & -44 \\ \hline & \;\;\;4 \end{array} \qquad \begin{array}{r} 22 \\ \times 2 \\ \hline 44 \end{array}$$

(1) Using the first digit of each number we say 4 ÷ 2 = 2, let us try 2, on the side. We see that it is possible to get 2 groups of 22 from 48, so we use.

(2) However after subtracting we are left with 4. Of course we cannot divide any further because at this stage this 4 ÷ 22 cannot be worked out. So our answer is 2 with a remainder of 4, or 2 R 4.

Let us try these: (1) 66 ÷ 21   (2) 83 ÷ 41   (3) 68 ÷ 21

We are now going to do some, where the first answer we try is not the correct one.
Example: 87 ÷ 24

$$\begin{array}{r|l} & \\ \hline 24 & \;87 \end{array} \qquad \begin{array}{r} 24 \\ 4 \\ \hline 96 \end{array}$$

*Steps*

Trying 4 on the side, we see that if we tried to take 4 groups of 24 then 87 would not be enough. *We cannot take 96 from 87,* this means that we must take less than 4 groups so we try 3 groups of 24.

Now we are able to get 3 groups of 24 from 87 and so we use 3 and continue working:

$$\begin{array}{r} 24 \\ \times 3 \\ \hline 72 \end{array}$$

$$\begin{array}{r} 3 \\ 24 \enclose{longdiv}{87} \\ -72 \\ \hline 15 \end{array}$$

*Answer is 3 R 15.*

In the case above, the first quotient we tried was too large. We knew that because the 96 was greater than the dividend 87 and we couldn't subtract. There are times though when the first number tried is too small. Whenever that happens the remainder, or the number we get after subtracting would be larger than the divisor. In that case we simply try a larger answer and scratch off the one we had.

For example: $87 \div 24$

$$\begin{array}{r} 2\ 3 \\ 24 \enclose{longdiv}{87} \\ -48 \\ \hline 39 \end{array}$$

Suppose we tried 2 first then we would get $24 \times 2 = 48$ on the side, subtracting 48 we get 39, 39 is more than 24, which means we could have taken out another group. Our 2 is too small therefore, so we now try 3 and start over.

*EXERCISE K*

Let us work these: (1) $64 \div 29$ (2) $83 \div 26$

(3) $44 \div 25$ (4) $94 \div 35$

(5) Let us divide 54 by 23. Looking at the first digit of each number as a guide, we start working:

$5 \div 2 = 2$ R 1. You may be a bit puzzled as to what happens here. Well simply ignore the remainder and try the 2. Then continue as usual. You can finish the problem.

$$\begin{array}{r} 2 \\ 23 \enclose{longdiv}{54} \end{array}$$

Let us now handle dividends of 3 and more digits. Let us divide:

$688 \div 22$

$$\begin{array}{r} 31 \\ 22 \enclose{longdiv}{688} \\ 66 \\ \hline 28 \\ -22 \\ \hline 6 \end{array}$$

*Steps:*

(1) Because the divisor has 2 digits, we begin by marking off the first two digits of the dividend, 68,8 we would now concentrate on dividing 68 by 22.

(2) Proceeding as before with the first digit of each number we get $6 \div 2 = 3$.

(3) Try out 3 on the side $22 \times 3 = 66$.

$$\begin{array}{r} 22 \\ \times 3 \\ \hline 66 \end{array}$$

(4) Subtract $68 - 66 = 2$.

This 2 is actually in the position of tens so its value is really 2 tens or 20. Now we still have 8 units from the dividend, 6 8,8 to divide.

$$\begin{array}{r} 22 \\ \times 1 \\ \hline 22 \end{array}$$

(5) We simply put that units digit together with the 2 tens giving 28.

(6) We now divide 28 by 22 using the first digits as a guide we get $2 \div 2 = 1$.

(7) Trying 1 we see it can work so we use it.

(8) Subtract; $28 - 22 = 6$. We are left with 6 and can go no further because we have no digits of the dividend left.

Our result is then 31 R 6

If there were 4 digits in the dividend then we had to go another steps. Let us do this one together.

4899 ÷ 23

```
        213
23 ) 48,99
     −46
      2 9
     − 2 3
       69
      −69
       00
```

*Steps:*

(1) Mark off first 2 digits of dividend 48,99
4 ÷ 2 = 2 -- we try 2. (23 X 2 = 46)

(2) Subtract 48 − 46,

(3) Carry down the 9 tens and divide again 29 ÷ 23 - - - - - 2 ÷ 2 = 1 try 1. (23 X 1 = 23).

(4) Subtract 29 − 23 = 6.

(5) Carry down 9 units.

(6) Divide again 69 ÷ 23 (6 ÷ 2 = 3), try 3 (23 X 3 = 69).

(7) Subtract 69 − 69 = 0.

*Answer is 213*

We must always remember to carry down any extra digits from the dividend at each stage before dividing again.

*EXERCISE L*

Let us try these: (1) 748 ÷ 22 (2) 634 ÷ 30 (3) 7 826 ÷ 25

Here now are some examples that need special attention.

*Case (1)* 184 ÷ 20

```
        9
20 ) 18,4
     18 0
        4
```

*Steps:*

Notice here that we cannot divide 1 by 2. We get around this problem by marking off 3 digits instead of 2, and now dividing 18 by 2.

18 ÷ 2 = 9, try 9.

*Our answer now is 9 with 4 remaining 9 R4*

Let us do this one: ← 196 ÷ 20

*Case* (2)

3425 ÷ 24

```
       101
34 ) 3435
     34
     0035
      −34
        1
```

*Steps:*

(1) We proceed as usual.

(2) Carrying down 3 we realize that we cannot divide 3 by 34.

(3) We therefore put 0 in the quotient, carry down the 5, and continue 35 ÷ 34 = 1.

*Answer 101 R 1*

As long as we carry down a number and find that we cannot divide we put nought in the quotient, carry down the next digit and continue. Let us do this one: 4 751 ÷ 47.

*Case* (3) 7 508 ÷ 25

This is similar to case (2) except that now we have noughts.

```
        30
25 ) 75,08
     −75
      0 08
```

*Steps:*

(1) 75 ÷ 25 = 3.

(2) Carrying down 0, we cannot divide so we put 0 in the quotient, carry down the 8.

(3) We still cannot divide so we put another 0 in the quotient.

*Our answer is 25 R 8*

Let us work this one: 7 506 ÷ 23

## PROOF OF DIVISIBILITY

We can look at numbers and at a glance tell what numbers divisors can divide them evenly, that is, without leaving a remainder. Here are the guidelines and proofs to use.

(1) A number can be divided by 2, if the last digit is a 0, 2, 4, 6, or 8.

$\begin{array}{r} 5 \\ 2\overline{)10} \end{array}$ $\quad$ $\begin{array}{r} 6 \\ 2\overline{)12} \end{array}$ $\quad$ $\begin{array}{r} 7 \\ 2\overline{)14} \end{array}$ etc.

Prove that this is true by using larger dividends.

(2) A number can be divided evenly by 4, if the number formed by the last two digits can be divided by 4, or if the last two digits are noughts 00".

$\begin{array}{r} 61 \\ 4\overline{)244} \end{array}$ $\quad$ $\begin{array}{r} 72 \\ 4\overline{)288} \end{array}$ $\quad$ $\begin{array}{r} 75 \\ 4\overline{)300} \end{array}$

Prove that this is true by using larger numbers.

(3) A number can be divided evenly by 5, if the last digit is a 5 or 0.

$\begin{array}{r} 13 \\ 5\overline{)65} \end{array}$ $\quad$ $\begin{array}{r} 965 \\ 5\overline{)4\,825} \end{array}$ $\quad$ $\begin{array}{r} 134 \\ 5\overline{)670} \end{array}$

Prove that this is true by using other numbers:

(4) If the last digit of any number is 0 then that number can be divided evenly by 10.

$\begin{array}{r} 10 \\ 10\overline{)190} \end{array}$ $\quad$ $\begin{array}{r} 10 \\ 10\overline{)100} \end{array}$ $\quad$ $\begin{array}{r} 10 \\ 10\overline{)160} \end{array}$

Prove that this is true by using other numbers. These facts are very helpful. They help us to work quickly and correctly. Try to learn them by heart and use them.

## SUMMARY

In this unit we saw how each operation had some things special about them. These discoveries would help us to work quicker and easier. The division by 2 digit numbers should be practiced regularly. Actually 3 digit divisors are handled in the same way. You would find them very easy to handle if you use your multiplication tables regularly and make efforts to learn them by heart.

## CONSOLIDATORY EXERCISES

(1) Write down all the operations that are commutative.

(2) Write down all those that are associative.

(3) Write down those that are distributive.

(4) Write down the operations that have 0 as their identity number.

(5) Write down those that have 1 as their identity number.

(6) Write down an addition statement to show that addition is commutative.

(7) Write down a multiplication statement to show that multiplication is associative.

*On division*

(8) (a) 36 421 ÷ 34 (b) 782 437 ÷ 46 (c) 872 143 ÷ 97
(d) 6 001 432 ÷ 48 (e) (341 + 672) ÷ 93

**SOLUTION OF PROBLEMS RELATED TO THE STUDENTS DAILY ACTIVITIES**

**UNIT 3**

## COMMON FRACTIONS

### REVIEW AND DEEPENING

In Book 1 we began learning about fractions. We learned that a fraction is really a part of a whole thing or number.

*EXERCISE A (REVIEW)*

(1) Let us write the words and symbols that these parts show.

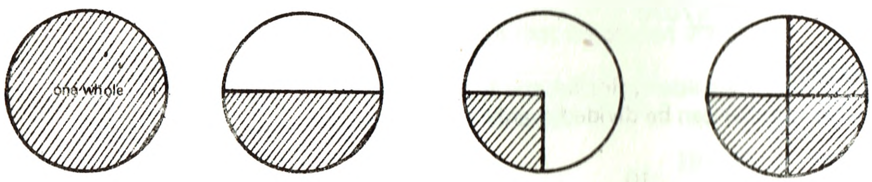



Fig. 3.1

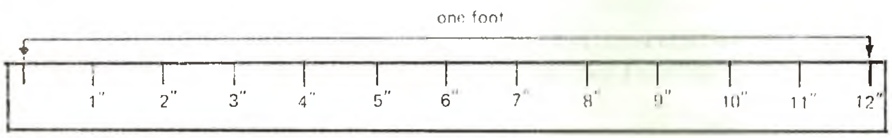



Fig. 3.2

| | *Words* | | *Symbols* |
|---|---|---|---|
| (a) 6″ = | - - - - - - - - - - - - - - - - - - - - - - | of a foot | - - - - - - - - - - - - - - - - - - - - |
| (b) 4″ = | - - - - - - - - - - - - - - - - - - - - - - | of a foot | - - - - - - - - - - - - - - - - - - - - |
| (c) 9″ = | - - - - - - - - - - - - - - - - - - - - - - | of a foot | - - - - - - - - - - - - - - - - - - - - |

On a number line we can show the fractions like this.

(See Fig. 3.3)

We are now going to learn some new fractions.


Fig. 3.3

(See Fig. 3.4)

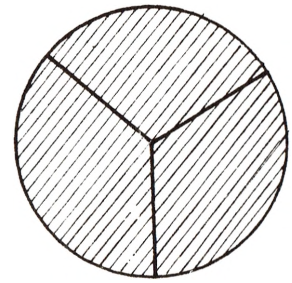


Fig. 3.4

Here we have a circle divided into 3 equal parts. How do you think we should call each part?

Let us read the words - - - - - - - - - - - - - - one third.

Let us write the symbol - - - - - - - - - - - - $\frac{1}{3}$.

The fraction is $\frac{1}{3}$ because we divided one circle into 3 equal parts. If we put two o those parts together we get $\frac{2}{3}$, two thirds.

Here is a chart showing some fractions and how they compare with each other. The bar in the middle shows the size of the whole. The fractions show how the bar can be divided into different numbers of equals parts. Pay close attention to parts of the same size.

(See Fig. 3.5)

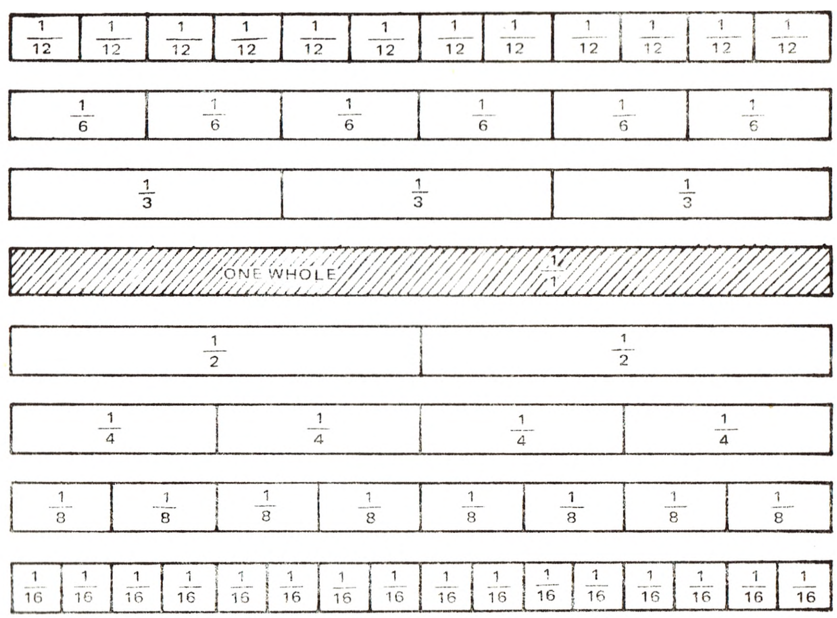



Fig. 3.5

Let us look at this fraction carefully and write it alongside.

$\frac{3}{4}$ - - - - - - - - - - - - - - - - - - - - - - ,

Notice that the symbol is made up with two numbers separated by a line.

We usually call the number on top the numerator. Let us read and write numerator:

- - - - - - - - - - - - - - - - - - - - - , - - - - - - - - - - - - - - - - - - - - - .

The numerator tells us how many parts we are talking about or considering, after the whole has been divided.

The number below is usually called the denominator. Let us read and write the word denominator: - - - - - - - - - - - - - - - - - , - - - - - - - - - - - - - - - - .

The denominator tells us how many equal parts the object or number is divided into.

The line is called the fraction line. This line tells us that we have divided some object or number into a certain number of equal parts.

Let us fill in the blanks with the correct names for each part and say what each part tell us.

$\frac{4}{5}$ ____________

____________

____________

## FRACTIONS OF THE SAME SIZE

In the chart of fig. 3.5 we saw that parts of the same size could be named using different fractions. Let us examine this more closely. We shall use a smaller chart to begin with.

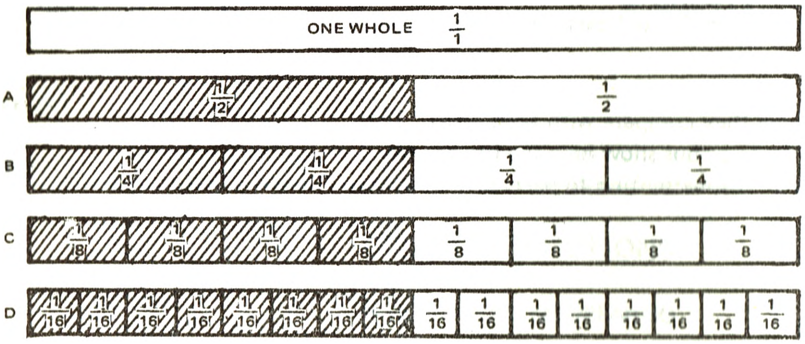


Fig. 3.6

First we notice that all the bars are the same size. Look at the shaded portion of each bar. What do you notice about their sizes?

What fraction should we use to name the shaded part bar A? . . . . . . . . . . . . .

How would we name the shaded part of bar B? . . . . . . . . . . . . . . . . .

And how would we name the shaded part of bar C? . . . . . . . . . . . . . ,

and bar D? . . . . . . . . . . . . .

Notice that the fractions we used, have different numerators and denominators, although they all are equal to the same size part. We usually say that they are equivalent. Let us read and write: equivalent . . . . . . . . . . . . . , . . . . . . . . . . . . . .

We have seen that the fractions:

$$\frac{1}{2}, \frac{2}{4}, \frac{4}{8}, \text{ and } \frac{8}{16} \text{ are equivalent.}$$

We can use signs to show that.

$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$$

| |
|---|
| = means equivalent or "same value as" |

Looking at the numerators of the first and second fractions we notice that the first one was multiplied by 2 to get the second one. $1 \times 2 = 2$.

Now looking at the denominators 2, and 4, we see also that we multiplied 2 by 2 to get 4. $2 \times 2 = 4$.

(See Fig. 3.7)

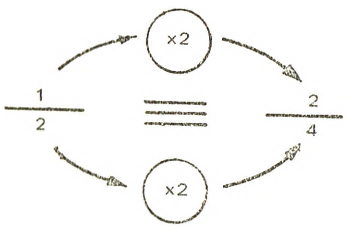


Fig. 3.7

We actually got $\frac{2}{4}$, by multiplying the numerator and denominator of $\frac{1}{2}$ by 2. Does the same thing happen for the fractions $\frac{2}{4}$ and $\frac{4}{8}$? How about $\frac{4}{8}$ and $\frac{8}{16}$?

Let us look at another case using other fractions.

(See Fig 3.8)

What name should we give to the shaded part of bar A? . . . . . . . . . . . . . .

What name should we give to the same size part of bar B? . . . . . . . . . . .

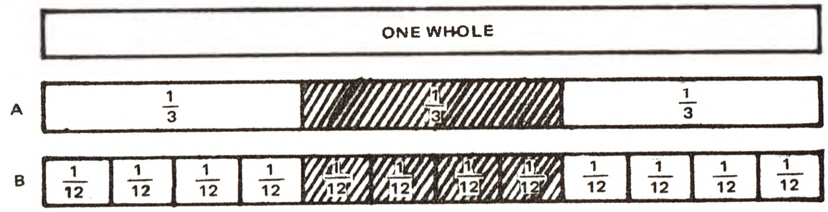



Fig. 3.8

Let us write down the two fractions we got: $\frac{1}{3}$, $\frac{4}{12}$

Let us write them using the sign to show they are equivalent (of the same value).

.................

By what number is the 1 multiplied to get 4?

By what number is the 3 multiplied to get 12? Notice that it is the same number 4.

(See Fig. 3.9)

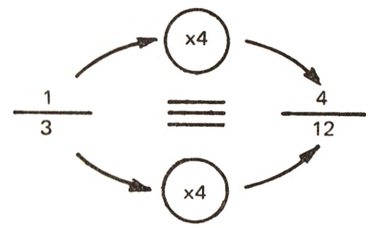



Fig. 3.9

From looking at the two examples we have shown.

(See Fig. 3.10)

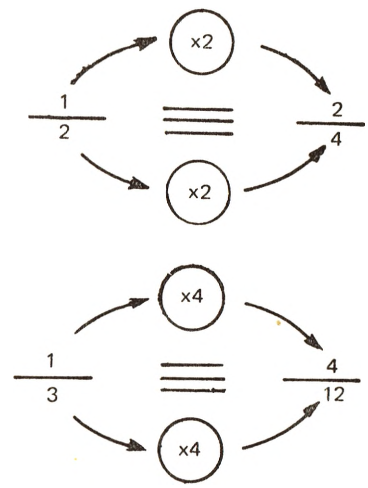



Fig. 3.10

We notice that in both cases we got equivalent fractions with *bigger numbers,* when we *multiplied* both the numerator and denominator of the first fractions by the *same number.* In example 1 # that number was 2, and in example 2 # the number was 4.

We have just discovered a very important fact. It is now easy for us to change the names and numbers of fractions without changing their value. Also it is easy for us to change the name of a fraction to any suitable name that we want. Let us practice what we learned.

*EXERCISE B*

(1) Let us produce 5 equivalent fractions for each fraction given below. We must use the signs; for this set we would multiply by 2. The first one is an example.

(a) $\frac{1}{3} = \frac{2}{6} = \frac{4}{12} = \frac{8}{24} = \frac{16}{48} = \frac{32}{96}$

(b) $\frac{1}{2}$ = ......................

(c) $\frac{1}{4}$ = ......................

(d) $\frac{1}{8}$ = ......................

(e) $\frac{3}{4}$ = ......................

(2) Now multiply by 3.

(a) $\frac{1}{2} = \frac{3}{6} = \frac{9}{18} = \frac{27}{54} = \frac{81}{172} = \frac{243}{516}$

(b) $\frac{1}{3}$ = ......................

(c) $\frac{1}{4}$ = ......................

(d) $\frac{1}{8}$ = ......................

(3) Are these two fractions equivalent? How do we know?

$\frac{3}{4}$, $\frac{9}{12}$

(4) Here are two columns of fractions. Let us draw lines to join up those that are equivalent.

(See Fig. 3.11)

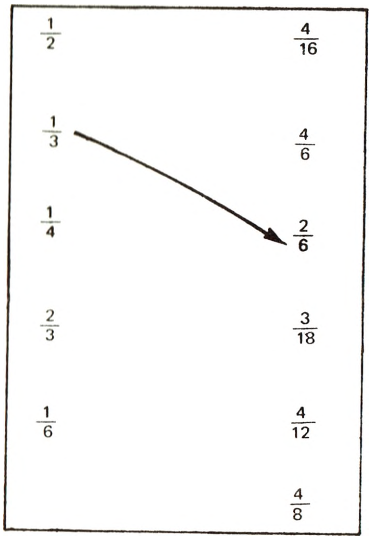



Fig. 3.11

(5) (a) Let us change $\frac{1}{2}$ to eighths.

clue: begin like this $\frac{1}{2} = \frac{\ }{8}$

Also the question what did we multiply 2 by to get 4?

(b) Let us change $\frac{2}{3}$ to ninths.

**INCREASING COMMONS AND REDUCING**

In all the examples we have had so far, we started with a fraction with small numbers as the numerators and denominators and by multiplying we moved to larger numbers. Whenever we do that we usually say that we are increasing the fraction. Is it really increased?

| N. B. to increase means to make bigger. |
|---|

We are going to learn to begin with larger numerators and denominators and produce equivalent fractions with smaller numbers. First let us look at these:

$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$$

We already know that these are all equivalent. Let us change around the order by putting $\frac{8}{10}$ first.

$$\frac{8}{16} = \frac{4}{8} = \frac{2}{4} = \frac{1}{2}$$

This time to move from the numerator 8 to the numerator 4 we divide 8 by 2 . . . . . . $8 \div 2 = 4$. Also to move from the denominator 16 to 8, we divide 16 by 2 - - - - - - - - $16 \div 2 = 8$.

Does the same thing happen for $\frac{4}{8}$ and $\frac{2}{4}$ ?

How about $\frac{2}{4}$ and $\frac{1}{2}$ ?

Let us use another example:

$$\frac{9}{27} = \frac{3}{9} = \frac{9}{27}$$

To move from the numerator 9 to 3 what number should we divide by? - - - - - - - - . Of course that would be the same number used to move from 27 to 9. So that:

(See Fig. 3.12)

$$\frac{9}{27} \div \frac{3}{9}$$

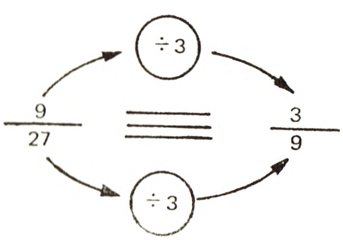



Fig. 3.12

Does the same thing happen for $\frac{3}{9}$ and $\frac{1}{3}$ ?

We have just discovered another important thing. In order to get an equivalent fraction with smaller numerator and denominator we must divide the numerator and denominator of the first fraction by the same number.

Let us try to produce 4 other equivalent fractions by dividing the numerator and denominator by 2 each time.

$$\frac{8}{16} = \text{. . . . . . . . . . . . . . . . . .}$$

Let us try to produce 4 other equivalent fractions by dividing by 3.

$$\frac{27}{54} = \dots\dots\dots\dots\dots\dots$$

For these examples could we really get 4 other fractions? How many did we really get? What is the smallest one we got? Whenever we are reducing fractions and we reach a point where we can go no further, we usually say that we have reduced the fractions to its lowest terms. In these cases the lowest terms were $\frac{1}{2}$.

Let us reduce $\frac{6}{9}$ to its lowest terms. We shall work this together.

First what number can we find that would divide 6 and 9 without a remainder? (Check the tables if necessary.)

We find that number is 3 so:

$$\frac{6 \div 3}{9 \div 3} = \frac{2}{3}$$

Then, can we find a number that can divide 2 and 3 at the same time without a remainder? We cannot find any so we have reached the lowest term, the smallest numerator and denominator we can get by reducing $\frac{6}{9}$.

Let us reduce these to their lowest terms:

Try to work the divisions in your mind and just write down the answer.

(a) $\frac{9}{12}$, (c) $\frac{27}{54}$ (e) $\frac{5}{15}$ (eg.) $\frac{9}{12} = \frac{3}{4}$

(b) $\frac{4}{16}$, (d) $\frac{8}{16}$

Let us change $\frac{6}{8}$ to quarters. . . $\frac{6}{8} = \frac{\phantom{0}}{4}$

**ADDITION OF COMMON FRACTIONS**

In Book 1 we did some very simple additions of fractions: eg. $\frac{1}{2} + \frac{1}{2} = \frac{2}{2}$ and $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + = \frac{4}{4}$.

We also saw that $\frac{2}{2}$ and $\frac{4}{4}$ both were equal to the whole or 1.

What do you notice about the denominators of those that we added above in eg. 1 and then in eg. 2?

This is very important: in order for us to add fractions they must all have the same number as denominator.

Let us try these together.

$\frac{1}{3} + \frac{1}{3}$ . . . read one third and one third. In the same way that 1 inch and 1 inch make 2 inches,

$$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$$

to prove it let us use the circle.

(See Fig. 3.13)

Shade in $\frac{1}{3}$ then shade in another third. What fraction do we have now?

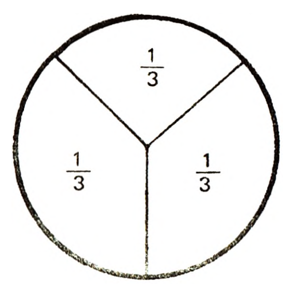



Fig. 3.13

*EXERCISE C*

(1) Let us add these:

a) $\frac{2}{8} + \frac{3}{8} + \frac{1}{8}$

b) $\frac{3}{12} + \frac{2}{12} + \frac{4}{12}$

c) $\frac{5}{9} + \frac{4}{9}$

d) $\frac{4}{8} + \frac{2}{8}$

For all the above we are assuming that we are working with the parts of the same size whole, in each addition. Also the denominators are the same for all the fractions in each example, we can say that they are fractions of the same kind. In this next step we are going to deal with fractions with different denominators. We are only going to use very simple cases. Let us add $\frac{1}{2} + \frac{1}{4}$, together.

First we notice that the denominators are different. Let us first do this on the diagram by shading in $\frac{1}{2}$ then $\frac{1}{4}$. What answer do we get?

(See Fig. 3.14)

| | |
|---|---|
| $\frac{1}{4}$ | $\frac{1}{4}$ |
| $\frac{1}{4}$ | $\frac{1}{4}$ |

Fig. 3.14

What we actually had to do was to regard the $\frac{1}{2}$ as $\frac{2}{4}$ that is, we had to change the name of the fraction by writing it as quarters. So now we have:

$$\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$$

Let us try another example: $\frac{2}{3} + \frac{1}{6}$

First we would have to change the name of one of the fractions. It is easier for us to change the one with the smaller denominator. So we change $\frac{2}{3}$ to sixths.

$$\frac{2}{3} = \frac{4}{6}$$

So we now add: $\frac{4}{6} + \frac{1}{6} = \ldots\ldots\ldots\ldots\ldots$

*EXERCISE D*

(1) Let us work these for practice:

a) $\frac{2}{3} + \frac{1}{3}$ b) $\frac{2}{5} + \frac{2}{10}$ c) $\frac{1}{8} + \frac{2}{8} + \frac{1}{4}$

d) $\frac{2}{6} + \frac{3}{6}$ e) $\frac{1}{5} + \frac{3}{10} + \frac{2}{10}$

(2) Let us solve these problems:

(a) Out of a bag of fertilizer a farmer used about $\frac{1}{4}$ the first week and $\frac{3}{8}$ the next week What fraction of the whole amount was used?

(b) Out of a sum of money a man spent $\frac{2}{10}$ for transport, $\frac{3}{5}$ for a meal and $\frac{1}{10}$ for a newspaper. What portion (fraction) of his money was spent?

## MULTIPLICATION OF FRACTIONS

The multiplication of fractions should be easy for us because we have dealt with a lot of multiplication in Book 1 and in the revision exercises of this book. However there are some new ideas we would learn that are specially related to the multiplication of fractions.

First we shall look at a very interesting case. Let us look at the fraction $\frac{1}{1}$. What does this fraction really mean?

First the denominator tells us that we have divided the whole into only 1 part. Of course if we divide any thing into only 1 part it means that part must be the same size as the whole thing itself.

(See Fig. 3.15)

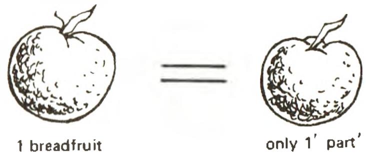



Fig. 3.15

Then the numerator tells us that we only take 1 of those parts so we end up with the same breadfruit.

Suppose we were to take 2 of those parts we would have this fraction, $\frac{2}{1}$, and that would be equal to 2 breadfruits.

Write the fractions then that are equal to the following:

(a) 3 breadfruits = ________________

(b) 4 breadfruits = ________________

(c) 6 breadfruits = ________________

For these examples we should have got the following results:

$$3 = \frac{3}{1}$$

$$4 = \frac{4}{1}$$

$$6 = \frac{6}{1}$$

What do you notice about the natural numbers and the numerators? We can say then that any fraction that has 1 as its denominator, has the same value as its numerator.

Also remember the fraction line means divided by so:

$$\frac{6}{1} = 6 \div 1 = 6$$

*EXERCISE E*

Let us write fractions that are equal to these numbers using 1 as their denominators.

(a) 5, (c) 7, (e) 8,

(b) 6, (d) 9, (f) 11.

## MULTIPLYING

*Example 1*

Let us multiply $\frac{1}{4}$ by 3.

(See Fig. 3.16)


Fig. 3.16

We can think of this in the same way that we would think of 1 X 3 only that now we are dealing with one quarter so that $\frac{1}{4} \times 3 = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$ that is $\frac{1}{4}$ coming up 3 times.

So that $\frac{1}{4} \times 3 = \frac{3}{4}$.

We can prove it by shading in $\frac{1}{4}$, 3 times in the diagram above.

*Example 2*

Let us multiply $\frac{2}{10}$ by 4.

$$\frac{2}{10} \times 4$$

again we can think of this as $\frac{2}{10}$ coming up 4 times.

$$\frac{2}{10} + \frac{2}{10} + \frac{2}{10} + \frac{2}{10} = \frac{8}{10}$$

so $\frac{2}{10} \times 4 = \frac{8}{10}$

Let us look at what happened in the examples more closely.
In example 1 #:

$$\frac{1}{4} \times 3 \text{ could be written as } \frac{1}{4} \times \frac{3}{1}\text{, why?}$$

And in example 2 #:

$$\frac{2}{10} \times 4 \text{ could be written as } \frac{2}{10} \times \frac{4}{1}\text{, why?}$$

We just saw that in example 1 #:

$$\frac{1}{4} \times \frac{3}{1} = \frac{3}{4}$$

And in example 2 # that:

$$\frac{2}{10} \times \frac{4}{1} = \frac{8}{10}$$

We have just discovered that to multiply fractions we simply multiply the numerators to get the numerator of the answer, and multiply the denominators to get the denominatc of the answer.

*EXERCISE F*

(1) Let us practice what we have just learnt:

(a) $\frac{2}{3} \times \frac{2}{1}$

(b) $\frac{1}{4} \times \frac{2}{1}$

(c) $\frac{3}{5} \times \frac{2}{3}$

(d) $\frac{2}{3} \times \frac{4}{5}$

(e) $\frac{1}{3} \times 7$

(f) $\frac{2}{3} \times \frac{1}{3} \times \frac{1}{4}$

(g) $\frac{6}{8} \times \frac{2}{3} \times \frac{1}{4}$

(h) $\frac{7}{8} \times \frac{1}{8}$

(2) A woman bought a yard of material to make some bands for some skirts. If she used $\frac{1}{8}$ yard for each skirt, and made 6 skirts. What fractions of the material was used? Reduce that fraction to its lowest terms.

**DIVISIONS WITH FRACTIONS AS THEIR QUOTIENTS**

Earlier, in Unit 2 #, we tried to do divisions where the divisor is larger than the dividend for example $2 \div 6$, $4 \div 8$, etcetera.

We know that the fraction line really means divided by or (÷) so then the fraction $\frac{1}{2}$ can be read $1 \div 2$

$$\frac{1}{2} = 1 \div 2 \quad \text{or} \quad 1 \div 2 = \frac{1}{2}$$

We can now tackle our divisions.

$3 \div 4 = \frac{3}{4}$, the 3 becomes the numerator and 4 becomes the denominator.

$6 \div 8 = \frac{6}{8} = \frac{3}{4}$ (reduced to lowest terms). The quotients of these are always fractions.

Let us work these, we must always reduce the answer to their lowest terms.

(1) $2 \div 6$ (2) $12 \div 24$ (3) $4 \div 6$

## FINDING A FRACTION OF A NUMBER OR ANOTHER FRACTION

Many times we would like to find what $\frac{1}{2}$ of a certain amount is, or what any fraction of that amount would be. For example if someone wants to find the cost of $\frac{1}{2}$ yd. of ribbon, and the cost of 1 yd. is 80 ¢, he actually has to find $\frac{1}{2}$ of 80 ¢ because $\frac{1}{2}$ yd. would be $\frac{1}{2}$ the cost of 1 yd.

Let us learn how to tackle cases like these:

Let us find $\frac{1}{2}$ of 8.

Fig. 3.17

(See Fig. 3.17)

Using the diagram, it is easy for us to see that to get the answer we can simply divide the group of 8 into 2 equal parts.

So that: $8 \div 2 = 4$.

But what we actually did was to take $\frac{1}{2}$ group of the group of 8. When we were dealing with multiplication, we saw that an example like $3 \times 8$ really means 3 groups of 8 and $1 \times 8$ really means 1 group of 8. To find $\frac{1}{2}$ group of 8 therefore we can simply write $\frac{1}{2} \times 8$.

$$\frac{1}{2} \text{ of } 8 = \frac{1}{2} \times 8$$

Let us now find our answer this way:

$$\frac{1}{2} \text{ of } 8 = \frac{1}{2} \times 8 = \frac{1}{2} \times \frac{8}{1} = \frac{8}{2}$$

$$\text{now } \frac{8}{2} = 8 \div 2 = 4$$

*Answer is 4*

Another example:

Let us find $\frac{1}{4}$ of 8.

$$\frac{1}{4} \text{ of } 8 = \frac{1}{4} \times \frac{8}{1} = \frac{8}{4} = 8 \div 4 = 2$$

*Answer is 2*

*EXERCISE G*

Let us work these examples:

(1) $\frac{1}{2}$ of 12 (2) $\frac{1}{4}$ of 16 (3) $\frac{1}{8}$ of 32

(4) $\frac{3}{4}$ of 12 (5) $\frac{3}{4}$ of 8.

## FINDING FRACTIONS OF FRACTIONS

Finding a fraction of another fraction is similar to finding a fraction of a whole number, but first let us look at it using diagrams:

Let us fund $\frac{1}{2}$ of $\frac{1}{2}$.

(See Fig. 3.18)

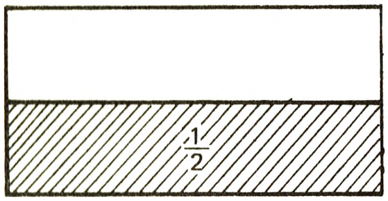



Fig. 3.18

First we show a half

Now we take $\frac{1}{2}$ of that portion.

(See Fig. 3.19)

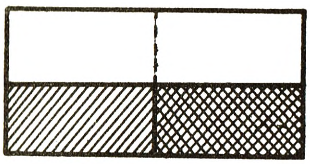


Fig. 3.19

What fraction of the whole we ended up with?

(See Fig. 3.20)

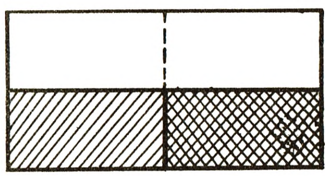


Fig. 3.20

So we saw that $\frac{1}{2}$ of $\frac{1}{2}$ is the same as $\frac{1}{4}$ of rectangle.

Here is another example.

Let us find $\frac{1}{3}$ of $\frac{1}{2}$.

(See Fig. 3.21)

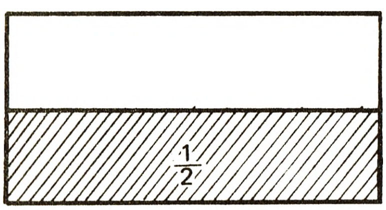



Fig. 3.21

(See Fig. 3.22)

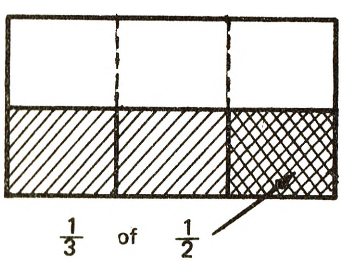



Fig. 3.22

(See Fig. 3.23)

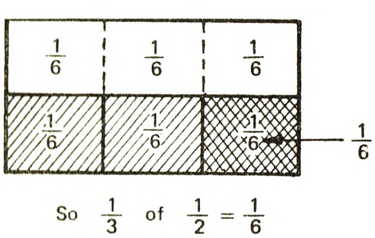



Fig. 3.23

Here again we see that we can get the result by simply multiplying the fractions.

So that $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ and $\frac{1}{3}$ of $\frac{1}{2} = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

*EXERCISE H*

Let us work the following:

(1) $\frac{1}{4}$ of $\frac{1}{2}$ (2) $\frac{1}{4}$ of $\frac{1}{4}$ (3) $\frac{1}{3}$ of $\frac{1}{4}$ (4) $\frac{2}{3}$ of $\frac{2}{3}$ (5) $\frac{3}{5}$ of $\frac{1}{6}$

## SUBTRACTION OF FRACTIONS

Subtractions of fractions is handled in very much the same way as the subtraction of natural numbers. Let us tackle it.

*Example 1*

Let us subtract: $\frac{3}{4} - \frac{1}{4}$

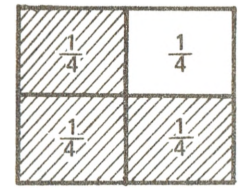
Using diagrams we show $\frac{3}{4}$ of the rectangle first.

(See Fig. 3.24)

Then subtracting a $\frac{1}{4}$ of the whole rectangle from that we would get:

(See Fig. 3.25)

So then $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$




$\frac{3}{4}$ of the rectangle.

Fig. 3.24

*Example 2*

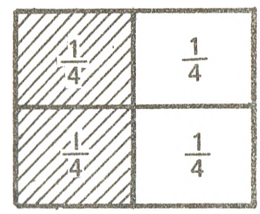
Again let us subtract: $\frac{5}{6} - \frac{2}{6}$

(See Fig. 3.26)

(See Fig. 3.27)

In these two examples:

(1) $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$ (2) $\frac{5}{6} - \frac{2}{6} = \frac{3}{6}$




$\frac{2}{4}$ of the rectangle.

ig. 3.25

We notice that the denominators of the fractions in example 1 are the same number; also those in example 2 are the same number. This is very important. We must have the same number as denominators before we can subtract the fractions.

Once the denominators are the same we subtract as normal, using the numerators. In that way we can think of $\frac{3}{4} - \frac{1}{4}$ in the same way as 3 dollars minus 1 dollar, it is only that we have instead 3 quarters minus 1 quarter.

Let us try to subtract: $\frac{1}{3} - \frac{1}{6}$.

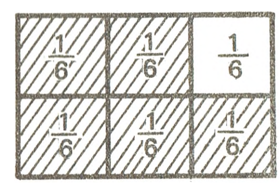
Notice the denominators are different. However we can change $\frac{1}{3}$ to sixths, using our knowledge of equivalence.

$$\text{so } \frac{1}{3} = \frac{\phantom{0}}{6},$$

$$\frac{1 \times 2 \rightarrow 2}{3 \times 2 \rightarrow 6}, \quad \frac{1}{3} = \frac{2}{6}$$

We can now use $\frac{2}{6}$ in the place of $\frac{1}{3}$ and continue to subtract.

$$\frac{2}{6} - \frac{1}{6} = \frac{1}{6}$$




$\frac{5}{6}$ of the rectangle.

Fig. 3.26

*EXERCISE I*

Let us do these subtractions:

1) $\frac{4}{5} - \frac{2}{5}$

2) $\frac{3}{6} - \frac{2}{6}$

3) $\frac{12}{16} - \frac{4}{16}$

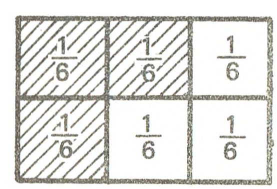
4) $\frac{3}{4} - \frac{2}{8}$

5) $\frac{2}{3} - \frac{1}{9}$

6) $\frac{6}{8} - \frac{1}{4}$

7) $\frac{8}{8} - \frac{2}{8}$

Note: any number over itself is equal to 1 or the whole




$\frac{3}{6}$ of the rectangle.

Fig. 3.27

## DIVISION OF FRACTIONS

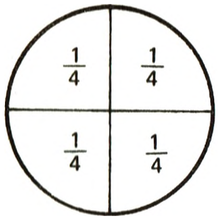
We have now come to the division of fractions. Before we proceed we should think back a little about the real meaning of division and how it is linked with subtraction.

*Example 1*

Let us divide 1 by $\frac{1}{4}$

statement: $1 \div \frac{1}{4}$

We can write this as $\frac{1}{1} \div \frac{1}{4}$ (because $\frac{1}{1} = 1$).




here we have four quarters.

Fig. 3.28

Here we are trying to find the number of quarters we can get from 1 whole. Let us use the diagram to help us.

(See Fig. 3.28)

Notice that the number of quarters we got from the whole circle is 4 times 1 or $1 \times 4$. So that:

(See Fig. 3.29)

$$\frac{1}{1} \div \frac{1}{4} = \frac{1}{1} \times \frac{4}{1}$$

What is the different between these two sections?

Fig. 3.29

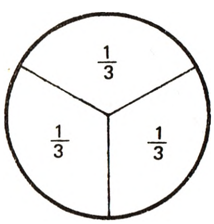
*Example 2*

Let us now try to work out: $1 \div \frac{1}{3}$

We rewrite it as $\frac{1}{1} \div \frac{1}{3}$.

Again using diagrams:

(See Fig. 3.30)




We get 3 thirds, or 3 parts.

Fig. 3.30

Here again the number we got is actually 3 times 1 whole.

(See Fig. 3.31)

$$\frac{1}{1} \div \frac{1}{3} = \frac{1}{1} \times \frac{3}{1}$$

What is the different between these two sections?

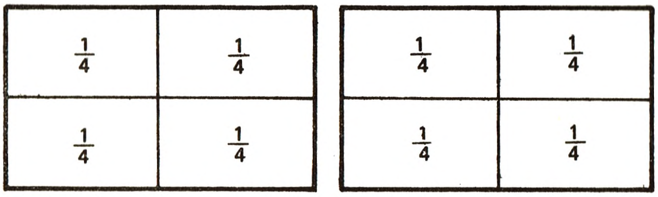
Fig. 3.31

*Example 3*

Now we are going to divide 2 by $\frac{1}{4}$. We are trying to find the number of quarter in two wholes.

$$\frac{2}{1} \div \frac{1}{4}$$

(See Fig. 3.32)




Here we got 8 quarters?

Fig. 3.32

Notice the number we get is really 4 times.

(See Fig. 3.33)

$$\frac{2}{1} \div \frac{1}{4} = \frac{2}{1} \times \frac{4}{1}$$

Fig. 3.33 Again notice the difference.

What we can see from these examples is that we can work out the divisions by rewriting the statements as multiplication and capsize the divisor, then we work the multiplication as normal.

e.g. $\frac{3}{1} \div \frac{1}{3} = \frac{3}{1} \times \frac{3}{1} = 9$

This is a very important trick for us to understand and learn to use well.

*EXERCISE J*

Let us therefore work out these:

(a) $\frac{4}{1} \div \frac{1}{8}$

(b) $\frac{6}{1} \div \frac{1}{3}$

(c) $\frac{2}{1} \div \frac{1}{2}$

(d) $\frac{4}{1} \div \frac{1}{6}$

(e) $\frac{6}{1} \div \frac{1}{3}$

Let us move a stage further. Here we are going to use dividends with other denominators apart from 1.

$$\frac{3}{4} \div \frac{1}{4}$$

Here we are trying to see how many quarters we can get from 3 quarters. A glance at it would tell us the answer is 3.

(See Fig. 3.34)

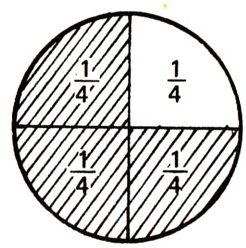



Fig. 3.34

Again if we used the multiplication sign and capsized or inverted the divisor we get:

$$\frac{3}{4} \times \frac{4}{1} = \frac{12}{4}$$

reducing to the lowest terms $\frac{12}{4} = \frac{3}{1}$ or 3.

So we see that our little trick can work for these too. As a matter of fact, we can safely use it to divide fractions no matter how big the numbers are.

Let us work these; reducing our answers to their lowest terms where possible. The first one is done as an example.

(1) $\frac{2}{3} \div \frac{4}{5} = \frac{2}{3} \times \frac{5}{4} = \frac{10}{12} = \frac{5}{6}$ → lowest terms.

*EXERCISE K*

(2) $\frac{1}{4} \div \frac{4}{5}$

(3) $\frac{3}{5} \div \frac{3}{4}$

(4) $\frac{9}{12} \div \frac{4}{5}$

(5) $\frac{1}{4} - \frac{7}{8}$

(6) How many quarters can we get from $\frac{6}{8}$ ?

(7) How many thirds can we get from $\frac{5}{8}$ ?

(8) How many halves can we get from $\frac{1}{2}$ ?

## FINDING WHAT FRACTION ONE NUMBER IS OF ANOTHER

*Example 1*

A man used 5 dollars out of the money he had to buy fruits. If he had 10 dollars, what fraction of his money did he spend? We can use a diagram to help us:

(See Fig. 3.35)


Fig. 3.35

It is easy to see that he spent half ($\frac{1}{2}$) of his money.

Without diagrams we simply write a fraction using the total amount he had as the denominator and the amount he spent as the numerator.

$$\frac{5}{10}$$

Then we reduce it to its lowest terms.

$$\frac{5}{10} = \frac{1}{2}$$

*Example 2*

What fraction is 8 out of 32?

$$\frac{8}{32} = \frac{4}{16} = \frac{2}{8} = \frac{1}{4}$$

*Answer is* $\frac{1}{4}$

Let us practice:

(1) What fraction is 4 out of 8?

(2) What fraction is 3 out of 9?

(3) What fraction is 3 out of 15?

(4) What fraction is 6 out of 11?

(5) Out of 24 mangoes collected, 6 were found to be spoilt.

   (a) What fraction was spoilt?

   (b) What fraction was good?

## SUMMARY OF FRACTIONS

In this unit we saw how whole objects or number can be divided into equal parts called fractions. In most of the diagrams we used rectangles, bars or circles, to represent the whole object, or numbers whatever the amount might be.

We saw also that fractions of a whole can be written with different names, forming new fractions which have the same value or are equivalent to the old ones. We learnt that these equivalent fractions could be formed by multiplying or dividing the numerator and denominator of the first fraction by the same number. We multiply if we are increasing the numbers, and divide if we want to reduce or decrease the numbers.

We learned that to add or subtract fractions we must ensure that they all have the same number as their denominators. In the section on multiplication we learned that we simply multiply the numerators to get the numerator of the answer, and multiply the denominators to get the denominator of the answer, then reduce the answer to its lowest terms.

$$\text{eg. } \frac{2}{3} \times \frac{2}{4} = \frac{2 \times 2}{3 \times 4} = \frac{4}{12} = \frac{1}{3}$$

We tackled the division of fractions by applying a little trick, that is change the statements to multiplications and inverting (capsize) the divisor (the fraction after the sign). Then, work the multiplication as normal.

Also in the unit we learned to find a fraction of a number and also what fraction a number was of another number.

This unit is very important for the understanding of fractions and for quick and accurate work later. If any section is not clear, you should go back and study it again until the ideas are clear in your mind.

## CONSOLIDATORY EXERCISES

(1) Let us write 4 equivalent fractions for each fraction given, by increasing them.

(a) $\frac{2}{3}$ ; (b) $\frac{1}{5}$ ; (c) $\frac{2}{6}$ ; (d) $\frac{3}{5}$

(2) Let us reduce these fractions to their lowest terms:

(a) $\frac{16}{24}$ (b) $\frac{16}{32}$ (c) $\frac{7}{28}$ (d) $\frac{28}{56}$

(3) Let us add these fractions:

(a) $\frac{1}{2} + \frac{1}{3} + \frac{1}{6}$ (b) $\frac{2}{5} + \frac{3}{25} + \frac{1}{5}$ (c) $\frac{7}{14} + \frac{1}{2}$

**Calculation of addition problems related to students needs and activities.**

(4) Let us subtract:

(a) $\frac{6}{7} - \frac{3}{7}$ (b) $1 - \frac{2}{3}$ (c) $\frac{3}{4} - \frac{1}{2}$

(d) $\frac{4}{6} - \frac{2}{6} - \frac{1}{3}$ (e) $\frac{5}{8} - \frac{1}{4}$

**Calculation of subtraction problems related to students needs and activities.**

(5) Let us multiply and reduce our answers to their lowest terms if possible:

(a) $\frac{2}{3} \times \frac{1}{4}$ (b) $\frac{4}{8} \times \frac{1}{4} \times \frac{1}{2}$ (c) $\frac{5}{16} \times \frac{2}{3}$

(d) $\frac{3}{8} \times \frac{1}{4} \times \frac{1}{3}$ (e) $\frac{4}{5} \times \frac{4}{5}$

**Calculation of multiplication problems related to students needs and activities.**

(6) Let us divide: Reduce your answers to their lowest terms

(a) $\frac{1}{2} \div \frac{1}{4}$ (b) $\frac{3}{16} \div \frac{2}{4}$ (c) $\frac{4}{5} \div \frac{2}{3}$

(d) $\frac{3}{12} \div \frac{1}{4}$ (e) $\frac{2}{8} \div \frac{3}{5}$

**Calculation of problems related to students needs and activities.**

(7) Let us solve these problems:

(a) $\frac{1}{4}$ of a mans' salary is usually spent for rent. If he gets $ 250.00, how much does he pay for rent?

(b) Out of a group of 33 footballers 22 were chosen to go on a tour. (a) What fraction was chosen? (b) What fraction remained behind?

**Calculation of similar problems related to students' needs and activities.**

UNIT 4

## LINES AND ANGLES

### REVIEW OF LINES

We dealt with the basic points about lines in Book 1. Let us revise a little of what we learned.

(See Fig. 4.1)

Here we have three straight lines shown. What are their names.

(1) ............ (2) ............

(3) ............

Here we have three points on line *d* let us name the points.

..............................

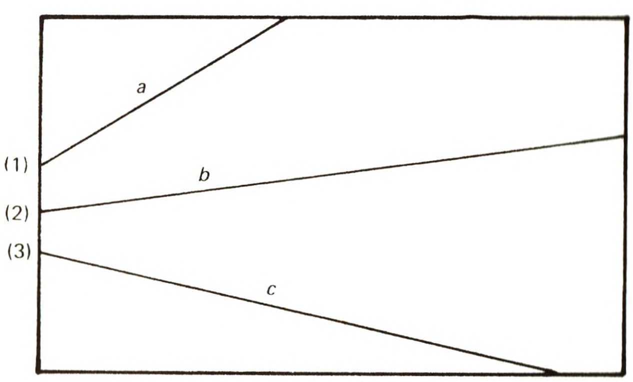



Fig. 4.1

(See Fig. 4.2)

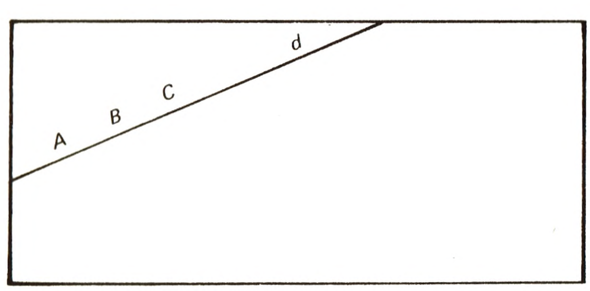



Fig. 4.2

What point is between *A* and *C?* What is different about the type of letters used to name the points, and those used to name the lines?

Look at the piece of line *A* to *B* its name is *AB*. *AB* is part or a segment of line *d*, it is called a line segment.

Write down the names of three segments shown in Fig. 4.3.

(See Fig. 4.3) ................................

................................

................................

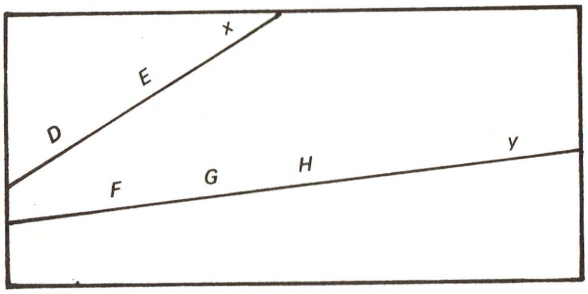



Fig. 4.3

(See Fig. 4.4)

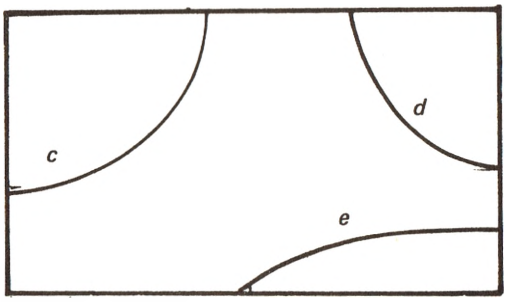



Fig. 4.4

(See Fig. 4.5)

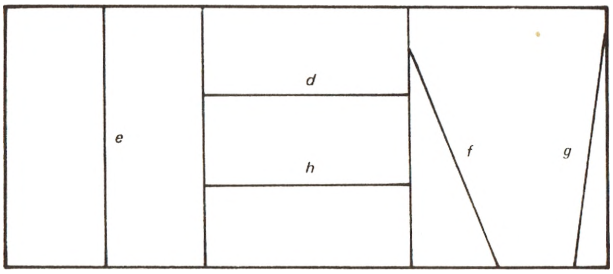



Fig. 4.5

Here we are showing curved lines.

What are some shapes that these are used to make?

(See Fig. 4.6)

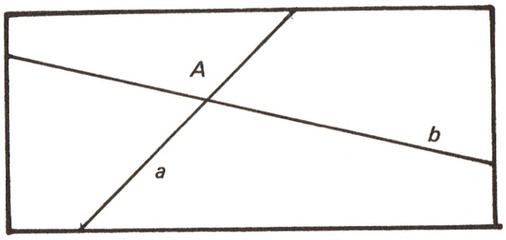



Fig. 4.6

Which line is upright or vertical? ................................

Which line is horizontal? ................................

Which are slanting or sloping? ................................

We would now move on a little further to learn more about lines.

Here we have two lines *a* and *b* crossing each other at point *A*. We usually say they *intersect* each other at *A*.

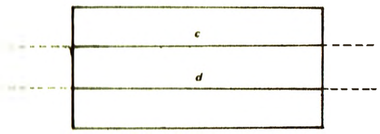



Fig. 4.7

(See Fig. 4.7)

The lines *c* and *d* shown here do not intersect each other. Even though we stretch them out as long as possible. They would not meet or intersect each other, nor would they come closer, or get farther away from each other. The lines are always going to stay the *same distance apart* from each other. Lines like these are said to be *parallel* to each other and they called *parallel lines.*

(See Fig. 4.8)

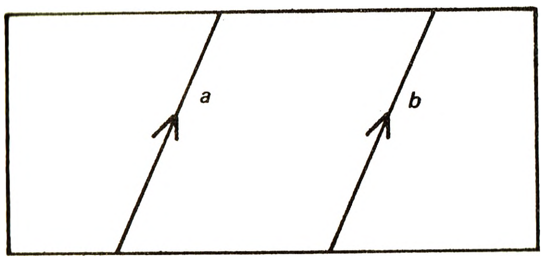
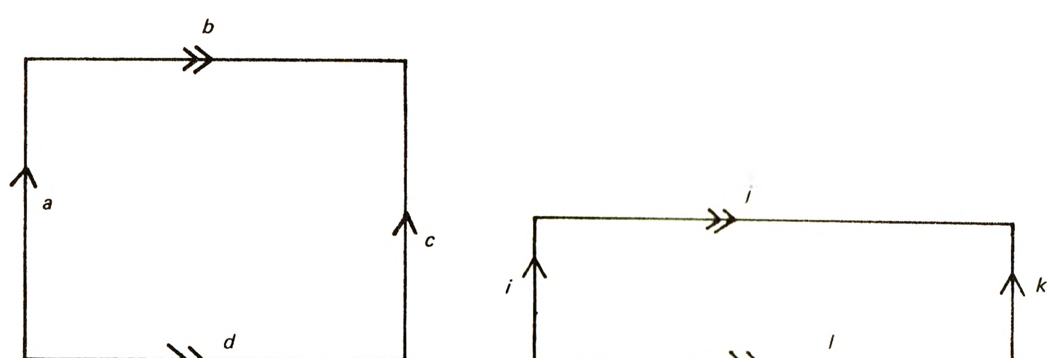



Fig. 4.8

In Fig. 4.8 lines *a* and *b* are also parallel lines. We have shown that they are parallel to each other by using one arrow on each line. Sometimes you would see two or three arrows on each line.

In shapes like squares and rectangles; the opposite sides are parallel to each other.

(See Fig. 4.9)




(1) (2)

Fig. 4.9

(1) line *a* is parallel to line *c*, so we use one arrow on each line. Then line *d* is parallel to line *b*, so to avoid confusion we use two arrows on each of these lines.

Using symbols: *a* is parallel to *c* can be written as $a \parallel c$.

Let us use symbols to show the other pairs of parallel lines in the rectangle (2).

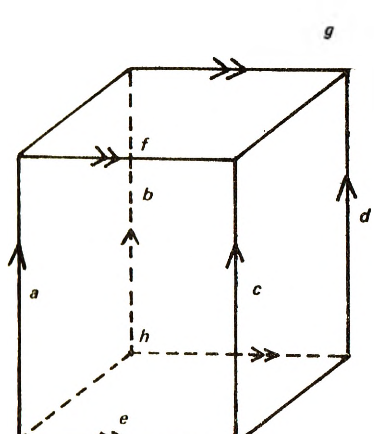



Fig 4 10

In this diagram of a cube. We can see many parallel lines.

Lines *a, b, c* and *d* are all parallel to each other.

$a \parallel b \parallel c \parallel d.$ (See Fig. 4.10)

Which others are parallel?

Look about you at the houses, plants, boxes and other objects. Can you see sets of parallel lines? Point out a few sets. How would you know if these two lines are really parallel?

(See Fig. 4.11)

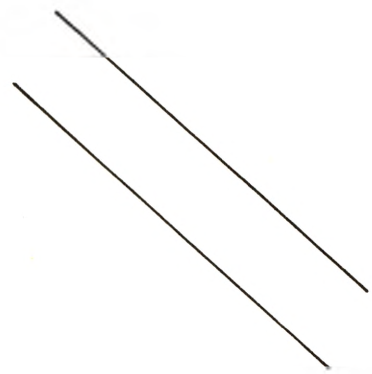


Fig. 4.11

PARALLEL LINES ARE ALWAYS THE SAME DISTANCE APART FROM EACH OTHER, NO MATTER HOW LONG THEY ARE STRETCHED OUT.

We would now learn to draw parallel lines using some simple tools.

(See Fig. 4.12)

(See Fig. 4.13)

Fig. 4.12 (1) ruler (2) set square

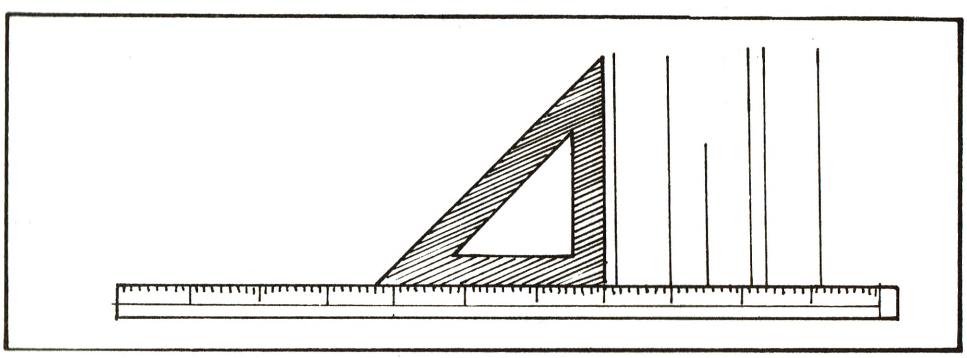


Fig. 4.13

To draw a set of parallel lines we can follow these steps.

(1) Place the ruler down on the paper and place one edge of the set square on the ruler as shown in the diagram.

(2) Slide the set square along the edge of the ruler while holding the ruler down firmly so that it would not move.

(3) Bring the set square to rest and while holding it firmly—draw your lines.

(4) Continue the above steps until you have drawn a number of lines of various lengths.

(5) Name each line.

All the lines you have drawn in this way are parallel to each other.

You can now change the position of the ruler and draw some other sets of different directions. For example:

(See Fig. 4.14)

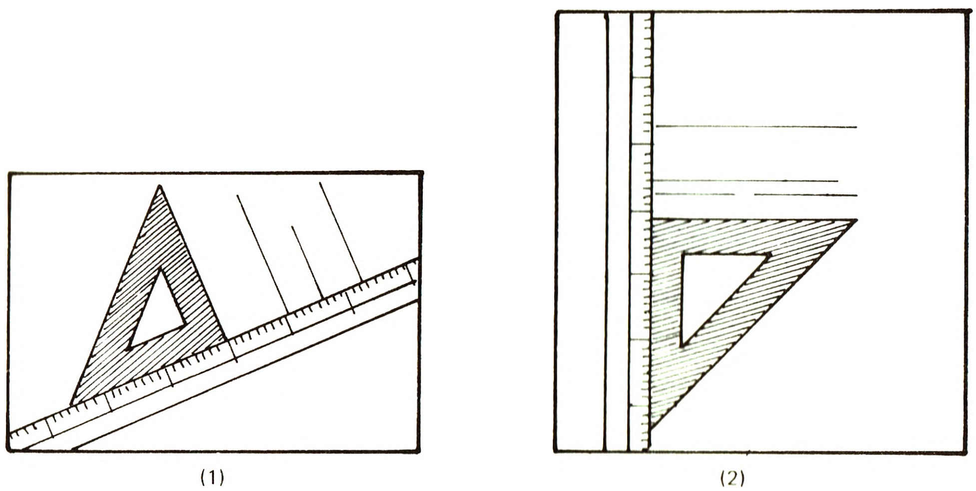



Fig. 4.14

Sometimes you may want to draw parallel lines to a line that is already drawn. Could you think of a way to do it? Here is a good way:

(See Fig. 4.15)

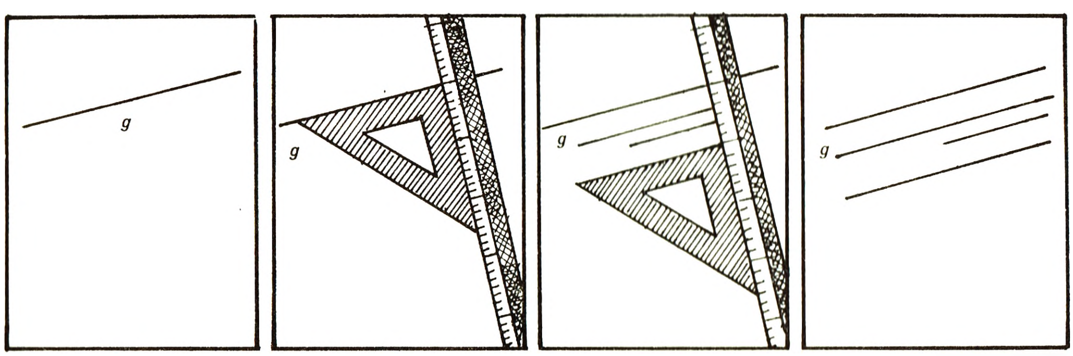



Fig. 4.15

(1) Place one edge of the set square along the line and the ruler along the edge of the square as shown as the diagram.

(2) Holding the ruler firmly, slide the square up or down which ever way is needed, and draw your parallel lines as before. Name each new line that you draw.

You may also want to draw a line parallel to the first one but passing through a particular point. Let us draw a line parallel to line *r*, passing through point *p*. Could you think of a way to do it.

(See Fig. 4.16)

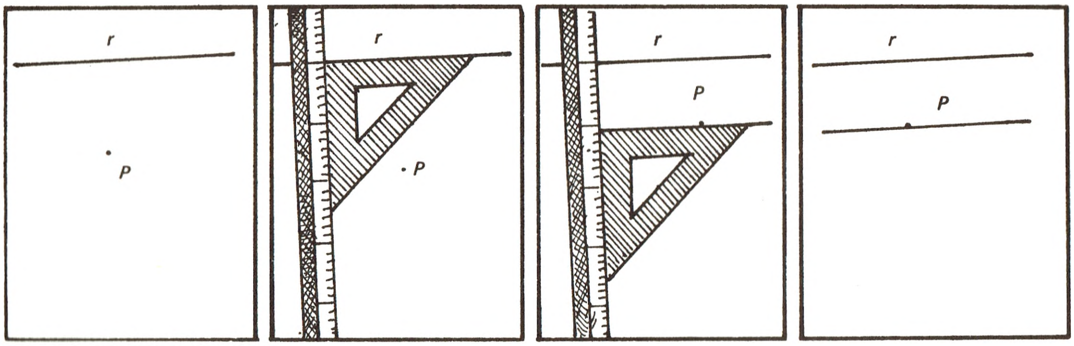


Fig. 4.16

Follow the same steps as before but bring the square to rest so that its edge passes exactly on point *p*. Then draw the line. Name this line.

Fig. 4.17

*EXERCISE A*

Let us practice:

(1) Let us draw five parallel lines.

(2) Let us draw 4 lines that are parallel to line *r*. Name each line.

(See Fig. 4.17)

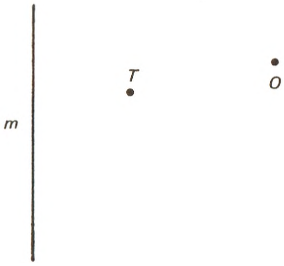


Fig. 4.18

(3) Let us draw two new lines that are parallel to line *m;* one passing through point *T* and one through point *o.*

(See Fig. 4.18)

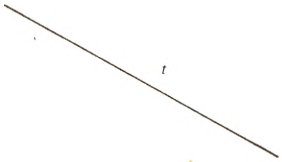


Fig. 4.19

(4) Let us draw a line, *s,* that is parallel to line *t* and 1 inch away from it.

(See Fig. 4.19)

**ANGLES**

We would now learn more about intersecting lines and lines that meet.

(See Fig. 4.20)

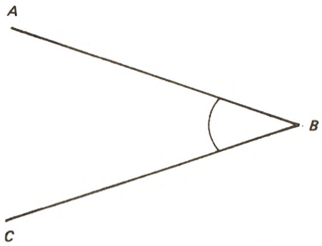


Fig. 4.20

In the figure we see lines *AB* and *BC* meeting at a common point *B.* Whenever lines meet at a common point they form *angles.* The common point is the *vertex* of the angle, and the lines are the sides of the angle. The curved line is the symbol used on figures to show angles; sometimes 2 or 3 curved lines are used.

To name the angle we can use the three letter names; angle *ABC* using symbols: $<ABC$. If that angle would not be confused with any other we can just use the letter *B*.

Sometimes a small letter is written in the angle, in this case that letter can be used to name the angle.

(See Fig. 4.21)

Fig. 4.21

*EXERCISE B*

Let us write down the names of the angles shown using symbols.

(See Fig. 4.22)

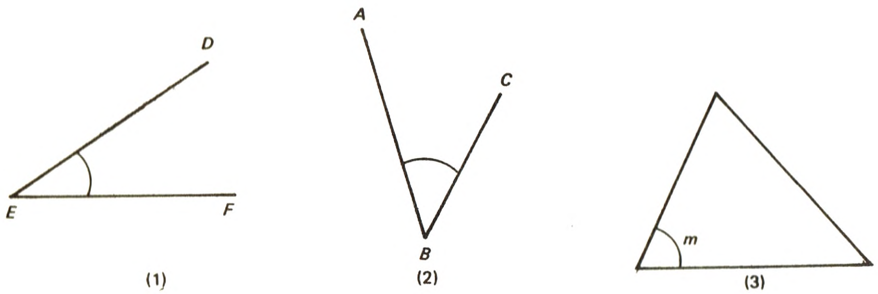



Fig. 4.22

We now know that whenever 2 lines meet they form an angle, actually two angles are formed.

(See Fig. 4.23)

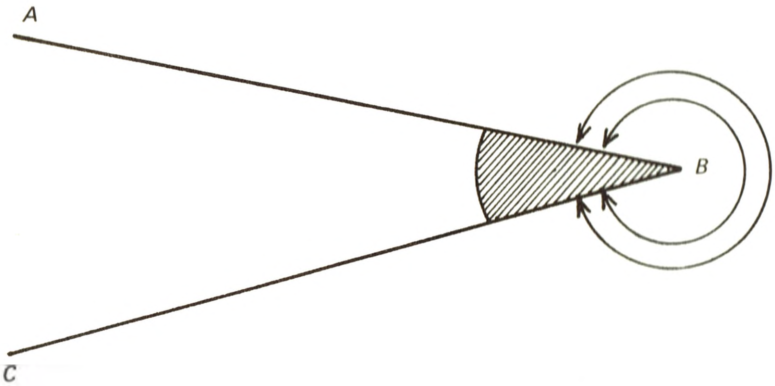



Fig. 4.23

In the Figure the shaded portion shows one angle, we can call this the inside angle. The double curved lines show the other angle which we can call the outside angle.

Of course both angles would have the same name. In cases like these a small letter can help us, or we can say if it is the outside or inside angle we are referring to.

Look around you at the different objects, buildings, etc. See how many angles you can identify.

**SOME BASIC ANGLES**

Different angles have different sizes. We therefore need to be able to measure the different sizes, in order to describe the angles properly. Earlier we measured lengths using yards, feet and inches, and measured weights using pounds ounces and so on. We measure angles using degrees. An angle of ten degrees can be written using symbols like: $10^\circ$ = ten degrees. Let us write . . . . . . . . . . . . . . . . . . . .

We usually measure angles using an instrument called a *protractor,* let us read and write protractor . . . . . . . . . . . . . . . . . . , . . . . . . . . . . . . . . . .

(See Fig. 4.24)

For now we would use only our set squares to measure angles. The corners of our set squares have been carefully designed by the makers to measure certain angles.

(See Fig. 4.25)

The set squares are slightly different in shape set square (1): $<A = 90^\circ$, $<B = 45^\circ$, $<C = 45^\circ$. This is called the $45^\circ$ square. On set square (2): $<D = 90^\circ$, $<E = 60^\circ$, $<F = 30^\circ$. We can call this one the $30^\circ$ square.

Notice that angles $A$ and $D$ are both $90^\circ$. The $90^\circ$ angle is a very important angle, and is usually called a *right angle.*

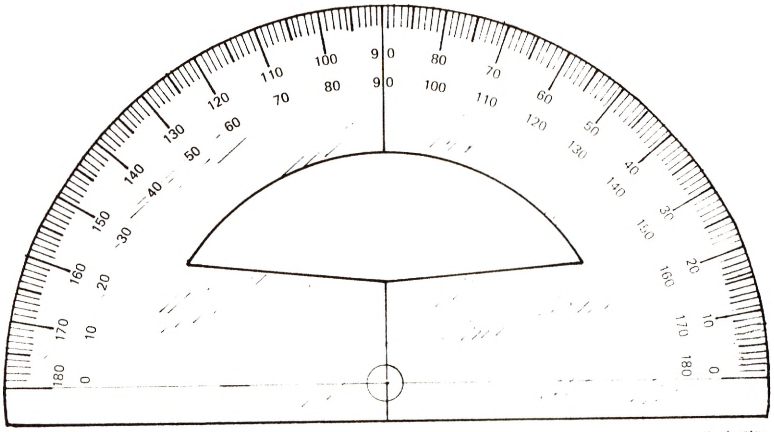



Fig. 4.24

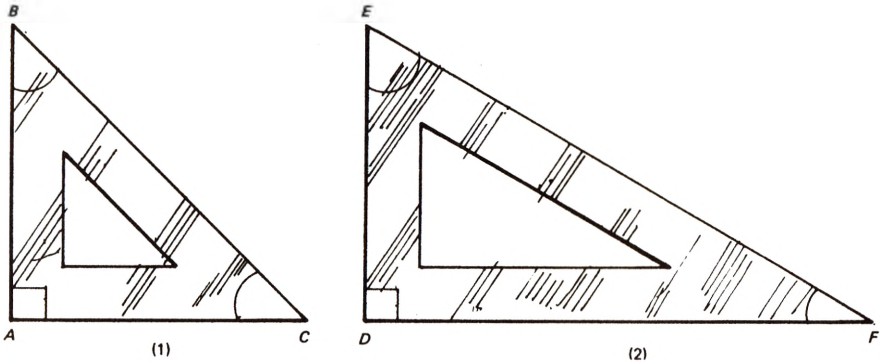



Fig. 4.25

We can show that an angle is a right angle by using a special symbol.

(See Fig. 4.26)

Carpenters usually use squares with 90° angles to make sure that their corners are square (90°). They usually refer to the right angle as a square corner.

(See Fig. 4.27)

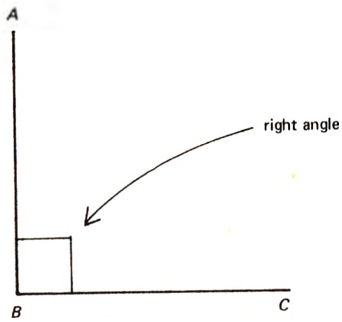



Fig. 4.26

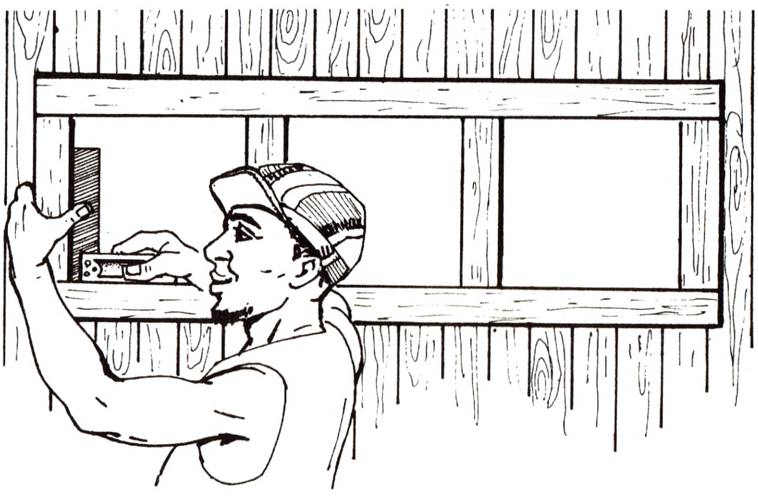


Fig. 4.27

The 45° angle, $< B$, and $< C$ are also important angles. These are also used to make corner joints of picture frames.

(See Fig. 4.28)

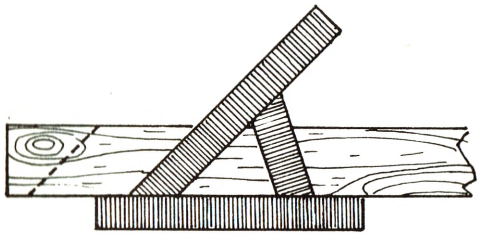


Fig. 4.28

If the angles $X$ and $Y$ are joined, what size angle would be formed?

$$45^\circ = \frac{1}{2} \text{ of } 90^\circ$$

Because we already have the angles on the squares measured for us, it is now easy to measure angles of the same sizes using these tools.

Let us see how it is done. Let us find the size of $< ABC$ in this figure.

(See Fig. 4.29)

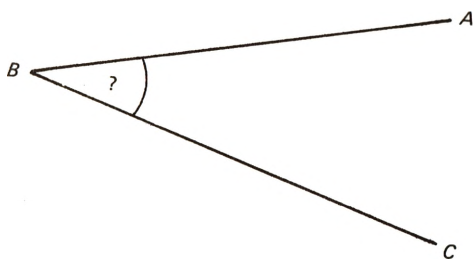



Fig. 4.29

We try to fit the corner of the squares into the angle making sure that the vertex of the set square is exactly in the vertex of $B$.

(See Fig. 4.30)

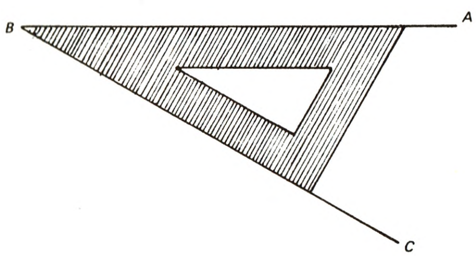



Fig. 4.30

Once we get a perfect fit as shown in the figure, we know that $< B$ is the same size as that angle on the set square. In this case 30°. $B = 30^\circ$

*EXERCISE C*

(1) Let us measure the size of these angle.

and fill in the answers in the blank spaces:

(See Fig. 4.31)

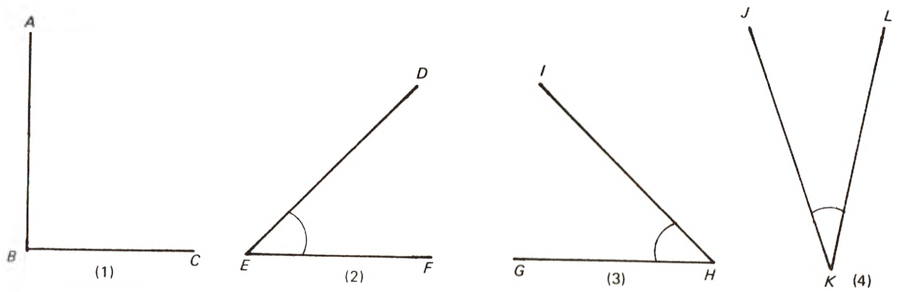



Fig. 4.31

<*ABC* = . . . . . . . . . . . .

<*DEF* = . . . . . . . . . . . .

< GHI = . . . . . . . . . . . .

<*JKL* = . . . . . . . . . . . .

(2) Let us draw an angle of 30° using the 30° square.

**PERPENDICULAR**

(See Fig. 4.32)

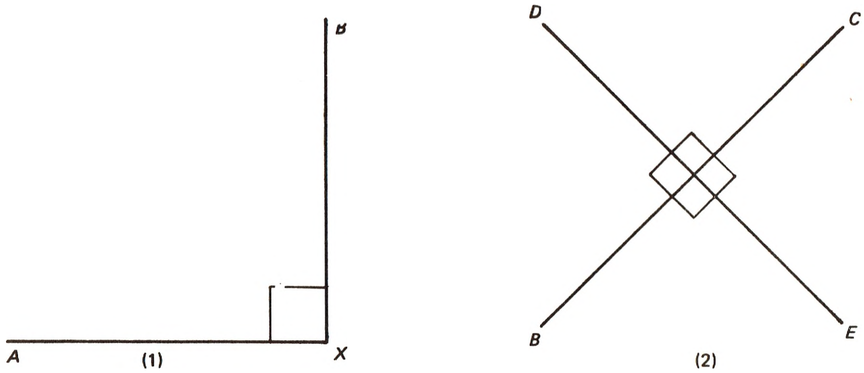



Fig. 4.32

In the above figures lines *AX* and *BX* meet at right angles, also lines *DE* and *BC* intersect each other at right angles.

Lines that meet or intersect each other at right angles like these are said to be perpendicular to each other. Let us read and write the word:

Perpendicular . . . . . . . . . . . . , . . . . . . . . . . . .

To show that *AX* is perpendicular to *BX* we can use a symbol.

$$AX \perp BX$$

Fill in the symbol to show that *BC* is perpendicular to *DE*.

*BC* . . . . . . . . *DE*

Which pairs of lines are perpendicular to each other?

(See Fig. 4.33)

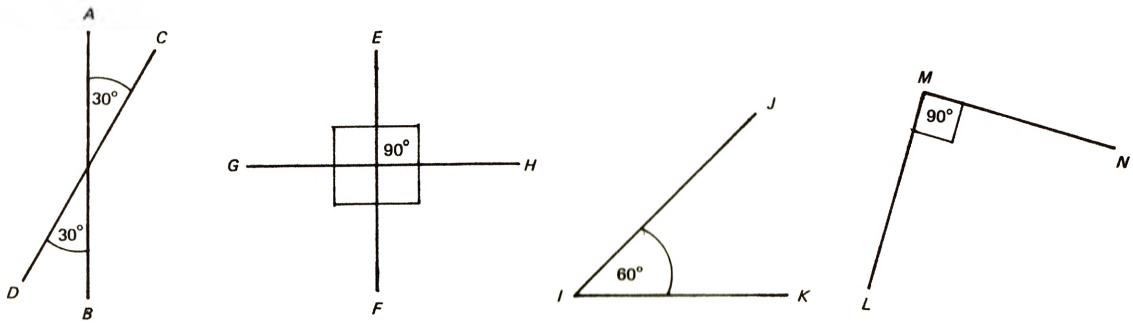



Fig. 4.33

Point out pairs of perpendiculars in the picture. The sides of the houses are vertical, carpenters usually say upright the platform is horizontal, verticals and horizontals are special kinds of perpendiculars. Builders usually use a tool called a spirit level to help them to put their posts and beams vertical or horizontal.

(See Fig. 4.34)

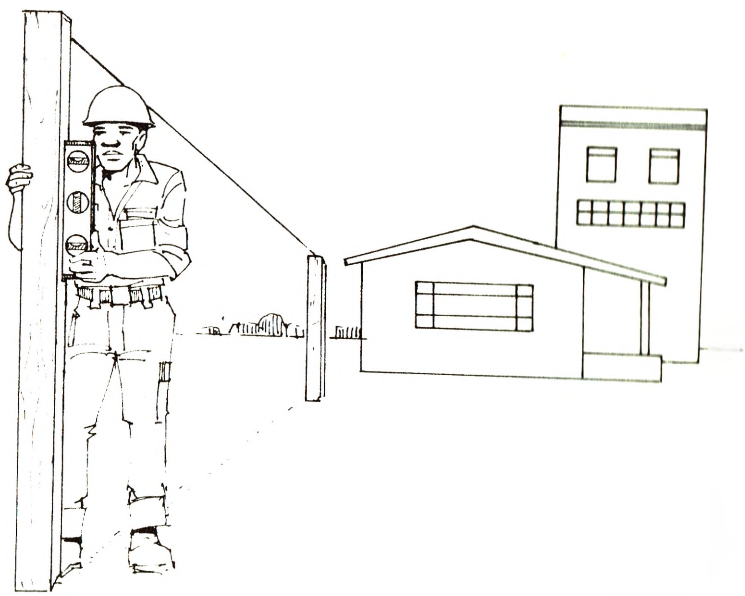


Fig. 4.34

## CONSOLIDATORY EXERCISES

(See Fig. 4.35)


Fig. 4.35

(1) Let us put in two points *A* and *B* one inch apart, on line ***e***.

(2) Name four line segments on line *f*.

(See Fig. 4.36)

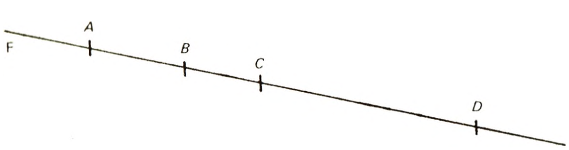



Fig. 4.36

(3) Which of these pairs of lines are parallel? Use the symbols as a guide.

(See Fig. 4.37)

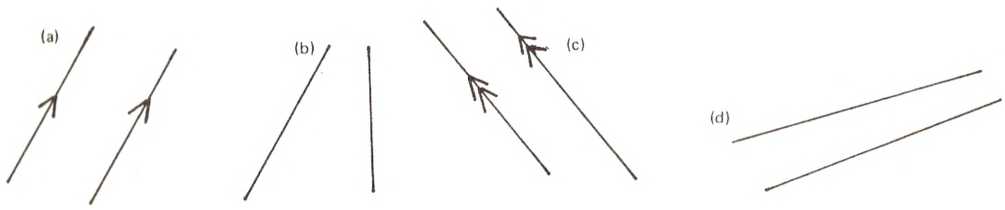



Fig. 4.37

(4) Let us draw two lines parallel to line *f*, and passing through points *T* and *X*. Name the lines when you have drawn them.

(5) Fill in the words in the right spaces to show the names of the parts shown.

(See Fig. 4.38)

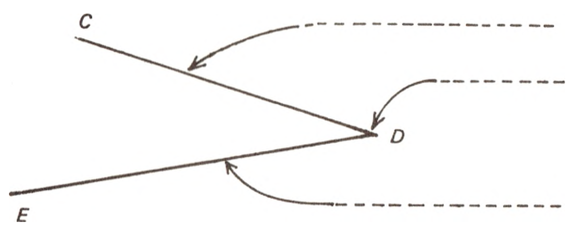
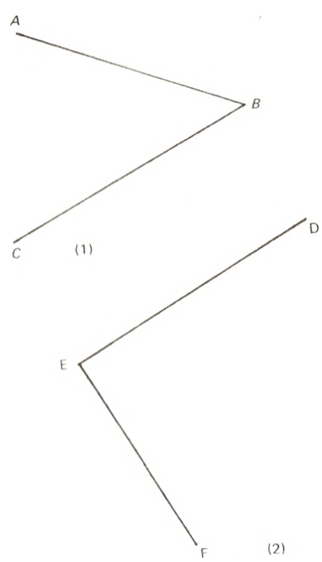



Fig. 4.38

(6) Using our set squares let us find the sizes of these angles and fill in the spaces with the correct answers.

(See Fig. 4.39)




$<ABC =$ . . . . . . . . . . . .

$<DEF =$ . . . . . . . . . . . .

Fig. 4.39

(7) What size angle is usually called a right angle or a square corner?

(8) What instruments can be used to measure angles?

(9) What instrument is used by builders to help in putting up verticals and horizontals.

10) Using your set squares, draw the following angles:

(a) $< ABC = 45^\circ$

(b) $< DEF = 90^\circ$

(c) $< GHI = 30^\circ$

(d) $< JKL = 60^\circ$

(11) How are lines that meet or, intersect each other at right angles called?

(12) Draw lines that are perpendicular to these lines, using your set squares.

(See Fig. 4.40)

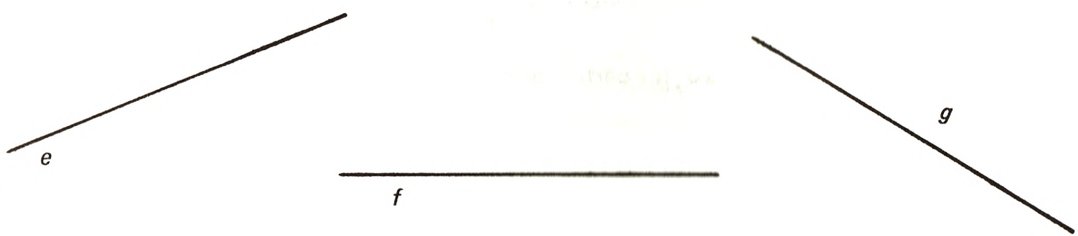



Fig. 4.40

UNIT 5

## A SECOND LOOK AT THE BASIC SHAPES AND FORMS

### REVIEW

We have just learnt a lot about lines and angles. All that we have learnt, would help us very much to understand the shapes and forms we met in Book 1 better.

Let us see how much we remember about those shapes that we met.

*EXERCISE A*

(1) Let us write the names of these shapes underneath them.

(See Fig. 5.1)

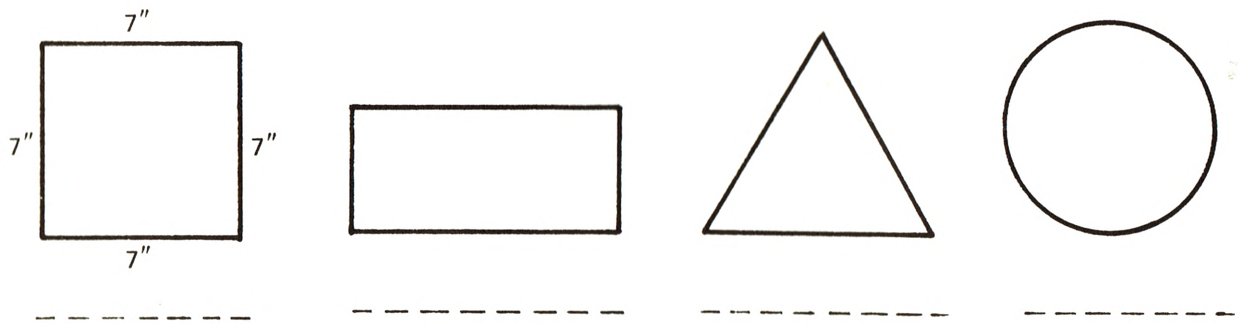



Fig. 5.1

(2) Let us write the names of these forms underneath them.

(See Fig. 5.2)

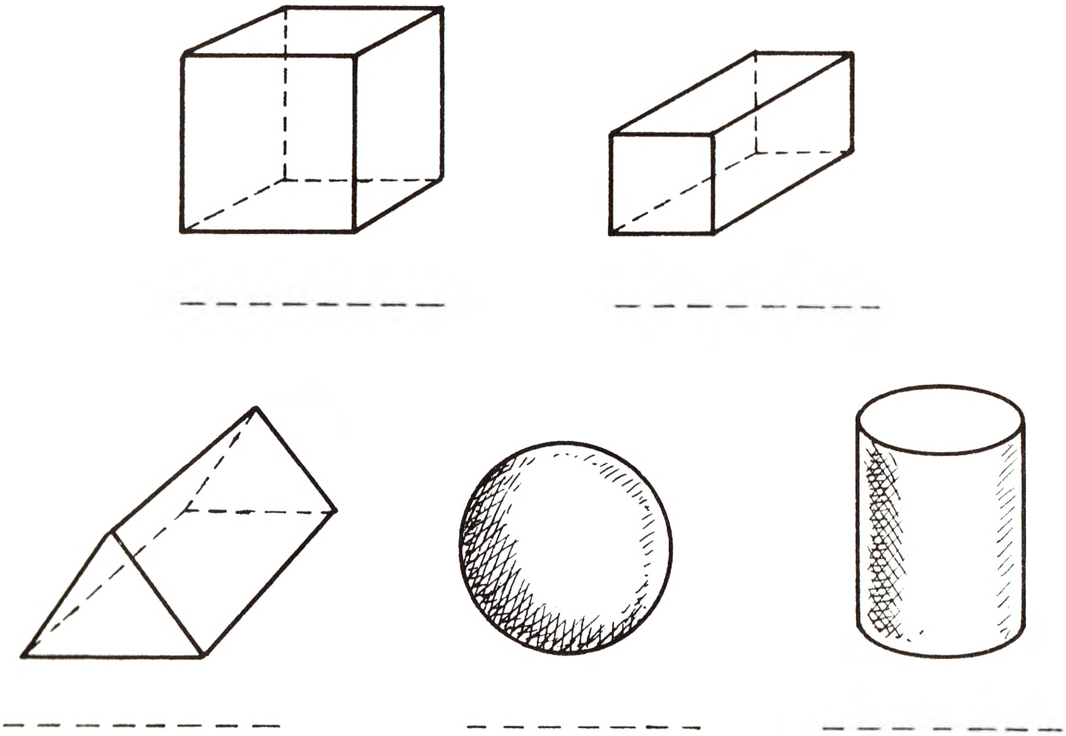


Fig. 5.2

## POLYGONS

(See Fig. 5.3)

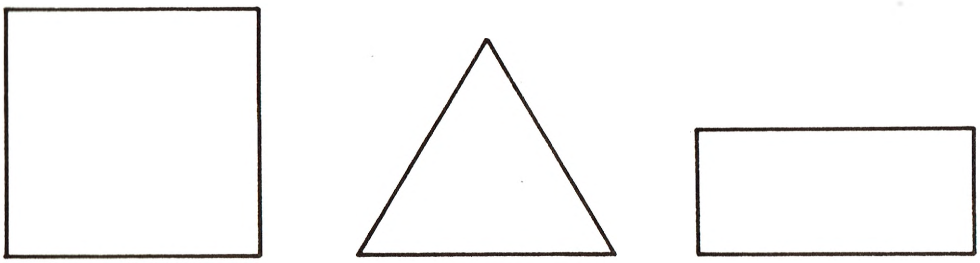



Fig. 5.3

All of these shapes have 3 or more sides. They can all be called by one name, *polygons* any shape that has 3 or more straight sides is a polygon.

**Let us read and write the word:**

**Polygon:** ............., ..............

| | | |
|---|---|---|
| **poly-** | **means -** | **many** |
| **-gon-** | **means -** | **sided** |

Here are some other polygons, count the number of sides each one has, and notice the name for that shape carefully. Also read and write the names in the spaces below.

(See Fig. 5.4)

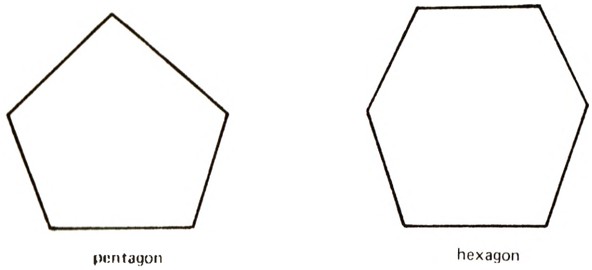



Fig. 5.4

| | | |
|---|---|---|
| penta | means | five |
| -gon | means | sided |
| hexa | means | six |
| -gon | means | sided |

The hexagon resembles a kite.

For most of the polygons we have seen, we can draw lines to correct the opposite corners (vertices). Let us put in these lines using dotted lines. The square is done as an example. You can do the rest.

(See Fig. 5.5)

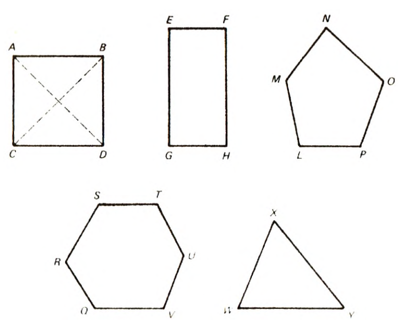



Fig. 5.5

The lines that we have just drawn are usually called *diagonals.* Let us read and write the word:

diagonals: . . . . . . . . . . . . , . . . . . . . . . . . . .

*EXERCISE B*

(1) Was it possible to get diagonals for the triangle? - - - - - - - - - - .
We got 2 diagonals for the square. Their letter names are *AD* and *BC.*

(2) How many did we get for the rectangle? - - - - - - - - - - - - .

(3) What are their names?

(4) How many did we get for the pentagon? - - - - - - - - - - - - .

(5) What are their names? - - - - - - - - - - - - .

(See Fig. 5.6)

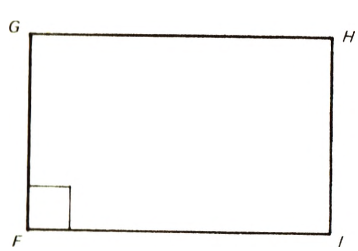



Fig. 5.6

Looking at the square, we see that sides *FG* meets side *FI,* at the vertex *F,* in these shapes, sides that meet at a common vertex are called *adjacent* sides, so *FG* is adjacent to *FI.* Using a shortened way we write: *FG* adj. to *FI.*

Let us read and write the word adjacent: - - - - - - - - - - - - - , - - - - - - - - - - - - .

Side *FG* is also adjacent to *GH.* Why?

Write down two other adjacent side from the square - - - - - - - - - - - - .

Sides *GF* and *HI* are called opposite sides. Of course, that is because they are on opposite sides of the polygon.

Write down two other opposite sides from the square.

. . . . . . . . . . . . . . . . . . . . . . . . .

Similarly $<H$ is opposite to $<F$.
We can shorten opposite by writing opp. so $<H$ opp. $<F$.
Write down two other opposite angles.
Now turning over to the pentagon.

(See Fig. 5.7)

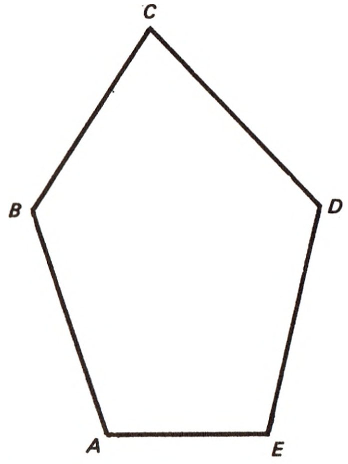


Fig. 5.7

Side $AE$ adj. $DE$. Why is that so?
Write down 3 other pairs of adjacent sides.
Side $AB$ has two opposite sides they are $CD$ and $DE$.
Write down the two opposite sides for sides $AE$, then sides $DE$.
Similarly $<A$ has two opposite angles they are $<C$ and $<D$.
Write down the two opposite angles for $<E$, $<D$, and $<C$.

## OTHER FOUR-SIDED FIGURES

We already know that the square and rectangle are four sided figures. But there are other four sided figures apart from these.

(See Fig. 5.8)

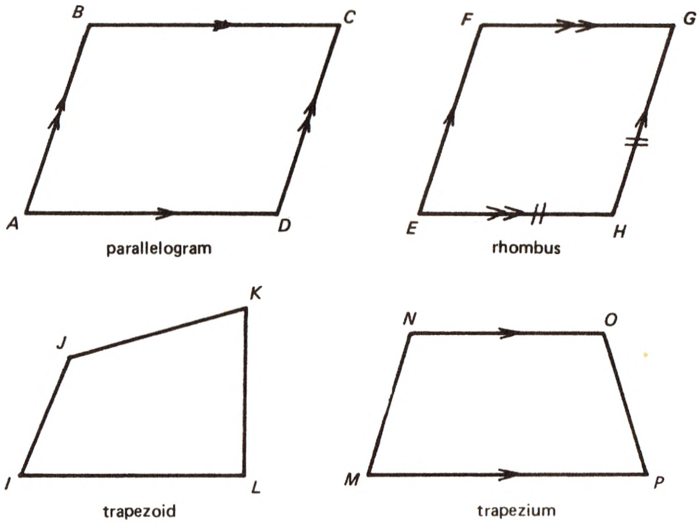


Fig. 5.8

Any figure that has 4 straight sides is called a *quadrilateral*.

quadri- means four, - lateral means sided. **Let us read and write:**

**quadrilateral:** . . . . . . . . . . . . . . . , . . . . . . . . . . . . . . .

Each of the quadrilaterals have some thing special about them.

(See Fig. 5.9)

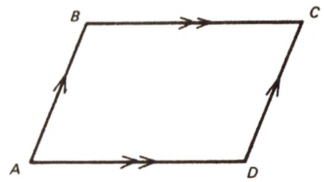


Fig. 5.9

## PARALLELOGRAM

The parallelogram has its opposite sides parallel to each other. So that side $AB \parallel C$.

Any quadrilateral that has its opposite sides parallel is a *parallelogram*. **Read and write the word:**

**parallelogram:** . . . . . . . . . . . . . . . , . . . . . . . . . . . . . . . .

(See Fig. 5.10)

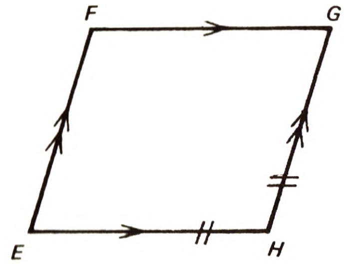


Fig. 5.10

The *rhombus* is also a parallelogram but it has at least any two adjacent sides equal. In this one $EH = GH$ and they are adjacent. Any parallelogram that has at least 2 adjacent sides equal is a *rhombus.*

Let us read and write rhombus: - - - - - - - - - - - - - - - , - - - - - - - - - - - - - - - - .

Notice how we showed the two equal sides on the figure, by putting 2 strokes on those sides that are equal. Sometimes you may see three or even one.

(See Fig. 5.11)

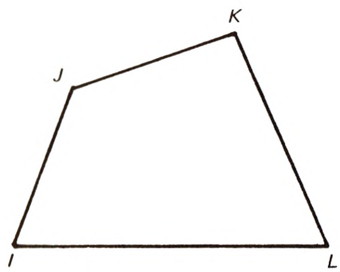


Fig. 5.11

A *trapezoid* is not a parallelogram no two sides are parallel to each other. Any quadrilateral that does not have any parallel sides is called a *trapezoid.* Let us read and write the word:

**Trapezoid:** - - - - - - - - - - - - - - - , - - - - - - - - - - - - - - - -.

(See Fig. 5.12)

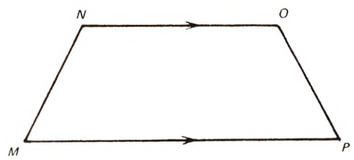


Fig. 5.12

The *trapezium* has only 2 opposite sides parallel to each other. In this case $MP \parallel NO$ the other two sides $MN$ and $OP$ are not parallel. Any quadrilateral that has only 2 of its sides parallel is called a *trapezium.*

Let us read and write the word:

Trapezium: - - - - - - - - - - - - - - - , - - - - - - - - - - - - - - - .

We can see now why the square is a special figure.

(See Fig. 5.13)

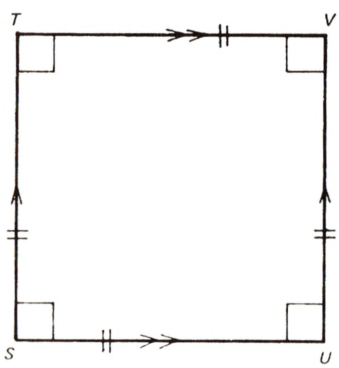


Fig. 5.13

First of all the square is a quadrilateral. Why?

Then the square is a parallelogram. Why?

The square is also a rhombus. Why?

Try using your set square to measure the angles, and write down what you find in the blanks.

$< S =$ - - - - - - , $< T =$ - - - - - - , $< U =$ - - - - - - , $< V =$ - - - - - -

What do you notice?

All the angles are right angles or square angles.

The rectangle is also special.

(See Fig. 5.14)

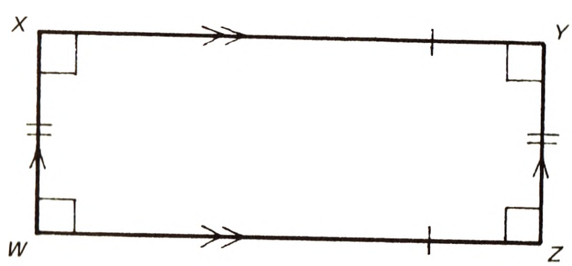


Fig. 5.14

First the rectangle is a quadrilateral. Why?

The rectangle is also a parallelogram. Why?

The rectangle is not a rhombus. Why?

The opposite sides are equal $WX = YZ$ and $WZ = XY$.

Try measuring the angles and write down your answers just as you did with the square.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

What do you notice?

*EXERCISE C*

(1) Look at the figures below very carefully and say which ones are quadrilaterals.

(See Fig. 5.15)

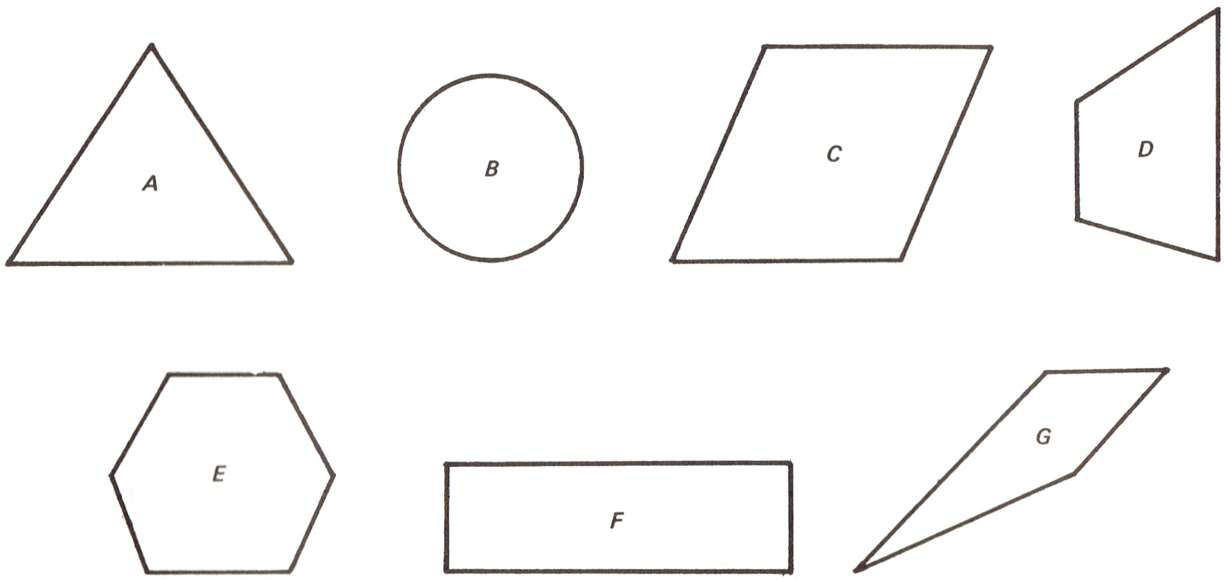



Fig. 5.15

(2) Look at the following figures very carefully, especially the symbols used on them. Then write down their names in the spaces.

(See Fig. 5.16)

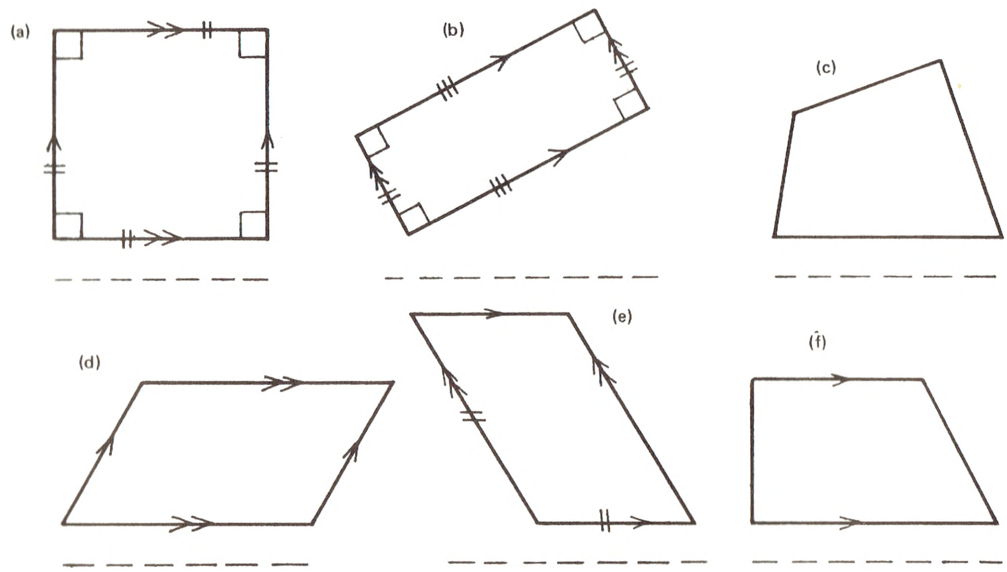



Fig. 5.16

## MORE ABOUT TRIANGLES

In the last section we talked a lot about quadrilaterals (4 sides). In this section we are going to concentrate on triangles and learn some new things about them.

First, let us look at the features of the triangle more closely. For this we can use any triangle.

(See Fig. 5.17)

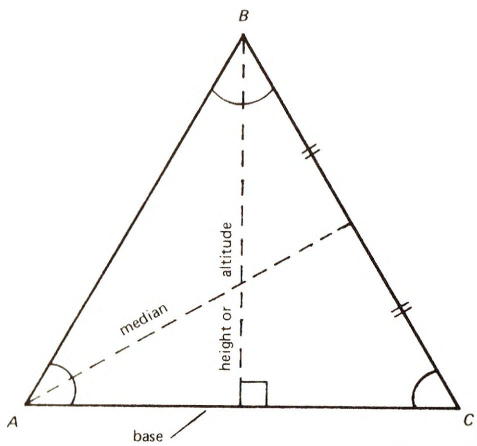



Fig. 5.17

In triangle $ABC$, the side $AC$ is called the base, generally this is the side the triangle seems to be standing on. There are times however when another side may be called the base.

Angles $A$ and $C$ are usually called base angles because they both have the base $AC$ as one of their sides.

Each angle has a side opposite to it. The side opposite $A$ is side $BC$.

Which side is opposite $C$?

On the figure a dotted line is drawn from the top angle to the base. This line meets the base at right angles and so is perpendicular to it. This line actually shows the height or *altitude* of the triangle.

In some triangles this line cannot be drawn on the inside. For example:

(See Fig. 5.18)

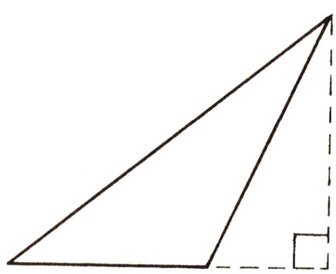


Fig. 5.18

In this case the base is stretched out until the perpendicular can be drawn to touch the top.

The altitude is very important as we would see in Unit 7.

Finally in this figure we show a dotted line coming from vertex $A$ to the midpoint of the opposite side $BC$. This line is called a *median*.

The *median* must meet the side at its midpoint. Let us read and write these words:

base: ----------------, ----------------.

altitude: ----------------, ----------------.

median: ----------------, ----------------.

Let us put in the right words for the parts shown.

(See Fig. 6.5.19)

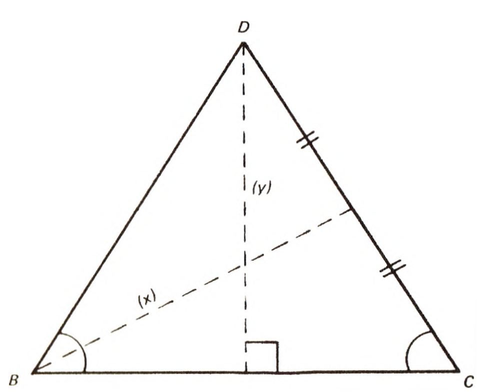



Fig. 5.19

Side $BC$ = . . . . . . . . . . . . . . . .

$<B$ and $<C$ = . . . . . . . . . . . . . .

Line $y$ = . . . . . . . . . . . . . . . . . .

Line $x$ = . . . . . . . . . . . . . . . . . .

## SOME TYPES OF TRIANGLES

(See Fig. 5.20)

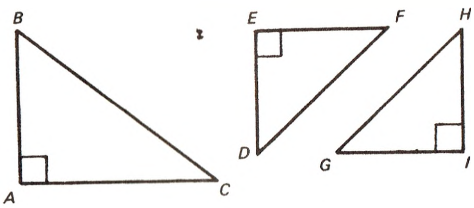



Fig. 5.20

What is common in all the triangles above? They all have a right angle. These are called *right angled triangles*, or *right triangles.* Any triangle which have a right angle as one of its angles, is a *right angled triangle, or right triangle.*

(See Fig. 5.21)

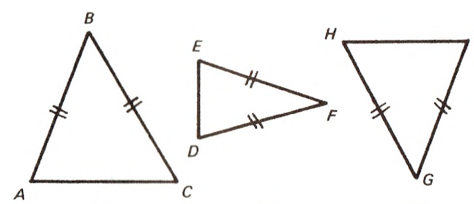



Fig. 5.21

These triangles all have at least two sides equal in the first one $AB = BC$, in the second, $EF = DF$. Triangles like these are called *isosceles* triangles. Any triangle which has at least two sides equal is an *isosceles* triangle. In *isosceles* triangles at least two of the angles would also be equal. In the first triangle, $<A = <C$, in the second one $<E = <D$. These are the angles on the unequal side.

Let us read and write the word:

Isósceles: . . . . . . . . . . . . . . . , . . . . . . . . . . . . . . . . .

(See Fig. 5.22)

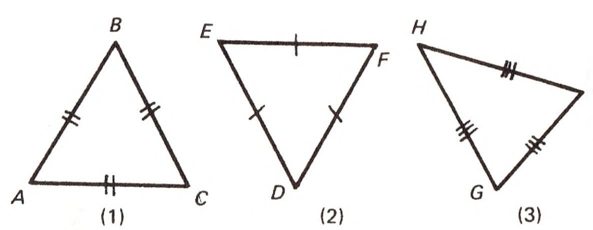



Fig. 5.22

In these, all three sides of each triangle are equal. Triangles like these are called *equilateral* triangles.

| |
|---|
| Equi – means equal; – lateral means sided. |

Any triangle which has its three sides equal is called an ***equilateral*** triangle. In equilateral triangles all the angles are also equal. So in the first one for example:

$$<A = \quad <B = \quad <C \text{ and sides } AB = BC = AC.$$

Let us read and write the word:

Equilateral: ................, ................

(See Fig. 5.23)

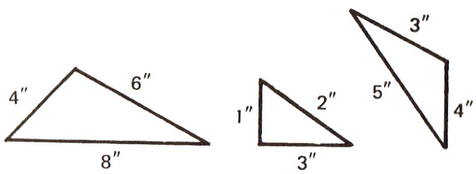



Fig. 5.23

Here we have some triangles in which all three sides are of different lengths. No two sides are equal. Triangles like these are called *scalene* triangles. Any triangle which has all its sides of different lengths is called a *scalene* triangle. In scalene triangles also no two angles are equal.

Let us read and write the word:

Scalene: ..............., ................

*EXERCISE D*

(1) Let us look at these triangles very carefully, especially the symbols on them, and write down the correct word for the types.

(See Fig. 5.24)


_____ _____ _____ _____

Fig. 5.24

(See Fig. 5.25)

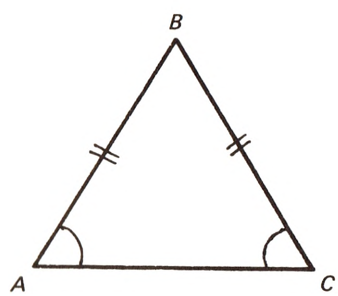



Fig. 5.25

(2) Triangle $ABC$ is an isosceles triangle.

(a) Which two sides are equal?

(b) Which two angles are equal?

(c) If $AB = 8''$, what should be the length of $BC$?

(d) If $<C = 40^\circ$ what should be the size of $<A$? ...... .

(See Fig. 5.26)

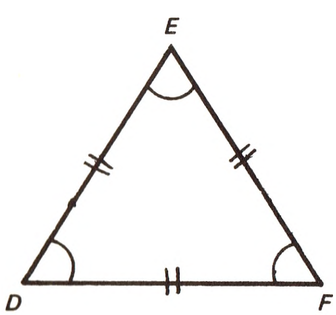



Fig. 5.26

(3) Triangle $DEF$ is an equilateral triangle.

(a) If side $DE = 6''$, what should be the lengths of $DF$ and $EF$?

(b) If $\angle F = 60^\circ$, what should be the sizes of $\angle D$, $\angle E$?

(c) If all the angles are added together how many degrees is that equal to?

## MORE ABOUT CIRCLES

In Book 1 we learned to identify circles and to name some of its parts. Let us name the parts shown here as a review.

(See Fig. 5.27)

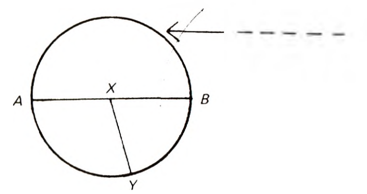



Fig. 5.27

Let us learn some more things about circles. How is a circle really formed or drawn?

Let us try to do one following the steps. All we need is a pin, piece of string a pencil and paper.

(See Fig. 5.28)

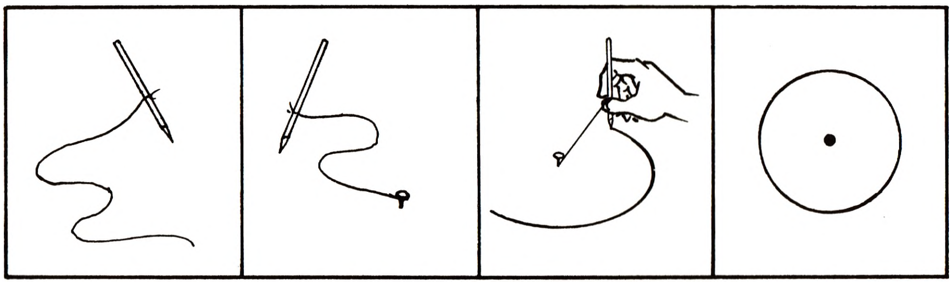


Fig. 5.28

(a) Tie the string firmly around the pencil, use a good knot so the pencil would not slide.

(b) Tie the string around the pin or thumb tack, in the same way about 6″ away from the pencil.

(c) Stretch the string out tightly as shown and pressing the pin into the paper about the middle of the page, move the pencil around to draw your curved line. Do not move the position on the pin, and keep the string tight. You may have to change hands.

(d) You should now have a fairly perfect circle with the pin mark as the centre.

Notice that the pencil was always kept at the same distance from the pin. This means that all points on the circumference of the circle are *always the same distance* from the centre. This is the most important fact about circles.

(See Fig. 5.29)

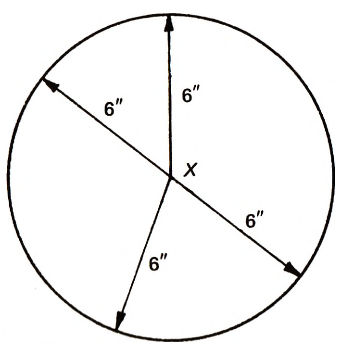



Fig. 5.29

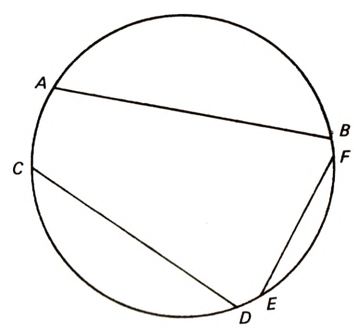



Fig. 5.30

See Fig. 5.30

In Fig. 5.30, we have shown three straight lines that do not pass through the centre of the circle but connects points on the circumference. Lines like these are called *chords*. *Chords* always touch two points on the circumference but do not pass through the centre. The straight lines $AB$, $EF$ and $CD$ are chords.

*AB, EF* and *CD* are also the names for three curved lines can you spot them? These curved lines are portions of the circumference and are called *arcs* any part of the circumference is an arc. Could you name any other arc on that circle?

Let us read and write the words:

arc: - - - - - - - - - - - - - - - - - - - , - - - - - - - - - - - - - - - - - - - - .

chord: - - - - - - - - - - - - - - - - - - , - - - - - - - - - - - - - - - - - - - .

(See Fig. 5.31)

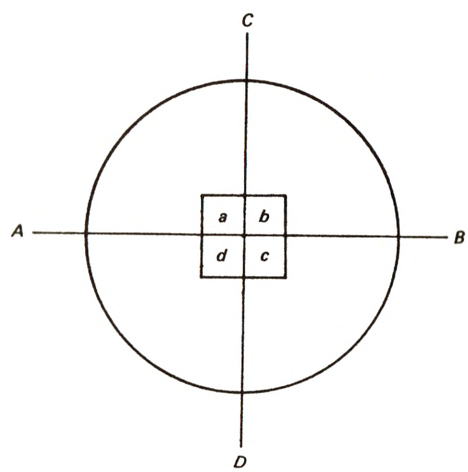



Fig. 5.31

In this figure lines *CD* and *AB* intersect each other at right angles, at the centre of the circle *X*.

We know that each of the angles shown *a, b, c,* and *d* is equal to 90°. What then is the total number of degrees represented by the circle?

All circles represent 360° regardless of how large or small the circle is. This is another important fact about circles.

Let us measure the length of the diameter *AB* in this circle, and then measure the radius *XY*.

(See Fig. 5.32)

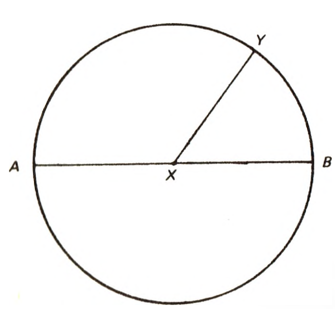



Fig. 5.32

Notice that the length of the diameter is twice the length of the radius. Put another way we can say that the radius is $\frac{1}{2}$ of the diameter. Putting it shortly we can write $D = 2r$ or $r = \frac{1}{2}D$.

*EXERCISE D*

(1) Let us put in the names for the parts shown.

(See Fig. 5.33)

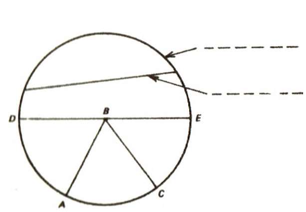



Fig. 5.33

(2) If $AB$ is 5″ long what should be the length of:

(a) $DE$ ? (b) $BC$ ?

(3) The diameter of a circle was 8″, what is the length of its radius?

## MORE ABOUT FORMS

In this section we are just going to look at the way the forms are made up. First we would take the cube.

(See Fig. 5.34)

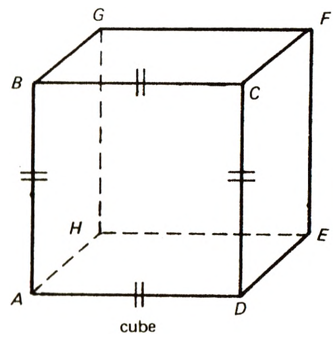


Fig. 5.34

Let us first count the number of surfaces or planes. These are the names of the planes.

- To the front - - - - - - - - - - - - - - *ABCD*
- To the right side - - - - - - - - - - - - *CDEF*
- To the back - - - - - - - - - - - - - - *EFGH*
- To the left side - - - - - - - - - - - - *ABGH*
- To the top - - - - - - - - - - - - - - - - *BCFG*
- To the bottom - - - - - - - - - - - - - *ADEH*

In the figure it may appear that some of the sides are not square, but in a perfect cube all the planes are supposed to be square. This also tells us that all the angles are square and all the edges are equal in length.

Next we are going to consider the rectangular solid.

(See Fig. 5.35)

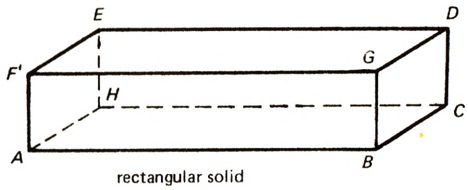


Fig. 5.35

We see almost the same things as in the cube. What is different in this case though?

In a perfect rectangular solid we would always find that, while all the surfaces are not equal in size the opposite surfaces are equal.

(See Fig. 5.36)

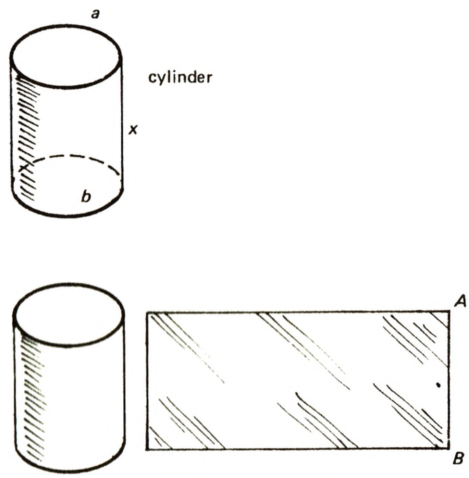
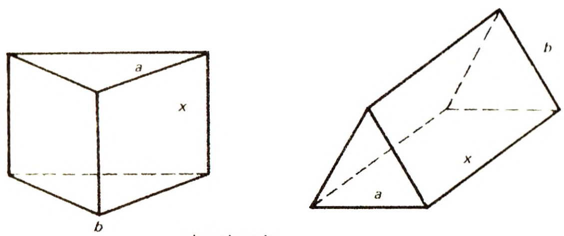


Fig. 5.36

Notice that the cylinder is made up of two circles $a$ and $b$ with a curved surface $X$ as its side walls. If we were to open up the cylinder and spread out the walls flat we would get a rectangle or a square depending on the cylinder.

(See Fig. 5.37)




triangular prism

Fig. 5.37

Finally we look at the triangular prism.
How many surfaces does this form have?
How many surfaces are triangles?
How many are rectangles or squares?

### SUMMARY

In this unit we learned quite a lot about shapes and forms. We learned that figures with three or more straight sides were called polygons. We looked at different types of quadrilaterals (4 sided figures) – squares, rectangles, trapezoids, trapeziums, and rhombus. We learned that each one had some special things about it.

We then looked at triangles and the different types we met were: isosceles, equilateral, scalene and right angled triangles again we saw that each one had some special things about it.

We learned some new parts of the circle, the chord and arc. We also discovered that the diameter was twice the radius $(D = 2r)$ or $(r = \frac{1}{2} D)$. The most important things we learned about the circle was that all points on the circumference was the same distance from the centre, and that the entire circle represents a total of $360^\circ$. Looking at forms we saw generally how the cube, rectangular solid, triangular prism and cylinder were formed.

This unit is very important. All shapes and forms around us are either variations of those we learned about here, or have exactly the same shapes.

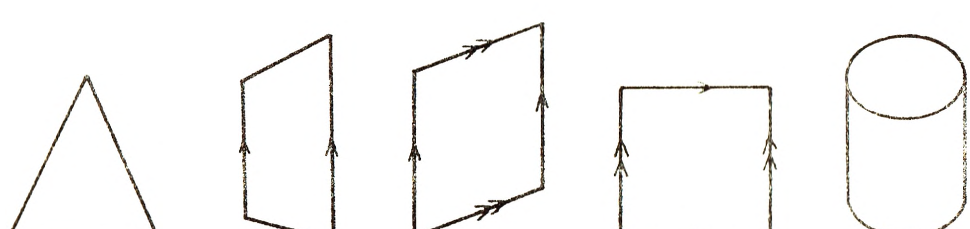
### CONSOLIDATORY EXERCISES

(1) Let us use one name for all these shapes: triangles, squares, rectangles, pentagons, hexagons.

(2) Let us use one name for all these figures: squares, rectangles, parallelograms, trapeziums, trapezoids, rhombus

(3) Which of the following figures are parallelograms?

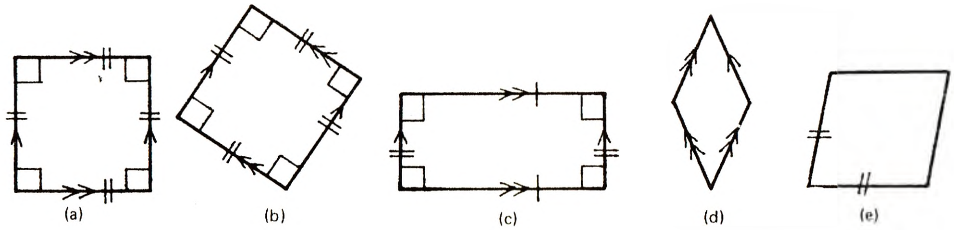
(See Fig. 5.38)



(a) (b) (c) (d) (e) Fig. 5.38

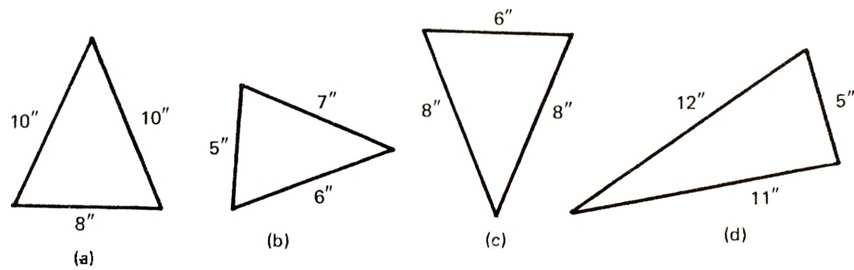
(4) Which of the following are squares?

(See Fig. 5.39)

Fig. 5.39



(5) Let us choose out the triangles that are isosceles. The numbers on the sides show the lengths.

(See Fig. 5.40)

Fig. 5.40



(6) What are the two most important facts about circles that you know?

(7) See if you can recognize the shapes and forms that we dealt with here in objects about you.

**UNIT 6**

## DECIMAL FRACTIONS

We have learnt quite a lot abour common fractions in Unit 3. We know that a fraction is simply a part of a whole number or object. We are now going to learn about another kind of fraction called decimal fractions. As the word decimal suggest, we are going to concentrate our common fractions that have 10 or a power of 10 as their denominator, and see how they give rise to decimal fractions.

On the number line we show one unit divided into 10 equal parts. Of course each part is a tenth.

(See Fig. 6.1)

All the fractions can be written in a new way.

$\frac{1}{10} = 0.1$ – it is read – nought point one.

Fig. 6.1


$\frac{2}{10}$ = 0.2 – it is read – nought point two

$\frac{3}{10}$ = 0.3 – it is read – nought point three

$\frac{4}{10}$ = 0.4 – . . . . . . . etc. . . . . . . . . . . . . . . .

$\frac{5}{10}$ = 0.5 – . . . . . . . etc. . . . . . . . . . . . . . . .

$\frac{6}{10}$ = 0.6 – . . . . . . . etc. . . . . . . . . . . . . . . .

$\frac{7}{10}$ = 0.7 – . . . . . . . etc. . . . . . . . . . . . . . . .

$\frac{8}{10}$ = 0.8 – . . . . . . . etc. . . . . . . . . . . . . . . .

$\frac{9}{10}$ = 0.9 – . . . . . . . etc. . . . . . . . . . . . . . . .

The point used is usually called the *decimal point.*

Those we have just used were all made by using common fractions which had 10 as their denominator. Also notice that there is only one digit after the decimal point, or one decimal place.

*EXERCISE A*

(1) Let us write down the decimal fractions that are equal to the common fractions shown, and read them off.

$\frac{5}{10}$ = . . . . . . . . . . . . . . . . . . .

$\frac{3}{10}$ = . . . . . . . . . . . . . . . . . . .

$\frac{2}{10}$ = . . . . . . . . . . . . . . . . . . .

$\frac{6}{10}$ = . . . . . . . . . . . . . . . . . . .

(2) Now let us begin with the decimal fractions and write down the common fractions that they are equal too.

0.3 = . . . . . . . . . . . . . . . . . . .

0.2 = . . . . . . . . . . . . . . . . . . .

0.1 = . . . . . . . . . . . . . . . . . . .

0.9 = . . . . . . . . . . . . . . . . . . .

0.5 = . . . . . . . . . . . . . . . . . . .

0.6 then really means – sixth tenths

We can also use those common fraction that have 100 as their denominator.

$\frac{1}{100}$ = 0.01 . . . . . . . . . . nought point nought one.

$\frac{2}{100}$ = 0.02 . . . . . . . . . . nought point nought two.

$\frac{3}{100}$ = 0.03 . . . . . . . . . . nought point nought three.

$\frac{9}{100}$ = 0.09 . . . . . . . . . . nought point nought nine.

$\frac{12}{100} = 0.12$ - - - - - - - - - nought point *one two.*

$\frac{25}{100} = 0.25$ - - - - - - - - - nought point *two five.*

etc., etc.

How that we used 100 or $10^2$ as the denominator, we have used 2 digits after the decimal point or two decimal places. Also notice that in the case of 0.12 and 0.25 they were read nought point one two and nought point two five instead of nought point twelve and nought point twenty-five. This is important we read out each digit by its own name.

We have used 10, and 100 or $10^2$ as denominators but we can use any other power of 10 as denominators to form other decimal fractions.

For example using 1 000 or $10^3$ as denominator.

$\frac{16}{1\,000} = 0.016$ — nought point nought one six.

This time we use 3 decimal places. (3 digits after the nought.)

$\frac{135}{1\,000} = 0.135$ - - - nought point one, three, five.

*EXERCISE B*

(1) Let us write down the decimal fractions for these common fraction and read them off:

$\frac{13}{100}$ = - - - - - - - - - - - - - - - - -

$\frac{27}{1\,000}$ = - - - - - - - - - - - - - - -

$\frac{200}{1\,000}$ = - - - - - - - - - - - - - - -

$\frac{1}{1\,000}$ = - - - - - - - - - - - - - - -

(2) Now let us write down common fractions that are equal to these decimal fractions.

0.31 = - - - - - - - - - - - - - -

0.02 = - - - - - - - - - - - - - -

0.701 = - - - - - - - - - - - - - -

In learning the natural numbers 1, 12, 25 etc. We learnt that each digit had a value according to which position or place it was in, whether units, tens, hundred etc. The digits of the decimal fraction also have the same idea. This chart should help to explain.

(See Fig. 6.2)

| | Natural numbers Powers of 10 | | | | | | decimal fractions | | |
|---|---|---|---|---|---|---|---|---|---|
| *A* | 10 000 | 1 000 | 100 | 10 | 1 | • | $\frac{1}{10}$ | $\frac{1}{100}$ | $\frac{1}{1\,000}$ |
| *B* | | | 1 | 2 | 3 | | | | |
| *C* | | | | | 0 | • | 1 | 2 | 3 |

Fig. 6.2

In section *A* we show what the values of the digits under each column would be.
In section *B* we have used the natural number 123, putting the digits in the correct

columns. And in section *C* we have used the decimal fraction 0.123, putting the digits in their right decimal places to show the actual value of each one.

So we are seeing that:

0.123 is the same as 1 tenth + 2 hundreths + 3 thousandth.

$$0.123 = \frac{1}{10} + \frac{2}{100} + \frac{3}{1\ 000}$$

But is this really true? Let us find out.

First $0.123 = \frac{123}{1\ 000}$

Now $\frac{1}{10} = \frac{10}{100} = \frac{100}{1\ 000}$

and $\frac{2}{100} = \frac{20}{1\ 000}$

then $\frac{3}{1\ 000}$ is already thousandths.

So $\frac{1}{10} + \frac{2}{100} + \frac{3}{1\ 000}$ is really equal to

$$\frac{100}{1\ 000} + \frac{20}{1\ 000} + \frac{3}{1\ 000} = \frac{123}{1\ 000}$$

So we are correct.

*EXERCISE C*

Let us put these decimal fractions into the chart, putting the digits in their right columns. The first one is done as an example.

(See Fig. 6.3)

| | 1 | decimal point | $\frac{1}{10}$ | $\frac{1}{100}$ | $\frac{1}{1\ 000}$ | $\frac{1}{10\ 000}$ |
|---|---|---|---|---|---|---|
| 0.32 | 0 | • | 3 | 2 | | |
| 0.301 | --- | --- | --- | --- | --- | --- |
| 0.542 | --- | --- | --- | --- | --- | --- |
| 0.001 | --- | --- | --- | --- | --- | --- |

Fig. 6.3

Here is a simple rule that would help you to change decimal fractions to common fractions easily. Use the digits after the point as the numerator of the fraction then for the denominator write down 1 to match the point, and a nought to match each digit of the numerator. Let us try it.

(See Fig. 6.4)

$$0.04 = \frac{4}{100}$$

Fig. 6.4

## NOUGHTS IN DECIMAL FRACTIONS

Let us look at these three decimal fractions.

(a) 0.2 (b) 0.20 (c) 0.200

All of these have the same value or are equivalent. Let us prove that.

First $0.2 = \frac{2}{10}$

Then 0.20 $\frac{20}{100} = \frac{2}{10}$ reducing the fraction

And also $0.200 = \frac{200}{1\,000} = \frac{20}{100} = \frac{2}{10}$

Therefore $0.2 = 0.20 = 0.200$ it does not matter therefore how many noughts we add *after* the 2, once these are the last digits they would not change the value of the fraction.

How about the noughts before the digits? Is 0.2 the same as 0.02 and 0.002 let us see.

$$0.2 = \frac{2}{10}$$

$$0.02 = \frac{2}{100}$$

$$0.002 = \frac{2}{1\,000}$$

They are not equal. Therefore it matters when the noughts are before the other digit, but does not matter when the noughts are after the others since they are last.

It was easy for us to change common fractions like $\frac{6}{10}, \frac{5}{10}$ etc., to decimal fractions. Let us now try to change $\frac{6}{20}$ to decimal fractions.

First we must reduce $\frac{6}{20}$ to tenths.

so $\frac{6}{20} = \frac{3}{10}$

We can now change to decimal fraction.

$$\frac{3}{10} = 0.3$$

Another example; let us change $\frac{20}{40}$ to decimal fractions.

Changing to tenths, $\frac{20}{400} = \frac{10}{200} = \frac{5}{100}$

Then $\frac{5}{100} = 0.05$

*EXERCISE D*

Let us change these common fraction to decimal fractions:

(1) $\frac{6}{30}$ (2) $\frac{20}{50}$ (3) $\frac{40}{400}$ (4) $\frac{50}{200}$

(5) $\frac{25}{100}$

## ADDITION AND SUBTRACTION OF DECIMAL FRACTIONS

Let us add $0.5 + 0.3$.

We do this simply by adding 5 and 3 and putting our point in the right place.

We can set it down like this:

$$\begin{array}{r} 0.5 \\ +0.3 \\ \hline 0.8 \\ \hline \end{array}$$

(1) $3 + 5 = 8$ (2) put in the point: $0 + 0 = 0$

Answer is 0.8

Notice though, that while we said $3 + 5 = 8$ we really mean

$$\frac{3}{10} + \frac{5}{10} = \frac{8}{10} = 0.8$$

Another example: Let us add $0.15 + 0.3$. Here we must be very careful to put the digits of similar place value together.

(See Fig. 6.5)

| 1 | $\frac{1}{10}$ | $\frac{1}{100}$ |
|---|---|---|
| 0. | 1 | 5 |
| 0. | 3 | |
| 0. | 6 | 5 |

Fig. 6.5

We have no hundredths to add to the 5 hundredths.

So $0 + 5 = 5$ in the hundredths place then 3 tenths + 1 tenths = 4 tenths in the tenths place putting the point.

$0 + 0 = 0$

Answer is 0.45

For subtraction we do the same kind of thing.

Example $0.68 - 0.24$

(1) 4 from 8 = 4 (hundreths)

(2) 2 from 6 = 4 (tenths)

$$\begin{array}{r} 0.68 \\ -\,0.24 \\ \hline 0.44 \\ \hline \end{array}$$

Another example: $0.84 - 0.05$

$$\begin{array}{r} 0.84 \\ -\,0.05 \\ \hline 0.79 \\ \hline \end{array}$$

Here we must break up 1 tenths to hundredths but 1 tenth, $\frac{1}{10} = \frac{10}{100}$ so now we have 14 hundredths and we can subtract

5 from 14 = 9

then 0 from 7 = 7

*Answer is 0.79*

**SUMMARY**

We would learn a lot more about decimal fractions in Book 3. For now, ensure that you understand all that we have learned here. Practice changing the common fractions to decimals and vice versa.

**CONSOLIDATORY EXERCISES**

(1) Let us change these common fractions to decimal fractions:

(a) $\frac{343}{1\,000}$ (b) $\frac{200}{1\,000}$ (c) $\frac{16}{400}$ (d) $\frac{5}{10}$ (e) $\frac{2}{100}$

Let us add these:

(2) (a) $0.4 + 0.2$ (c) $0.211 + 0.435$

(b) $0.3 + 0.41$ (d) $0.307 + 0.003$

(3) Let us subtract:

(a) $0.68 - 0.42$ (c) $0.34 - 0.12$

(b) $0.28 - 0.06$ (d) $0.83 - 0.05$

(4) Could you find what decimal fraction is equal to $\frac{1}{2}$?

A hint: change $\frac{1}{2}$ to tenths first.

UNIT 7

## MEASUREMENT

The measurements we used in Book 1 were very simple measurements, using some basic units: the yard, foot, inch, pound, ounce. In measuring the lengths of the objects like tables, chairs, etc. You may have found that in most cases there was a small piece left over that we could not measure using the larger units. At that time we just ignored them.

In this unit we are going to learn to make these measurements better, thereby developing our ability to measure accurately. Also we are going to learn some more units of lengths and compare them. Then, we would learn to add, multiply, subtract and divide them. Later on in the unit we are going to learn to measure weights, and areas of surfaces. This unit is very important. Let us make a special effort to understand the units and systems used.

### REVIEW

First let us review a little:

Fill in the spaces with the correct amounts:

1 yard (yd.) = - - - - - - - - - - - - feet

1 foot (ft.) = - - - - - - - - - - - - inches

1 pound (lb.) = - - - - - - - - - - - ounces (oz.)

(See Fig. 7.1)

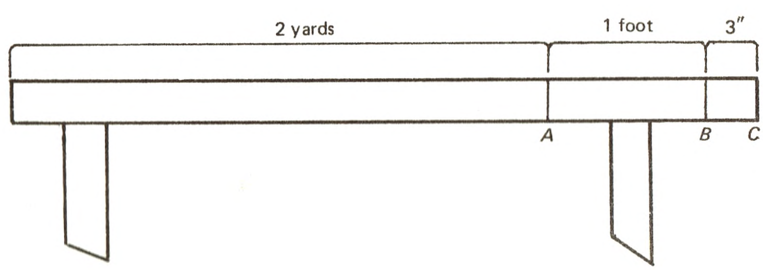



Fig. 7.1

Suppose we measured the table in the figure, and in measuring found that we got two complete yards and a portion $AC$ left over that couldn't be measured in yards, we simply mark of the two yards length, as at point A in the diagram, then continue to measure using feet. In this case we may again find that we have a piece left that cannot be measured using feet, *BC,* we simply mark off the last foot that we got at point *B,* take a note of how many feet we got between points *A* and *B,* let's say 1 in this case, and then continue to measure in inches. We should at least get close enough to the edge, to have a fairly accurate answer. But still if there is a small piece left over you can estimate it as a fraction of an inch. In the diagram we use 3″.

*The total length of the table is therefore:*
*2 yds. 1ft. 3ins.*

*EXERCISE A*

Let us measure some objects in the room in this manner:

(a) The length of the blackboard.

(b) The length of the table top.

(c) The width of the table top.

(d) The width of the blackboard.

Long distances are usually measured in miles. One mile is equivalent to 1 760 yards or 5 280 feet.

1 mile = 1 760 yds. = 5 280 ft.

The distance from Sauteurs to St. George's passing through Victoria is about 24 miles.

Now that we know the basic units of length that we use we can therefore make up a table of lengths. This particular table of lengths is called the British table of lengths or *British linear measures.* Because it is based on the British way of measuring lengths.

| British Table of Length | |
|---|---|
| 12 inches (ins.) | = 1 foot (ft.) |
| 3 feet (ft.) | = 1 yard (yd.) |
| 36 inches (ins.) | = 1 yard (yd.) |
| 1 760 yards (yds.) | = 1 mile |
| 5 280 feet (ft.) | = 1 mile |

From looking at the table we can see that if a measurement is given in one unit it is easy to change it to another unit.

*Example 1:*

A table was 4 feet long. How many inches was that? If each foot is equal to 12 inches; then what we really have is 12 coming up 4 times (12 X 4 or 4 X 12).

*Answer is* 4 X 12 = 48 *in.*

*Example 2:*

Now let us change 6 yds to feet. Here we know that each yard equals 3 feet so:

6 yards = (6 X 3) feet
= 18 feet

*Answer is 18 ft.*

*EXERCISE B*

Let us do the following:

(1) change 16 yards to feet

(2) change 14 feet to inches

(3) change 6 yards to inches

(4) change 2 miles to yards

(5) 1 yard = 36 inches how much would $\frac{1}{2}$ yard be in inches?

Sometimes we want to change measurements like 6 yds; 2 ft; 3 ins., to ins. To do this we must first change yards to feet, then feet to inches. Let us work this one together.

After measuring a length of rod a man found it to be 2 yds., 2 ft., 4 ins. What would be the length in inches?

We set down the given length as shown here and proceed with these steps.

*Steps:*

(1) Change yds. to feet by multiplying by 3, because 3 ft. = 1 yd.

(2) We got 6 ft. but already have 2 ft. under ft. so we must add them together 6 + 2 = 8 ft.

(3) Now we change 8 ft. to ins. by multiplying by 12, because 12 ins. = 1 ft.

| yds. | ft. | ins. |
|---|---|---|
| 2 | 2 | 4 |
| X 3 | | |
| 6 ft. | | |
| + 2 ft. | | |
| 8 ft. | | |
| X 12 | | |
| 96 ins. | | |
| + 4 | | |
| 100 ins. | | |

(4) We got 96 ins. but already have 4 ins. in the length to add in so (96 + 4) in. = 100 ins.

*Answer is 100 ins.*

Let us practice by doing these:

Change 3 yds. 1 ft. 6 ins. to ins. Follow the steps carefully. Also be careful not to confuse x and x.

Change 2 yds. 1 ft. 3 ins. to ins.

Once you have understood how the changes are made we can now go on to use a short cut way of working it. It is not very different from that above.

Let us change 1 yd. 2 ft. 6 ins. to ins. Here we are going to multiply and add at the same time in one step.

*Steps:*

(1) Change yds. to ft. and add in the extra ft. (1 X 3) + 2 = 5 ins.

(2) Now change ft. to ins. and add on the extra ins. (5 X 12) + 6 = 66 ins.

| yds. | ft. | ins. |
|---|---|---|
| 1 | 2 | 6 |
| X 3 | | |
| 5 ft. | | |
| X 12 | | |
| 66 ins. | | |

*Answer is 66 ins.*

One has to be very careful to remember to add on the extras and at the same time to multiply accurately.

Here is another example:

(1) (3 X 1) + 1 = 4 ft.

(2) (4 X 12) + 5 = 53 ins.

| yds. | ft. | ins. |
|---|---|---|
| 1 | 1 | 5 |
| X 3 | | |
| 4 ft. | | |
| X 12 | | |
| 53 ins. | | |

*Answer is 53 ins.*

Let us practice these:

Change 1 yd., 2 ft., 8 in. to ins.

Change 1 yd., 1 ft., 1 in. to ins.

Sometimes we meet some examples which only need one step.

Example 1: Change 3 yds., 2 ft. to ft.

We proceed as before simply stopping at feet.

| | yds. | ft. |
|---|---|---|
| So we get | | |
| Change yds. to ft. $(3 \times 3) + 2 = 11$ ft. | 3 | 2 |
| | $\times$ 3 | |
| | 11 ft. | |

*Answer is 11 ft.*

| | | | |
|---|---|---|---|
| Example 2: Change | 3 ft. | 6 in. | to ins. |
| | ft. | in. | |
| | 3 | 6 | |
| $(3 \times 12) + 6 = 42$ | $\times$ 12 | | |
| | 42 ins. | | |

*Answer is 42 ins.*

*EXERCISE C*

Let us work out the following:

(1) Change 6 yds., 2 ft., 3 ins. to ins.

(2) A length of cloth is exactly 4 yds., 1 ft., 6 ins. What is its length in inches?

(3) Change 6 yds. 0 ft. 0 in. to ins. (This can be done in 1 step — remember 36 ins. = 1 yd.)

(4) Change 6 ft., 3 ins. to ins.

(5) A length of wire was 2 ft. 3 ins. What is its length in inches?

We have been learning to change measurements from one unit of length to another without changing the actual length of the measurement.

All those we have done so far, involved changing from a large unit eg. yards to smaller units feet or inches, or feet to inches. Notice in those examples that when we moved from a large unit to a smaller one, the numbers get larger, even though the actual length remained the same. This is to be expected because we are multiplying.

eg. change 2 yd. to ft.

$(2 \times 3) = 6$ ft.

2 yds. = 6 ft.

We are now going to learn to change from a small unit of length to a larger one.

Let us change 65 inches to feet. We know that each foot is worth 12 inches, so the number of feet we would get, is the same as the number of groups of 12 we can get from 65. This means that we are going to *break up 65 into groups* of 12. In other words we are going to *divide* 65 by 12.

Let us set it down and follow the steps.

(1) Divide as usual

The division is telling us that we were able to get 5 groups of 12 ins. that is 5 ft. but were left with 5 ins. which we could not divide, the remainder is 5.

$$\begin{array}{r|l} & \text{5 ft.} \\ \hline 12 & 65 \\ & -60 \\ \hline & \text{5 ins.} \end{array}$$

*Our answer then is 5 ft. 5 ins.*
*65 ins. = 5 ft. 5 ins.*

Let us try to change the same lengths, 65 ins. into yds., ft., and ins.

Again starting out as before dividing by 12 to change to feet.

(1) Dividing as usual we got the same number of ft. and ins. 5ft. 5ins.

$$\begin{array}{r|l} & \text{5 ft.} \\ \hline 12 & \text{65 ins.} \\ & 60 \\ \hline & \text{5ins.} \end{array} \qquad \begin{array}{r|l} & \text{1 yd.} \\ \hline 3 & \text{5 ft.} \\ & 3 \\ \hline & \text{2 ft.} \end{array}$$

(2) We now have to change the number of ft. to yds. Remember, every 3 ft. = 1 yd., so we again must find how many groups of 3 we can get from 5 : $5 \div 3 = 12$. We got 1 group of 3, or 1 yd. and had 2 ft., remaining which we could not divide.

Our answer is therefore: 65 ins. = 1 yd. 2 ft. 5 ins.

In actually working it out, notice how we scratched off the 5 ft., we got in step (1). This is because we used it to move to yds. This would prevent us from being confused in reading off the answer. Once we use the amount to change further, we can scratch it from the first quotient. Note: do not rub it off though.

Another good idea is to write down the parts of the answer as fast as you get them.

Here is another example using a different number of inches. Let us change 100 ins. to yds., ft. and ins.

$$\begin{array}{r|r} \cancel{8}\text{ ft.} & 2\text{ yds.} \\ 12\,\overline{)100\text{ ins.}} & 3\,\overline{)\cancel{8}\text{ ft.}} \\ -96 & 6 \\ \hline 4\text{ ins.} & 2\text{ ft.} \end{array}$$

*Steps:*

(1) $100 \div 12$ to move to feet write down 4 ins. in the answer.

(2) divide 8 ft. by 3 to move to yds., scratch the first ~~8~~ ft.

(3) write down the 2 ft., and then 2 yds., in your answer.

*Answer is 2 yds. 2 ft. 4 ins.*

Notice how we were careful to write the correct names eg. ft., ins., yds., alongside their numbers. This is a very important, thing to do, as we would then be able to see exactly what unit we are working with in each step, and also what we are expected to get in the quotient and remainder of each step.

*EXERCISE D*

(1) Let us change 94 ins. to ft.

(2) Let us change 36 ft. to yds. (only one step)

(3) Let us change 212 ins. to yds., ft., and ins.

(4) Let us change 72 ins. to yds. (only one step remember 36 ins. = 1 yd.)

(5) Let us change 6 yds. 2 ft. 3 ins. to ins.

(remember this one calls for multiplication)

We would now learn to add measurements, using the units we have learnt.

An upholsterer joined a piece of leatherette 4 yds. 2 ft. 3 ins., long to another piece that was 3 yds. 1 ft. 2 ins. long. What is the total length he now had?

To do this we must add:

4 yds. 1 ft. 3 ins + 3 yds. 1 ft. 2 ins.

Let us set it down and work it out:

*Steps:*

(1) add inches $3 + 2 = 5$

(2) add ft. $1 + 1 = 2$

(3) add yds. $4 + 3 = 7$

| | yds. | ft. | ins. |
|---|---|---|---|
| | 4 | 1 | 3 |
| + | 3 | 1 | 2 |
| | 7 | 2 | 5 |

*Answer is* 7 yds. *2 ft. 5 ins.*

This one was very easy all we did was to add each unit of length. Sometimes they are not so straight forward.

Let us add: 4 yds. 1 ft. 6 ins. + 2 yds. 1 ft. 8 ins.

*Steps:*

(1) Add inches; $6 + 8 =$ 14 inches, but 14 inches

| | yds. | ft. | ins. |
|---|---|---|---|
| | 4 | 1 | 6 |
| + | 2 | 1 | 8 |
| | 7 | 0 | 2 |

$$\begin{array}{r} 1\text{ ft.} \\ 12\,\overline{)14\text{ ins.}} \\ 12 \\ \hline 2\text{ ins.} \end{array}$$

is greater than 1 ft. why? We must therefore change it to ft. on the side 14 ÷ 12 = 1 ft., 2 ins. we use 2 ins., under the ins. column. and add the 1 ft. to the ft. column.

$$\begin{array}{r} 1 \text{ yd.} \\ 3\overline{)\,3 \text{ ft.}} \\ \underline{3} \\ 0 \text{ ft.} \end{array}$$

(2) We then add feet. 1 + 1 + 1 = 3 ft.
but 3 ft. is the same as 1 yd. so we
change ft. to yds. 3 ÷ 3 we get 1 yd., 0 ft.
We use 0 under ft. and add 1 yd. to the yds. column.

(3) Now adding yds. 1 + 2 + 4 = 7 yds.

Answer is 7 yds. 0 ft. 2 ins.

These steps are very important. Let us do another example:

Add 6 yds. 2 ft. 3 ins. + 2 yds. 2 ft. 5 ins.

*Steps:*

adding ins.

| | yds. | ft. | ins. |
|---|---|---|---|
| | 6 | 2 | 8 |
| + | 2 | 2 | 5 |
| | 9 | 2 | 1 |

$$\begin{array}{r} 1 \text{ ft.} \\ 12\overline{)\,13 \text{ ins.}} \\ \underline{12} \\ 1 \text{ in.} \end{array}$$

8 + 5 = 13 ins. change to ft. use the 1 in. under ins. and add the 1 ft. to ft. column.

(2) Add ft.: 2 + 2 + 1 = 5 ft.

Change to yds. Use 2 ft. and add 1 yd. to yds. column.

(3) Add yds. 6 + 2 + 1 = 9 yds.

$$\begin{array}{r} 1 \text{ yd.} \\ 3\overline{)\,5 \text{ ft.}} \\ \underline{3} \\ 2 \text{ ft.} \end{array}$$

*Answer is 9 yds. 2 ft. 1 ins.*

*EXERCISE E*

1. Add 3 yds., 1 ft., 1 ins. + 2 yds., 1 ft., 2 ins.
2. Add 2 yds., 2 ft., 6 ins. + 3 yds., 2 ft., 7 ins.
3. Add 1 yd., 2 ft. + 2 yds., 1 ft.

## MULTIPLICATION OF MEASUREMENTS

A carpenter needed 3 pieces of white pine 4 ft., 6 ins. long. How many ft. does he has to buy?

Statement: 4 ft., 6 ins. X 3

Let us set it down and work it.

*Steps:*

| ft. | ins. |
|---|---|
| 4 | 6 |
| | X3 |
| 13. | 6 |

$$\begin{array}{r} 1 \text{ ft.} \\ 12\overline{)\,18 \text{ ins.}} \\ \underline{12} \\ 6 \end{array}$$

(1) Multiplying ins.; 6 X 3 = 18 ins.

We must change 18 ins. to ft. on the side.
We get 1 ft., 6 ins. We use 6 ins.

(2) Multiplying ft. we get 4 X 3 = 12 ft. But we must add in the 1 ft. from step 1. So 12 ft. + 1 ft. = 13 ft.

*Answer is 13 ft. 6 ins.*

Here is another example.

An upholsterer needs 4 yds., 2 ft., 3 ins. of twine for putting a beading around the edge of a couch. If he has to make 4 couches. How much twine should be buy at least?

Statement: 4 yds., 2 ft., 6 ins. X 4.

*Steps:*

| yds. | ft. | ins. |
|---|---|---|
| 4 | 2 | 6 |
| | | X 4 |
| 19 · | 1 · | 0 |

$$\begin{array}{r} 2 \\ 12\overline{)\,24} \\ \underline{24} \\ 00 \text{ in.} \end{array}$$

(1) Multiplying ins. 6 X 4 = 24 ins.
we must change ins. to ft.

(2) Multiplying ft. 2 X 4 = 8 ft.
adding on the 2 ft. 8 + 2 = 10 ft.

$$\begin{array}{r} 3 \\ \hline 3 \\ 3\overline{)10} \\ 9 \\ \hline 1 \text{ ft.} \end{array}$$

(3) We must change 10 ft. to yds. $10 \div 3 = 3$ yds. 1 ft.

(4) Multiplying yds.; $4 \times 4 = 16$ yds.

Adding the 3 yds. from step 3: we get $16 + 3 = 19$ yds.

*Answer is 19 yds., 1 ft., 0 ins.*

*Let us practice*

*EXERCISE F*

(1) Multiply 6 yds. 2 ft. 3 in. by 4.

(2) 2 yds. 1 ft. 4 ins. $\times$ 6

(3) 8 yds. 2 ft. $\times$ 3

(4) 2 ft. $\times$ 2 (give your answer in yds. and ft.)

(5) 6 ft. 2 ins. $\times$ 3;

**SUBTRACTING MEASUREMENTS**

Now let us see how subtraction is handled.
Example: 4 yds., 2ft., 6 ins. − 2 yds., 1 ft., 5 ins.

*Steps:*

(1) Subtract ins. $6 - 5 = 1$ ins.

(2) Subtract ft. $2 - 1 = 1$ ft.

(3) Subtract yds. $4 - 2 = 2$ yds.

| | yds. | ft. | ins. |
|---|---|---|---|
| | 4 | 2 | 6 |
| − | 2 | 1 | 5 |
| | 2 | 1 | 1 |

*Answer is 2 yds. 1 ft. 1 in.*

This was a very easy example, we simply subtracted each column and wrote down the answer.

*Example 2:* 6 yds., 2 ft., 4 ins. − 2 yds., 1 ft., 6 ins.

*Steps:*

1. Subtract ins. $4 - 6$

   we cannot subtract this.

2. We must break up one of the 2 ft. on top into ins. This gives us 12 new ins. adding this to the 4 we have, we get 16 ins., cross out the four and write 16 ins., now we subtract $16 - 6 = 10$ ins.

3. We now have 1 ft. because we broke up 1, so scratch 2 and put 1. Subtract ft. $1 - 1 = 0$ ft.

4. Subtracting yds. $6 - 2 = 4$ yds.

| | yds. | ft. | ins. |
|---|---|---|---|
| | 6 | 2 | 4 |
| | | 1 | 16 |
| − | 2 | 1 | 6 |
| | 4 | 0 | 10 |

*Answer is 4 yds., 0 ft., 10 ins.*

In this case we had to break up 1 ft. to get a new stock of ins. each foot is 12 ins. so when we put all the ins. together we get 16. We then were able to subtract. We must be careful to scratch out the old numbers when we do this.

Let us do an example where we have to break up ft. and then break up yds.

*Steps:*

(1) Subtracting ins.; we cannot

(2) Break up 1 ft. subtracting ins.
$16 - 6 = 10$ ins.

(3) Subtracting ft. $1 - 2$; we cannot.

| | yds. | ft. | ins. |
|---|---|---|---|
| | 3 | 2 | 4 |
| | 2 | 4 | 16 |
| − | 2 | 2 | 6 |
| | 0 | 2 | 10 |

(4) Breaking up 1 yd; we would get 3 *new feet,* adding it in to the 1 we get 4, scratch 1 and write 4 also scratch 3 yds. and write 2. Now subtracting ft., 4 − 2 = 2 ft.

(5) Subtracting yds. we no longer have 3 yds. on top because we broke up 1, 2 − 2 = 0 yds

*Answer is 0 yds., 2 ft., 10 ins.*
*or simply 2 ft. 10 ins.*

*EXERCISE E*

Let us work these:

(1) Subtract 4 yds., 2 ft., 9 ins. − 2 yds., 1 ft., 8 ins.

(2) Subtract 3 yds., 2 ft., 4 ins. − 1 yds., 1 ft., 2 ins.

(3) Subtract 4 yds., 2 ft., 6 ins. − 1 yd., 1 ft., 7 ins.

(4) Subtract 12 yds., 1 ft., 5 ins. − 8 yds., 2 ft., 6 ins.

(5) Add 3 yds., 2 ft., 8 ins. + 2 yds., 2 ft., 6 ins.

(6) Add 2 yds., 1 ft., 9 ins. + 1 yd., 1 ft., 5 ins.

**DIVIDING MEASUREMENTS**

Here are some simple examples:

36 yds. ÷ 2, 18 ft. ÷ 3, 6 ins. ÷ 3

These are straight forward.

36 yds. ÷ 2 = 18 yds.

18 ft. ÷ 3 = 6 ft.

$$\begin{array}{r|l} & 18 \text{ yds} \\ \hline 2 & 36 \\ & 36 \\ \hline & 00 \end{array}$$

and so on.

Whenever we have the measurements given in more than one unit for example yds., ft., and ins. it is not so easy to work. First we change all the units to the smallest name in that example then divide that number, and then change back the answer to yds., ft., and ins.

Let us try this one:

Divide 4 yds., 2 ft., 7 ins. by 5.

*Steps:*

(1) Change 4 yds. 2 ft. 7 ins. to ins. that is 175 ins.

| yds. | ft. | ins. |
|---|---|---|
| 4 | 2 | 7 |
| × 3 | | |
| 14 ft. | | |
| 12 | | |
| 175 ins. | | |

$$\begin{array}{r|l} & 35 \text{ ins.} \\ \hline 5 & 175 \\ & 15 \\ \hline & 25 \\ & 25 \\ \hline & 00 \end{array}$$

(2) Divide 175 ins. by 5 that gives 35 ins.

(3) Change back 35 ins. to yds., ft., ins. = 0 yds., 2 ft., 11 ins.

*Answer is 2 ft., 11 ins.*

Let us practice:

*EXERCISE G*

(1) 6 yds., 2 ft., 3 ins. ÷ 4

(2) 3 yds., 1 ft., 4 ins. ÷ 3

(3) 12 yds., 2 ft., 4 ins. ÷ 5

(4) 3 yds., 1 ft., 1 ins. ÷ 11

(5) A piece of ribbon, 6 yds., 2 ft. long, was to be cut into 10 equal parts. What should be the length of each piece?

**METRIC MEASURES**

We have been using the yard, foot, inch and mile to measure length. These units form one system of measuring, called the British or English System. That system is not very easy to use. In this section we are going to learn to use the units of another system called the Metric System. In Grenada we have not begun to use this system nationally as yet, but because it is a very easy system to handle it is expected that sooner or later we would forget about yards, feet and inches of the British System and begin to use the units of the Metric System which is already used in may countries eg. Trinidad, South American countries, Cuba.

We would begin with the smallest unit of length in the metric system.

(See Fig. 7.2)



Fig. 7.2 1 millimetre

Let us read and write. . . Millimetre - - - - - - - - - - , - - - - - - - - - - .

Using a shortened way we write 1 *mm* - - - - - - - - - - , - - - - - - - - - - .

(See Fig. 7.3)



Fig. 7.3 6 millimetres

Here we have a line that is 6 millimetres long.

(See Fig. 7.4)



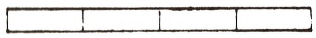
Fig. 7.4 10 millimetres

Here we have a length of 10 millimetres. This length has another name: 1 centimetre. So 10 millimetres = 1 centimetre.

Let us read and write: 1 centimetre: - - - - - - - - - - , - - - - - - - - - -

Using a shortened way we write 1 *cm* : - - - - - - - - - - , - - - - - - - - - - .

(See Fig. 7.5)



4 centimetres

Fig. 7.5

Here we have a length of 4 centimetres. 10 centimetres. This length is called by another name 1 decimetre *(dm)* so 10 centimetres = 1 decimetre *(dm).*

Let us read and write 1 decimetre: - - - - - - - - - - , - - - - - - - - - - .

In the same way 10 decimetres = 1 metre *(m)*. The metre is a little longer than the yard. Compare the metre length with the yard length. The metre is about 39 inches. Very soon we may have to buy cloth by the metre instead of the yard. The other important unit is the kilometre *(km)*. Let us read and write: kilometre: - - - - - - - - - -, - - - - - - - - - - .

This is equal to 1 000 metres. The kilometre would soon take the place of the mile. The kilometre is just more than half a mile.

Let us now write out the metric table of length using the new units we have learnt.

| Metric Table of Length | | |
|---|---|---|
| 10 millimetres *(mm)* | = | 1 centimetre *(cm)* |
| 10 centimetres *(cm)* | = | 1 decimetre *(dm)* |
| 10 decimetre *(dm)* | = | 1 metre *(m)* |
| 1 000 metres | = | 1 kilometre *(km)* |

*EXERCISE H*

Let us answer these questions:

(1) What do you notice about the endings of the words?

(2) What do you notice about the way the table is built up?

(3) Let us fill in the spaces with the correct amounts?

(a) 1 centimetre = - - - - - - - - - - - - millimetres.

(b) 1 metre = - - - - - - - - - - - - decimetres.

(c) 1 kilometre = - - - - - - - - - - - - metre.

(4) There are 10 millimetres in a centimetre. How many millimetres are in 3 centimetres?

(5) Which is longer 1 metre or 1 decimetre.

(6) Say which statements are true, and which are false by writing *T* or *F* in the spaces.

eg. 1 000 metres = 1 kilometre ...T....

(a) 10 decimetres = 1 metre ________

(b) 20 centimetres = 2 decimetres ________

(c) 2 centimetres = 20 millimetres ________

(d) 1 000 metres = 1 kilometre ________

## CHANGING FROM ONE UNIT TO ANOTHER

Because the Metric System is based on groups of 10 or powers of 10 it is very easy for us to work with them.

Example: let us change 1 metre to millimetres. We proceed by multiplying just as we did from the British System.

| *Steps:* | *m* | *dm* | *cm* | *mm* |
|---|---|---|---|---|
| (1) Changing *m* to *dm* 1 X 10 = 10 | 1 | 0 | 0 | 0 |
| | X 10 | | | |
| | 10 *dm* | | | |
| (2) Changing *dm* to *cm* 10 X 10 = 100 | X 10 | | | |
| | 100 *cm* | | | |
| (3) Changing *cm* to *mm* 100 X 10 = 1 000 | X 10 | | | |
| | 1 000 *mm* | | | |

Another example: Let us change a length of 3 *m*, 2 *dm*, 6 *cm*, 1 *mm* to *mm*.

| *Steps:* | *m* | *dm* | *cm* | *mm* |
|---|---|---|---|---|
| (1) *m* to *dm* = (3 X 10) + 2 = 32 | 3 | 2 | 6 | 1 |
| | X 10 | | | |
| (2) *dm* to *cm* = (32 X 10) + 6 = 326 | 32 *dm* | | | |
| | X 10 | | | |
| (3) *cm* to *mm* = (326 X 10) + 1 = 3 261 | 326 *cm* | | | |
| | X 10 | | | |
| | 3 261 *mm.* | | | |

*Answer is 3 261 mm*

In the first example we found:

1 *m*, 0 *dm*, 0 *cm*, 0 *mm* = 1 000 *mm*

and in the second example:

3 *m*, 2 *dm*, 6 *cm*, 1 *mm* = 3 261 *mm*

What do you notice about the digits in the answers and the digits we started off with. We just found that the digits were the same.

We would now compare some of the British Units with the Metric Units.

1 foot $= \frac{3}{10}$ of a metre, or 0.3 *m*.

1 yard $= \frac{9}{10}$ of a metre, or 0.9 *m*.

1 mile $= 1\frac{6}{10}$ of a kilometre.

At a later stage we are going to learn more about the metric system and to handle more calculations using that system.

## MEASUREMENT OF AREAS OR SURFACES

We have learned to measure lengths and work with the units of length. Now we are going to learn to measure surfaces. Every surface takes up a certain area. We therefore need to be able to measure in order to know the sizes of different surfaces.

(See Fig. 7.6)

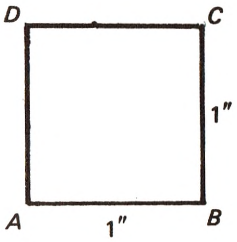



Fig. 7.6

## SQUARE MEASURES

Here we have a square *ABCD*. Let us call side *AB* the length and side *AD* the *breadth* (it can be also the width or height)

Because this square is 1 inch on both sides we call it a square inch.

(See Fig. 7.7)

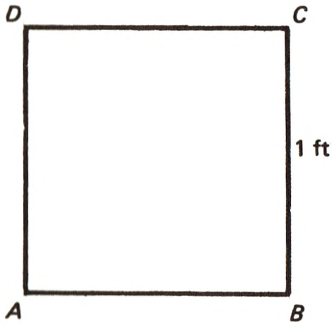



Fig. 7.7

The square of Fig. 7.7 is a measurement of 1 ft. on both sides its length and breadth It is therefore called a square foot. This is not the real size though (the real size would b drawn on the black board).

In the same way we have square yards, square centimetre, square metres, square mil etcetera.

All these are the units that are used to measure area.

These are the units together with their shortened forms:

| British System | Metric |
|---|---|
| Square inch (sq. in.) | Square millimetre *(sq. mm)* |
| Square foot (sq. ft.) | Square centimetre *(sq. cm)* |
| Square yard (sq. yd.) | Square decimetre *(sq. dm)* |
| Square mile (sq. mile) | Square metres *(sq. m)* |
| Square mile (sq. mile) | Square kilometre *(sq. km)* |

There are some other units which we would look at in Book 3.

(See Fig. 7.8)

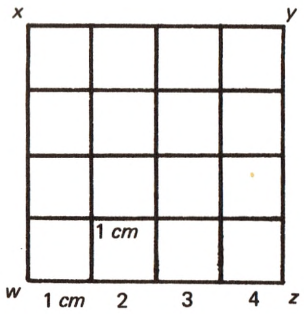



Fig. 7.8

In the Fig. 7.8 we have a surface *WXYZ*. The surface is made up of a number of squares. If each square is a square centimetre this means that the length of the surface *WZ* is 4 centimetres and the breadth is also 4 centimetres and the breadth *ZY* is also 4 centimetres. How many square centimetres then does the surface *WXYZ* have? then does the surface *WXYZ* have?

We can count them or we can say that we have 4 rows of 4 and multiply 4 by 4 = = $4 \times 4 = 16$. We found that the surface has 16 square centimetres. This means that it is taking up an area. That 16 square centimetres would take up. We simply say its area is 16 square centimetres.

The area of *WXYZ* = 16 *sq. cm.*

Notice that to find the area we actually multiplied the length of the surface by its breadth.

So length *x* breadth = area

Using letters $L \times B = A$

We can use this to find the area of any square or rectangle once we know the length and the breadth.

Let us find the area of this rectangle:

(See Fig. 7.9)

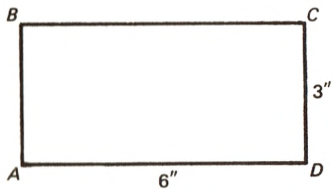



Fig. 7.9

We know that $L \times B = A$.

So we replace the letters with the right numbers and then multiply. We therefore get

$$6'' \times 3'' = A$$

$6'' \times 3'' =$ 18 square inches (sq. in.)

Our measurements were in inches so our area must be in square inches.

*EXERCISE I*

(1) Let us find the area of these figures.

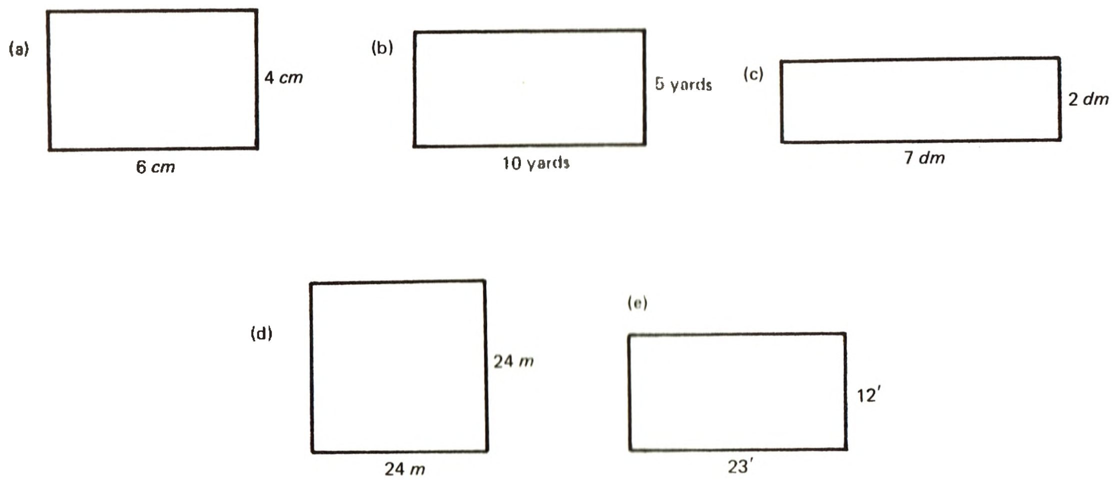



Fig. 7.10

(2) A floor 16 ft. long and 19 ft. wide, needed carpeting. How many sq. ft. of carpet would it require to cover the floor exactly?

**FINDING THE AREAS OF TRIANGLES**

We know that the areas of squares and rectangles are found by multiplying the measurement of the length by the measurement of the breadth or width. We would now learn to calculate the areas of triangles.

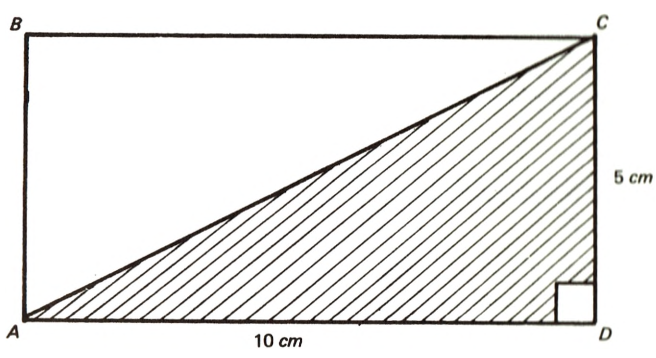



Fig. 7.11

What would be the area of the whole rectangle *ABCD*? $L \times B = A$ $10 \times 5 =$ $= 50$ *sq. cm.* Notice that the shaded part is really $\frac{1}{2}$ of the whole rectangle. This means that the area of that part must be $\frac{1}{2}$ of the area of *ABCD*. That is $\frac{1}{2}$ of $50 = 25$ *sq. cm.*

Since we found the area of *ABCD* saying $L \times B = A$ then the area of the shaded part which is a triangle is simply $\frac{1}{2}$ of $L \times B$.

Normally as far as the triangle is concerned side *CD* is called the height or altitude instead of the breadth. (The height must be perpendicular to the base.) In this triangle also side *AD* would be called the base instead of the length. So instead of writing: $\frac{1}{2} L \times B$, we can write $\frac{1}{2}$ base x height. Using letters *B* for base and *H* for height, and *A* for the area of the triangle we write:

$$A = \frac{1}{2} \text{ of } (B \times H)$$

$$\text{or } A = \frac{1}{2} \times B \times H.$$

Example:

Let us find the area of this triangle

(See Fig. 7.12)

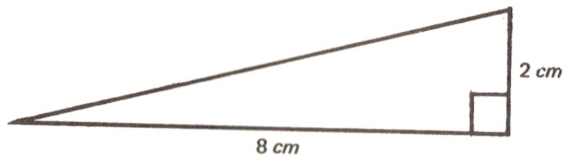



Fig. 7.12

(See Fig. 7.13)

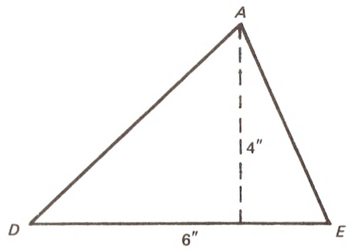



Fig. 7.13

*EXERCISE J*

(1) Let us find the area of these triangles:

(See Fig. 7.14)

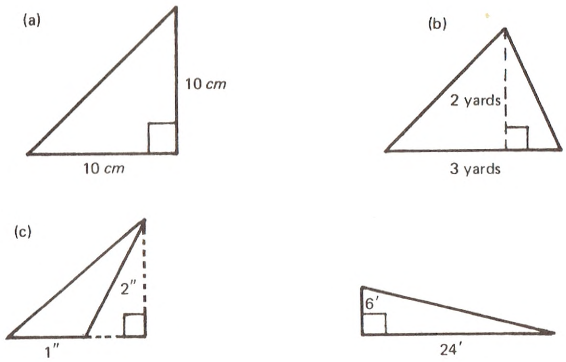



Fig. 7.14

## MEASURING WEIGHT

We already dealt with the pound and ounce in Book 1. We found out that 1 pound is the same as 16 ounces. We would now learn some new units of weight. A weight of 112 pounds is usually called a *hundred weight* (cwt.). This weight is hardly used these days. Let us read and write hundred-weight:

- - - - - - - - - - - - - - - - - - - - - - - - -, - - - - - - - - - - - - - - - - - - - - - - - - .

The shortened form cwt: - - - - - - - - - - - - - - - - - - - - -, - - - - - - - - - - - - - - - - - - - .

Another weight that is more important is the *ton*. This weight is used in measuring very heavy objects for example, vehicles, cargo, truck loads of bananas, etc. You would have heard of 7 ton trucks or 20 ton boats. This means that they can carry safely weights of 7 or 20, or whatever amount of tons. The ton is equal in weight to 20 cwts. or 2240 pounds.

Here is a table of weight measures showing the units we have learnt. Again these units belong to the British System of measuring.

British table of weight measures now used

| | | |
|---|---|---|
| 16 ounces (ozs.) | = | 1 pound (lb.) |
| 112 pounds | = | 1 hundredweight (cwt.) |
| 20 hundredweight | = | 1 ton |
| 2240 pounds | = | 1 ton |

There are two other units of this system that are hardly ever used. The *stone* and the *quarter.*

| | | |
|---|---|---|
| 1 stone (st.) | = | 14 pounds |
| 1 quarter (qt.) | = | 4 stones. |

Once we know the tables properly it is easy for us to change weights from one unit to another using the same method we used for lengths.

Let us change 6 pounds to ounces.

| *Steps:* | pounds | ounces |
|---|---|---|
| (1) Multiply by 16 | 6 | 0 |

$$\begin{array}{r} 6 \\ \times\ 16 \\ \hline 36 \\ 60 \\ \hline 96 \end{array} \text{ ounces}$$

How many pounds are equal to 3 tons? We simply multiply 2 240 by 3 because each ton is equivalent to 2 240 pounds.

We therefore get 6 720 pounds.

We would not bother to add, or subtract weights here. It is more important for us to be able to find fractions of the pound, giving the answers in ounces.

Example 1: How many ounces are equal to $\frac{1}{2}$ pound?

Since 1 pound is 16 ounces.

Then $\frac{1}{2}$ pound is $\frac{1}{2}$ of $\frac{16}{1} = \frac{1}{2} \times \frac{16}{1} = 8$ ounces.

How many ounces are in $\frac{1}{4}$ pound?

1 pound = 16 ounces

$\frac{1}{4}$ pound $= \frac{1}{4}$ of $16 = \frac{1}{4} \times \frac{16}{1} = 4$ ounces.

*Let us find the following*

$\frac{1}{2}$ of 1 hundredweight in pounds.

$\frac{1}{4}$ hundredweight in pounds.

$\frac{1}{2}$ ton in pounds.

$\frac{1}{4}$ ton in pounds.

## METRIC WEIGHT MEASURES

Here again we would see that the metric system for weights is based on 10.

The smallest unit of weight in the metric system is the milligramme *(mg)* notice the part of the word milli, that same *prefix* was used for millimetre. The milligramme is very light and is mostly used for measuring medicines at pharmacies. 10 milligrammes is equal to a new unit called the *centigramme; (cg)* again the prefix is the same as in *centimetre;* in fact all the other prefixes are the same as those we met for metric length. 10 centigrammes is equal to 1 decigrammes *(dg)*.

Now that we have an idea of how the metric units of weight are built up we can show all of them on the table.

*Metric table in weight*

| | | |
|---|---|---|
| 10 milligrammes *(mg)* | = | 1 centigramme *(cg)* |
| 10 centigrammes *(cg)* | = | 1 decigramme *(dg)* |
| 10 decigrammes *(dg)* | = | 1 gramme *(g)* |
| 1 000 grammes | = | 1 kilogramme *(kg)* |
| 1 000 kilogrammes | = | 1 tonne *(t)* |

The gramme is very light and again it is used mostly in medicines. A kilogramme is a little heavier than 2 pounds. A kilogramme of rice would be about twice the amount of 1 pound, and twice the cost.

1 tonne is a little lighter than the British ton.

| | |
|---|---|
| 1 tonne | = 2 205 pounds. |
| 1 ton | = 2 240 pounds. |

so 1 tonne $\neq$ 1 ton.

Calculating with the units of metric weight is similar to calculating with metric length.

Let us change 16 grammes to centigrammes.

$$\begin{array}{rr} g & cg \\ 16 & 0 \\ \times\ 10 & \\ \hline 160 \cdot cg & \end{array}$$

16 grammes = 160 centigrammes.

*EXERCISE K*

(1) How many ounces are there in 2 pounds?

(2) How many hundredweights are equal to 2 tons?

(3) Which is heavier 1 ton or 1 tonne?

(4) Let us change the following to milligrammes:

(a) 2 grammes

(b) 6 decigrammes

(c) 5 centigrammes.

(d) 2 *g* 3 *cg* 4 *dg* 5 *mg*

(5) One pound of margarine cost $2.40. How much should $\frac{1}{2}$ pound cost?

## SUMMARY

This unit contained a lot. If there are sections that you did not understand clearly you should study them again together with your teacher. Also you should use the new skills you have gained in this unit when you purchase things from the shop or stores, eg. groceries, cloth, lumber etc. or in measuring out small areas of garden plots, etc. The tables are very important. You should make special efforts to know them and to use them and to use them properly. The general method used for changing the unit names, of lengths or weights, or for doing the calculations, is the same throughout. Be on the look out for metric units, all the best.

## CONSOLIDATORY EXERCISES

(1) A length of board 6 ft., 8 ins., long, is to be cut into pieces each 10 ins. long to make some pegs. How many pegs would be got?

(2) A length of cloth 2 yds., 4 ft. was needed to cover a large cushion. How much cloth would be needed to cover 6 cushions of the same size?

(3) Let us divide 4 *m*, 6 *dm*, 8 *cm*, by 4.

(4) If you go to buy cloth, and instead of asking for 2 yds., you ask for 2 metres. (a) About how many inches of cloth would you get? (b) What would that be in yds., ft., ins? (remember 1 metre 39 ins.)

(5) Let us fill in the blank spaces with the correct answers:

(a) 7 metres ---------- decimetres.

(b) 3 yds. ------------ ins.

(c) $\frac{1}{2}$ yd. ------------ ins.

(d) $\frac{1}{4}$ yd. ------------ ins.

(e) $\frac{1}{8}$ yd. ------------ ins.

(6) Let us find the area of the rectangles and squares which have the following measurements: $(L \times B = A)$

(a) length = 14 ins, breadth = 6 ins.

(b) length = 12 ft, breadth = 1 ft.

(c) length = $\frac{1}{2}$ ft, breadth = $\frac{1}{4}$ yd. (multiplying fractions or change to ins.)

(d) length = 18 ft, breadth = $\frac{1}{4}$ ft.

(e) length = 8 metres, breadth = 6 metres

(f) length = 6 *dm*, breadth = 4 *dm*.

(7) Let us find the areas of the triangle with the following measurements:

$(A = \frac{1}{2} \times b \times h)$

(a) Base = 6 ins. height = 4 ins.

(b) Base 12 ins. height = 6 ins.

(c) Base = 18 yds. height = 4 yds.

(8) The weight of a van is $\frac{1}{2}$ ton. How many pounds is that?

(9) A pick-up was designed to take 2 tons as its maximum weight. Is it safe to carry a cargo of 7 720 pounds?

(10) A truck carried a load of cane to the factory. When it was weighed on the scale the first time, the weight of the truck and its cargo was 7 tons. After unloading, the truck was weighed again. This time the truck alone weighed 5 tons. What was the weight of cane it carried? (a) in tons, (b) in pounds.

**SOLUTION OF OTHER PROBLEMS RELATED TO THE STUDENTS EVERYDAY ACTIVITIES**

## UNIT 8

## LETTERS SYMBOLS AND NUMBERS

In Book 1 we learned to use letters of the alphabet to represent numbers that are unknown, and also to replace letters in statements.

Let us review a little of what we learned.

A young man made 15 dollars doing odd jobs in one day. He spent a certain amount and ended up with 5 dollars.

Use a statement to show what happened, using letters and numbers.

First he had 15 dollars. So we start off with 15. He then spent a certain amount. We do not know the exact amount yet so we use a letter 15 - a, then he ended up with 5 dollars, so $15 - a = 5$.

*EXERCISE A*

(1) Let us write a similar statement for this problem. There were 10 people in a work force on a project. Some more people came to join them. At the end of the project there were 16 people working. How many came on?

Write the statement using a for the unknown number.

(2) Let us now do some replacement or substitutions. Find the value of $b$ in these statements if $a = 5$:

(1) $a + 6 = b$ (2) $6 - a = b$ (3) $3 \times a = b$
(this could be written as $3a = b$)

(3) What is the value of $c$ in this statements if $a = 7$ and $b = 8$:

(1) $a \times b = c$ (2) $a \times b \times b = c$ (3) $3 \times a \times b = c$ (4) $\frac{1}{2} \times b = c$

Same as $ab = c$
" " $abb = c$
" " $3ab = c$ and $\frac{1}{2} b = c$

Here are some substitutions related to some of the problems we met in the last unit.

You would remember that to find the area of a rectangle we simply multiplied the length by the breadth. For this we used the statements $L \times B = A$ using $L$ for length, $B$ for breadth and $A$ for the area of the rectangle or square.

Then to find the area of the triangle we used the statement $\frac{1}{2} \times B \times H = A$, using $B$ for the base of the triangle, $H$ for the height or altitude and $A$ for the area of the triangle.

These statements are called formulas. Let us read and write the word:

Fórmula: - - - - - - - - - - - - - - - - - - - - - - , - - - - - - - - - - - - - - - - - - - -.

(1) Let us find the areas of these rectangles with the following measurement using the formula: $L \times B = A$.

(a) $L = 5''$, $B = 6''$ (b) $L = 6\,m$ $B = 4\,m$ (c) $L = 14\,m$ $B = 7\,m$

(2) Now let us find the areas of these triangles using the formula: $\frac{1}{2} \times B \times H = A$

(a) $B = 6'$, $H = 2'$ (b) $B = 14'$, $H = 2'$

(c) $B = 16\,m$ $H = 4\,m$ (d) $B = 160\,cm$, $H = 100\,cm$

Normally in writing formulas we do not put in the multiplication sjgn when it comes next to a letter.

so $A \times B = AB$

and $2 \times B = 2B$

or $\frac{1}{2} \times C = \frac{1}{2}C$

The formulas for the areas of the rectangles and triangles can be written then as:

$$LB = A \text{ or } \frac{1}{2}BH = A$$

Let us write the formula for the radius of a circle when the length of the diameter is given.

$$\frac{1}{2}D = r \quad \text{or} \quad r = \frac{1}{2}D$$

Let us then find the radius for the circles with the following diameter. Using the formula $\frac{1}{2}D = R$

(a) $D = 8''$ (b) $D = 14''$ (c) $D = 22\,m$

Earlier in this Book, and in Book 1 we met a number of symbols that are used in statement. These are very important. Let us concentrate on them here.

$<$ means 'lesser than' — $6 < 7$ means 6 is less than 7.

$>$ means 'greater than' — $7 > 6$ means 7 is greater than 6.

$=$ means 'the same value as' — $6 = 6$ is true, $7 = 6$ is false.

$\neq$ means 'not the same value as' — $6 \neq 7$ is true, $6 \neq 6$ is false.

$\equiv$ means 'equivalent' the same value as. This is very similar to: $=$ but is only used in special situations. For example: \$ 1.00 us $\equiv$ \$ 2.67 E.C.

$\not\equiv$ means not equivalent.

This means, almost equal to or approximately.

( ) brackets are used to tell us that whatever is inside is to be handled first or as a separate amount.

Let us now say whether these statements are true or false by putting *T* for true and *F* for false in the spaces. The first one is done as an example:

(1) $6 \neq 6$ — this is false so we put *F*

(2) $7 \neq 6$ — - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - .

(3) $8 > 5$ — - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - .

(4) $10 < 11$ — - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - .

(5) $12 < 12$ — - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - .

(6) $15 = 15$ — - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - .

(7) $16 = 15$ — - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - .

(8) $(4 \times 3) \times 2 = (2 \times 3) \times 4$ - - - - - - - - - - - - - - - - - - - .

(9) $0.5 \neq 0.50$ – - - - - - - - - - - - - - - - - - - - - - - - - - - .

(10) $0.3 \quad \frac{3}{10}$ – - - - - - - - - - - - - - - - - - - - - - - - - - - - - .

**SUMMARY**

By now you would have noticed that there are a lot of signs and symbols used in Mathematics. These symbols are tools that help us to use Mathematics properly, and to communicate our calculations to others. We must therefore bear in mind that every symbol means something very specific. Signs and symbols should then be used with care, and in the right places where they are required to make all mathematical statements true. Be careful not to confuse the sign for angle, with the signs for less than.

**LOOKING FORWARD**

We have come to the end of the Mathematics section of this book. This does not mean that we would stop practising until the next course starts. We should always use what we have learned to do our calculations from day to day. This is the only way that Mathematics can become useful and real for us. Don't be afraid to approach your teacher on any problem that you may find in making any calculations as you go about your day to day business.

The next thing you are going to do is prepare for your final evaluation. Study over any section or sections you didn't understand fully with your teacher.

In Book 3 we are going to learn some more about fractions, decimals, measuring the space taken up by bones and other solids, and how to tackle more problems that we meet from time to time. You can look forward to that.

| Remember: Work harder study harder. |
|---|

*All the best.*

# Natural Science

## UNIT 1

## THE FORCE OF GRAVITY IN THE UNIVERSE

### WHY DO THE PLANETS REVOLVE AROUND THE SUN?

If you were able to stand in space, millions of miles out from the Earth, and observe our Solar System, you would find all the planets circling about the Sun in a counter-clockwise direction, i.e. in the direction of the hands of a clock moving backwards.

(See Fig. 1.1)

force that is pulling on the Earth and other planets, pulling them towards the Sun —that is called the Sun's *gravity.*

### UNIVERSAL GRAVITY

The force with which all the bodies of the universe attract each other is called *universal gravity* and it helps keep the Solar System in a particular pattern. All the bodies of the universe have this attraction power and this force of gravity depends on several things.

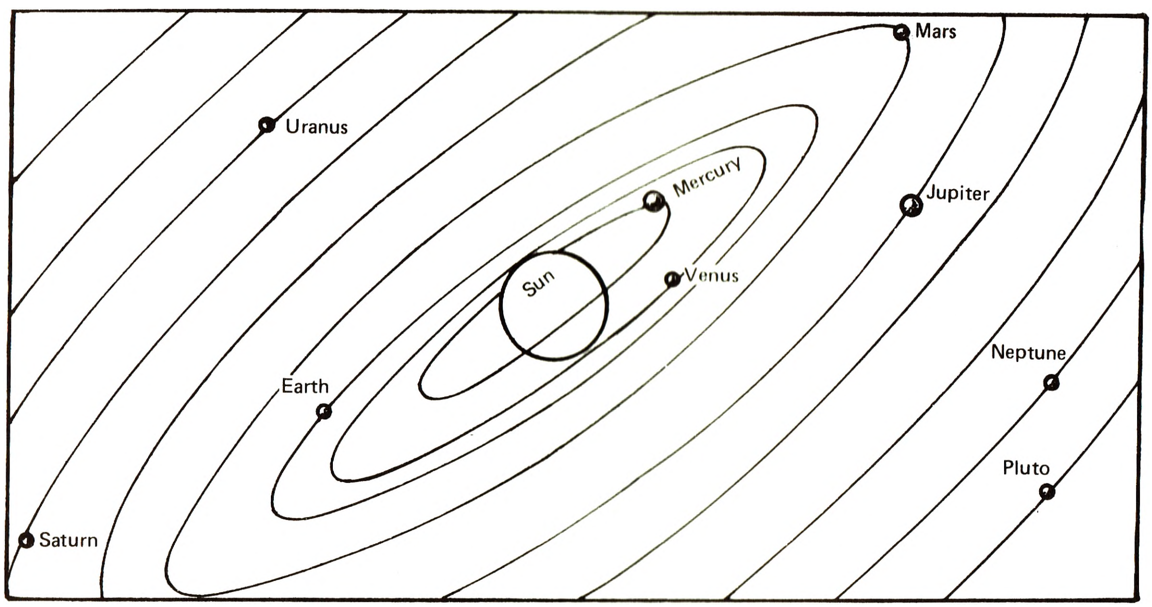



Fig. 1.1 Diagram showing the solar system with the planets revolving around the sun.

Why do the planets follow this pattern. If you take a stone tied to a string, and spin it in a circle around you, you will find that as long as the stone travels at the same speed, it stays in the same path and it stays the same distance from you. The same is true of the Sun and the Earth even though there is no string between them. As the Earth and the other planets are travelling around the Sun, they are pulling away from the Sun. However, at the same time, there is another

First of all the greater the amount of weight or mass of the body, the greater it's gravity pull. This explains why for example, the Moon rotates round the Earth, while the Earth rotates round the Sun. Because the Moon is smaller than the Earth, while the Earth is smaller than the Sun.

Secondly, the distance between the bodies affect the strength of the force. So that gravity has a stronger pull when the two bodies are closer together than when they are further apart.

Because of this force of Universal Gravity, the Sun attracts and makes all the bodies of the Solar System spin or rotate around it.

In the same way, the Earth attracts the Moon and other man-made satellites that rotate around her.

(See Fig. 1.2)

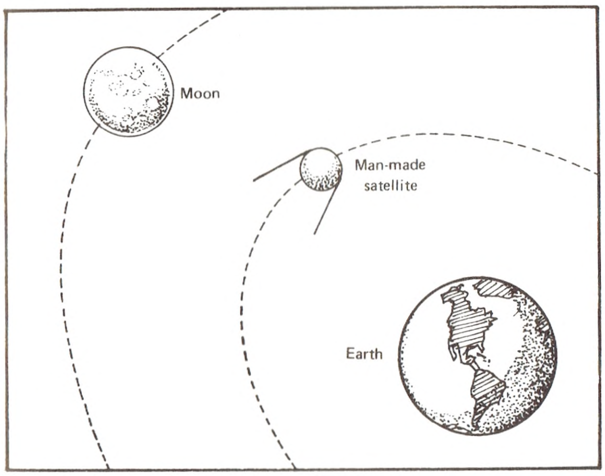



Fig. 1.2 Moon and other satellite rotating around the Earth.

**A satellite is a body that rotates around another larger body e.g. the Moon is a satellite of the Earth, the Earth is a satellite of the Sun.**

Note well:

There are also other man-made satellites that rotate around the Earth.

## GRAVITY OF THE EARTH

We know from experience that all bodies, whatever, they are, if they are not supported or suspended would fall.

Why do objects fall back down when thrown into the air? Why don't bodies situated on the surface of the Earth project into space?

Bodies that are left to fall freely and objects that are on the surface of the Earth do not project into space, because the Earth exerts a force of attraction on them.

(See Fig. 1.3)

**The force with which the Earth attracts or tends to pull all bodies towards its centre is called the force of gravity.**

All bodies falling into the Earth's surface follow a vertical direction. This vertical line, unites the point in space where the body is situated with the centre of the Earth.

(See Fig. 1.4)

Fig. 1.3 The Earth posseses a force that attracts bodies to its centre.

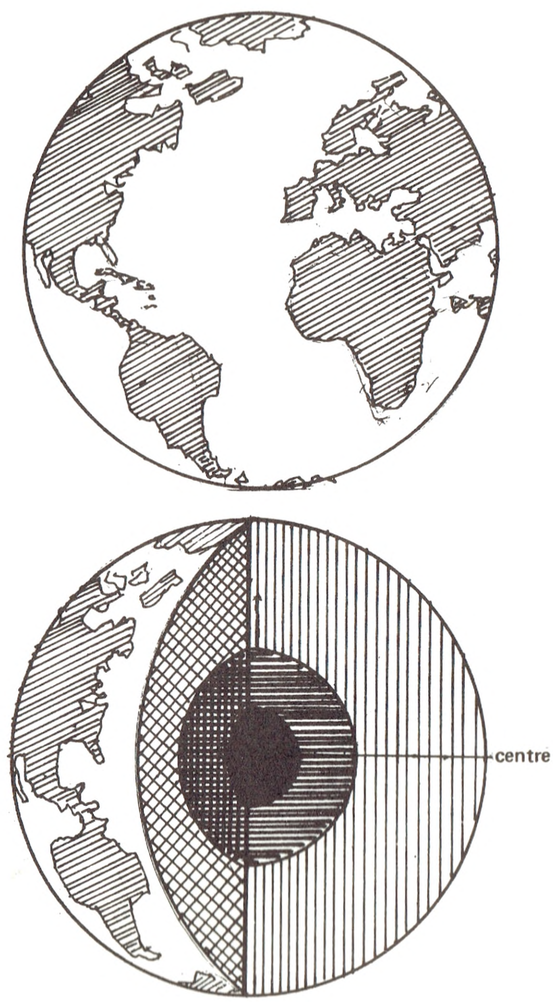



Fig. 1.4 Illustration of the centre of the Earth.

The direction which the bodies follow is towards the centre of the Earth.

In order to show this force, part of a line can be used with an arrow at one end. The part of the line shows the direction of the force of attraction.

(See Fig. 1.5)

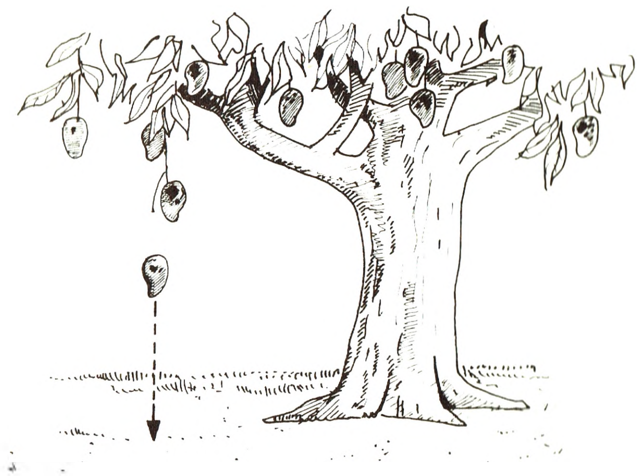


Fig. 1.5 Effect of gravity on the fall of bodies.

In order to test the vertical direction of falling bodies, a weight can be used. This weight should be attached to one end of a string. As soon as the end with the weight is dropped, the string takes up a vertical direction which is towards the centre of the Earth. This can be used to determine how vertical walls, pillars, etc., are.

(See Fig. 1.6)

*Exercises:*

(1) What force causes bodies to fall when they are not supported or suspended?

(2) Make the simple instrument shown and use it to check how upright a wall and a show window is.

### THE FALL OF BODIES

All bodies fall due to the force of gravity.

If we ask different persons what happens when two or more objects of different weights are allowed to fall simultaneously, from the same height in space, the majority will answer that the object with more weight would arrive on the ground first.

But this answer is not correct, because science has shown that when two bodies of different weights are allowed to fall simultaneously from the same height in space, both reach the ground together.

Why is this so?

Galileo Galilei demonstrated in an experiment that Earth's gravity causes the same rate of falling to be given to all bodies. Because of this, they develop equal speed and reach the ground together if they are dropped from the same point in space.

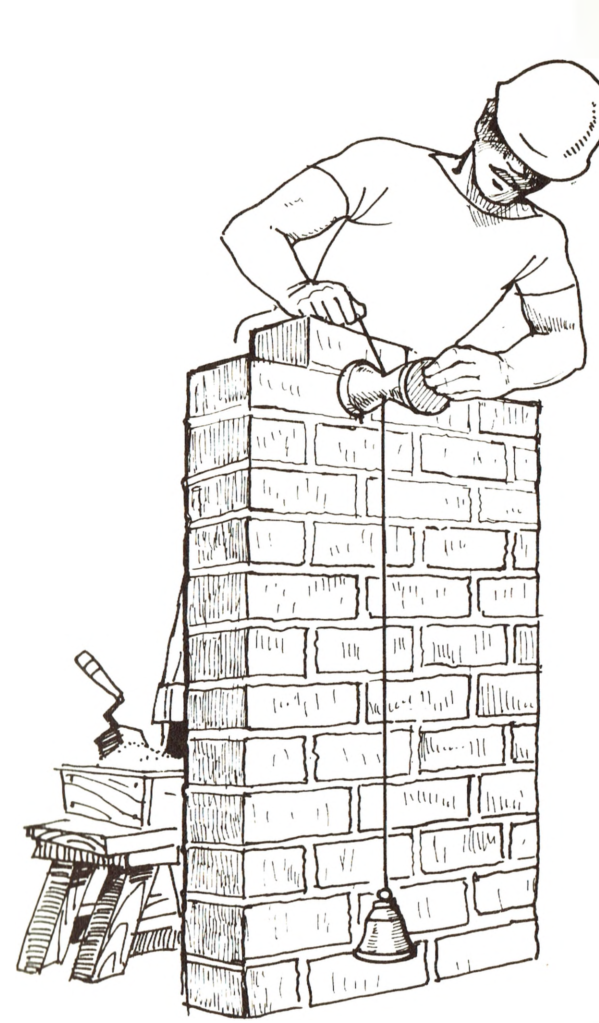


Fig. 1.6 You can test how upright a wall is with this simple instrument.

We must also note that the explanation given above does not always appear to hold true under normal conditions. This is because resistance of air also act on bodies when they fall in space. This is why if a coin and a sheet of paper are dropped simultaneously from the same height, the paper will take more time to reach the ground than the coin. The air gives more resistance to the larger surface area of the paper.

On the other hand if the paper is made into the smallest ball possible, you will observe that on dropping it, it reaches the ground almost the same time as the coin. Man invented the parachute based on this same principle of the resistance that air gives to bodies with a larger surface area.

(See Fig. 1.7)

### MORE ABOUT AIR

If we look up into the sky, we can see many, many miles away. We can see through the air. Sometimes when it is cloudy, we cannot see very far up into the sky.

Fig. 1.7 A parachute.


Figs. 1.8, 1.9 Experiment to show that air has weight.

As we saw in Book 1, the Earth is surrounded by a thick layer of air. It is many, many miles thick. It is like an ocean of air, which is called the Earth's *atmosphere.* It is part of the Earth. As the Earth moves, the atmosphere moves with it. We live in this ocean of air. We learned earlier that air is around us everywhere. We cannot see air, but we can feel it. We know that air occupies space. But does air have weight?

**AIR HAS WEIGHT**

Take a piece of stiff wire or a stick about three feet long. Blow up two balloons until they are quite big and tie the neck of each balloon. Now tie one balloon to each end of the stick.

Tie another string to the middle of the stick and hold the stick with the balloons by this string. The string may not balance, but you can move one of the balloons along the stick until it is balanced.

(See Fig. 1.8)

Take a pair of scissors and cut a slit on one of the balloons so that the air slowly escapes. After all the air has escaped, see what happens to the stick. Does it balance now? Which end of the stick is heavier now? Why is this end heavier? Does this show that air has weight?

(See Fig. 1.9)

**PRESSURE**

Take away all the things from the top of your desk. Lift it. Is it easy to lift up? Now put some heavy books on the desk. Lift it again. Is it as easy to lift as before?

(See Fig. 1.10)

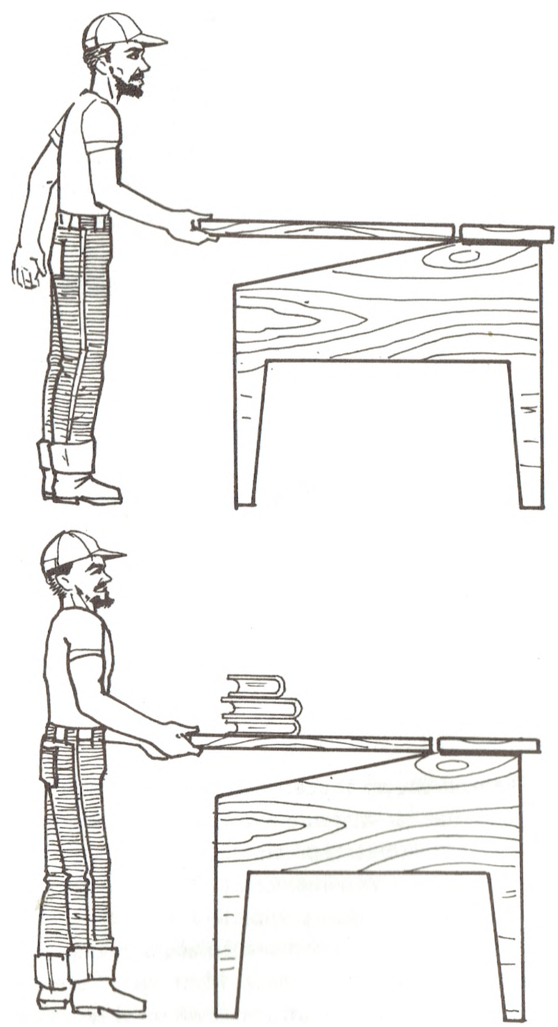


Fig. 1.10 Everything that has weight exerts pressure.

The books that were put on the desk have weight. When these books are on the desk their weight exert a downward force on top of the desk. So it is more difficult to lift up. We call this type of force pressure. We say that the books exert a pressure on the top of the desk. What causes the pressure?

Anything that has weight exerts pressure. The pressure is caused by the weight. When you go swimming, you can feel the pressure of the water acting on your body. If you dive deeper in the water, the pressure becomes greater. This is because more water is above you and thus the weight of water above you is greater.

(See Fig. 1.11)

Fig. 1.11

## AIR EXERTS PRESSURE

We have shown that air has weight. We also learnt that anything that has weight exerts pressure. Therefore we can now say that air exerts pressure. This can easily be shown by a few simple experiments.

Fill a drinking glass completely with water. Allow some water to overflow. Now place a piece of waxed paper (or cardboard) on top of the glass. Make sure there are no air bubbles. Turn the glass upside down quickly. When you do this keep the waxed paper in place with your hand. Now remove your hand from the paper and see what happens. Does the paper fall? What keeps the paper and water from falling? Carefully turn the glass in all directions. Is there any position in which the paper and water falls? What does this show you about air pressure?

(See Fig. 1.12)

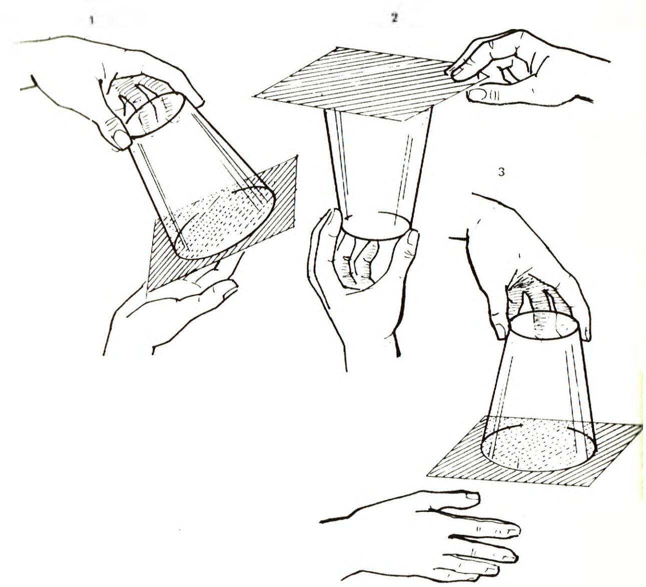



Fig. 1.12

## MAKING USE OF AIR PRESSURE

We make use of air pressure in many ways. Have you ever seen a medicine dropper?

(See Fig. 1.13)

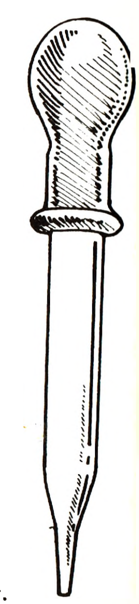


Fig. 1.13 Medicine dropper.

Take a medicine dropper and dip the tip into some water. Press the rubber bulb. What do you see? Release the bulb and notice what happens. What makes the water enter the dropper?

When the rubber bulb is squeezed the pressure from your finger pushes the air from the dropper. When it is released, because of the lesser pressure in the dropper the air pressure pushes the water up into the dropper.

(See Fig. 1.14)

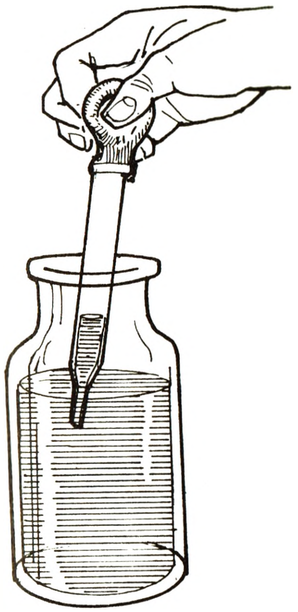


Fig. 1.14

A syringe also works by air pressure. Doctors make use of the syringe for injections. When the handle is pulled out, air pressure pushes the medicine into the empty space in the syringe.

Drinking through a straw also makes use of air pressure. Put a straw in a glass of drinking water. Suck the straw with your mouth. What happens to the air pressure in the straw? Why does the water go up into your mouth?

(See Fig. 1.15)

Can you think of any other ways in which air pressure is put to use in everyday life?

Another name for air pressure is *atmospheric pressure.*

You can see from all these ways that air or atmospheric pressure can be used in many ways. It is also used in car and bicycle tyres, which makes them behave like a cushion, so that we do not feel the bumps on the road. Netballs and footballs are also kept hard with air pressure so that they can bounce.

**HOT AND COLD AIR**

Have you ever seen a candle flame or fire that burns downwards? All flames and fires burn upward. Put your finger near to a flame. Can you feel the hot air. Now try putting it closer to the flame, as close as possible without

Fig. 1.15

being burnt. You will feel that the air next to the flame is hot. You can now see that hot air rises.

Draw a spiral on a piece of paper and cut it out so that it is like a "snake". Look at how it is done in the picture.

(See Fig. 1.16)

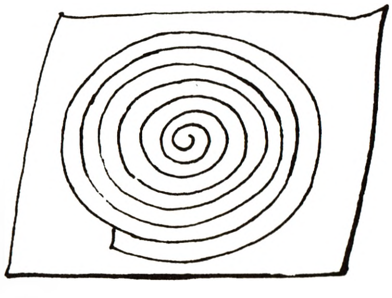


Fig. 1.16

Tie one end of a piece of thread to the centre of the paper spiral and the other end to a pencil. Now hold the spiral over the candle flame. What happens to the spiral? What makes it move? This also shows that hot air rises.

(See Fig. 1.17)

Take a thin sheet of tin. Cut out a fan with four blades and twist each blade a little in the same direction as shown in the picture. Make a small hole in the centre and tie the fan to a piece of thin wire. Hold the wire steady and place

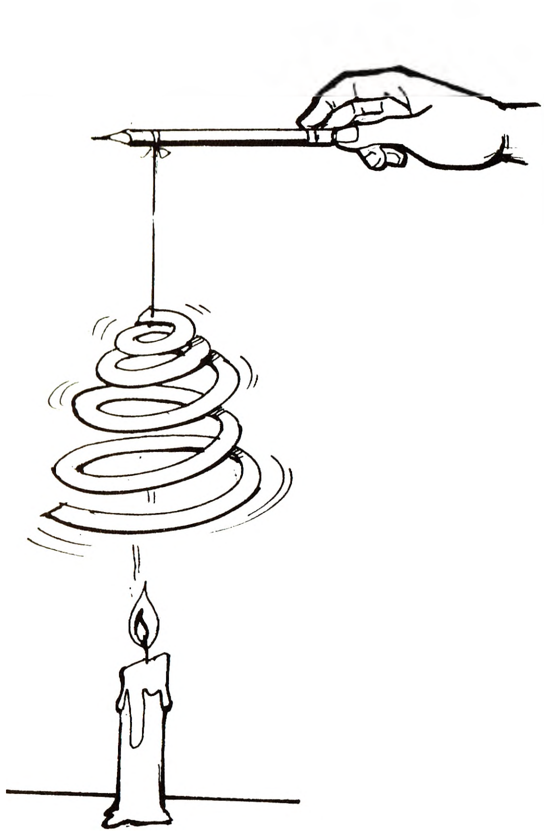


Fig. 1.17 Hold the spiral over a lighted candle like this.

the fan above the candle flame. What happens to the fan? Why does this happen?

(See Fig. 1.18)

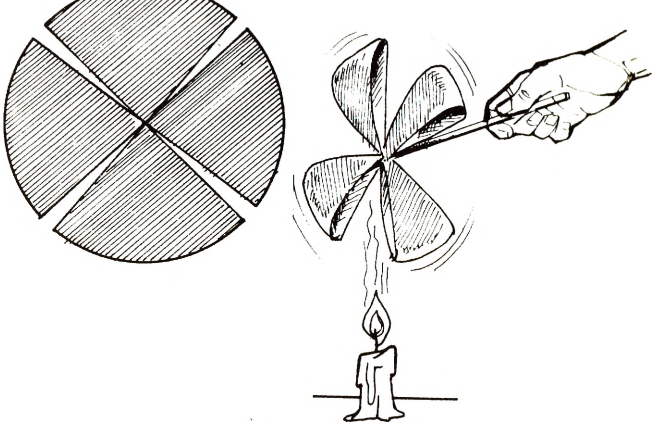


Fig. 1.18 How to make a fan.

We can also do a simple experiment to show that hot air is lighter than cold air which makes it easy for it to rise. Tie two large paper bags to the ends of a ruler so that it balances as shown in the diagram.

(See Fig. 1.19)

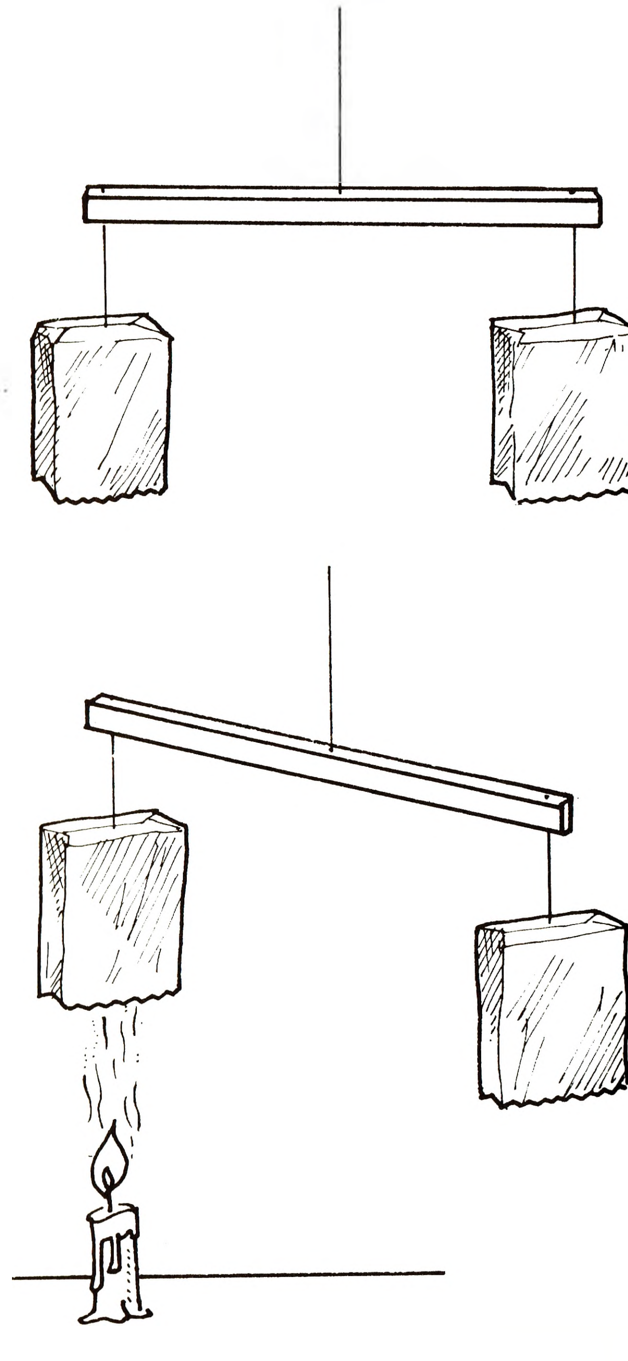
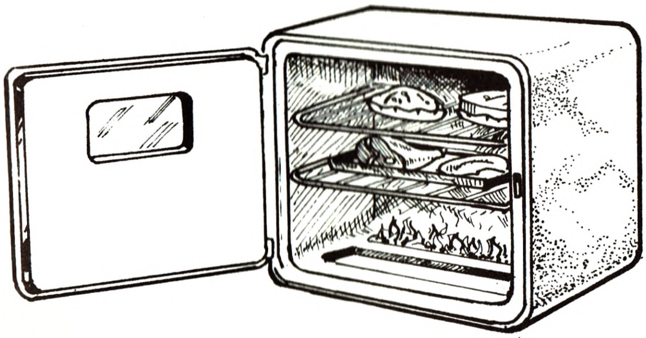


Fig. 1.19

Place a lighted candle underneath one not for the flame to touch the bag. What happens? Can you explain why? Is hot air heavier or lighter than ordinary air? We can see how this process occurs in our ovens when we bake. Which part of the oven is the hottest? Can you explain why? Knowing this, we can put different types of food to cook at different levels in an oven. For example foods that require fast cooking can be put higher up in the oven than those foods that require slower cooking.

(See Fig. 1.20)



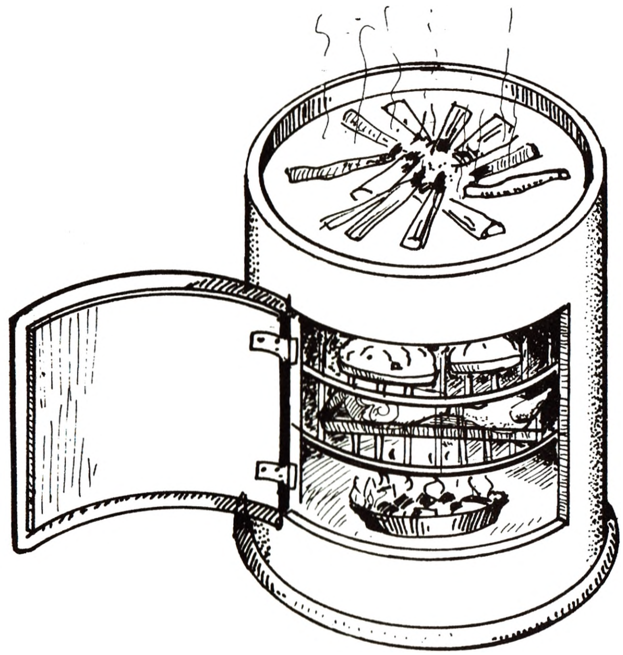


Fig. 1.20 a, b The hottest part of an oven is the top.

UNIT 2

## CLASSIFICATION OF THINGS IN NATURE

### MATTER

Matter is the basic substance that makes up everything in nature. Everything that we could possibly think about is made up of matter, but this matter exist in different states or forms.

We know that different things have different shapes, sizes, weight, feel and other characteristics. This is because of the different states that the basic matter from which they are made, exists in. For example, wood, tin, water, oxygen, oil, stone, plants and animals are all made of matter, yet each is quite different from the other.

Let us now look at the three states in which matter exists.

(See Fig. 2.1)

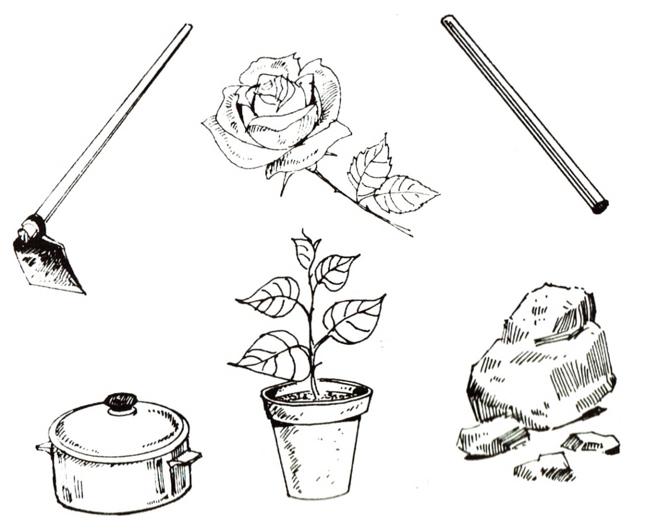


Fig. 2.1

### SOLIDS

Paper, stone, wood, tin, sugar, bone, wax and clay are all solids. What do you observe is common about all these things? You will obviously note that they are all firm or rigid and have a particular shape, one way or another. This is the main feature of solids. Can you give other examples of solids?

Note that not all solids are large e.g. a grain of fine salt or sugar. Some solids can be crushed into very fine particles, but they are still solids. If we were to observe a grain of salt or sugar carefully, we would notice that it has a definite shape and is firm or rigid. Give some examples of other solids that exist as fine particles.

(See Fig. 2.2)

Fig. 2.2 A grain of salt is a good example of a small particle of a solid.

## LIQUIDS

Another form in which matter exists is as a liquid. We looked at some things and noted the features that they had in common. Now we can look at other things e.g. blood, water, oil, milk, kerosine and ink. Is there anything common about these things? What is it? They are not rigid, and do not have any definite shape. They run easily and would wet your finger if you touch them. Liquids do not have a definite shape as solids do, they take up the shape of the container into which they are put. Try pouring some water into two differently shaped containers, what happens? Do the same thing with a piece of wood. What happens in this case? These are some of the main features that distinguishes a liquid from a solid.

(See Fig. 2.3)

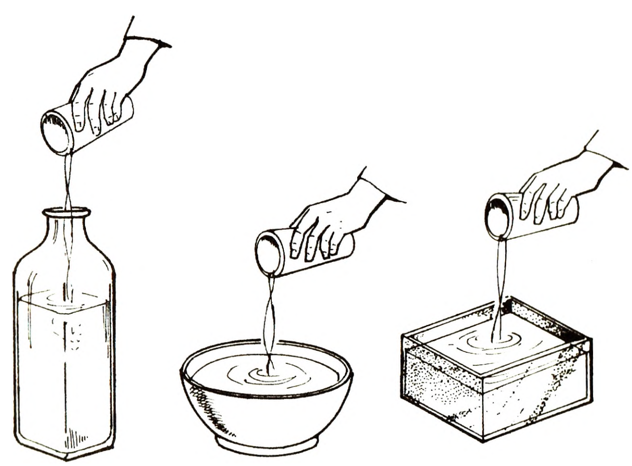


Fig. 2.3 Liquids take up the shape of the container in which they are placed.

*Exercise:*

(1) Collect a variety of things and classify them into solids and liquids.

## GAS

There is yet another state in which matter exists and that is as a gas. Does the air we breathe have a definite shape, is it a solid? Are we able to pour air into a container and see it take up the shape of that container. Is air wet? On answering these questions correctly we would recognize that it is neither solid nor liquid. It consists of gases and has the form of a gas. We can feel it, we know it has weight, but we cannot see it. We can also sometimes smell gases even when they cannot be seen. Gases seek to spread out and fill up the entire space in which it is placed. For example, that explains why when there is a gas leak in the kitchen, it can be smelt in other parts of the house after a while. All gases have these properties except a few.

## CHANGE FROM ONE STATE OF MATTER TO ANOTHER

Put a few cubes of ice in a small tin and heat it. Observe what happens carefully. Notice that the ice which is a solid is changed to water, a liquid, and on further heating the water changes to steam which is in the form of a gas. What does this show? This very simple experiment shows that the state of matter can be changed. What do you think caused the change? It is important to note that heat affects changes in the state of matter.

(See Fig. 2.4)

Fig. 2.4 Collecting steam from a kettle.

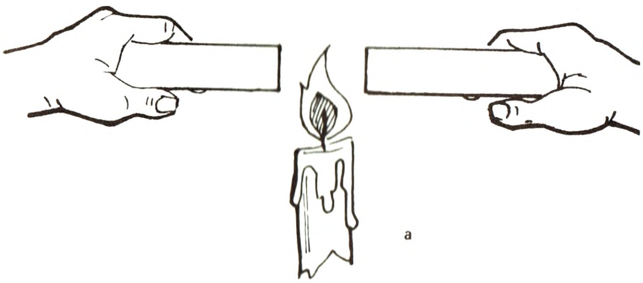
Now if we hold a cold cup to the spout of a kettle in such a way that some steam is collected, we would observe that the steam (gas) changes to drops of water (liquid). If this water is collected, allowed to cool and placed in the freezer of a refrigerator, it will gradually change to ice (solid).

This also helps to show that the change in state of matter can take place in any direction —from gas to solid and from solid to gas.

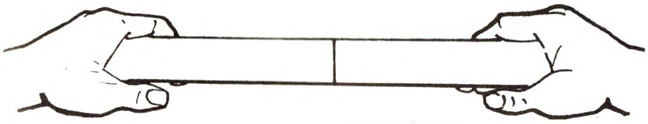
An understanding of this process can be applied to man's benefit in everyday life. Can you think of any example where this is put in use?

Can you explain what happens in the processes shown below?

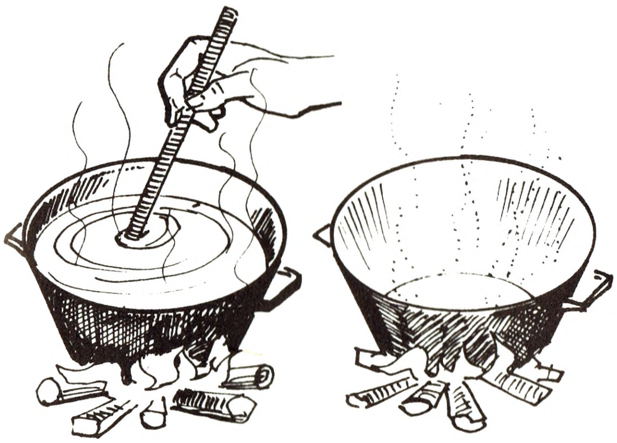
(See Fig. 2.5)



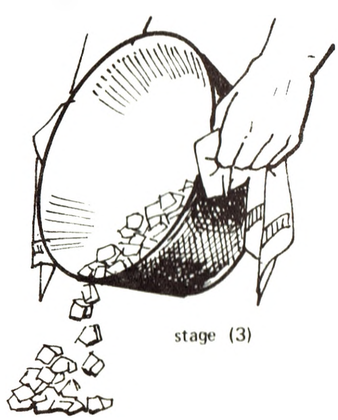
a



b



stage (1) stage (2)



stage (3)

stage (1)

stage (2) stage (3)

Fig. 2.5 a, b, c Illustrations of the process involved in welding iron.

## WHY CLASSIFY THINGS?

We have seen that everything in nature is made up from that basic substance matter. We have also learnt that matter can exist in three state or forms as described before.

When we look around us we note that there are millions of different things in nature existing together. In order to identify and distinguish one thing from another, everything has been classified —put into some grouping or order. The first two main groupings of nature are living and non-living things. Already you can determine whether some things are living or not. There are certain characteristics that one, .or . looks for in order to determine whether the object is living or not. Even among things that are not living, we differentiate between those that never had life (non-living) and those that once had life (dead).

(See Fig. 2.6)

(See Fig. 2.7)

(See Fig. 2.8)

## CHARACTERISTICS OF LIVING THINGS

There are certain features that distinguishes a living thing from a non-living one. Can you explain some of them? What do living things do that make them different from non-living ones?

## LIVING THINGS FEED

Animals feed, they eat food and drink water. Different animals feed in different ways.

(See Fig. 2.9)

(See Fig. 2.10)

Living things.

a

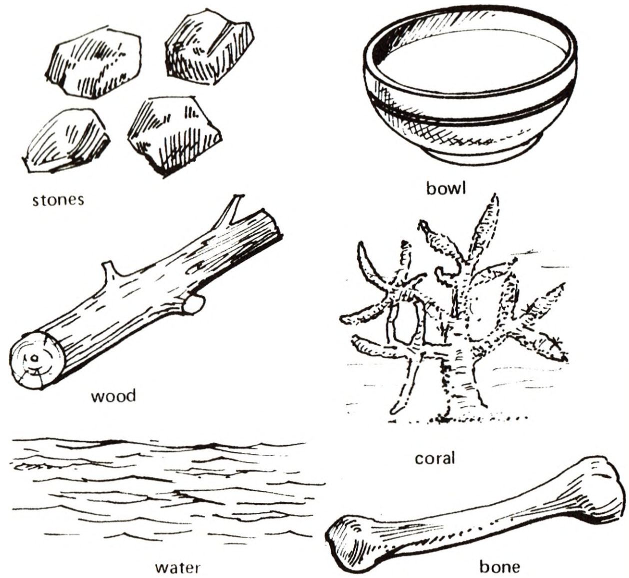



Fig. 2.7 What is the difference between non living and dead things?

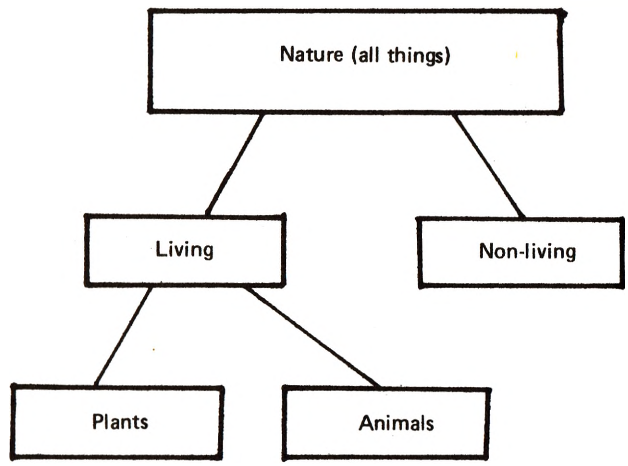
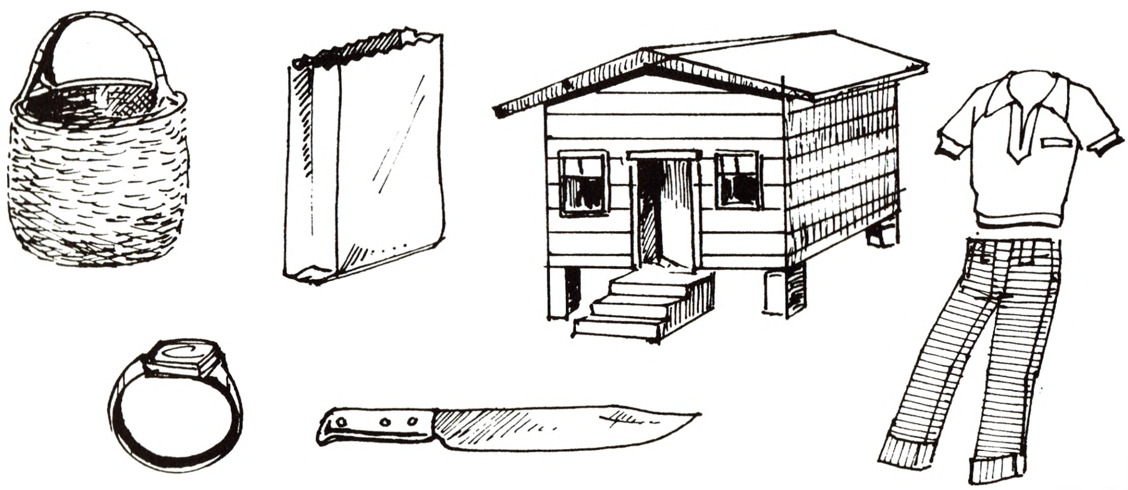



Fig. 2.8 Classification of things in nature.



b

Non-living things.


Fig. 2.9 Animals feed in many different ways. Can you identify these examples?

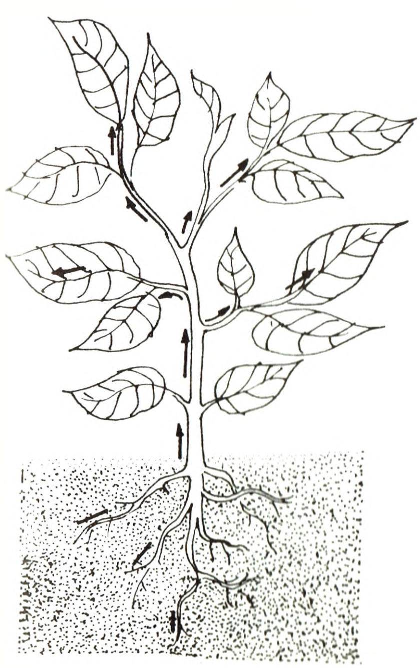


Fig. 2.10 Plant feeding through its roots.

Plants also feed. They take in water and dissolved food through their roots. Plant food es different from animal food. Can you explain the use of fertilizer? Why does a plant dry up and eventually die in the dry season when there is no water?

## LIVING THINGS GROW

We are quite familiar with the process of growth in animals and plants. All living things grow not only in size, but also in maturity. Can you explain what happens in growth and give examples of the growth process in plants and animals.

(See Fig. 2.11)

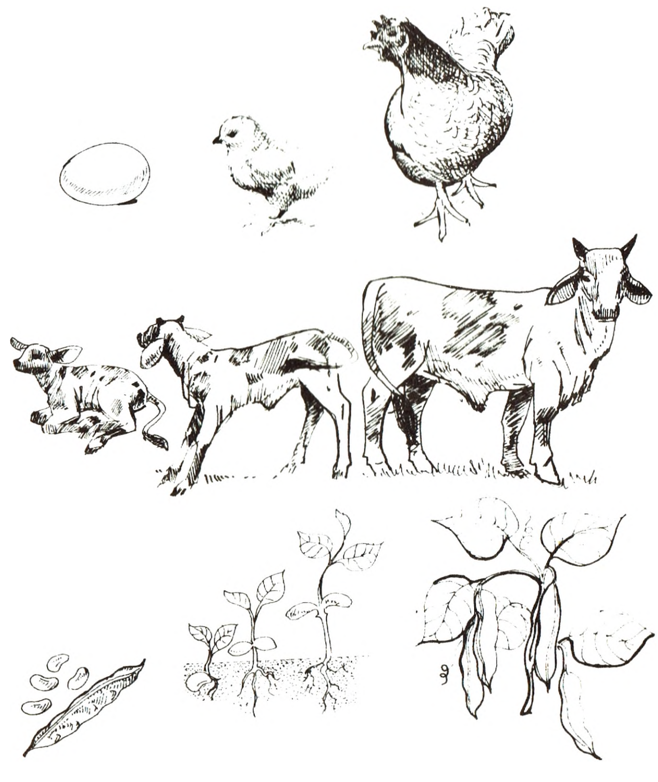


Fig. 2.11 Diagram showing growth in different animals and plants.

## LIVING THINGS MOVE ON THEIR OWN

This is another obvious characteristic of life, and more so in animals than in plants. Plants show growth movements e.g. climbing, running and growth movements towards light, etcetera.

(See Fig. 2.12)

What are the different forms of movements shown in animals? Why do animals move?

(See Fig. 2.13)

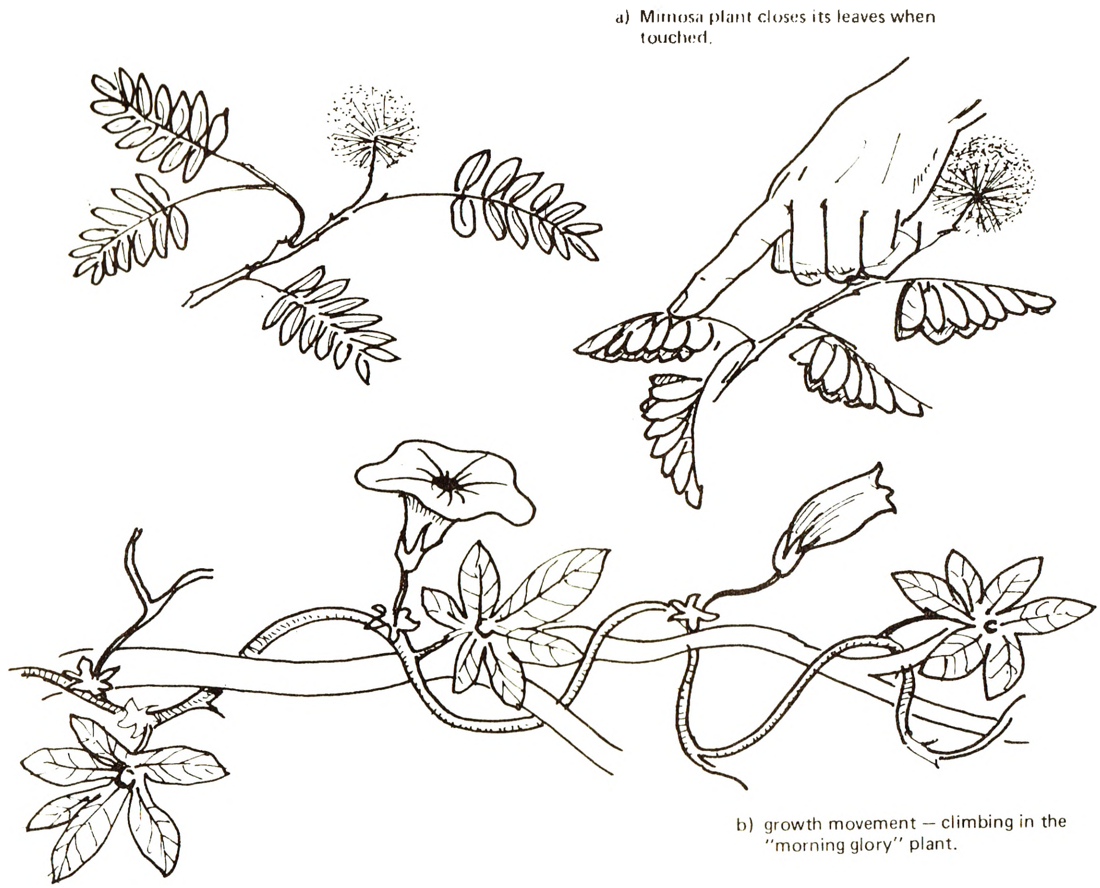



Fig. 2.12 Illustration of movements in plants.

Fig. 2.13 Can you name these different forms of movement in animals?

## LIVING THINGS PROTECT THEMSELVES FROM DANGER

Plants and animals must protect themselves so that they may live longer. They protect themselves in many different ways. Look at the following pictures and describe in your own words the form of protection that is being used, then add some more from your own experience to this list. How does man protect himself?

(See Fig. 2.14)

## LIVING THINGS BREATHE

Living things use air to survive. Some of the gases in air are important for some of the life processes. Breathing is the process through which oxygen and carbon dioxide are obtained from the atmosphere by animals and plants. Plants breathe through their leaves. They take in carbon dioxide and give out the oxygen. On the other hand animals take in the oxygen into their bodies and give out carbon dioxide. This shows one way in which plants are useful to us. They provide even more oxygen than what exists in the atmosphere, for our breathing.

Animals breathe in different ways. Some have gills, others breathe through their skin and still others have lungs for breathing. Can you give examples of each of these three types.

(See Fig. 2.15)

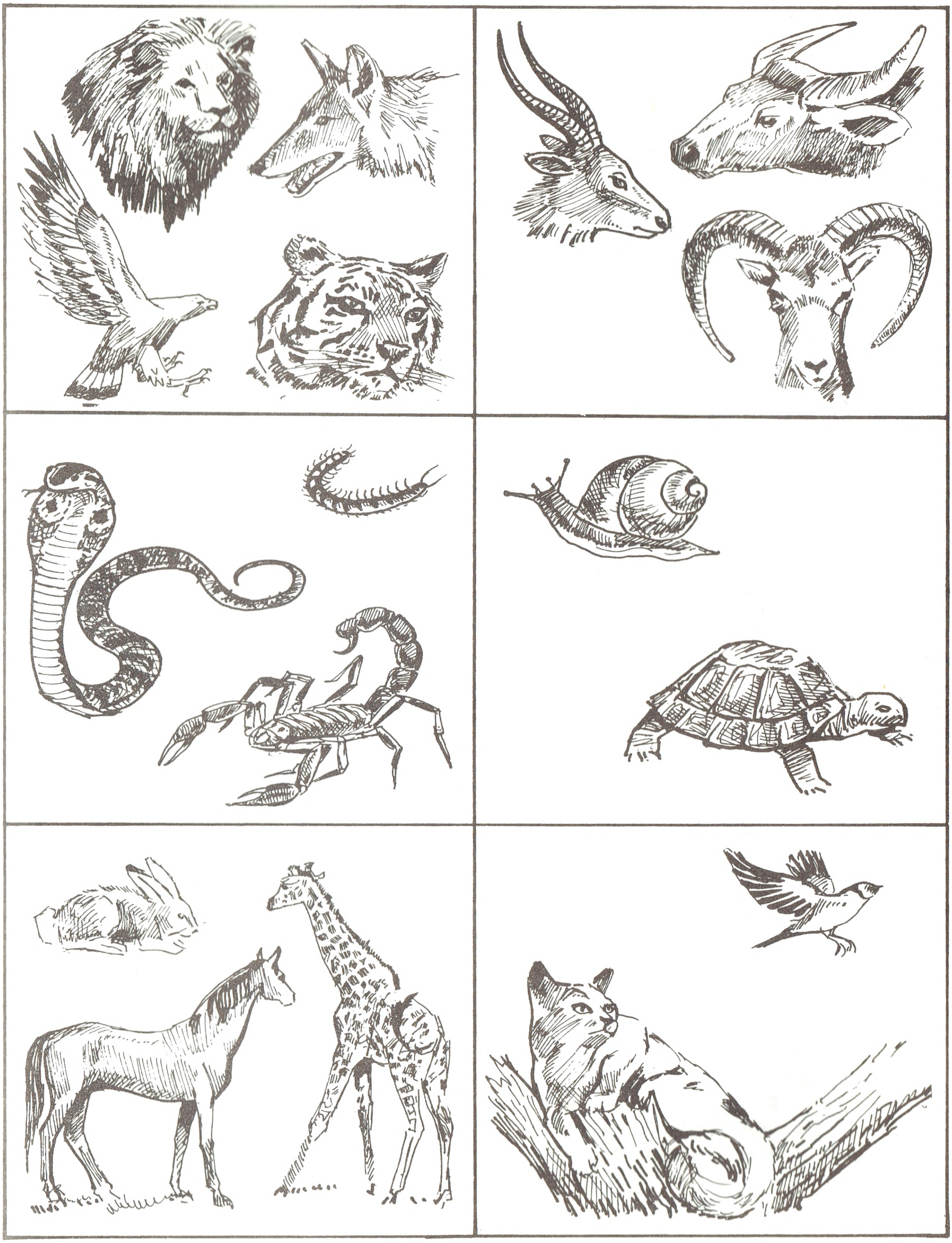


Fig. 2.14

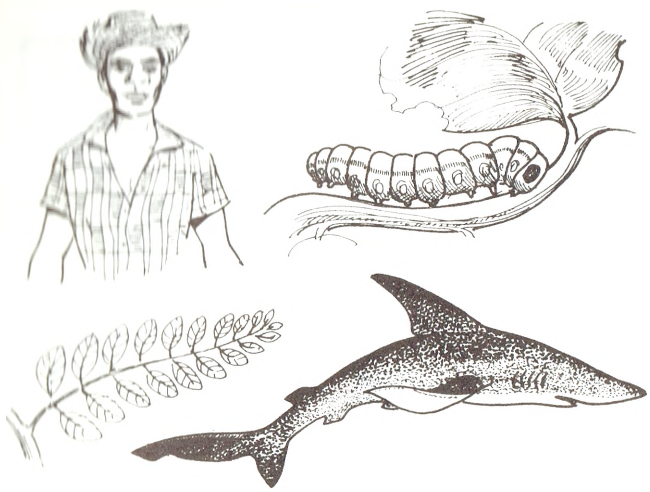


Fig. 2.15 Breathing in different living things.

## LIVING THINGS REPRODUCE

In order to have continuation of life, all living things reproduce or produce young ones of their type. The process of reproduction varies widely between animals and plants and among plants and animals.

Plants generally produce seeds that, with the right conditions of food, light and air grow into new plants.

Animals generally either produce eggs which are like seeds, that hatch into young ones. Or give birth to young ones from the mother. Some animals care for their young for a while and others don't.

(See Fig. 2.16)

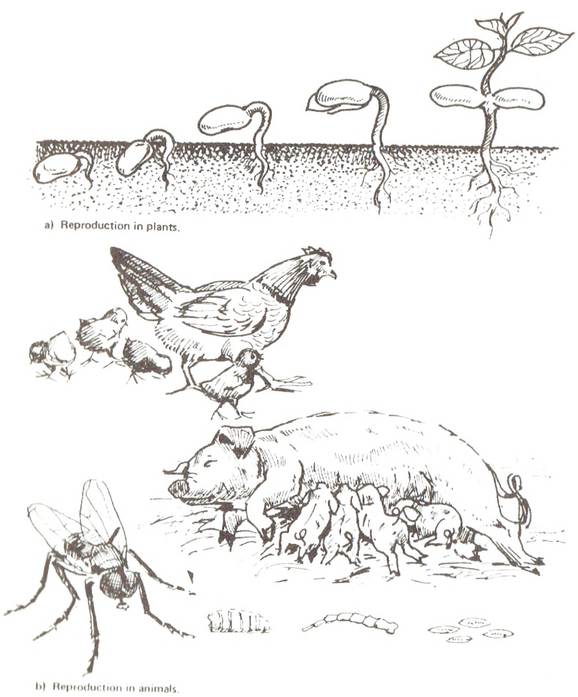



Fig. 2.16

The life processes as described above, feeding, growth, movement, protection from danger, breathing and reproduction distinguish living things from non-living ones. But in nature both living and non-living things exist together as the continuation of life depends on the inter-relation and interaction of the two, as the use of non-living things is put to the greater benefit and success of life.

Life exists in millions of variations and forms, from the tiniest organism that cannot be seen with the naked eye to the most developed organism-man. Each has its own purpose, its own use, its own potential for destruction and damage. So too the life processes vary in the different living organisms from very simple to more complex forms.

Fig. 2.17 Picture showing the interaction of living and now living thing in nature.

## PLANTS

Plants are very important living things. Life cannot go on if there are no plants. This is because plants can make food from air, water and sunlight. The food made by plants are needed by all animals, including man. This is because animals cannot make these foods themselves.

Animals and man need plants in order to live. This is why there are so many plants around us, many more plants than animals. As these plants are used up, new plants are grown to take their place.

(See Fig. 2.18)

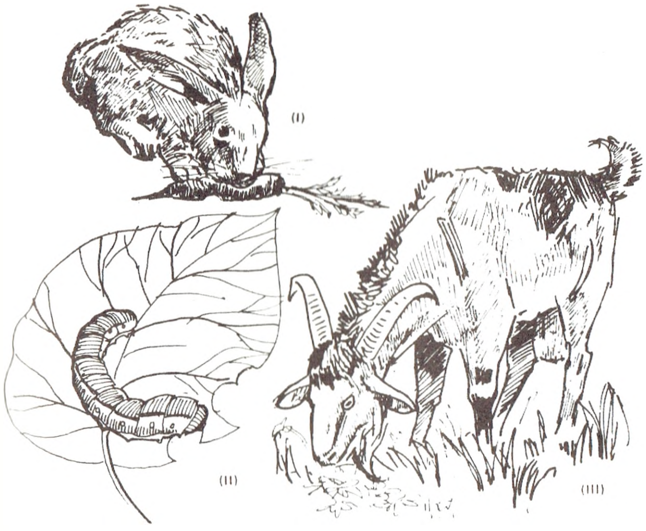



Fig. 2.18 **Animals need plants in order to live.**

You know that there are many different types of plants. Most of them are green. Most of them grow in soil, but some can grow in water. Some grow on other plants and some grow on animals.

(See Fig. 2.19)

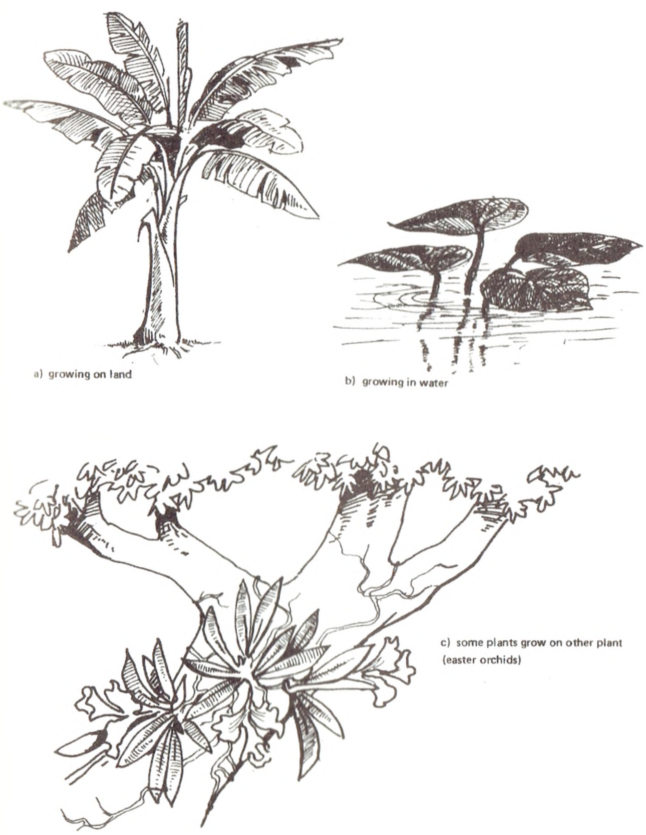



Fig. 2.19 Different types of plants.

There are two main types of plants:

(a) flowering plants, and

(b) non flowering plants.

(See Fig. 2.20)


Fig. 2.20 The two main types of plants.

Flowering plants have roots, stems, leaves, flowers, fruits and seeds.

Non flowering plants do not have all these different parts. Some of them, like the ferns, have roots, stems, and leaves but do not have flowers, fruits and seeds. Instead of growing from seeds like flowering plants do, they grow from *spores.* Spores are very tiny, round, seedlike structures.

Toadstools, mushrooms, mildews and moulds, are other types of non flowering plants because they are not green in colour and they do not have leaves.

(See Fig. 2.21)

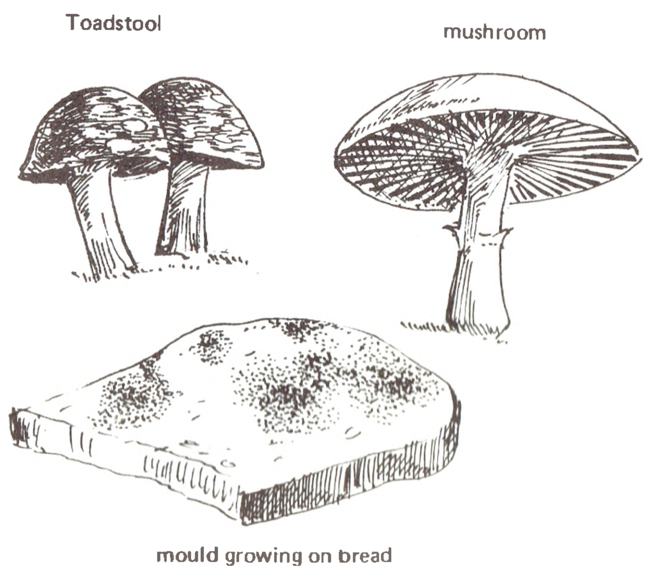



Fig. 2.21 Other types of non flowering plants.

Think of some examples of plants that you know, that fit into the different categories explained above.

Can you explain giving examples, how animals including man use plants for food?

## ANIMALS

The world we live in contains many different kinds of animals. Animals differ from plants in two main ways. First, they cannot make their own food in the way that plants do, so they have to depend on plants for food. Second, their bodies are more compact or less branched than that of plants. There are other differences between plants and animals that would be dealt with later on in the programme.

Animals differ from each other in many ways, the main ones being size, shape and structure. Some animals like worms and leeches are small and soft while others like snakes are long and scaly. Some animals like sea coral are branched like most plants.

Animals also differ from each other in the way they breathe, move, reproduce, protect themselves, grow and feed. Can you think of examples to show how different animals carry out each of the life processes in different ways.

(See Fig. 2.22)

You also know that some animals are egg layers while others are live-breeders. This is another way in which animals are different from each other.

Though all animals can respond to outside influences or protect themselves from danger, not all of them have sense organs like eyes, ears and noses.

Animals differ in their diets. Some animals like rabbits, cows and certain fishes eat plants only. These animals are known as *herbivores*. Animals like tigers, eagles, and jelly fish, which feed on other animals are known as *carnivores*. Some animals eat both plants and animals and are known as *omnivores*. Can you name some other examples apart from those given of herbivores, carnivores, and omnivores.

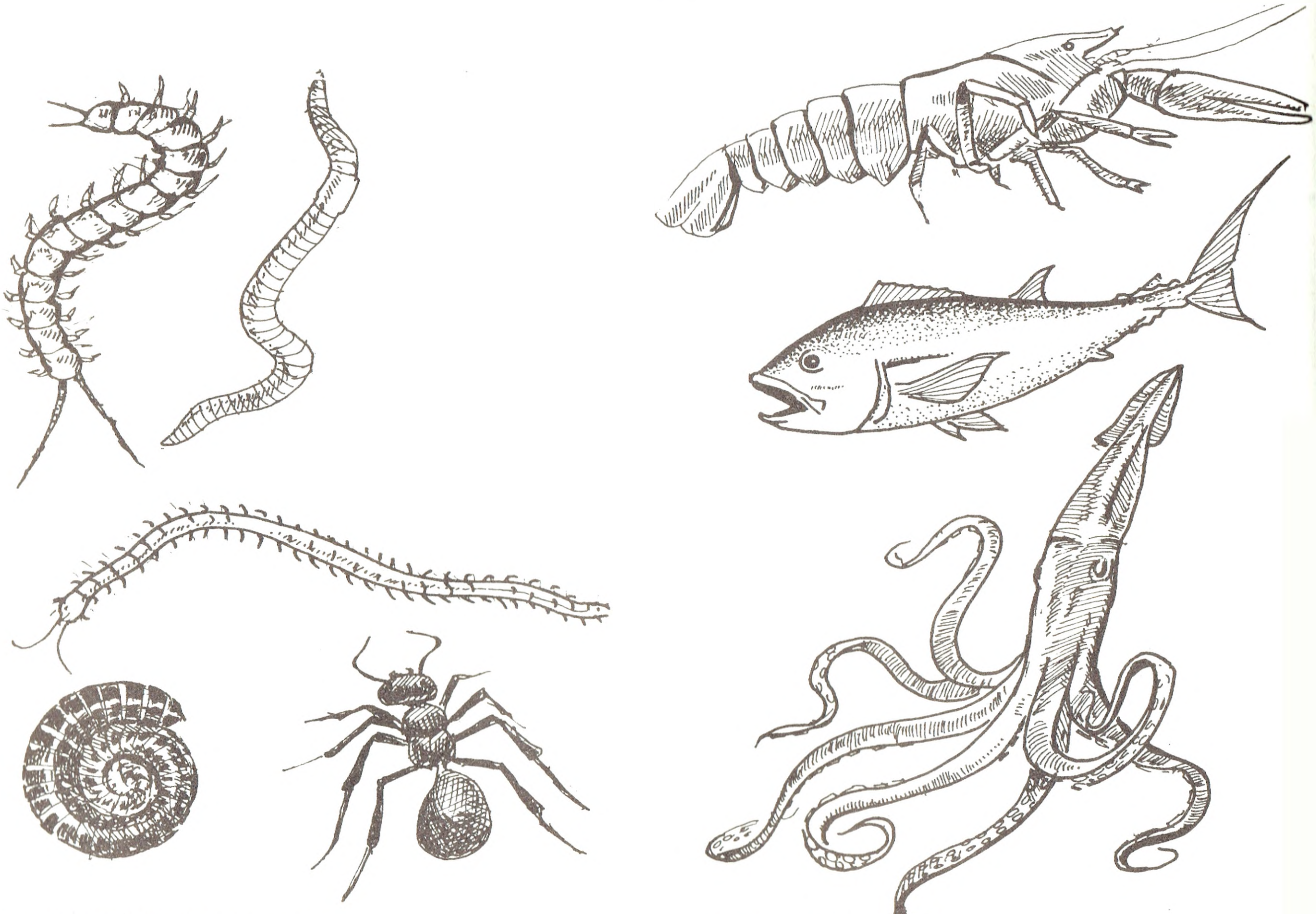
Sometimes each group of animals is further divided into smaller groups. This placing of animals into groups is known as classification of animals, just as the placing of plants into groups is known as the classification of plants.

There are two main groups of animals. Every animal belongs to one of the two groups:

(a) the *invertebrates,* and

(b) the *vertebrates.*

The invertebrates are animals which do not have backbones or internal skeletons. Most of them have external skeletons which protect and support their bodies



some animals live in the ground

others live in water

a

Fig. 2.22 Different types of animals.

others live on land and in trees

c

e.g. snails, crabs. Can you name others that will fall into this group?

(See Fig. 2.23)

The vertebrates are animals which have backbones and internal skeletons. Some of them also have external skeletons in the form of scales, feathers or hair e.g. birds, lizards, man. Vertebrates do not depend on their external skeletons as invertebrates do.

Can you gives some other examples of vertebrates?

## MAN AS AN ANIMAL

We may sometimes ask what class of living things does man fall into. What do you think? Man is the most advanced of all living things. Man is an animal in the strictest sense of classification. Man belongs to the most developed category of animals called *mammals.* Mammals are warm-blooded animals, whose bodies are generally covered with hair. They give birth to their young, and provide them with milk from the mother's breast. Cows, dogs, tigers, whales, rats all fall into this highly developed class of animals. Can you describe any similarities between man and other mammals?

But what makes man different, superior to all other animals. What puts man in command of all the things of nature, both living and non-living. The brain in man, is more highly developed than in any other animal. He is

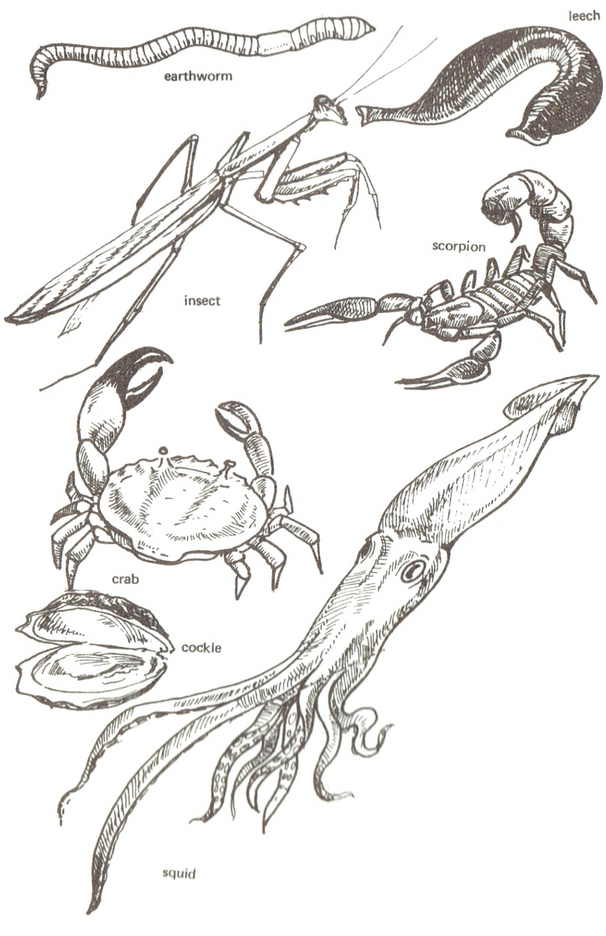



Fig. 2.23 a Examples of the invertebrates.

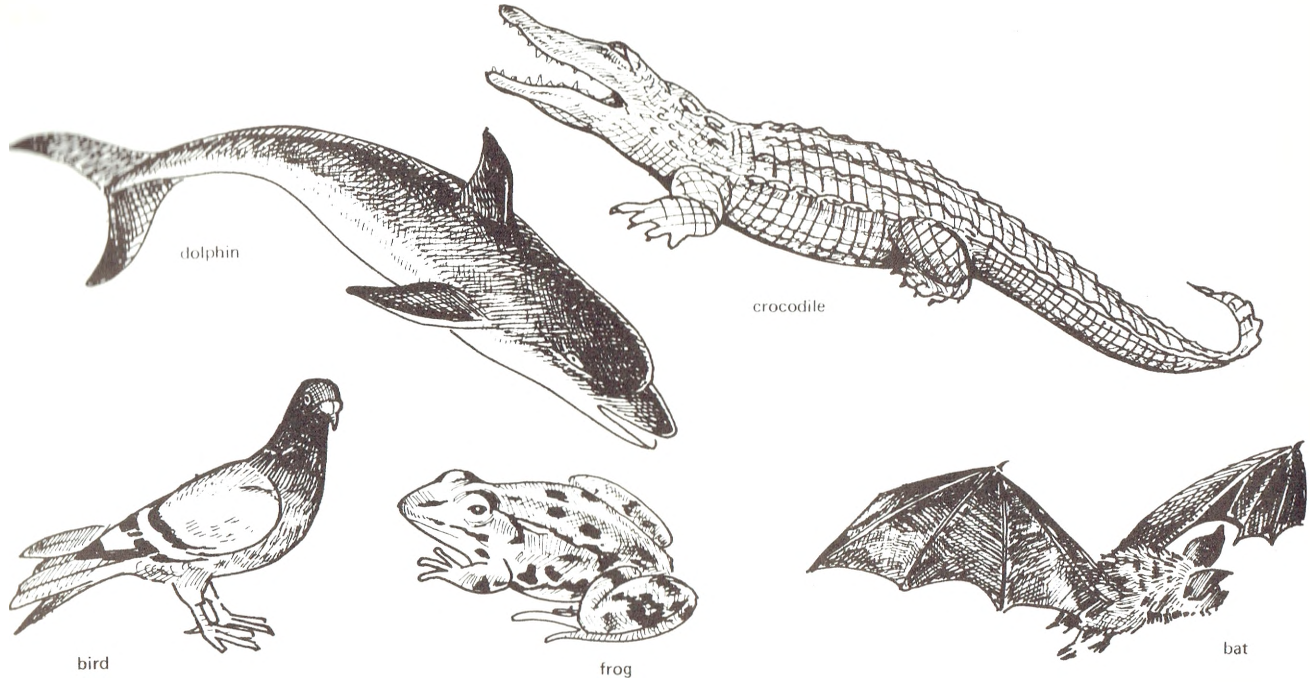



Fig. 2.23 b Examples of vertebrates.

therefore able to think. Man is the only animal yet, that can think and reason. Man is the only animal that can talk. Talking here does not refer to the imitation done by parrots.

Most of all, man can *labour* with purpose. Note, with purpose, because other animals e.g. donkey, birds can do labour, but the difference is that man's labour is purposeful but that of the other animal is not.

Man's thumb is placed opposite the other fingers. This allows him to make and use tools to assist in labour.

(See Fig. 2.24)

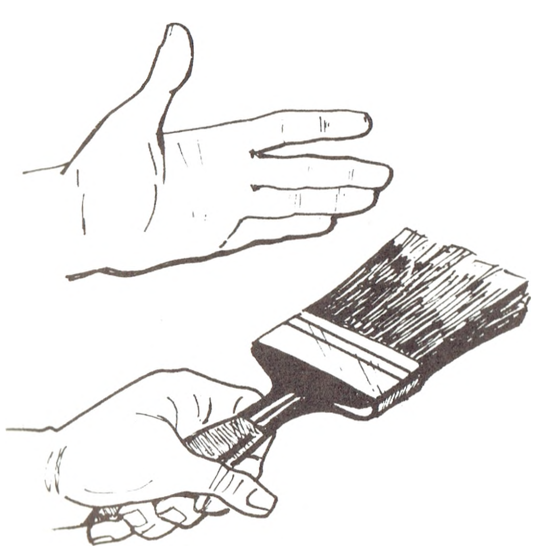


Fig. 2.24 The position of man's thumb enables him to **grasp tools** and machines that advance his work.

The fact that man can think, labour, and use tools puts him way ahead of all other living things. He can use these features to his advantage to make better tools, machines etcetera, that will help improve and make maximum use of his labour.

(See Fig. 2.25)

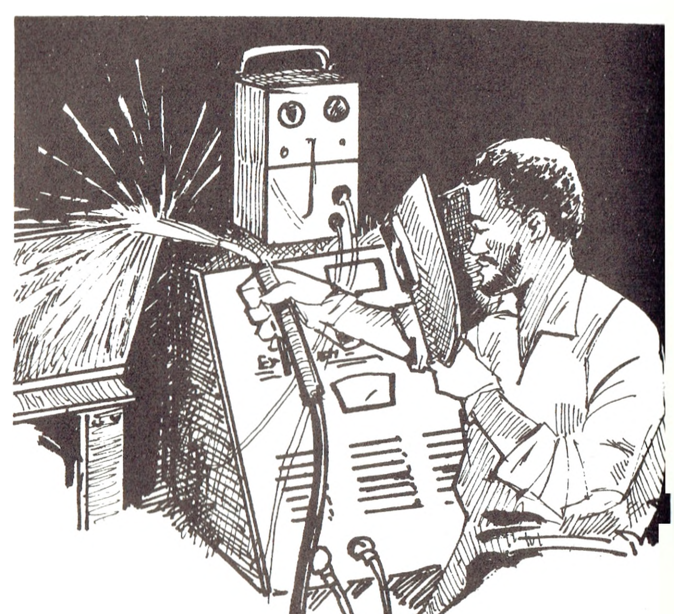


Fig. 2.25 Man using advanced machines and technology.

# ENERGY FORMS, SOURCES AND USES

## WHAT IS ENERGY?

The meaning of work used in Science is different and refers to much more than the everyday use of the word. In the language of science work occurs when a push or pull moves something that has weight through a distance. Here are some examples of work being done. Can you say what they are?

(See Fig. 3.1)

Energy is needed in order to do all these different types of work.

What is this thing called energy?

Energy is the ability to do work. Water flowing downhill can do work such as turning a wheel. It has energy. The air that moves as wind has energy, since it can do the work of turning a windmill. We also can lift heavy things and move them from one place to another. We have energy. Energy can be obtained from flowina water moving air, burning fuel from the food we eat as well as from other sources.

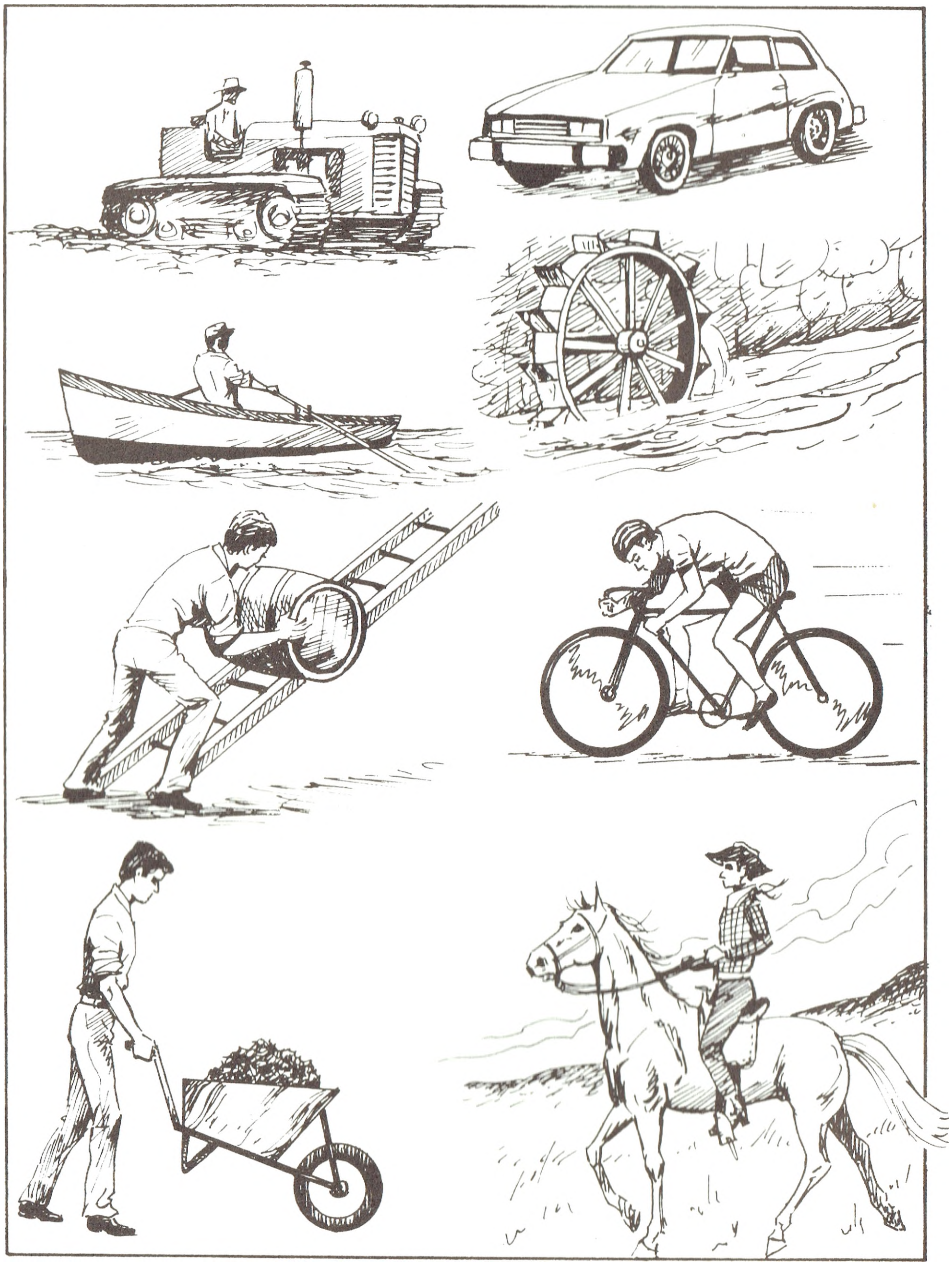


Fig. 3.1

Anything that can do work possesses energy. The more energy something possesses, the greater is its capacity to do work.

In nature there are different forms of energy. They are:

| *Type of energy* | *Form in which it is shown* |
|---|---|
| Mechanical | Movement |
| Heat | Heating and cooling |
| Electrical | Sparks and attraction |
| Light | Light and colour |
| Chemical | Burning; production of gases. |
| Atomic or nuclear | High temperatures, atomic or nuclear bombs. |

## TRANSFORMATION OF ENERGY

One form of energy can be changed into another form of energy. This can be proved in the following way: rub a ring or metal object with a piece of cloth. Observe that they become hot after some time. When we connect an electric iron to a plug it becomes hot.

In the first case the energy that is used to rub the objects (mechanical energy) is converted to heat energy; and in the second, electric energy is converted to heat energy that heats up the iron.

Animals eat food that supply their bodies with chemical energy, that enables them to move (mechanical energy).

**Energy can neither be created nor destroyed. It can only be changed from one form to another**

This is one of the most important laws of nature. In order for man to control and put the things of nature to work for his benefit, he needs immense quantities of energy. Energy is the basis of present day scientific techniques. Electricity is the main driving force of modern industry. In order to produce it other forms of energy are required, for example that which comes from waterfalls, water vapour and the burning of petrol or carbon. What form of energy is used to produce our electricity in Grenada?

From this we can see that man can bring about and utilize changes in the form of energy, and put it to the source of production.

*Exercises:*

(1) Complete the following table:

| *Energy* | *Form* | *How can it be used* |
|---|---|---|
| Mechanical | | |
| Heat | | |
| Electrical | | |
| Light | | |
| Chemical | | |
| Atomic | | |

(2) Describe two examples of the transformation of one type of energy to another, apart from the ones given in the text.

## THE SUN AS THE MAIN SOURCE OF ENERGY

Long, long ago, some people thought that the Sun was a shining object being carried across the sky by a sailing ship. Scientists think that the Sun is a huge ball of hot glowing gases. These gases are so hot that this huge ball is giving off heat and light in all directions.

On a hot day on Earth the temperature is about 80°F to 90°F. The temperature on the Sun's surface is as 10 000°F. The Sun is glowing so brightly that it is dangerous to look at it directly with our naked eyes.

When we look at the Sun, it seems to be calm and peaceful. This is not really so. The surface of the Sun is very stormy. Great storms of hot glowing gases disturb its surface all the time.

As the Sun gives off heat and light in all directions, we say that the Sun radiates heat and light. But only a very small part of the Sun's heat and light reaches the Earth. The rest of it is lost in space as it travels over millions of miles. This heat and light are two forms of energy that can be converted to the other forms of energy in a series of changes.

Study this diagram carefully and see how this is possible.

(See Fig. 3.2)

Living things need heat and light. They cannot live and grow without them. Plants use heat and light from the Sun to make food. Animals eat plants and other small animals to live and grow.

The Sun also keeps us warm. Without warmth many living things will die. On the other hand if there were too much heat the whole Earth would be hot and dry like a desert. The Earth gets just the right amount of heat and light from the Sun. That is why we can live on it.

All places on the Earth do not receive the same amount of heat from the Sun. Some countries are hot while others are cold. People wear different types of clothing according to how or cold their country is.

Heat from the Sun can also dry things that are wet. It makes the water in wet things evaporate and become dry. The Sun's heat also evaporates water from the oceans, seas,

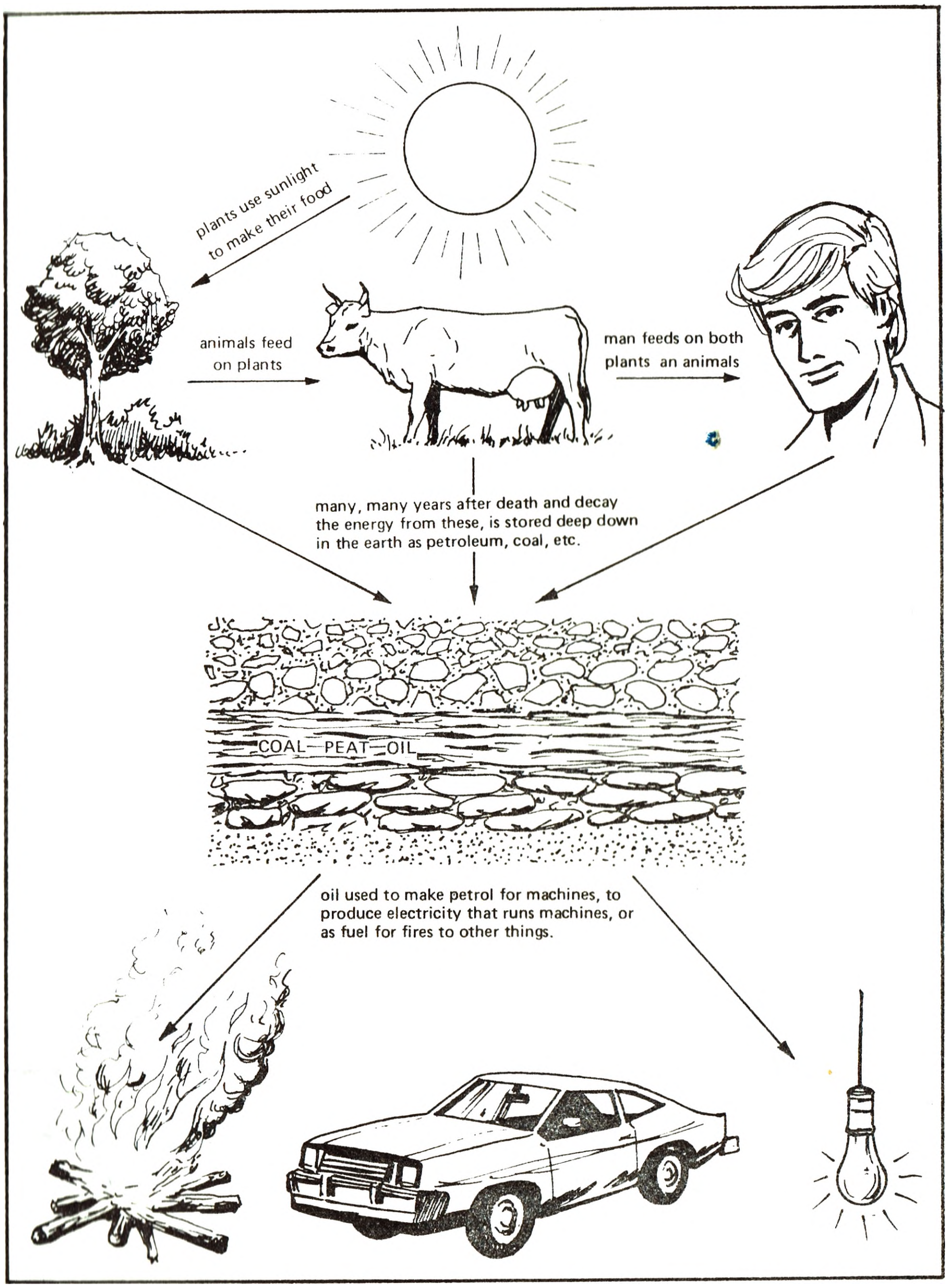



Fig. 3.2 The sun is the main source of energy.

rivers and lakes. This gives water vapour to the air which in turn gives it back in the form of rain.

The Sun is therefore a very important source of heat and light energy for life.

## OTHER SOURCES AND USES OF HEAT ENERGY BURNING OR COMBUSTION

We can produce heat by making a fire. Burning or combustion produces heat. What happens when we burn wood, coal, and other forms of fuel e.g. kerosene, gas, etcetera, where does all this heat come from.

These forms of fuel originate from plants that lived very long ago. When these plants were living, they absorbed heat from the Sun to grow and produce food. Energy was stored in the bodies of these plants even as they died, rotted and decayed in the ground. After many years, these became coal. Yet others become petroleum from which we obtain fuels like kerosene. When these fuels are burnt, the heat stored in them is released. Notice that in this way too we get heat indirectly from the Sun.

(See Fig. 3.3)

Can you then explain what happens in the process of making charcoal.

Fig. 3.3 Burning or combustion produces heat.

On burning, all fuels give out energy in the form of light and heat. We have learnt this from our daily experience. This source of energy is used to move machines in industries and transport. Petrol is used generate electricity that run many machines. Vehicles move as a result of the combustion of petrol and gas. We also use fuel as a source of heat for cooking e.g. wood in a fireside or gas and kerosene in the stoves.

**Fig. 3.4**

### RUBBING AND FRICTION

We also know that rubbing produces heat. Observe how a match stick is lighted by rubbing it against the rough surface of a match box.

The axle of a wheel heats up by rubbing. The heat produced develops as a result of the rubbing or friction. Can you give other examples of how rubbing or friction produces heat.

(See Fig. 3.5)

### ELECTRICITY

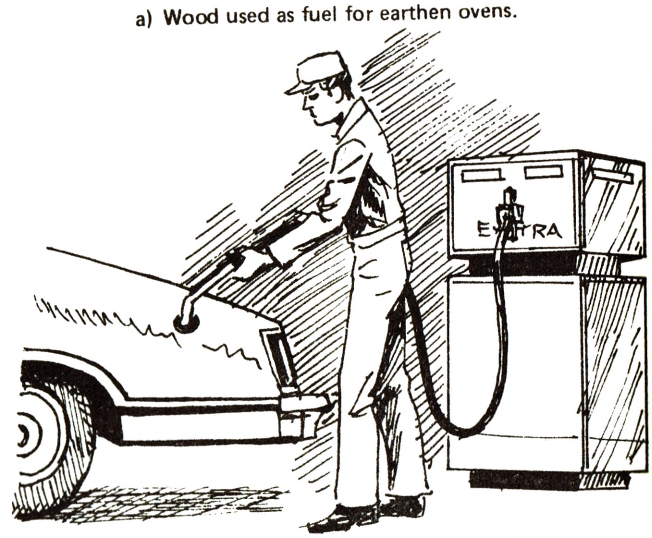
Electricity is one of the most important sources of energy today. It can be converted into different forms of energy e.g. light, mechanical energy, sound, heat and others. The heat produced by electricity is used to solder and melt metals, and also to separate materials, etc. This form of energy is also used in different electrical home appliances, like irons, heaters, toasters, cookers.

(See Fig. 3.6)

### TEMPERATURE, THE THERMOMETER AND ITS USES TEMPERATURE

We always talk about temperature. Every day we hear weather news on the radio and can read it from the newspapers. But what is temperature?

a) Wood used as fuel for earthen ovens.




b) Gasoline used as fuel for vehicles

Fig. 3.4

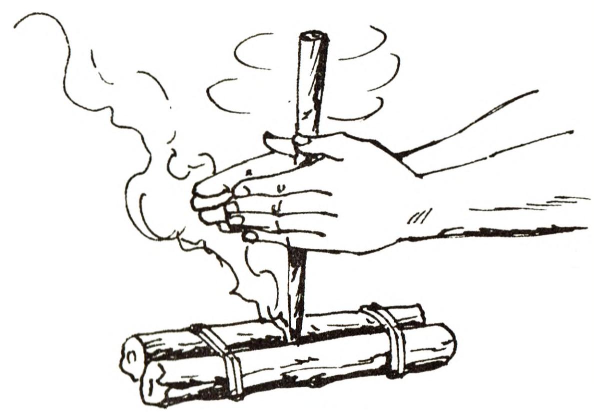


Fig 3.5 Rubbing or friction produces heat.

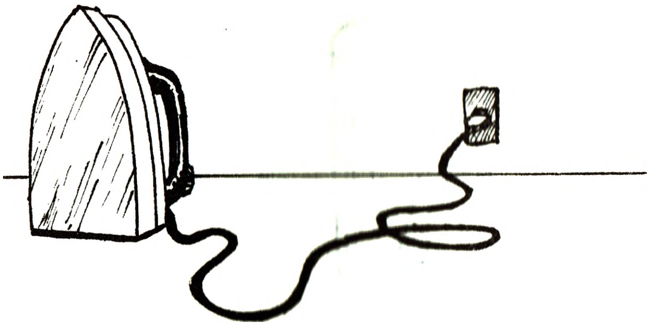


Fig. 3.6 Electricity, another source of heat that is used in our homes.

**Temperature refers to different levels or grades of heating that something has.**

The words cold, warm and hot describes different levels of heat in objects that we determine by our senses. But our senses do not tell us exactly what grade or level of heat there is. For this reason it is better to measure temperature with an adequate instrument.

### THE THERMOMETER

**The thermometer is the instrument used to measure temperature.**

(See Fig. 3.7)

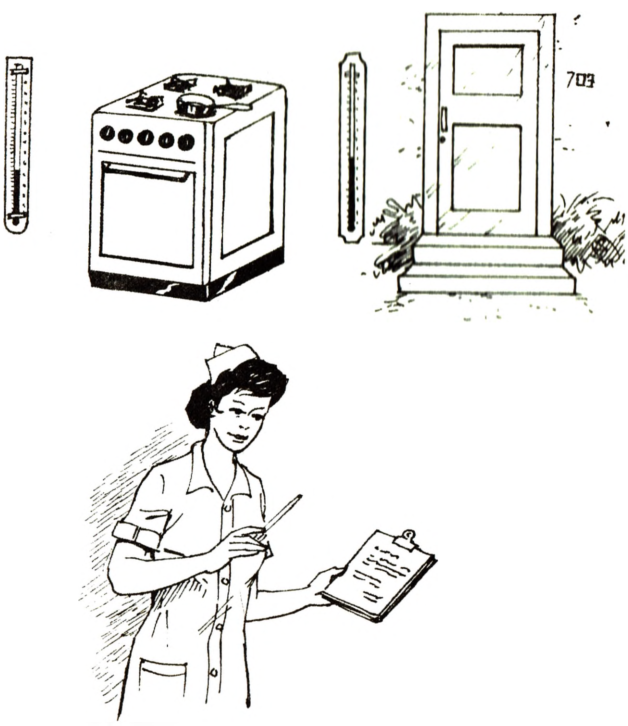



Fig. 3.7 Different uses of the thermometer.

There are different types of thermometers according to the purpose for which they are made. Observe them carefully in the illustrations given. What are some of the uses of a thermometer.

Thermometer measure temperature, they are graded in different scales, but all are divided in degrees.

In order to grade the scale on a thermometer, two fixed points of temperature are taken: the freezing point of water, which is zero degrees (0°C) and the boiling point of water which is one hundred degrees (100°C) both at normal atmospheric pressure. (C. represents Celsius. The Celsius scale is fast becoming the more commonly used scale in recent times.) Between these two points one hundred equal divisions are marked, each division is equivalent to one degree Celsius (1°C).

(See Fig. 3.8)

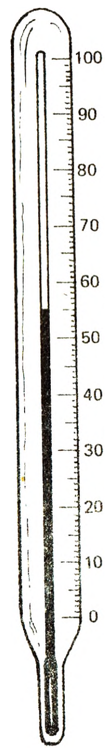



Fig. 3.8 Enlarged celsius thermometer.

Generally the liquid used to make thermometers is mercury, a silver coloured liquid metal otherwise known as quick-silver. Coloured alcohol is also used. As temperature rises the mercury inside the thermometer also rises to a particular grade or degree. As temperature drops, the reverse also takes place. In order to determine the temperature, one has to look at where the mercury stands still, at what degree. This is also called "Reading the thermometer". Practice reading the thermometer at different temperatures like the nurse is doing in the illustration.

Let us look at two examples of thermometer readings used in measuring temperature on a Celsius thermometer.

1st. Reading 35°

this is read: thirty-five degrees Celsius.

2nd. Reading – 15°C

this is read: minus fifteen degrees Celsius or fifteen degrees Celsius below zero.

## CONDITIONS THAT FAVOUR BURNING OR COMBUSTION

Combustion is the process that takes place when fuel is burnt in the presence of oxygen. During combustion, heat, light and water vapour are produced.

Conditions that help combustion to take place:

- Rise in temperature.
- Presence of air.
- Small bits of the fuel.
- Removal of the gases produced in combustion.

## RISE IN TEMPERATURE

There must be a rise in temperature in order for a fuel to burn.

Not all fuels begin to burn at the same temperature. The fuels that change to vapour very easily do not need a high temperature for them to start to burn. These include things like gasoline, alcohol, ether, acetone, etc. Others like kerosene or paraffin need to heat up to a certain temperature in order to start burning.

## PRESENCE OF AIR

Combustion or burning cannot take place without air, because the oxygen in air helps things to burn. When one wants to light up a small fire e.g. in a fire-side, it is necessary to put the fuel (wood in this case) in such a way that air can enter.

We can prove that air is necessary for burning in the following simple experiment. Light a small piece of candle or small oil lamp. Invert a wide mouthed bottle over the lighted candle as shown in the diagram. Measure the time that it takes to go out.

Repeat the experiment, but this time invert the bottle over two small pieces of wood, in a way that allows air to reach the lighted candle. What do you notice happens in the second case?

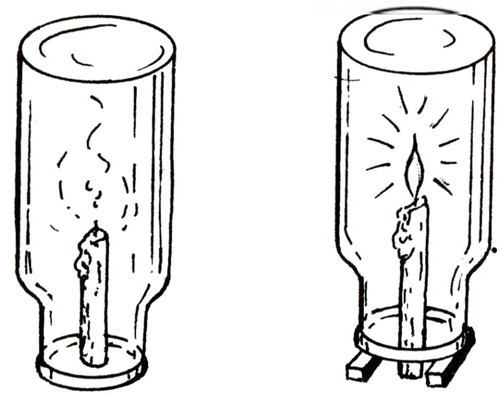


Fig. 3.9 Experiment to show that burning requires air.

From these experiments we can conclude that oxygen is necessary for combustion.

## SMALL BITS OF FUEL

Another condition that assists combustion is breaking up of the fuel into small parts. This can be shown by burning a piece of wood at the same time as some saw-dust or small twigs.

There is a part in motors that carry out internal combustion with gasoline called, the carburetor, that mixes the gasoline with air and then sends it to the cylinders of the motor.

## REMOVAL OF THE GASES PRODUCED BY COMBUSTION

If we remove the gases as they are formed during combustion, we would be helping the process.

On burning in air, all fuel that contain carbon produce a combination of carbon with oxygen, which results in the formation of a gas called carbon dioxide. Water vapour is also formed and energy given off as heat.

Carbon dioxide does not aid burning. It is said that things do not burn in its presence. For this reason, it is used with other substances to make fire extinguishers. This is why oil lamps have chimneys that allow the carbon dioxide formed by the burning flame to escape.

The presence of carbon dioxide can be tested with lime water. When lime water reaches carbon dioxide, it turns into a whitish colour.

## CAUSES OF FIRE

A fire can be described as uncontrolled combustion. Every year fires cause loss of life and material resources. It is therefore very important to understand the causes of fires so that in the long run we can avoid them.

(See Fig. 3.10)

Some causes of fire:

(a) Short circuits:

this occurs in an electrical circuit where, because of some fault, the current does not take


Fig. 3.10 A fire can always be avoided.

the normal course, but passes through a shorter route and this causes sparks, that can start a fire.

(See Fig. 3.11)

(b) Inflammable materials:

inflammable substances are those materials that burn very easily e.g. gasoline, alcohol, turpentine, or other similar materials. These can easily cause fires if they are not properly put away, or if the necessary precautions are not taken when handling them, like lighting a match or throwing lighted cigarette butts.

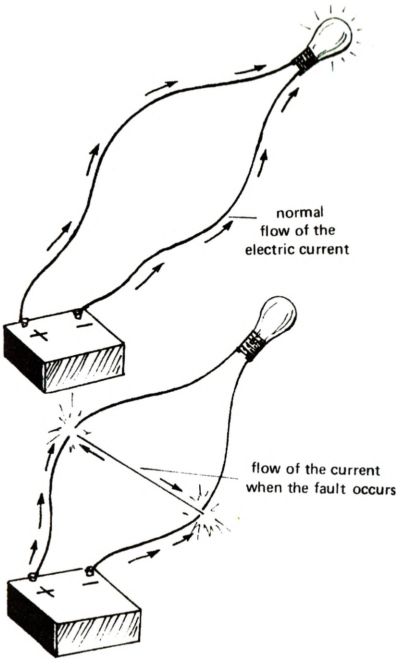



Fig. 3.11 Diagram to show how short circuits can cause fires.

(c) The piling up of rubbish in places such as dump heaps, waste food, plants etc., that can cause an increase in temperature that is capable of starting combustion.

(d) Lightning which are electrical discharges that are produced during storms can sometimes cause fires in residential areas, in the country and in the woods.

## HOW TO PREVENT AND EXTINGUISH FIRES

In order for a fire to take place, the following things must be present:

(a) some kind of fuel,

(b) a rise in temperature,

(c) air.

Knowing that these conditions help combustion, it is easy to determine what measures must be taken to prevent or put out a fire. Those measures must be based on the following principles:

(a) Preventing the entry of air to the object that is burning.

(b) Cause a drop in the temperature of the material that is burning.

If it continues, then the following principles should be observed:

(1) Water puts out different fires, because the amount of heat that is absorbed for its evaporation reduces the temperature of the material or object that is burning. Besides, the water acts as a barrier that makes it difficult for air to reach the fire. This reduces the amount of oxygen that is available.

(2) A gas that does not assist burning and is heavier than air, will remain for a longer time near the base of the flame e.g. carbon dioxide is heavier than air, it is therefore used to put out flames.

(3) A fire caused by gasoline or other oily fuels cannot be put out with water, because the flaming oil will float on the water. When sprayed the fire is spread further and is stirred up, instead of being put out. To out the flames carbon dioxide or a foamy liquid that is full of this gas should be used.

(4) In order to put out fires in an oil well, an explosion of dynamite is used, this stops the flow of fuel for a while.

## FIRE EXTINGUISHERS

The fire extinguishers that are most commonly used contain a solution of bicarbonate of soda and an acid.

When the extinguisher is inverted for use, the solution mixes with the acid and this causes a foamy solution that contains carbon dioxide.

(See Fig. 3.12)


Fig. 3.12 A fire extinguisher.

We can show that carbon dioxide can put out a fire by using dry ice. Dry ice is solid carbon dioxide. It changes to carbon dioxide gas without melting, that is why it is called dry ice.

You will need a bottle with a stopper. Make a hole in the stopper so that a rubber tube just fits into it. Pour some water into the bottle and put a few pieces of dry ice into the water. (Do not handle the dry ice with your hands, it is so cold that it can burn.)

(See Fig. 3.13)

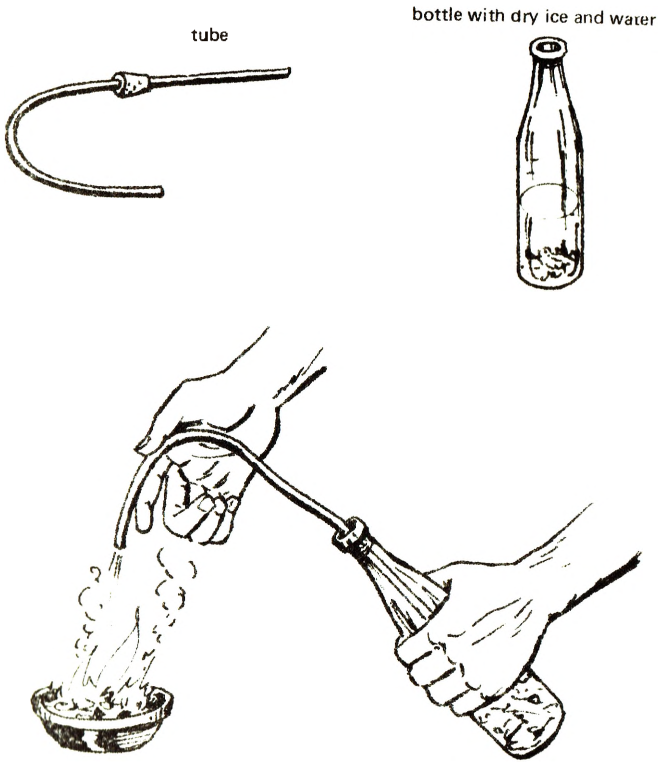



Fig. 3.13 Experiment to show that carbon dioxide can put out fire.

Cork the bottle with the stopper. Set fire to a piece of paper in a metal plate or bowl. Now direct the rubber tubing at the burning paper. Is the fire put out? What do you see when you put the dry ice into the water? What gas is given off?

Carbon dioxide can also be produced by adding vinegar to baking powder. (Vinegar contains acid and baking powder contains bicarbonate of soda. Do you remember what two substances are mixed in some types of fire extinguishers?) What do you see? Light a match and put the flame into the glass with the mixture. What happens to the flame?

Baking powder is used for making cakes. The bicarbonate of soda in the baking powder produces the gas carbon dioxide. We know that hot air rises, so that when the cake is being baked the carbon dioxide produced becomes hot and rises. This is what causes the cake to rise and become light and spongy.

Whenever you see a fire extinguisher, try to investigate how it works with the assistance of someone who knows how to use it. Also try to find out about different types of extinguishers and how they are made.

(See Fig. 3.14)

*Exercises:*

(1) What are the conditions that allow burning to take place?

Fig 3.14 Water being used to put out a blaze.

(2) Explain how you would demonstrate that oxygen is necessary for burning.

(3) Say why it is necessary to get rid of gases that are produced in burning.

(4) Based on the principles that should be considered when putting out a fire, explain what is the purpose of covering a small blaze with canvas or crocus bag, or sand when trying to put it out.

(5) Write the names of five different fuels, showing which of them are used in your home and what are they used for.

(6) Give an example of a case where water should not be used to put out a fire and explain why.

# Geography

## UNIT 1

## OUR HOME IN THE UNIVERSE

### INTRODUCTION TO THE UNIVERSE

At night the sky often appears to be full of stars each of which seems to be no bigger than a twinkling speck. But it comes as a surprise to learn that every star is much bigger than the Earth: indeed some are several millions of times bigger.

(See Fig. 1.1)

Again, the distances between stars in the night sky do not appear to be very great, but astronomers have calculated that despite the millions of stars in the Universe, they are so scattered in space that together they occupy only a very small part of space.

(See Fig. 1.2)

(See Fig. 1.3)

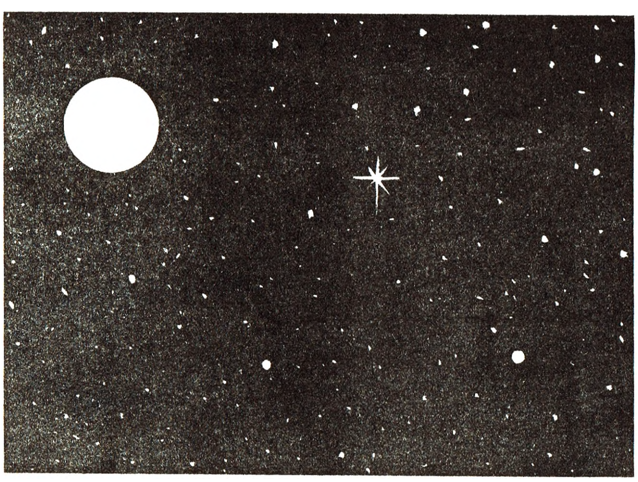


Fig. 1.1 Starry night.

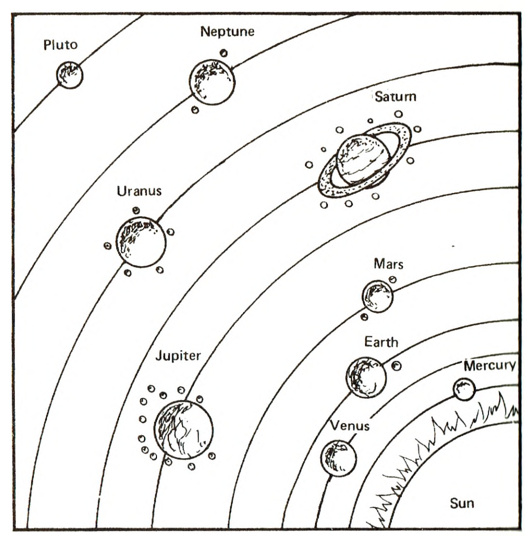



Fig. 1.2 System showing the planet Earth.

THE SUN AND NINE PLANETS FORM SOLAR SYSTEM

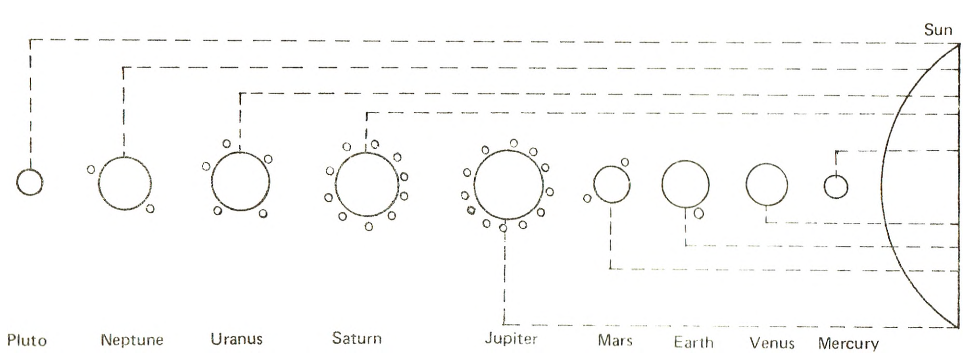



Fig. 1.3 Diagram showing the relative sizes of the planets.

When we study Geography, we try to understand the relationship between the *physical* environment of man —the land, water, sea, sun, weather etc. and man's activities. We look for example at why some countries e.g. Europe and North America have a very cold climate while we in the Caribbean have a much warmer climate. As such we look at how the way of life of those people differs very much from ours.

(See Fig. 1.4)

Fig. 1.4

We try to determine why do bananas and cocoa grow in Grenada while apples and pears do not.

We learn a great deal about the shape, size, climate, type of people etc., of many countries without actually visiting those countries, through maps, diagrams, and so on.

(See Fig. 1.5)

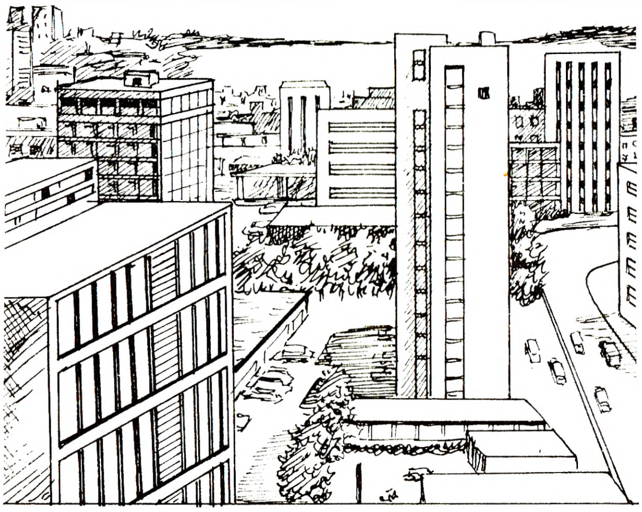


Fig. 1.5 Another type of city.

Through the study of Geography too, we can find out which countries are close to ours, have similar climate, way of life of the people, and other such countries throughout the world. On the other hand we find out about other countries that are very different from our own, and see how and why they differ.

Let us now look at different ways in which the Earth is represented.

## FORM OF THE EARTH

Many thousand years ago, man did not know the true shape of the Earth.

In ancient Greece for example they believed that it was an enormous disc surrounded by angry sea.

The Hindus, for their part thought that it was a massive helmet supported on the shoulders of four elephants. These four elephants rested on a gigantic turtle that floated on the water of a large ocean.

Nevertheless, even in those ancient times, not everyone thought this way. Many learned persons of that time considered the true shape of the Earth, but their ideas were not accepted as true since the knowledge of the world was very limited.

Aristotles, one of the most remarkable learned Greeks at the time thought that the Earth had a spherical (or round) shape.

(See Fig. 1.6)

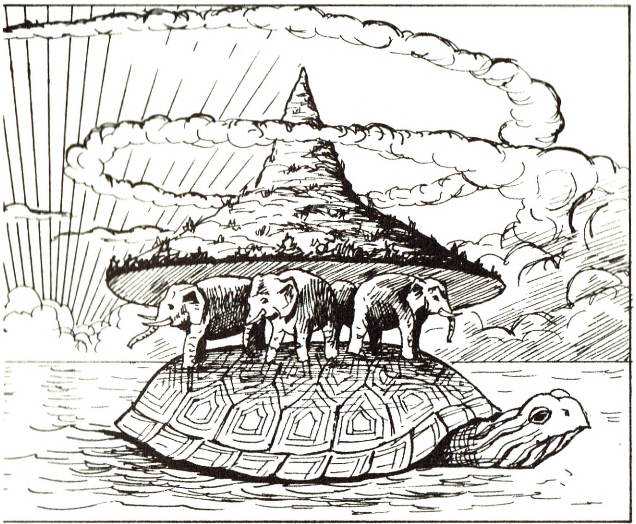


Fig. 1.6 Man's first conception

His observations were based on the shadow of the Earth —always circular— that was projected on the moon during *eclipses.*

(See Fig. 1.7)

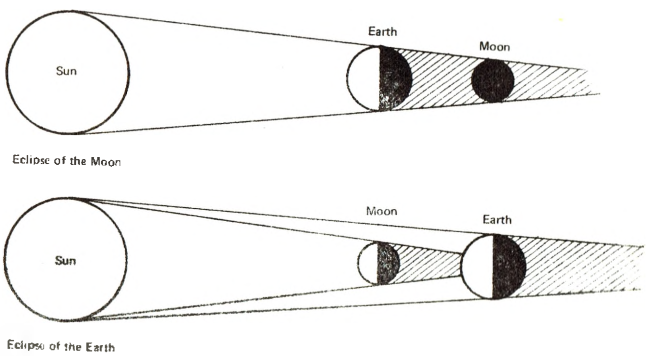



Fig. 1.7 Eclipse of the Earth.

More recently in another age of the history of mankind, in which the Church became a powerful institution that dominated the world, any idea that was in favour of this spherical shape of the Earth was not accepted as true, as it contradicted the theories of the Church.

The ideas put forward by the Church were accepted for many centuries until the discovery voyages of the fifteenth and sixteenth centuries were able to prove that the Earth was really spherical in shape.

Nowadays the voyages made by space ships have allowed photographs to be taken of the Earth where its shape can be clearly observed. It was German Titov, a soviet *cosmonaut,* who for the first time succeeded in taking photographs of the curved surface of the planet Earth from space.

(See Fig. 1.8)

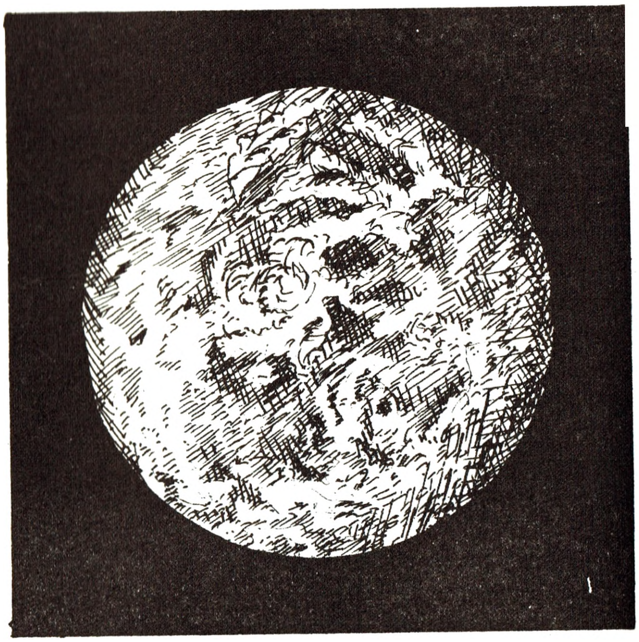


Fig. 1.8 Picture showing the spherical shape of the Earth from space.

### DISTRIBUTION OF LAND AND WATER ON THE SURFACE OF THE EARTH: THE CONTINENTS AND OCEANS

The planet Earth has a surface area of five hundred and ten million (510 000 000) square kilometres. Its shape is similar to a sphere. It is said that it is *spheroid* mainly because of the movement of *rotation.* This causes it to be slightly flattened at the *poles* and bulges at the *equator.*

(See Fig. 1.9)

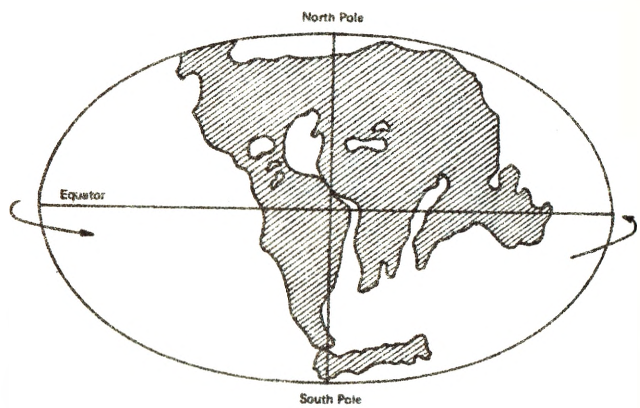



Fig. 1.9

**Activity: observe what happens when a spherical object is spun on an axis e.g. a top. Note the apparent spheroid shape that results. The same thing happens when the Earth rotates.**

The cosmonauts have observed the Earth from space. The dark areas of Earth's surface are the *continents* and the clearer areas are the oceans.

The continents, like the islands are surrounded by water, but can be differentiated mainly by their size.

| *Continents* | *Oceans* |
|---|---|
| Europe | Pacific |
| Asia | Atlantic |
| Africa | Indian |
| America | Arctic |
| Australia | Antarctic or Southern Ocean |
| Antartica | |

(See Fig. 1.10)

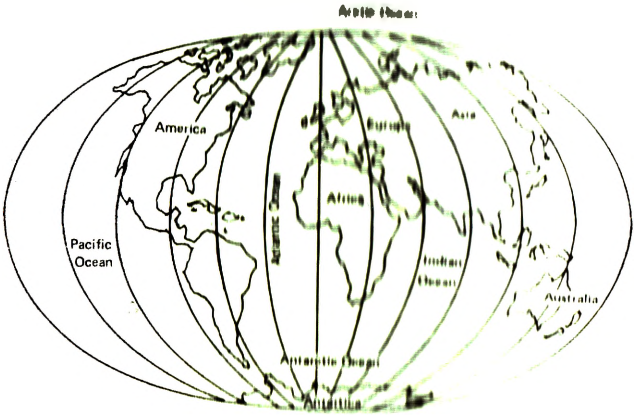



Fig. 1.10 Map of the continents and oceans

Some of these continents are not separated, but form continuos extensions of land, for example: the continental land masses of Europe, Asia and Africa are joined by the Suez *isthmus*, now converted to a canal.

The continental land masses of North and South America are joined by the Central American Isthmus region. This also includes the Central American area formed by the *archipelago* of the West Indies.

Australia which is a continent by itself is the smallest of them all.

Antartica which is completely covered with ice is found at the South Pole. It is very mountainous and volcanic. Antartica has been a source of territorial dispute between England, Chile, Argentina and other capitalist countries. 1957-1958 was declared "Year of International Geophysics" during which important investigations were done into all aspects of land and the atmosphere. Many countries took part in this and it was then agreed that Antartica should be used for investigation.

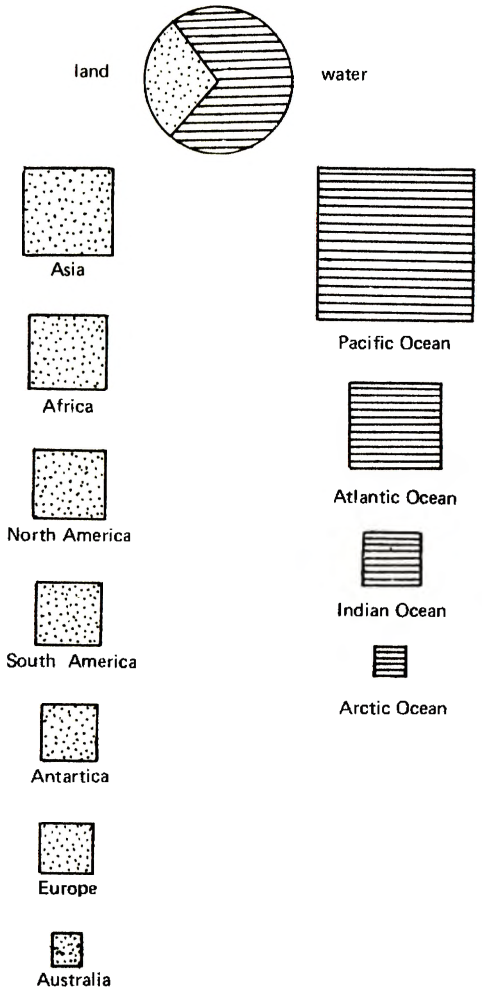



Fig. 1.11 Diagram showing the amount of land compared to the amount of water on the Earth's surface.

## THE GLOBE

When we study the Earth's surface, we need to represent it in a way that is easy to look at and understand.

Sometimes we need to show that part that interests us at a particular point in time.

As the Earth is spherical in shape, the best way of representing it is by the use of a sphere, the globe. This allows us to know not only the shape of the Earth, but also the real proportion in which the land and water is distributed. The shape of the continents and oceans, their size, as well as the differences between various points on the Earth can also be correctly represented.

(See Fig. 1.12)

(See Fig. 1.13)

Even with all these advantages, when using a sphere, we still have some limitations that should be noted. No matter how large the sphere we use, it would be impossible to put in all the geographical details of the Earth on it. For example, Grenada would be like a dot. The details have to be reduced so much, that one can obtain very little

Fig. 1.12 The globe is a better representation of the Earth.

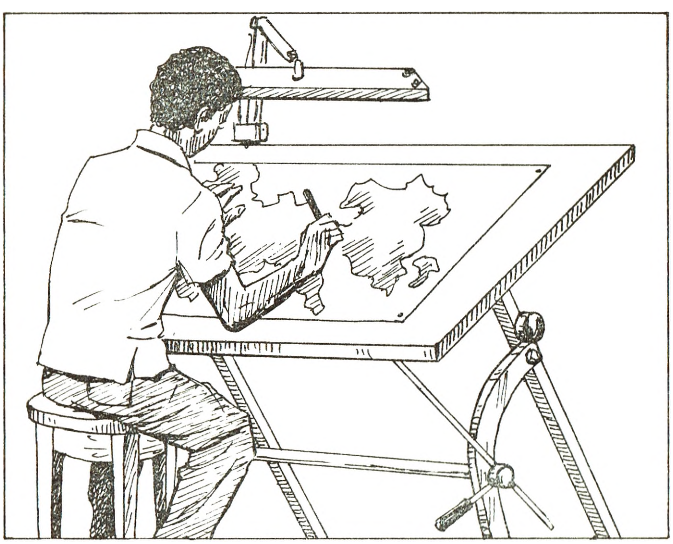


Fig. 1.13 Map maker at work.

information about our country from it. For this reason, other forms of geographic representations are used like *maps,* which we will look at in the next section.

## MAPS: THEIR USE

On a map is shown, on one plane, the whole area of the Earth's surface, or one part of it. But it will not be true to say that a map accurately shows every aspect, detail for detail, of the land and seas that it represents.

Why must these distortions, as they are called, be there?

Take an orange to represent the Earth. Peel it carefully so that after the skin is removed, the spherical shape is maintained.

Try to extend this skin over a page without breaking or stretching it, giving it the form of a flat plane. You will see that it is impossible to make it into the form of a perfect plane. The same thing occurs with a sphere if we try to roll it flat.

In the same way, the Earth's surface is curved, so that it is very difficult to represent it on a flat surface or a plane. And so maps show some distortions.

In order to reduce the possible distortions, the map makers or cartographers (specialists who are dedicated tp making maps) use detailed calculations and special techniques to resolve this difficulty. With all these precautions, they are able to get the least distortions possible.

(See Fig. 1.14)

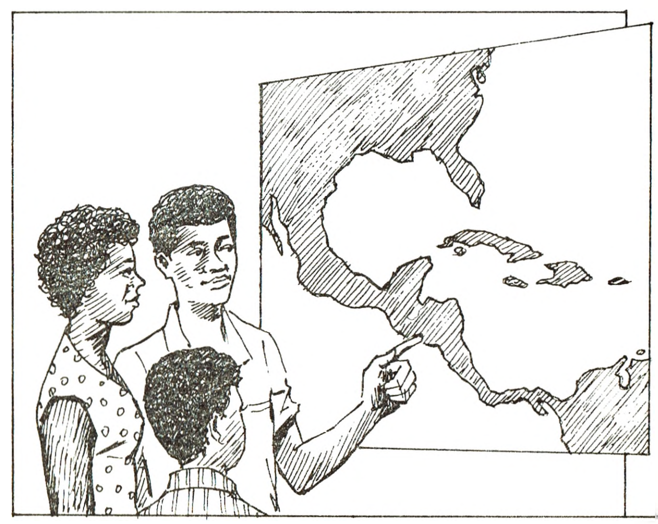


Fig. 1.14 It is very important for one to be able to read and interpret maps.

## IMPORTANCE OF GLOBES AND MAPS

The globe, like the maps, have a lot of important information for geographers and scientists. It will be impossible to study the Earth or part of it, without its suitable representation.

Globes and maps are essential for the study of Geography.

It is very useful for every person to be able to read maps correctly. When one is able correctly interpret geographical representations, it becomes possible to obtain valuable information from them. The process of interpreting maps to obtain information is like reading many pages of a book to gain knowledge about a particular topic. From this, the importance of learning the language of maps and spheres can be seen.

## MAP OF THE WORLD AND THE HEMISPHERES

When one wants to observe, at one time, the whole surface of the Earth, the globe is not suitable, because only the part directly in front of us can be seen.

In this case it is more useful to show the Earth's surface on a plane or flat surface.

> **A map which shows all of the Earth's surface on one plane is called a *world map.***

(See Fig. 1.15)

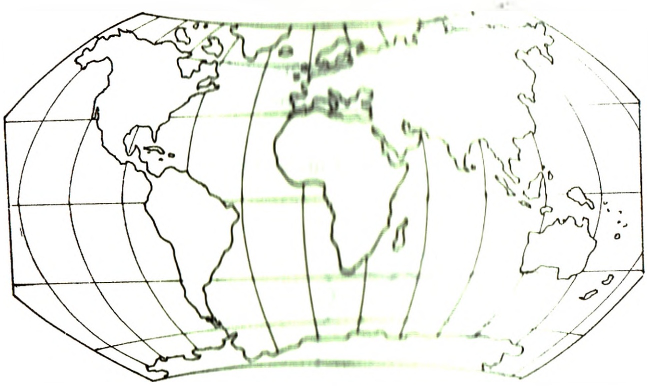


Fig. 1.15 World Map.

It is also possible to show the whole Earth's surface on a map in other ways. The surface of the Earth could be divided into two equal called *hemispheres.*

If each of these hemispheres is shown on a map, another image of the world can be obtained, that image is the *map of the hemispheres.*

**(See Fig. 1.16)**

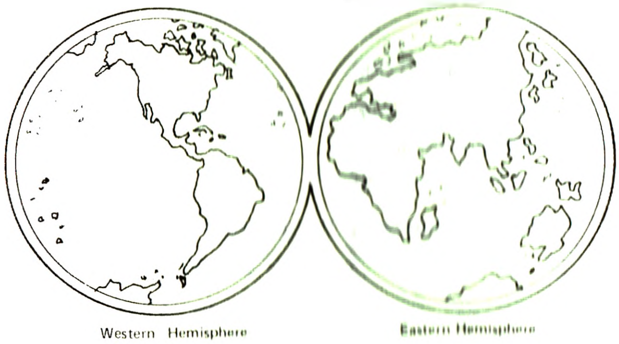



**Fig. 1.16 Map of the hemispheres.**

## ORIENTATION OF MAPS

Orienting the map means trying to determine directions on it.

Whenever we are going to use a map, we first have to orient it, in order to get correct information about the direction of the things and places shown on that map.

When trying to determine direction there are four (4) main directions or points as they are sometimes called. North, South, East and West are called the four cardinal points and their direction are shown in the following diagram:

(See Fig. 1.17)

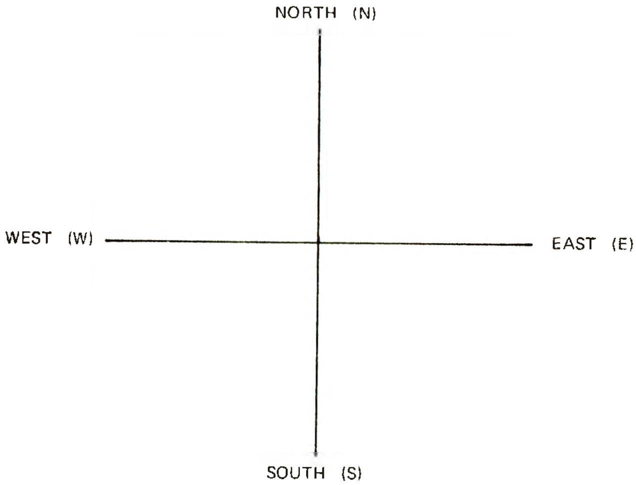



Fig. 1.17 The four cardinal points.

Other directions are determined as "in-betweens" of these four (4) main directions.

Remember that this is only a way of representing them on paper. In real life there are some things that help us determine direction. For example:

The direction from which the Sun rises is always. East.

Therefore, according to the diagram, the opposite direction is West, that is the direction in which the Sun sets. This is a simple example since it is very easy for everyone to determine where the Sun rises and sets and accordingly, the directions East and West, from a particular point.

There are other more difficult ways of determining direction in real life. If you know of any, you can probably suggest them.

Once any one of the four (4) main directions is known, the other three can be determined. The directions as shown in the diagram are fixed, one in relation to the other.

Can you work out some patterns based on this? Example:

"When I face North, my back is to the South, my right side is to the East and left, to the West."

In order to help map readers to judge direction quickly and easily, most maps are printed so that North is at the top.

The direction of North on a map is shown by means of an arrow or compass needle.

A special instrument is used to determine direction. It is called a *compass.*

(See Fig. 1.18)

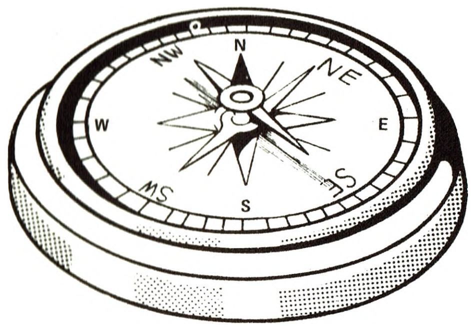



Fig. 1.18 A compass.

## SCALES, SYMBOLS AND COLOURS

### THE SCALE

| |
|---|
| **Any representation of anything on paper must have a relation or proportion with the real object that is being represented. This proportion is called a scale.** |

The scale represents the number of times that the real distance taken in nature, have been reduced in order to be able to show that distance on paper.

In order to make a map of the classroom, we begin by measuring its length and width. If it measures six (6) metres long and four (4) metres wide, we cannot represent this exact measurement on paper. But we can use a smaller measurement for example one (1) centimetre for each metre that is measured in the classroom. If it is done in this way, we will obtain a rectangle of six (6) centimetres by four (4) centimetres. In that rectangle, by the same method, we can show everything that was in the classroom: doors, windows, the teacher's table.

In the same way we can make map of the school, of the city or a house.

(a) The scale can be expressed in different ways. The simplest form is the one that is shown using part of a horizontal line divided into centimetres. This type of scale is called a *line scale.*

(See Fig. 1.19)

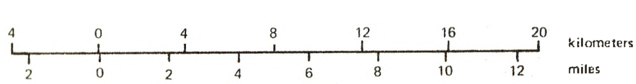



Fig. 1.19 Line scale.

Example:

If the distance between your home and your work place is eight hundred (800) metres. In order to represent this distance on paper we can use one (1) centimetre of paper to correspond to ten (10 000) centimetres on the ground. In this way, the drawing will work out to be eight (8) centimetres long.

b) The scale can also be expressed with words and numbers: 1 centimetre = 10 000 centimetres (this is read 1 centimetre is equivalent to 10 000 centimetres).

c) The scale can also be expressed as a ratio: 1: 10 000 (this is read one for every 10 000).

(See Fig. 1.20)

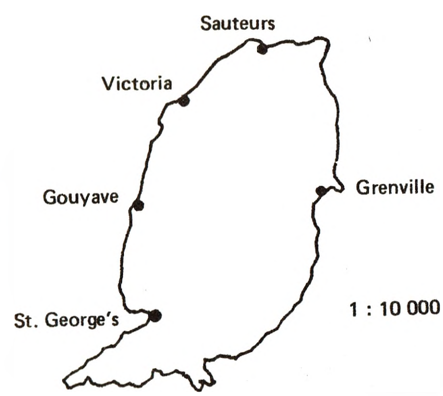



Fig. 1.20

*Exercises:*

When we measure the distance from St. George's to Sauteurs we get 5 centimetres approximately. If the map has a scale of 1: 10 000 the distance can be worked out in this way:

Scale used 1: 10 000

Therefore every 1 *cm* on the map is equivalent to 10 000 000 on the ground.

Distance on the map = 5 *cm.*

Therefore distance on the ground = 5 X 10 000 *cm.*

5 X 10 000 = 50 000 *cm.*

50 000 *cm* to *km.*

50 000 *cm* = 5 *km.*

Therefore according to the scale St. George's is 5 *km* away from Sauteurs.

### SYMBOLS

In maps and plans, the objects are represented using rectangles, circles, and other signs according to the real shape that these objects have. Besides, other details are given that specify even more, the things that are drawn on the map.

| |
|---|
| **These details make up the symbolic language of maps and plans and are called** ***conventional signs and symbols.*** |

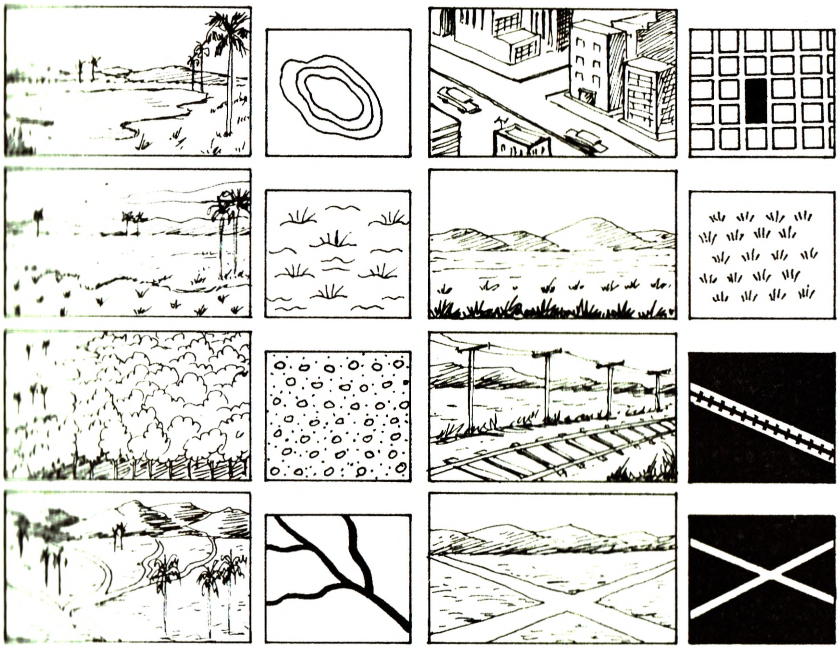


Fig. 1.21 Some conventional signs.

In the map showing St. George's, it is possible to identify the following: the Cathedral, St. George's Cemetery, the Post Office (P.O.) and the Botanical Gardens, using the conventional sings given in the map, that represents them.

The more one knows the symbols on maps and plans, the better one is able to read information from them. The meanings of the different symbols used on a map are usually given in a *key*, somewhere on the map.

(See Fig. 1.22)

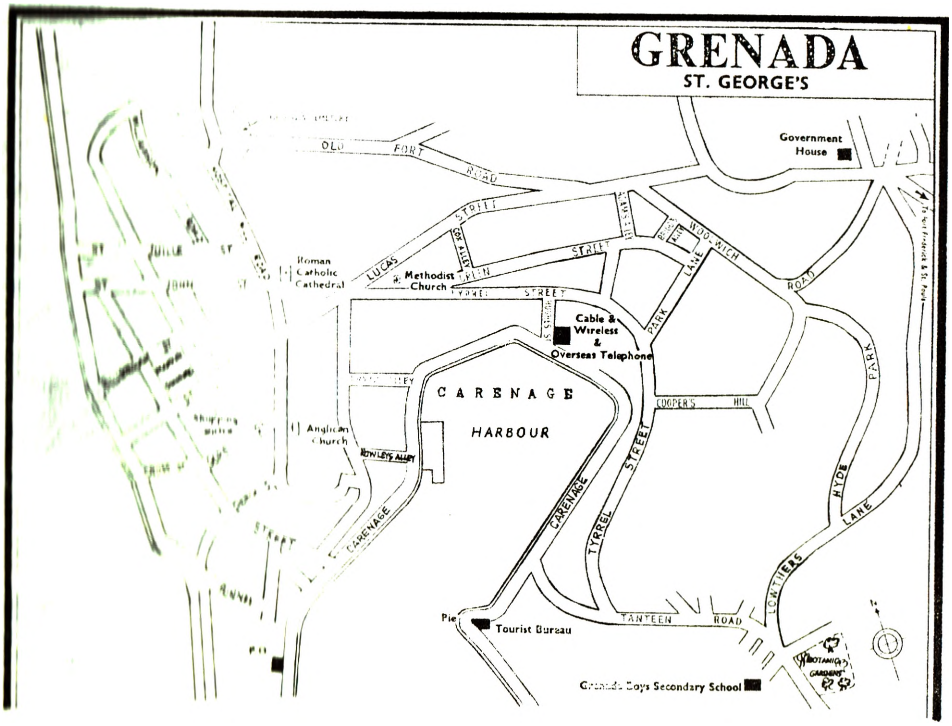



Fig. 1.22 Large scale map of St. George's.

## THE COLOURS

In order to show *relief* (that is different heights of the land) or sea depths on a map, different methods are used. For example, generally, green is used for places up to two hundred (200) metres above sea level. For greater heights, yellow and purple are used.

Let us observe some colour patterns and the key on a larger coloured map.

## TYPES OF MAPS ACCORDING TO THEIR SCALE AND CONTENTS

There is a great variety of maps. Some differ by their scale, others by their contents.

When one is about to make a map or plan of a particular place, he or she must have all the information that is to be shown in that map, so as to select a suitable scale.

If we want to show on the map plenty details of the real thing, like the houses, industries, the streets, the roads, relief etc., it will be necessary to choose a large scale. The type of scale for example, where each centimetre on the map represents a distance of one (1) kilometre or less. These types of maps are called *Large Scale Maps.*

(See Fig. 1.23)

These maps are used by some specialist for their investigations. They are also used by tourists and other travellers and give the most details. When the scale of a map is that large e.g. 1: 1 000 or 1: 2 000, they are called *plans.*

The maps that show extensive areas, like the territory of a country, a continent or the whole world, need a greater reduction of the real distance in order to represent it on paper. Because of this their scales are much smaller, for example 1: 50 000 or 1: 1 000 000 or 1: 20 000 000.

The wall maps used in classrooms are of this type. Let us look at some examples.

(See Fig. 1.24)

Some maps give information of a general character: the relief, rivers, boundaries within the country, provinces and other territories, railway lines, main roads, the main cities etc., these are represented in a simple way. Many school maps are of this type.

Other maps give more detailed information of different aspects of Geography and deal with a particular topic. For example, the unevenness that exist on the land surface are shown in a relief map. In these also, rivers, lakes and swamps are shown. There are maps that show the different forms of vegetation, others the layer of the Earth, types of climate, etcetera.

(See Fig. 1.25)

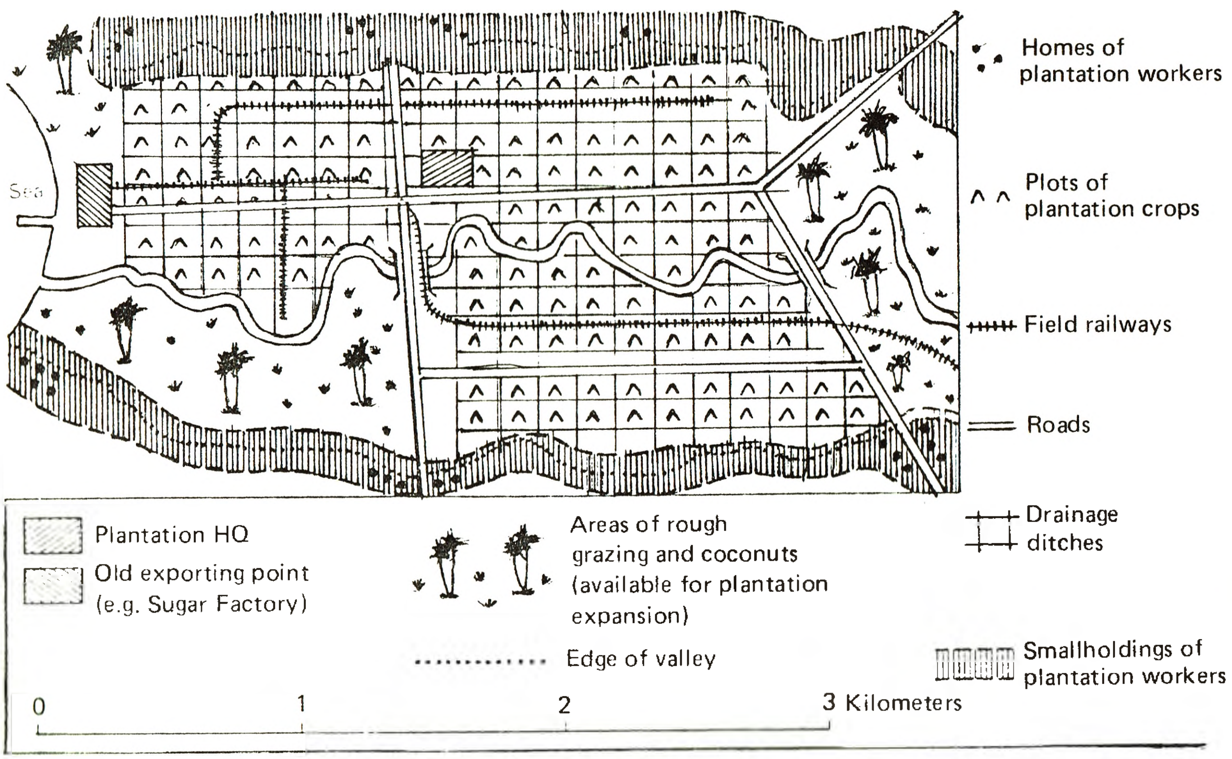



Fig. 1.23 Large scale map of a plantation

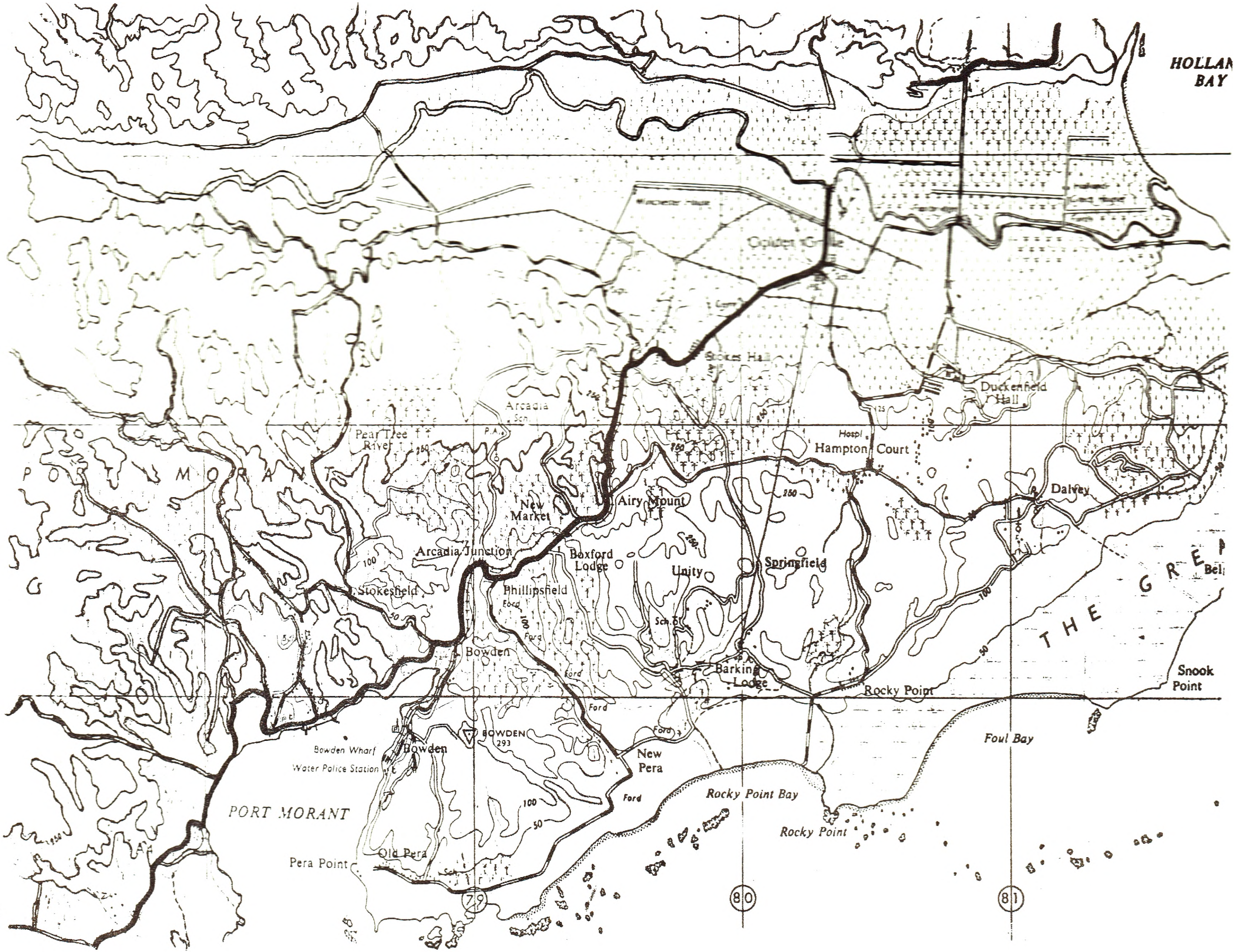

HOLLAND BAY
Golden Grove
Stokes Hall
Duckenfield Hall
Arcadia
Hampton Court
Pear Tree River
PORT MORANT
New Market
Airy Mount
Dalvey
Arcadia Junction
Boxford Lodge
Unity
Springfield
Stokesfield
Phillipsfield
THE GREAT
Bowden
Barking Lodge
Rocky Point
Snook Point
BOWDEN 293
Bowden Wharf
Water Police Station
Bowden
New Pera
Foul Bay
Rocky Point Bay
PORT MORANT
Rocky Point
Pera Point
Old Pera
79
80
81

Fig. 1.24

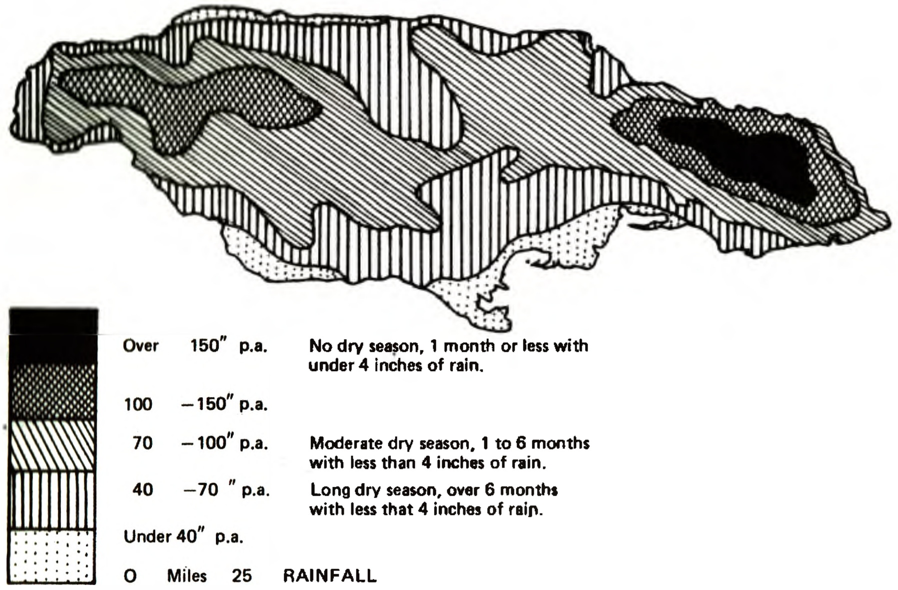



Fig. 1.25 a Map showing rainfall in Jamaica.

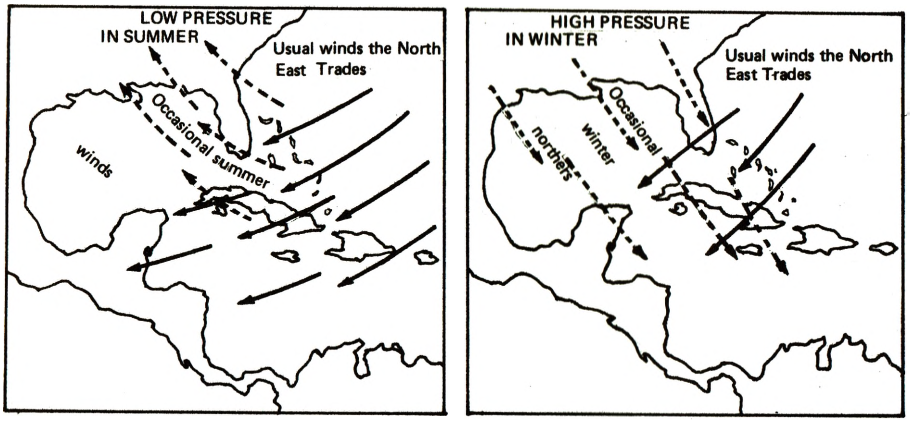



Fig. 1.25 b Map showing direction of winds.

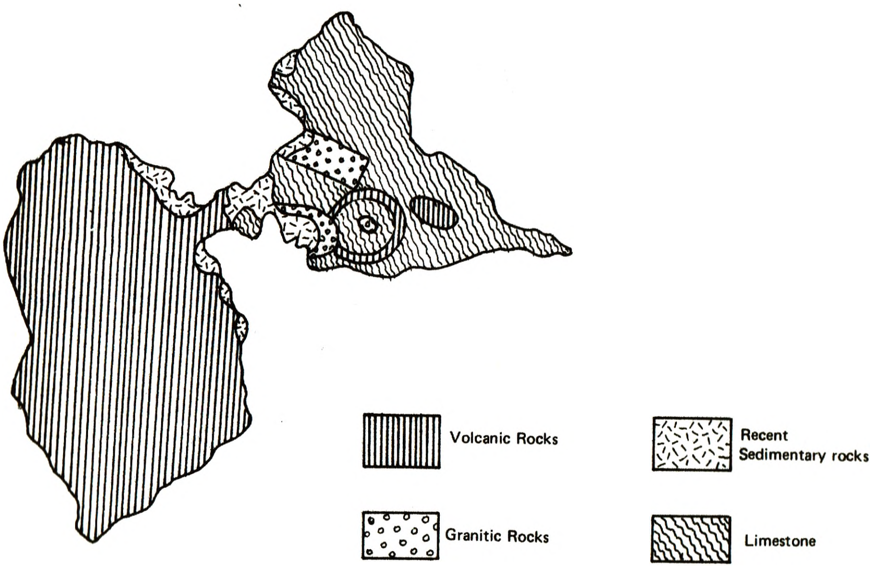



Fig. 1.25 c Another type of map showing rocks in Guadeloupe.

When many maps are put together in a book, it is called an *atlas.*

*Exercises:*

(1) Using the world map, point out all the continents and oceans.

(2) Draw a sketch of the shape of the different continents.

(3) Explain why the globe is the best representation of the Earth.

(4) Look at the world map carefully and say in which hemisphere Grenada is located.

(5) Explain the importance of globes and maps.

UNIT 2

## GRENADA AND ITS POSITION IN THE WESTERN HEMISPHERE

Grenada is situated in the Western Hemisphere, North of the Equator. It belongs to the group of islands called the West Indies, which extends from Florida in the North to Venezuela in the South. Within the West Indies there are smaller groups of islands, and Grenada belongs to a smaller grouping situated in the South of the West Indies called the Windward Group; in fact it is the most southerly island in the Windward Group. The state of Grenada is made up of three small islands, they are Grenada, Carriacou and Petit Martinique.

(See Fig. 2.1)

### LOCATION OF GRENADA AND THE GRENADINES

There are a number of small islands lying to the North of Grenada, and to the South of St. Vincent, called the Grenadines.

(See Fig. 2.2)

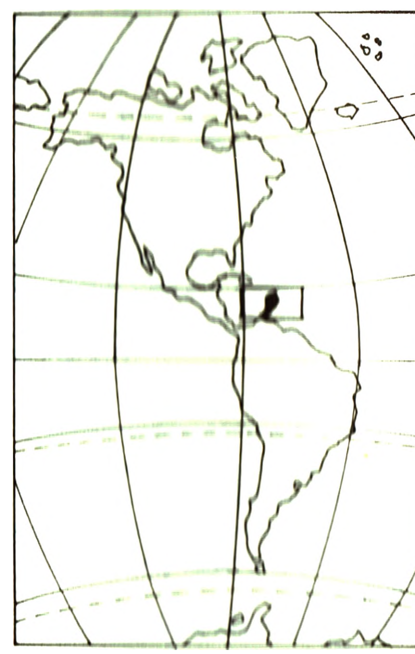
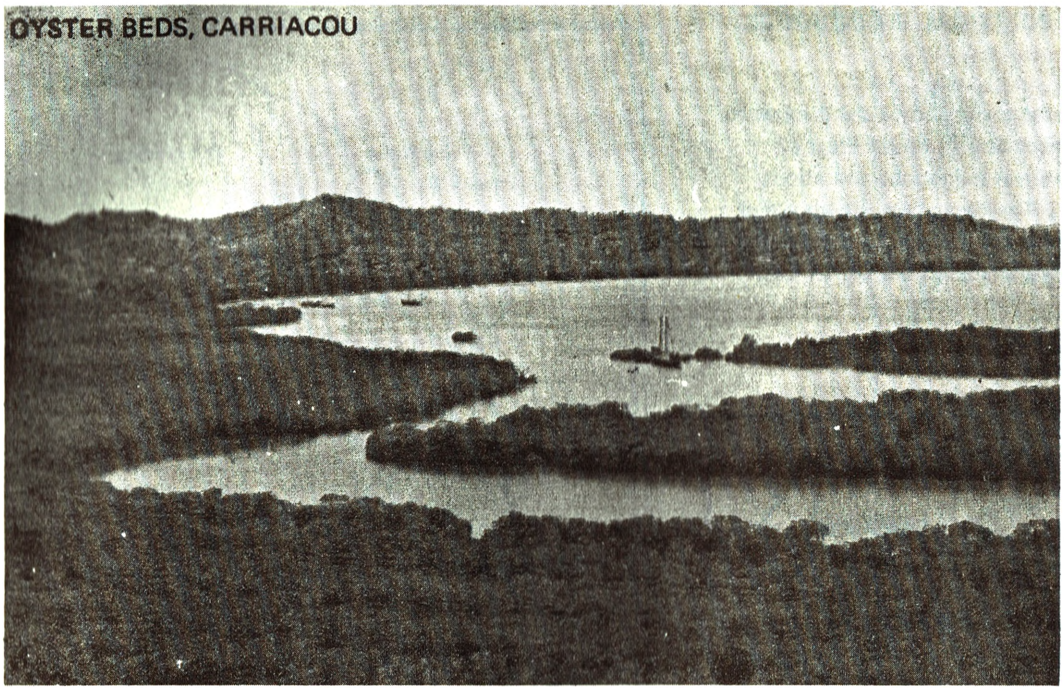


Fig. 2.1 b Grenada's position in the Western Hemisphere.

Fig. 2.1 a Grenada's position in the world.




b

There are about two hundred (200) villages on the island, of these about one hundred and forty (140) areas where large numbers of people are concentrated. The most densely populated areas (villages) are areas as Belmont, Grand Anse, River Road and St. Paul's in St. George. Munich, Byelands, Tivoli and Birchgrove in St. Andrew. Vincennes, Pomme Rose and Perdmontemps in St. David, Concord and Grand Roy in St. John, River Salle, Chantimelle and Rose Hill in St. Patrick.

UNIT 3

## IMAGINARY LINES AROUND THE EARTH

These are lines that are drawn on a map of the Earth, these lines do not really exist on the Earth's surface; they are only drawn on the map to show the different places and other important facts about the Earth. They run from East to West and from North to South. These lines are of two kinds, latitude and longitude.

(See Fig. 3.1)

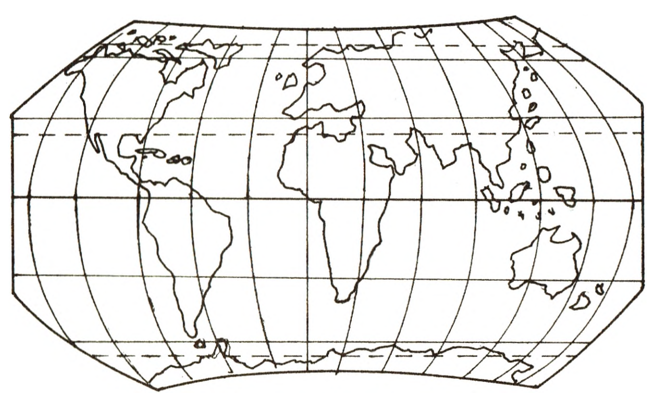


Fig. 3.1 a World's Map showing latitude and longitude.

### EQUATOR

This is the most important line of latitude. It is an imaginary line running fr m West to East around the middle of the Earth. The Equator divides the Earth into two equal parts, a northern portion, and a southern portion. This can be demonstrated by using a piece of string to tie around the

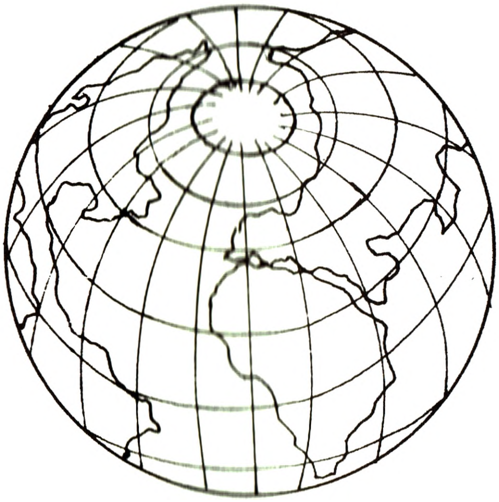


Fig. 3.1 b Globe showing latitude and longitude.

middle of a football. This would divide the ball into two equal sections, and would represent what the Equator does to the Earth.

(See Fig. 3.2)

**NORTHERN AND SOUTHERN HEMISPHERES**

(a) Northern Hemisphere

This is the half of the Earth that is north of the Equator. The Northern Hemisphere begins at the Equator, and ends at a point called the North Pole. Places north of the Equator are said to be in the Northern Hemisphere.

(b) The Southern Hemisphere begins at the Equator and ends at the South Pole. It is the half of the Earth that lies South of the Equator. All lands lying South of the Equator fall within the Southern Hemisphere.

(See Fig. 3.3)

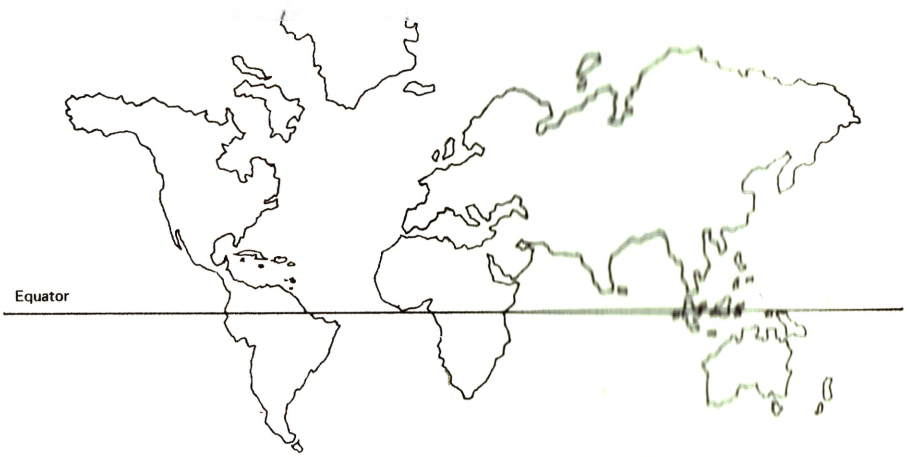



Fig. 3.2 a World Map showing the Equator.


Fig. 3.2 b Globe showing the Equator.

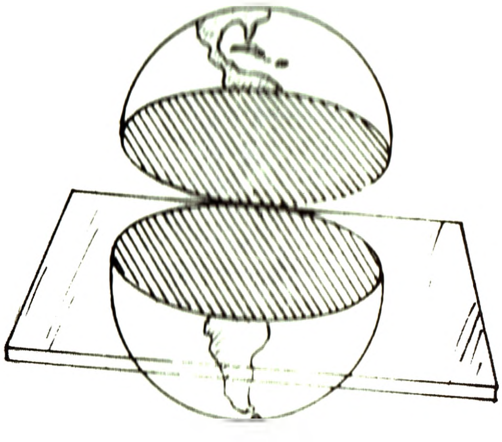


Fig. 3.3 Diagram showing the Northern and Southern Hemispheres of the Earth.

## THE PARALLELS

These are lines of latitude that run across the Earth. These lines of latitude maintain the same distance between them throughout their length and as a result can never meet. All lines of latitude are parallel lines.

If we take an orange and draw a line around the middle to represent the Equator, we can then draw another North and South of the Equator, both quarter of an inch away from the Equator, we can continue this process and draw about five lines North and South of the Equator. Notice the way in which the lines run. These represent the way in which the lines of latitude run on a map.

(See Fig. 3.4)

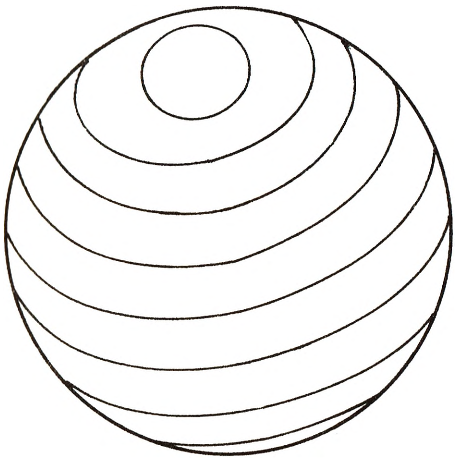


Fig. 3.4 a Lines of latitude on the globe.

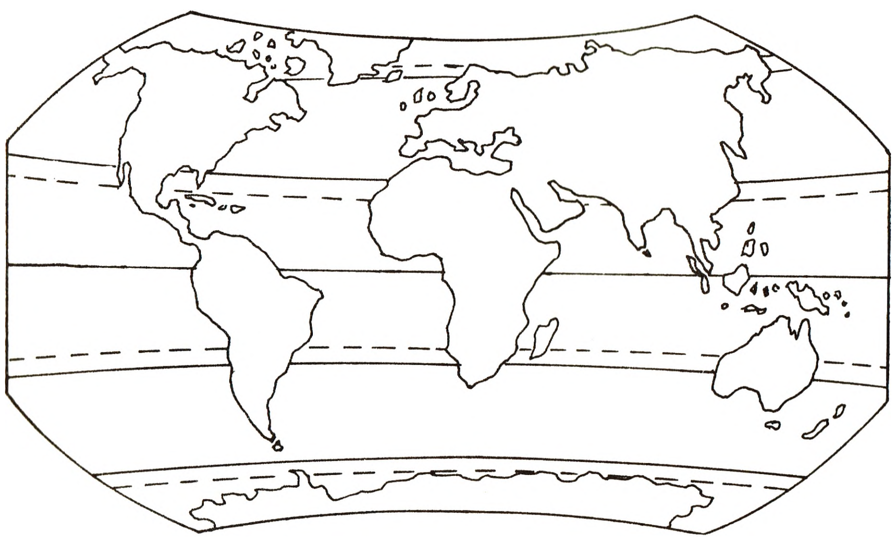


Fig. 3.4 b Lines of latitude on a World's Map.

## THE TROPICS

The Tropics is the region between the Equator, the Tropic of Cancer which is North of the Equator and the Tropic of Capricorn, South of the Equator. All lands within that region is said to be in the Tropics. The Tropics is the hottest area on the Earth's surface. This is because, throughout the year, the Sun is always shining. Our island, and the islands of the West Indies lie within the Tropics.

The Tropic of Cancer is a very important parallel or line of latitude to the North of the Equator. The Tropic of Capricorn is also another important line of latitude South of the Equator.

(See Fig. 3.5)

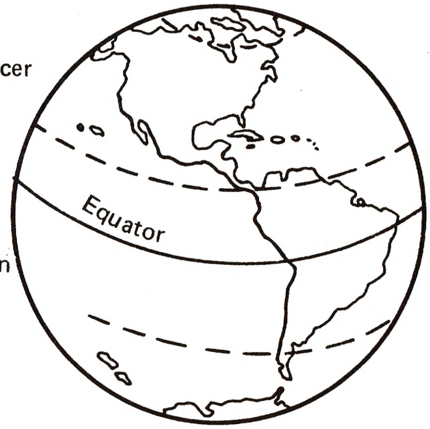



Fig. 3.5 Diagram showing the Equator and the Tropics.

If we take a round object, example a medium sized ball, and we draw a line around the middle, to represent the Equator, we can then draw two lines, one North and the other South of the Equator, each about 1 $\frac{1}{2}$ inches away from the Equator. The line to the North would represent the Tropic of Cancer and the one South, the Tropic of Capricorn; the area within the two lines would be the Tropics.

(See Fig. 3.6)

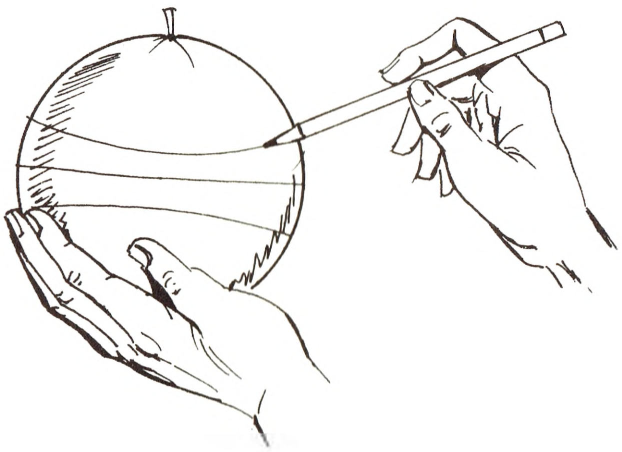


Fig. 3.6

**ARCTIC AND ANTARCTIC CIRCLES**

The Arctic and Antarctic Circles are lines of latitude or parallels North and South of the Equator. The Arctic Circle is situated North of the Equator and also North of the Tropic of Cancer. The Arctic Circle is a very important line of latitude, that is near the North Pole; the region between the Arctic Circle and the North Pole is called the Arctic Region.

(See Fig. 3.7)

The Antarctic Circle is South of the Equator and also South of the Tropic of Capricorn. This line of latitude is near to the South Pole. All the area between the Antarctic Circle and the South Pole is within the Antarctic Region.

(See Fig. 3.8)

**THE MERIDIANS**

These are large circles drawn from North to South on a map of the Earth. All the meridians pass through the North and South Pole. Meridians are sometimes called lines of longitude. They are not parallel, because they meet at two points. Meridians are furthest apart at the Equator, and as they near the poles the distance between them lessens until they meet.

(See Fig. 3.9)

We can use a football to represent the Earth, and place thin strips of tape around it running from North to South to represent the lines of longitude (meridians), this would resemble the way the meridians run on the Earth's surface.

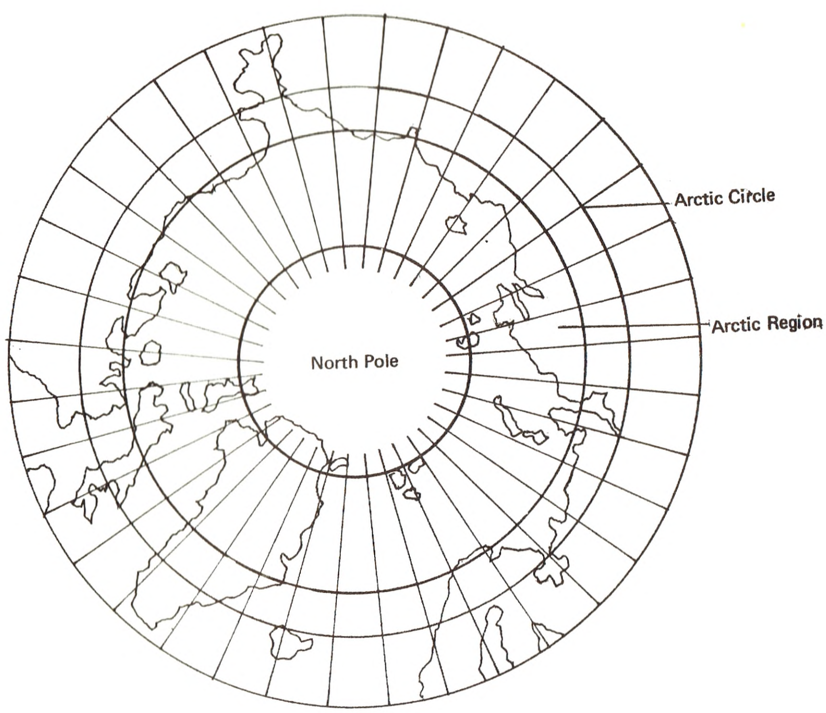



Fig. 3.7 Arctic **Region**.

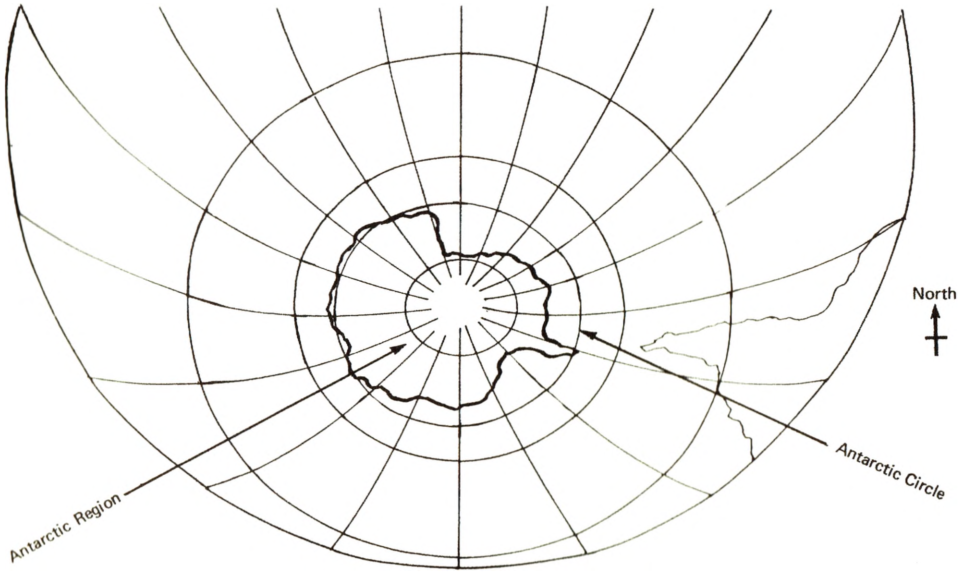



Fig. 3.8 Antarctic Region seen from the South Pole.

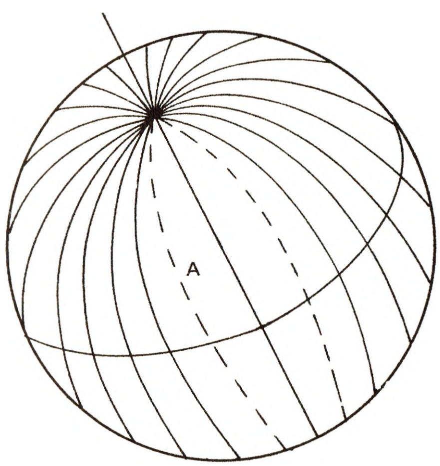



Fig. 3.9 a Lines of longitude drawn on the globe.

## MERIDIAN OF GREENWICH

In the same way that the Equator divided the Earth into two equal sections, the Meridian of Greenwich also divides the Earth into two halves. This time it is divided into the Eastern and Western Hemispheres. The Meridian of Greenwich is the most important meridian or line of longitude. All other meridians of lines of longitude are counted East and West of Greenwich. Let us use a globe to show the meridian of Greenwich.

We can take an orange to represent the Earth, and draw a line around it, passing through the top and bottom like the line of longitude marked A in Fig. 3.9. This line would represent the Meridian of Greenwich. All lands which lie east or west of Greenwich are either in the Eastern or Western Hemisphere.

(See Fig. 3.10)

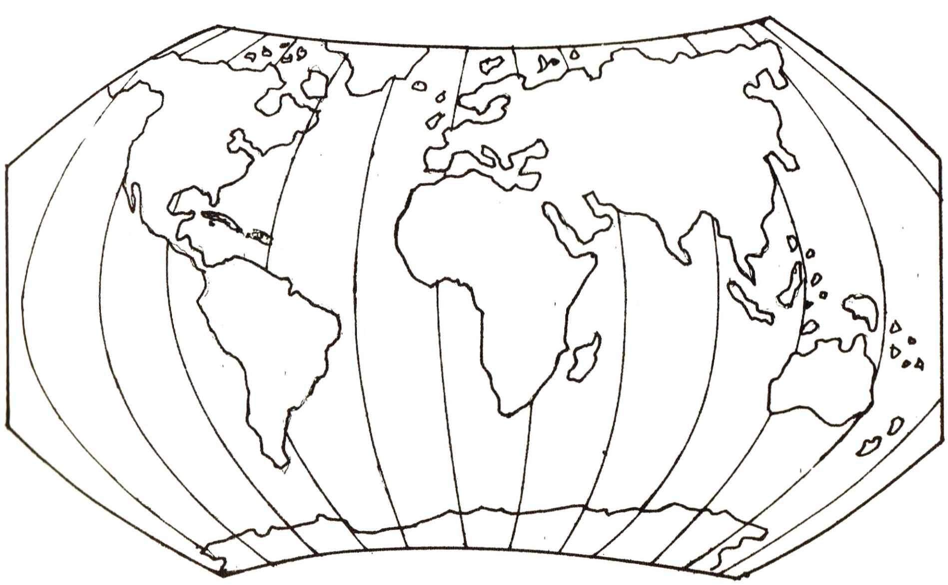


Fig. 3.9 b Lines of longitude drawn on the world's map.

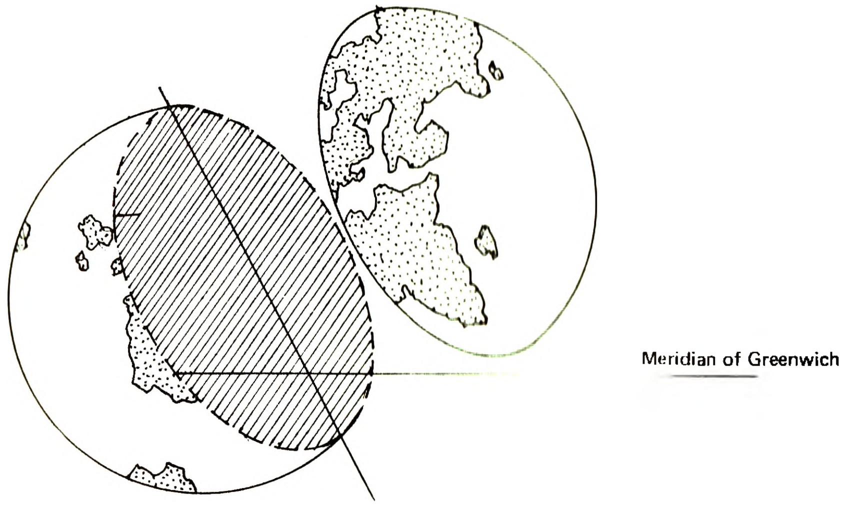



Fig. 3.10 Diagram showing the Eastern and Western Hemispheres of the Earth.

## LATITUDE: IMPORTANCE TO MAN

Lines of latitude are drawn on the map to establish the distance between one place and another. Each line of latitude is 69 miles away from the next. Therefore, it is possible to find out the distance between one place and another once their latitudes are known.

The latitude of a place would also help people to have a general idea of the type of climate that is most likely to be experienced in that place. This is because, the further one goes from the Equator, the lesser is the effect of the heat from the Sun, and as a result it would become colder and colder.

This helps to explain why countries in different latitudes have different climates e.g. The Caribbean Area which is situated between the Tropic of Cancer and the Equator (two important lines of latitude) has a much warmer climate than North America which is situated between the Arctic Circle and the Tropic of Cancer.

(See Fig. 3.11)

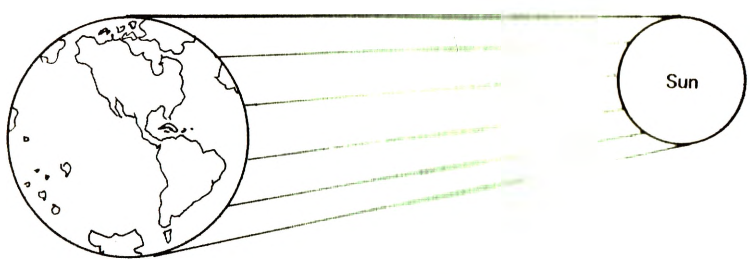



Fig. 3.11 Diagram showing the different lengths of the Sun's ray's as the reach the Earth.

UNIT 4

## PHYSICAL FEATURES AND CLIMATE OF GRENADA

### PHYSICAL SETTING

As shown in the previous lesson, Grenada lies at the Southern end of the arc of volcanic islands.

Apart from a little limestone in the North, it is wholly volcanic. It is mountainous, thickly wooded, very picturesque and contains many streams.

(See Fig. 4.1)

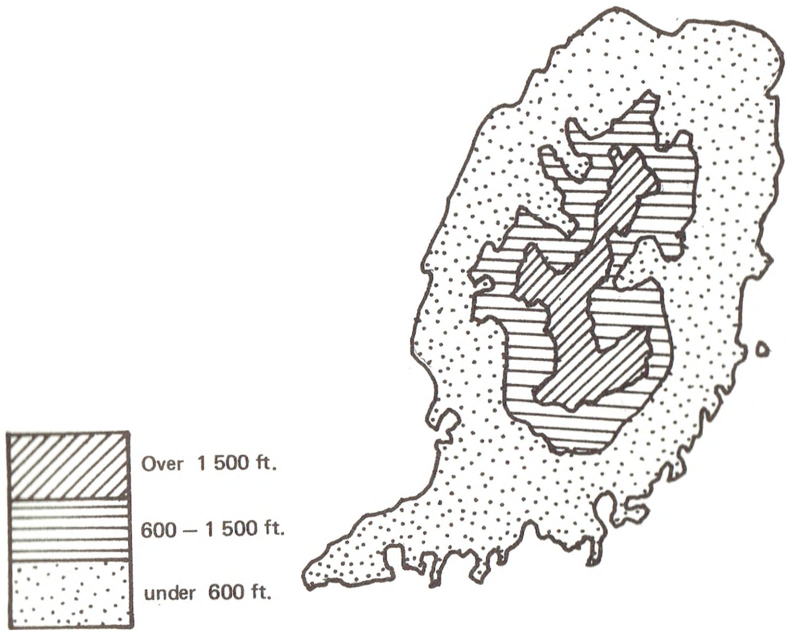



Fig. 4.1 Map showing relief of Grenada.

## MOUNTAINS

There is a central, rugged mountain range which runs in a North-South direction along the length of the island.

The highest mountain, Mt. St. Catherine, 2 756 feet is North of the centre of the island. Several other mountains and hills to its South rise above 2 000 feet in the central core of hills.

A number of these ridges contain old Crater Basins and one is occupied by a large crater lake, the Grand Etang, which is above 1 740 feet above sea level.

(See Fig. 4.2)

## TRACES OF PAST VOLCANOES

Apart from the Grand Etang, which is the largest, there are two other large crater lakes.

Lake Antoine and Levera Pond are the other two lakes, situated fairly close to each other, in the North-East part of the island, near the coast. They are both in the parish of St. Patrick.

The only other remaining traces of former volcanic activity in Grenada are a few cold and hot mineral springs.

## LOWLANDS

Here and there pocket-sized valleys or small coastal plains are squeezed between the slopes and the sea. The

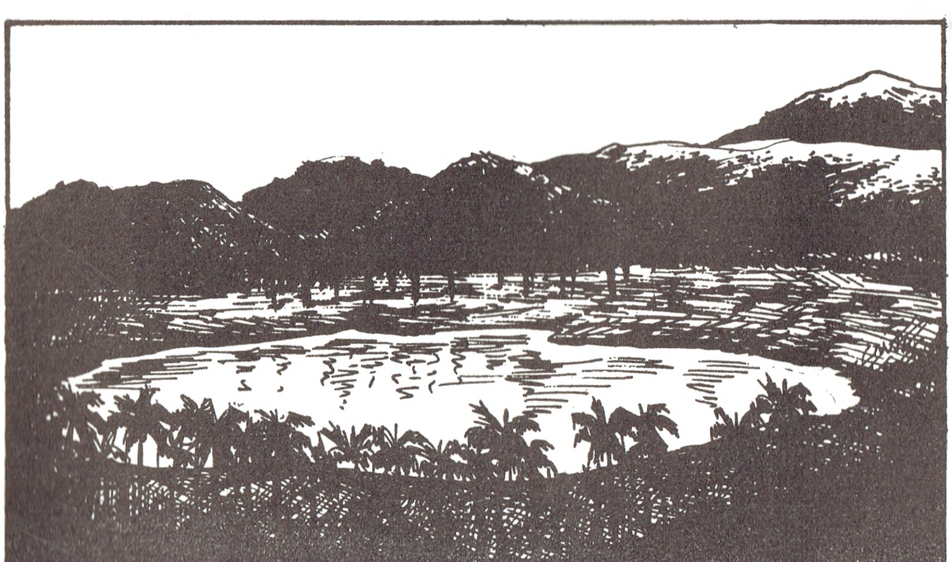


Fig. 4.2 Grand Etang lake.

only lowlands are those in the North-Eastern and South-Western tips of the island.

The South Coast is very rugged and deeply indented. It is also important to note that the mountains rise steeply from the West Coast, and descend somewhat more gently to the East. The West Coast is therefore much steeper than the East.

There are many beautiful beaches, and in some areas and picturesque bays along the coastline of Grenada and Carriacou. The famous Grand Anse beach in the South-West, is a tourist attraction and the country's main hotels are located in this area.

(See Fig. 4.3)

## CLIMATE

Grenada enjoys a tropical climate with temperatures favourable to plant growth all through the year. There are two seasons. The dry season lasts from January to May. The wet season lasts from June to December with November as the wettest month.

## TEMPERATURE

Cold weather as such is unknown in Grenada and during the drier period the temperature seldom drops below 60 °F at night even in the higher, interior, mountainous part of the island.

The coolness of the sea breezes over this fairly narrow island usually makes the hotter part of the wet season easier to bear. At times however, during the rainy period, high temperatures and a high "humidity" together, makes it very difficult to bear in the lowlands. Even during the hottest time of the year —August/September— the thermometer does not usually rise above 90 °F.

At St. George the average temperature of the warmest month, September, is 81 °F.

( See Fig. 4.4)

## WINDS

The prevailing North-East trade winds blow right across the highlands, and there is no "rain-shadow" as such. The coolness of the sea breezes play a great part in cooling the high temperature during some parts of the year.

(See Fig. 4.5)

## RAINFALL

The average annual rainfall varies from about 30 inches to over 200 inches in Grenada. In Carriacou there is an average of 40 inches annually.

The driest part of the island is the south-east coast where about 30-50 inches of rain fall each year.

The wettest parts are the mountain peaks which are often cloud-capped. This hilly centre of the island, almost

Fig. 4.3

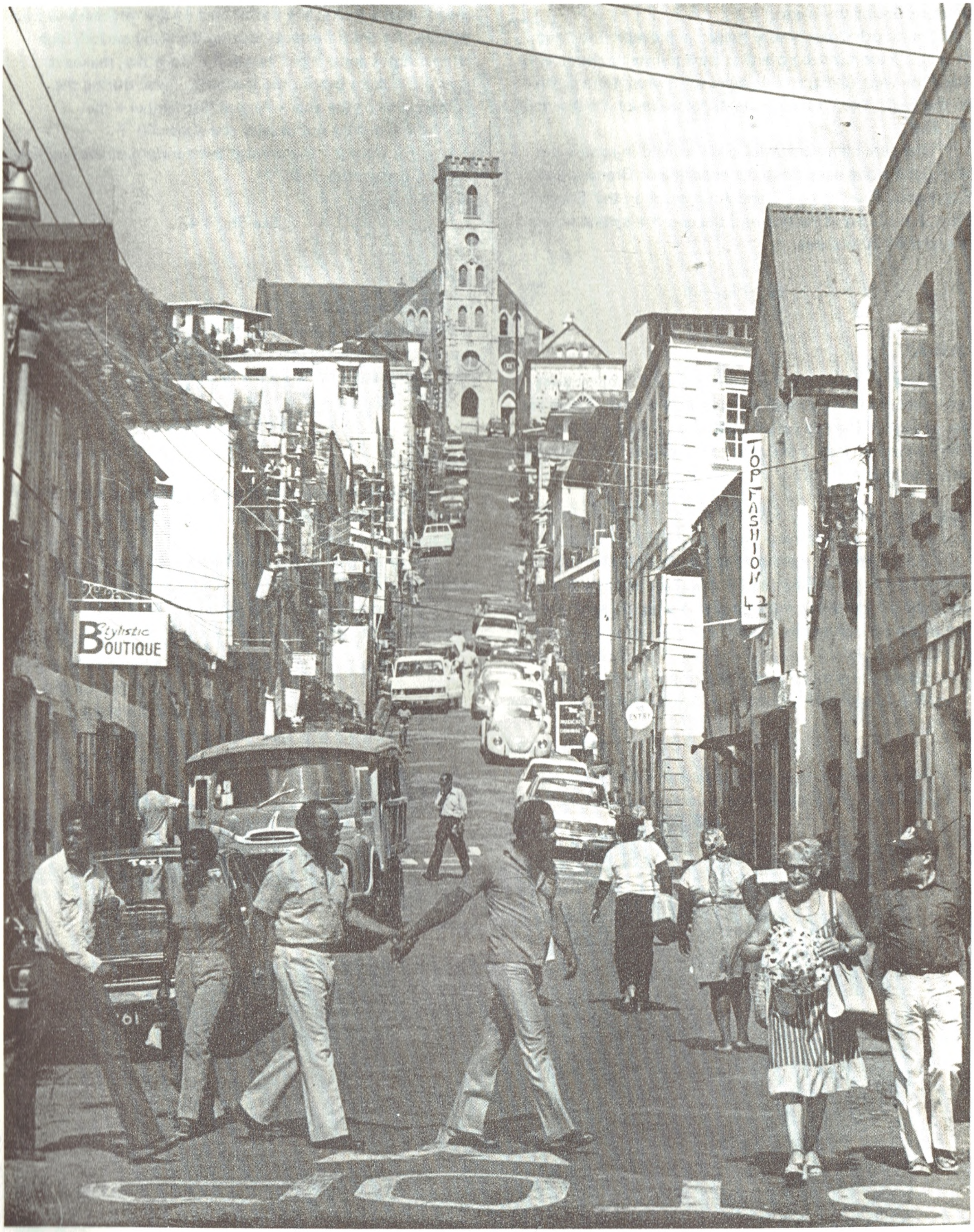



Fig. 4.4 St. George's

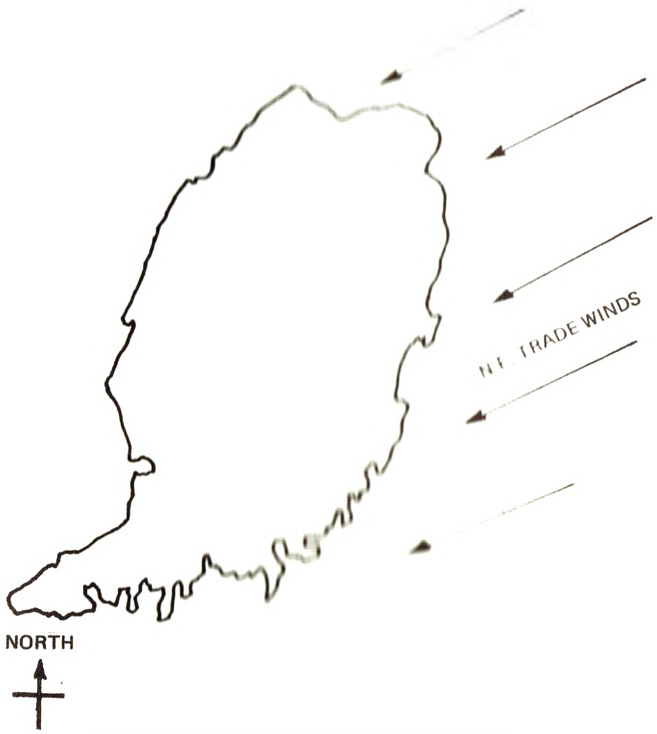



Fig. 4.5 Directions of the prevailing winds

one third of Grenada, receive over 150 inches of rain annually. Usually there are great changes in the rainfall from day to day, as well as from year to year.

Most of this rain falls during the wet season, from June to December, especially November.

(See Fig. 4.6)

Within recent years (the last five years) the character of the Grenadian climate has been undergoing some change. The dry season which normally begins in January and lasts until June has brought a considerable amount of rain and there is little distinction between the rainy and dry season, this has been especially true for the years 1979, 1980 and 1981.

In general, this rainfall is sufficient for the present needs of the country. Irrigation is rarely necessary. However, the South Coast of Grenada and some parts of Carriacou experience occasional droughts, and field crop failures. As a result, much of these areas are not used or are under-used.

With so much of its income derived from tree crops, Grenada suffers severely whenever a hurricane strikes. The experience of tropical hurricane Janet, of September 1955, has shown this. When this happens it takes years for the country to be built back up into its former levels of production.

The hurricane season extends from June to December.

## CLIMATE AS A NATURAL RESOURCE

Nowadays, climate is considered as a natural resource because by using scientific knowledge, it is possible to obtain best results in agriculture and industry.

In general the climate of our country is favourable for the cultivation of nutmegs, cocoa, banana, sugar cane and other agricultural production. It is also excellent for forestry.

The beaches and other places of recreation, the tropical climate, warm sunshine, blue skies, pure, clear atmosphere and other beauties of our country are ideal conditions for the development of a great tourist industry.

(See Fig. 4.7)

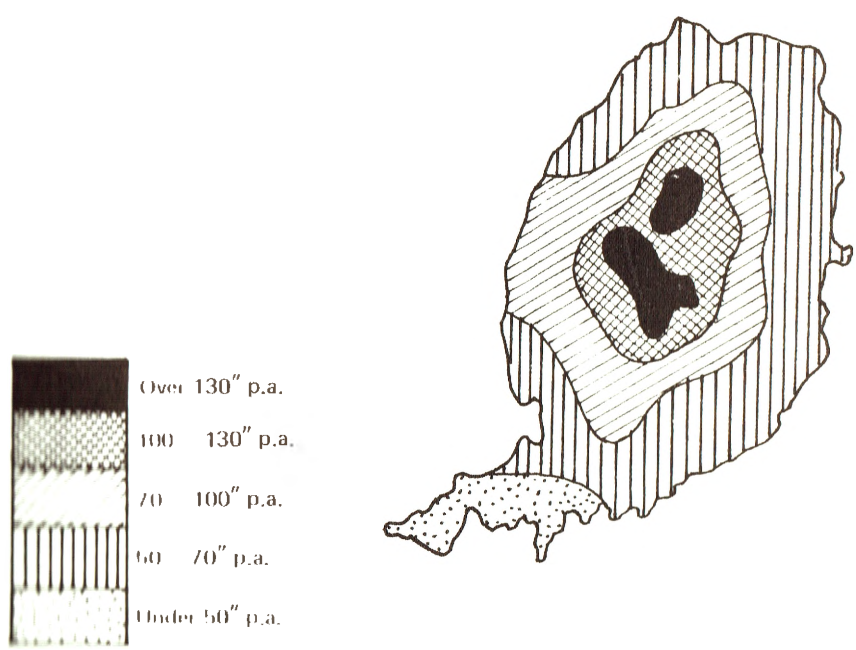



Fig. 4.6 Annual rainfall in Grenada

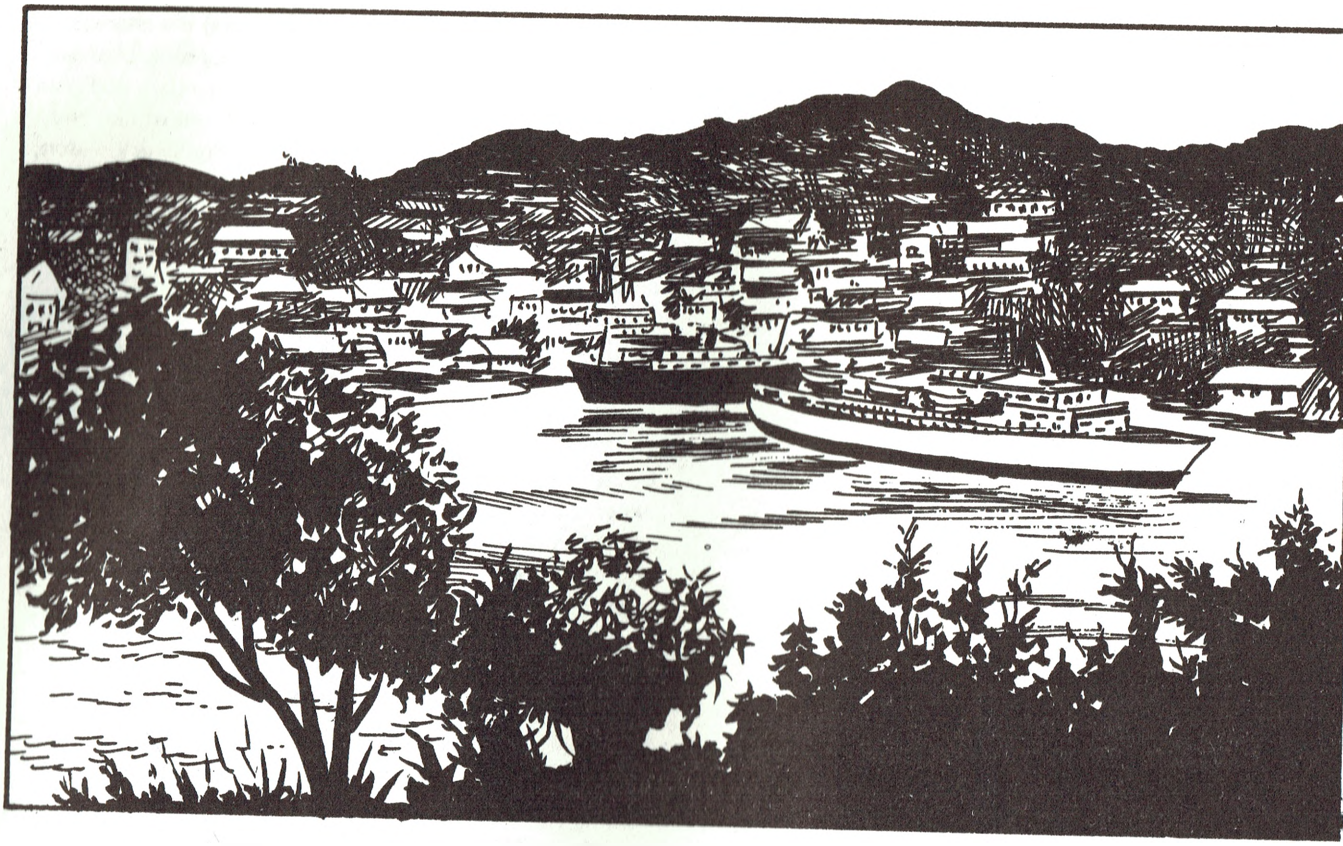


Fig. 4.7 With this type of beauty Grenada has great potential for development of tourism.

Impreso por el Combinado Poligráfico de Guantánamo "Juan Marinello"
en el mes de Marzo de 1982 "Año 24 de la Revolución"