GENERAL PREFACE

The Homi Bhabha Centre for Science Education (HBCSE) has been active in research and field work since 1974. Interdisciplinary scholarship at the Centre has been developed around a doctoral programme in Science Education. Textbooks, workbooks and teacher's books in primary science brought out by HBCSE are one outcome of this research and field work.

These books have received warm and appreciative response from all quarters - teachers, students, parents, professionals and also government agencies. When these books were first published, several ideas in them appeared radical and unconventional. Today these ideas have become part of the discourse on education in our country. We are therefore very happy that Oxford University Press is publishing these books for wider dissemination to schools across India.

The National Curriculum Framework 2005 has laid down five guiding principles for curriculum development: connecting knowledge to life outside the school; ensuring that learning shifts away from rote methods; enriching the curriculum so that it goes beyond textbooks; making examinations more flexible and integrating them with classroom life; and nurturing an overriding identity informed by caring concerns within the democratic polity of the country. Often, however, there remains a gap between the generally agreed objectives of the curriculum, and their translation into textbooks and teaching practices. The books authored by HBCSE reflect an attempt to close this gap as much as possible. We hope the attempt has been successful, and is a step towards imparting quality elementary education in Indian schools.

Arvind Kumar
Centre Director
Homi Bhabha Centre for Science Education
Tata Institute of Fundamental Research

PREFACE TO SMALL SCIENCE CLASS 5

The class 5 book, like others in this series, attempts to encourage the natural curiosity and powers of observation which children have. It uses these qualities to help children learn about the world around them.

The emphasis in the books is on the process of science - observing, asking questions, trying to find the answers through further observations and experiments - rather than on information that children are expected to memorize without any real understanding. Needless to add, it would be difficult to use this book meaningfully without doing the activities.

The activities have been designed such that easily available materials can be used; sometimes low cost materials may have to be purchased, but this small investment is unavoidable, and certainly worthwhile if it makes learning fun and easy.

The material in this book has been tested and incorporated in the book when it was found to be successful in our classroom. We would like to know how you found it in yours. Please send us your feedback and suggestions by e-mail, or use the form provided in the WorkBook and also in the Teacher's book.

I hope the teachers and children have as much fun with this book as I did in developing it.

Jyotsna Vijapurkar

Teacher Support: smallscisupport@hbcse.tifr.res.in

ACKNOWLEDGEMENTS

My sincere thanks to Arvind Kumar for his active interest in this work, for constant encouragement and for making time for discussions despite his busy schedule.

Jayashree Ramadas pointed the way in the beginning, and the pitfalls along the way.

Madhugandha Damle contributed much more than the illustrations; she gave many inputs all through the text. I am very fortunate indeed to have had the pleasure of collaborating with her.

I would have been grateful to the biology folks - Shilpa Pathak, Rekha Vartak, Anupama Ronad, Ritesh Khunyakari, Abhijeet Bardapurkar- had they just tolerated my many questions; they welcomed them! Sandhya Thulasidas shared her naturalist's knowledge with me.

G. Nagarjuna and Chitra Natarajan gave valuable feedback. I often went straight to them after the classroom trials, with much to share. Thanks for always keeping the door open.

Many thanks to V. G. Gambhir, to whom I turned for answers unlikely to be found in any book.

Manoj Nair and R. S. Patwardhan made innumerable troubleshooting trips to the Cognitive Lab where the layout work was done. We could not have proceeded without their help.

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Suchitra Varde in the initial stages, then Gouri Patil and Fouzia Dohadwalla carried out trials of the activities, maintained logs, and aided in the research. Archana Shinde and Aisha Kawalkar gave valuable help during the final stages of production.

I thank Mariona Gomes and her colleagues of the NGO 'PATH', Madhavan Nair and his colleagues at the National Institute of Nutrition, Hyderabad for their help. Madhav Gadgil gave very helpful and detailed comments and suggestions on the first two chapters.

The principals and teachers of Atomic Energy Central Schools and Childrens Aid Society school accomodated us in their schedules, making the classroom trials of the material possible. The children of these schools were enthusiastic participants, and taught me much.

Photographs from Space are by NASA and ISRO. A. Ghaisas provided photographs of the globe.

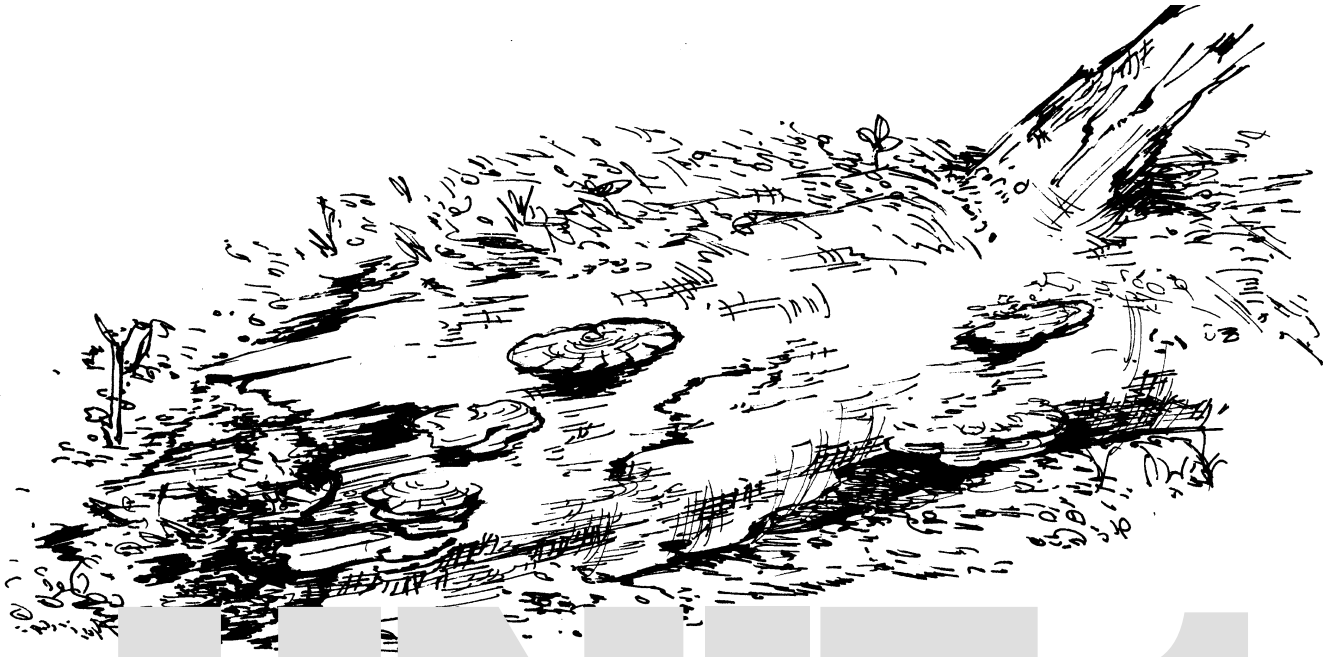
I thank all my other colleagues at HBCSE whom I consulted from time to time. I am grateful for the computer and administrative support at HBCSE.

Thanks to many friends, and friends of friends - who contributed in many ways.

My mother, Sharada, is one of the best teachers I have ever had. She inculcated in me a love of learning. I dedicate this effort to her.

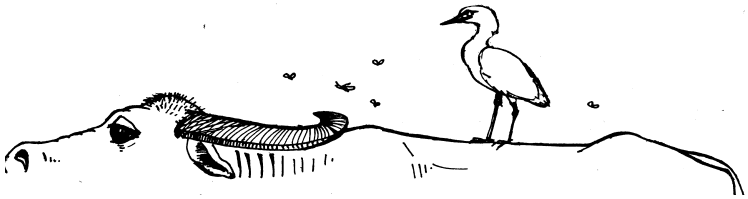
Jyotsna Vijapurkar

CONTENTS



UNIT 1

THE WEB OF LIFE



CHAPTER **1**

LIVING TOGETHER

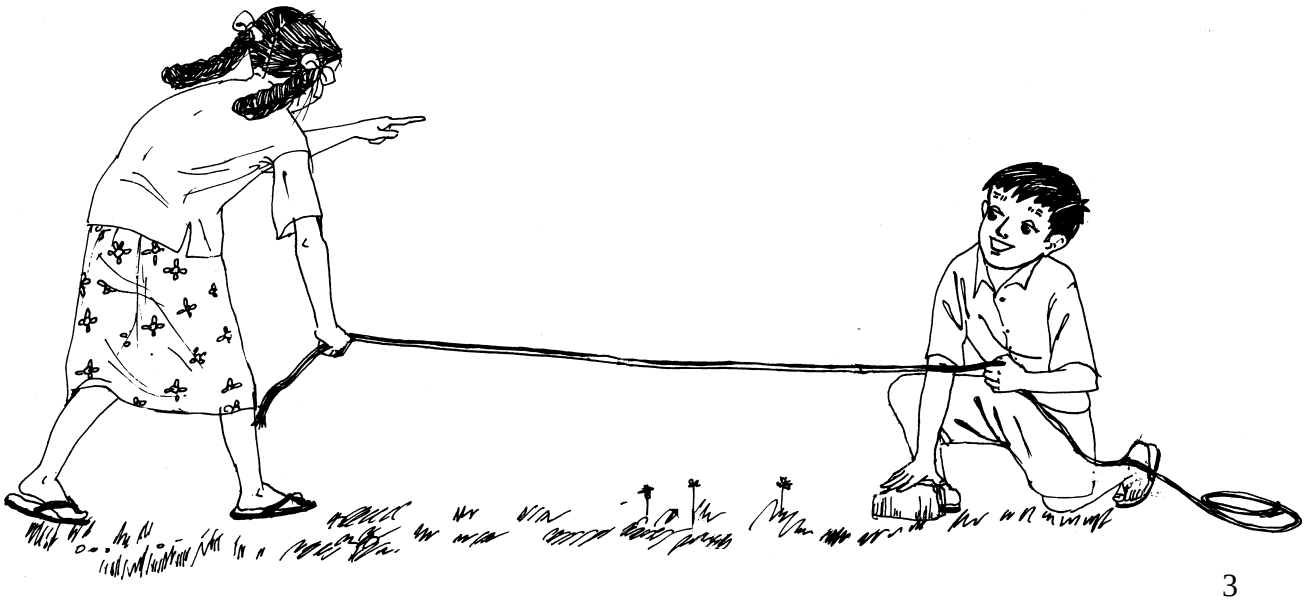
A green branch
A spider's web
A patient spider in the web

A hungry aphid sucking leaves
A busy bulbul in the bush
With twigs and cobwebs for its nest

Living things everywhere, need others too
For food, for homes, for so much more...

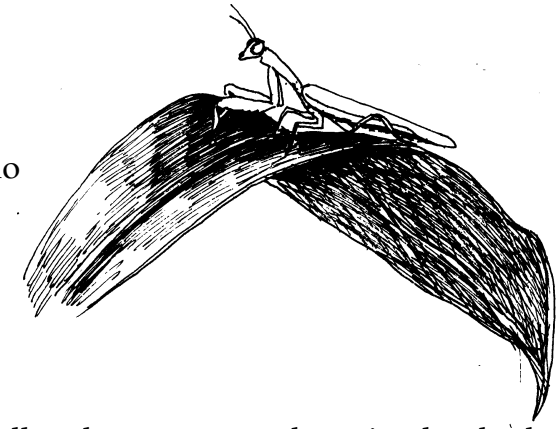
Animals and their food

1. Find a plot of land in or near school which has some grass, other plants, one or more trees and which has a lot of insects and other living things. You are likely to find more kinds of living things if your plot has a pond, *nullah* or some other water body in it. Mark the boundary of your plot with stones, twigs and sticks etc.



a. On page 3 of your WorkBook, make a list of all living things, parts of living things and homes of animals you find there. Look for birds, birds' nests, different kinds of worms, ants, ants' nests, spiders, spider webs and anything that is caught in them, etc.

Be sure to look inside flowers, under leaves and in cracks in the bark.



If you find any living thing whose name you do not know, write a short description of it. How big (or small) was it? Draw it.

Observe carefully where you saw the animals - both large animals and small ones like tiny insects and worms. Make a guess - what do they eat? In the list, circle the animals, as shown.

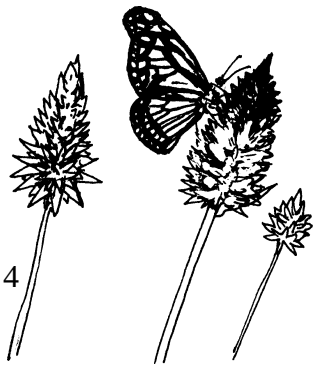
Think! Think!

Where do plants get their food from?

b. The plot where you found these living things.

On page 5 of your WorkBook, describe the shape of your plot. How big is it? Measure the lengths of the boundaries. Draw a map of your plot.

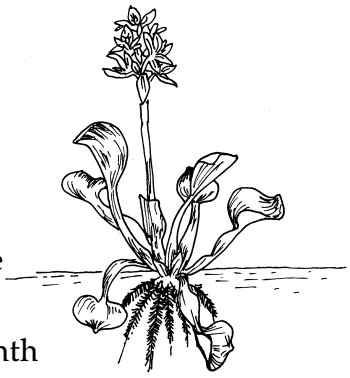
Mark the lengths of the boundaries on it. Draw the map to scale - decide how many centimetres on the map show one metre on the ground.



In the map, show where the trees and bushes were and write their names. Write the names of the animals where you found them.

c. Here is a list of some living things.

ant-lion	human being	elephant	wall spider
frog	oyster	fish	rabbit
bee	flea	sparrow	dung beetle
earthworm	root bacteria	rat	crab
red ant	bat	monkey	water hyacinth



water hyacinth

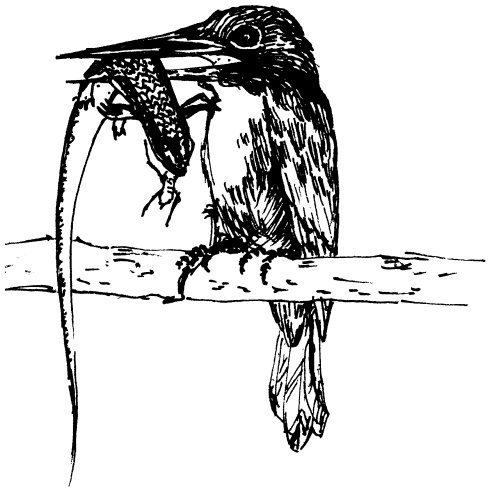
Where is each one found most often - under the ground, on the ground, or in some other place?
Mark the correct column with a (✓) for each one on page 7 of your WorkBook.
If you mark the column 'in some other place', write in which place you find that living thing.
Are there living things which have a mark in more than one column? Now write all the names in the correct places in the diagram.

Think! Think!
Where would you put a mango tree in this diagram?

Living things depend on each other.

2 . Every animal depends on other living things for its food.

a. On page 9 of your WorkBook, select an animal from your list and write some things it eats :
Animal: __
Eats: __, __, __, __, __ etc.
Now all the animals which eat the animal you selected.
It is eaten by:__,__,__,



b. Food chain:
Draw arrows between the following living things, showing which eats the other. The arrow should always point from the plant or animal that is eaten (food) to the animal that eats it.

Here are two examples.

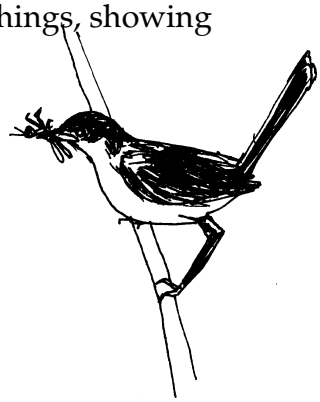
A cow eats grass
grass ———> cow

An owl eats a mouse, a mouse eats rice

owl	<—	mouse	<—	rice
mynah		earthworm		decaying leaves
koel		caterpillar		fresh leaves
wheat		mouse		snake
snake		frog		fly
mosquito		frog		stork
seagull		*bombil* fish		prawns

c. Make a web
On page 10 of your WorkBook is a part of a web showing some living things, showing who eats whom. Add more living things to this to make a larger web by asking questions like these:

Who else eats a grasshopper?
What else does a frog eat?



Now...
weave (!) a story about five of the living things in your web.
Imagine that they can talk to each other.

3. Animals depend on other animals and plants for many things, not just food.

a. Pick one animal from your list, and write down some other living things it needs.

What does it need them for? Think of where it lives, whether it builds its home, and with what.

b. Look at the picture of a banyan tree on page 12 of your WorkBook. It shows

i) some things the tree uses **from** its surroundings and the living things in the surroundings.

ii) some things that the tree gives **to** its surroundings and the living things in the surroundings.

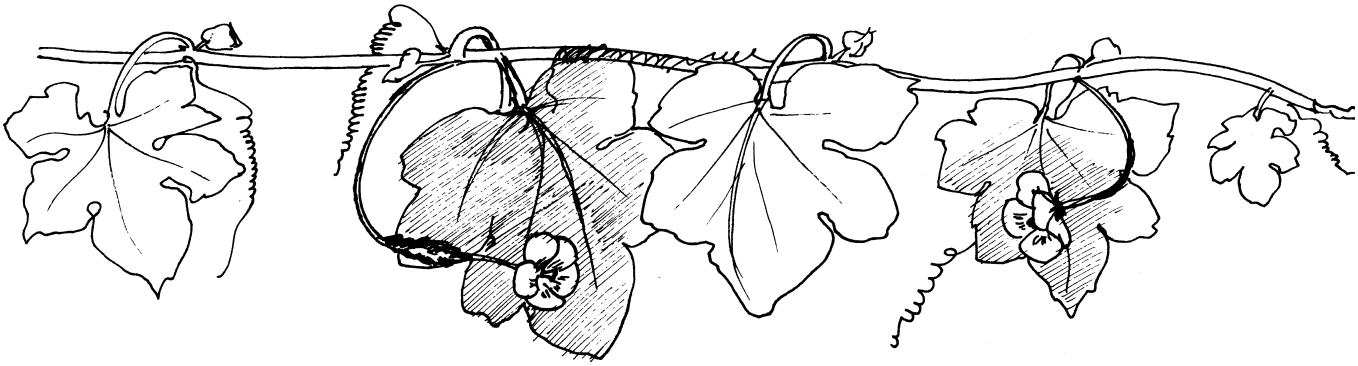
Add as many things as you can to this picture. Remember - the arrows have to point in the correct direction!

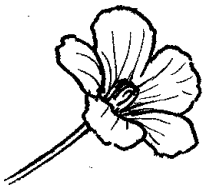
Now in your WorkBook draw a similar picture for an ant.

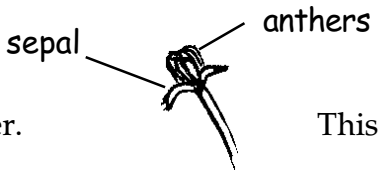
Animals need plants. Do plants need animals?

4. Pollination

a. The pictures below show how a *karela* (bitter-gourd) grows from a flower on the plant. The *karela* plant has two kinds of flowers - a male flower and a female flower.



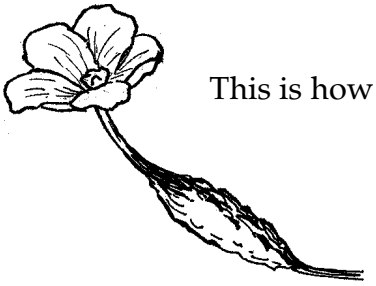
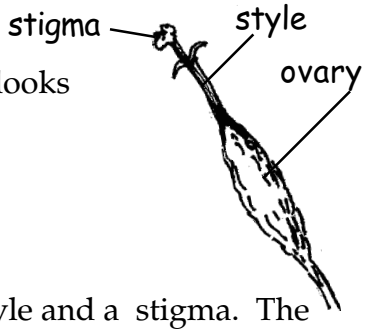
i)  This is a male *karela* flower.



This is how it looks with the petals removed. The male flower has stamens. Each stamen has an anther at its end.

In the *karela* flower, the anthers are all joined together in the centre of the flower. The anthers are yellow-orange in colour.

They have pollen grains. If you touch the anthers, the grains come off on your fingers as a yellow powder.

ii) This is a female *karela* flower.  This is how it looks 

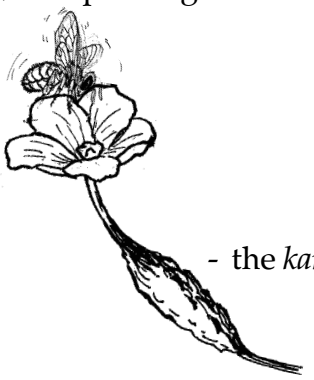
with the petals removed. The female flower has an ovary, a style and a stigma. The stigma is sticky. The style is a tube that joins the stigma to the ovary.

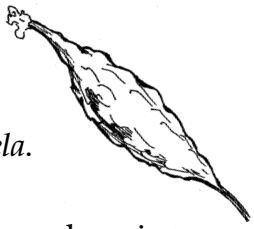
.

iii) A bee  comes buzzing along, looking for nectar. When it 

sits on the male flower, the pollen grains stick to its body.

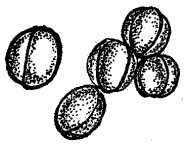
iv) The pollen grains can fall off on the next flower the bee sits on. If the bee later sits on a female flower of the *karela* plant, pollen grains from its body fall off on the stigma, and stick to it. The pollen grain grows into a long tube. It enters the ovary through the style and combines with the ovules inside. Only after this happens can the ovary grow into a fruit

 - the *karela*!

The ovules grow into seeds of the *karela*. 

The pollen grains are very small. You need a microscope  to see each

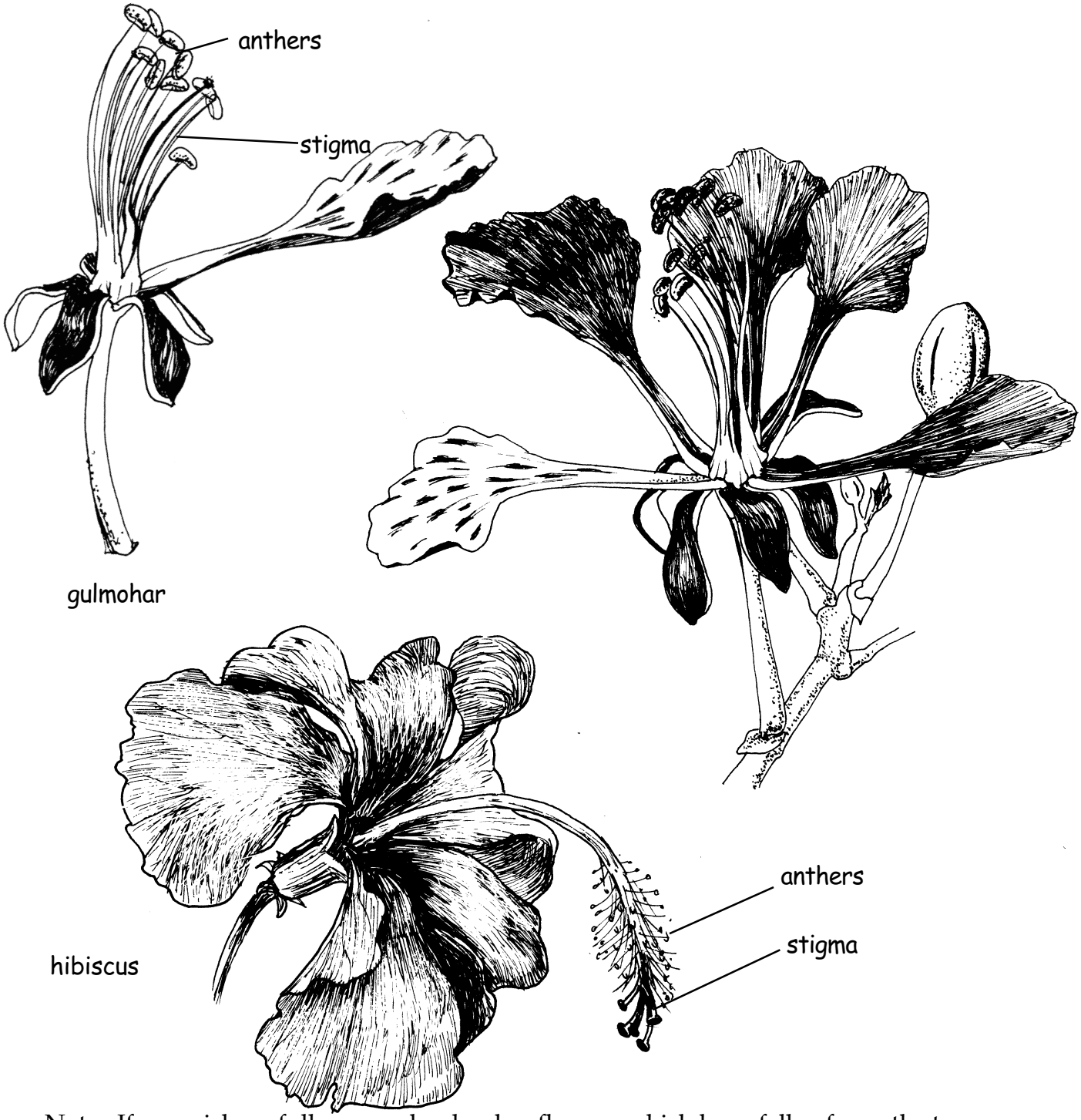
pollen grain. The yellow powder that rubs off on your hand has hundreds or thousands of grains.

This is how karela pollen grains look  under a microscope, if magnified a hundred times.

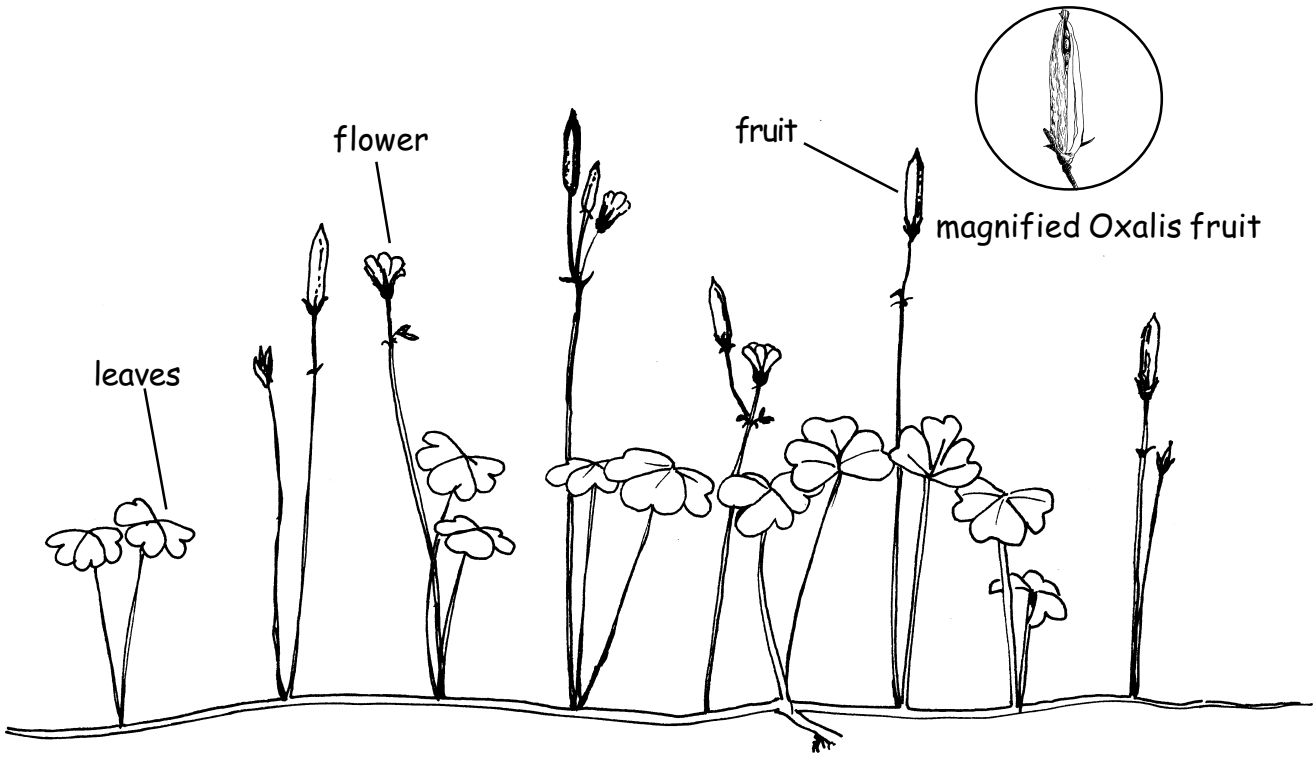
Flowers of many plants, like the hibiscus and gulmohar, have both the male parts (stamen, anthers, pollen) and the female parts (stigma, style, ovary) in the same flower.

On the next page are a few more flowers showing the male and female parts.

The flowers of most plants, even those with both male and female parts in the same flower, need insects or other animals for pollination.



Note: If you pick up fully opened gulmohar flowers which have fallen from the tree, the anthers and stigma may have fallen off.

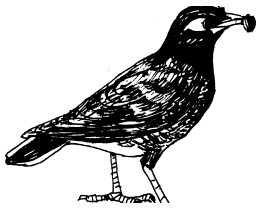


Oxalis plant - Actual size

b. On pages 13 and 14 of your WorkBook drawings of Oxalis, Pea, Mirabilis *(Gulab bas)*, Talinum *(Ceylon basali)* flowers are shown.
In these flowers, can the pollen reach the stigma without the help of insects or other animals?

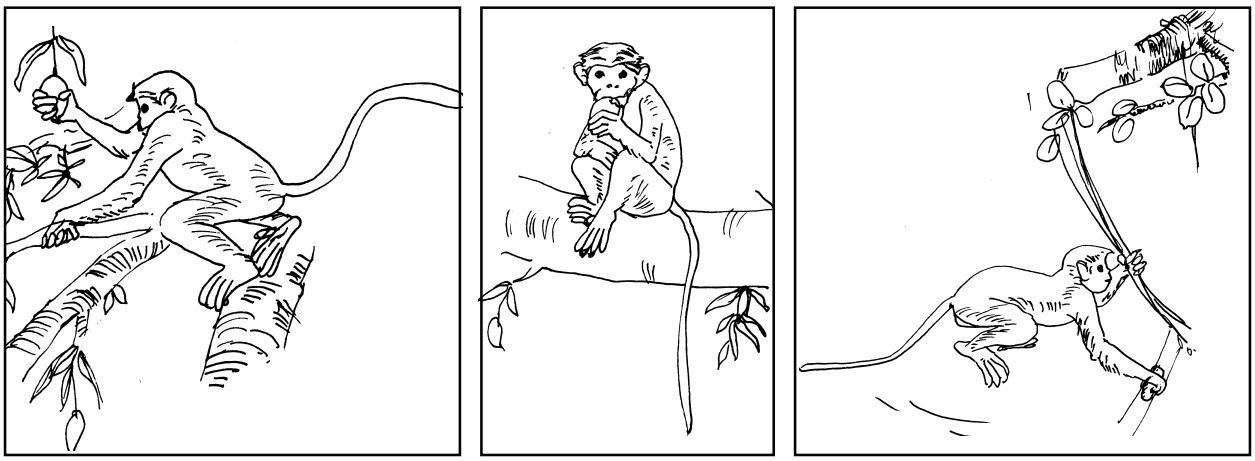
c. Find any flower that has only a few petals and draw it; show where the anthers, ovary and stigma are. Does your flower have both the male and the female parts?

d. Which animals, other than bees, pollinate flowers?

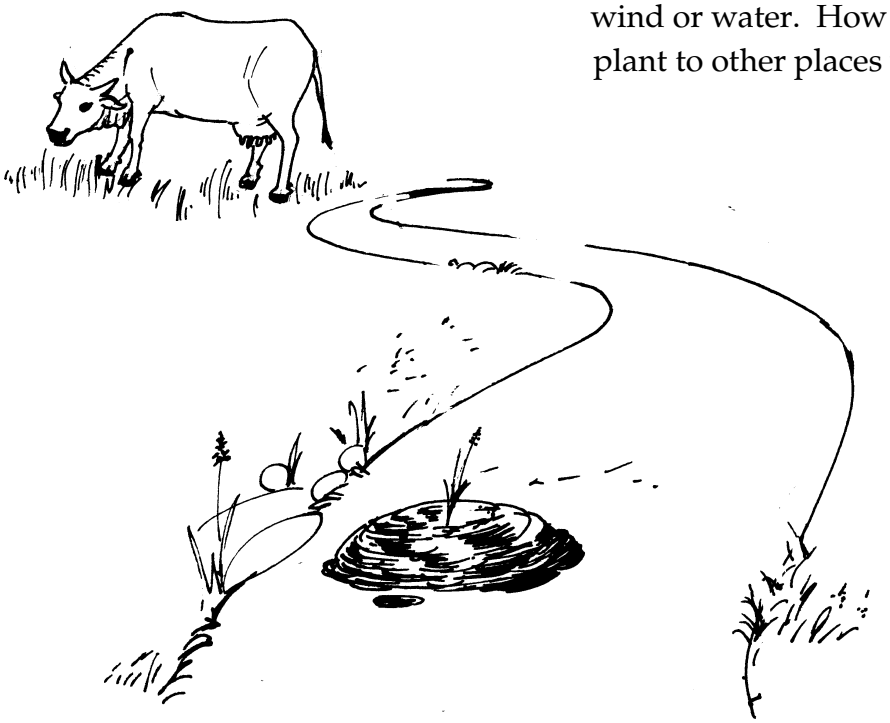


5. Dispersal of seeds

Slowly the fruit ripens and the seeds are ready to grow into plants. How do they go from the plant to some other place in the soil? Make a guess.



a. You learned last year how some seeds can be carried by the wind or water. Think of some seeds which cannot be carried by the wind or water. How can they travel from the plant to other places where they can grow?



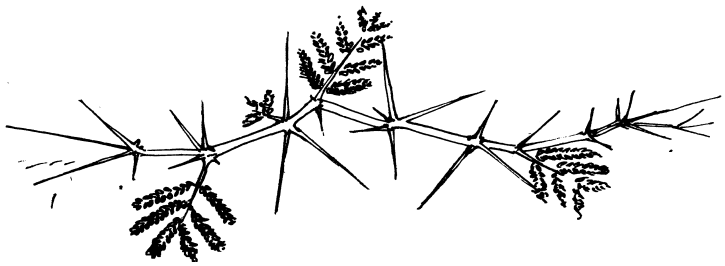
b. Many animals eat fruits and their faeces contain the undigested seeds. The seeds grow where the faeces are dropped.

c. Some seeds stick in different ways to the hair or skin of animals. Walk through an area where grass grows wild (not lawns).

Check your clothes and legs (and *chappals* or shoes and socks) for seeds that got stuck there. How did they cling to you? Pick out these seeds and fruits. Draw them. Show which part of the seed or fruit attached itself to you or your clothes.

Take care!

Be careful not to step on thorns; be alert for snakes, ants etc. which may bite you. Don't walk into thorny plants.



Think! Think!

Plants and animals die, parts of plants like leaves and branches fall off. What happens to all these dead plants?

Know these words

pollination, pollen, stigma, anther, ovary, style, ovule, dispersal

EXERCISES

Interesting questions

1. In the following, fill in the blanks. One is filled out for you.

   More snakes -> fewer rats -> more grain.
   More _____ -> fewer rats -> less plague.
   More _____ -> fewer mosquito larvae -> less malaria.
   More snakes -> fewer frogs -> more _____.
   More bulbuls -> fewer _____ -> more grain.
   Less bees - > less pollination -> fewer _____.
   More people -> more _____ -> less trees.
   Less trees -> fewer bulbuls -> more _____ -> less _____.

   Add similar lines of your own.

2. Suppose two flowers are very far apart. How can pollen from one flower reach the stigma of the other? Can this happen without the help of insects? How?

3. What would happen to leaves if snails and earthworms did not eat them?

4. Name some animals which
   a) drink the blood of other animals
   b) eat grain
   c) eat dead animals
   d) eat wood
   e) eat insects
   f) eat decaying leaves

5. Now what would happen if you used insecticides to kill off all insects?
   If you burned all dead leaves?

6. What did people eat before they started farming?

7. Do all fruits grow from flowers?

8. Do all flowers grow into fruit?

9. What would happen if the pollen from the *karela* falls on the stigma of a papaya flower?

10. Which of these vegetables are fruits, and which ones are not? How do you know?

Bhindi, tomato, potato, brinjal, ginger, beet-root, chilli, *palak,* green peas, radish

Observe and draw

Flowers of as many fruits as you can, like those of *ber*, papaya, mango, *neem*, tamarind, drumstick, tomato, *bhindi.*

Act it out

Pretend to be any animal of your choice. Describe it, then act like it.

a) How does this animal move?
b) Does it make any sound you can hear?
c) Does it build its home? Where, and with what?
d) How does it eat?
e) Does it hunt other animals? How?
f) Is it hunted by any animal? How does it try to escape?

Ask and find out

Are there places near your school or house that had fewer animals and plants than they do now? How did this happen?

Are there places that had **more** animals and plants than they do now? How did this happen?

Play with words

Write a poem on your favourite living thing.

Show and tell

Bring to class and show any baby fruit with part of the flower still attached. You may find such tender vegetables in the market (or garden or field).

Figure it out

1. On page 19 of your WorkBook is a map of Apu's plot. Study the map and answer the questions.

a) Give your answers in metres for the questions below:

How far is the plant with big leaves from the tamarind tree? You can measure from the base of the tree to the base of the plant.

How far is the lizard from the ant?

b) There is a banyan tree 30 m from the shoe flower plant.

Can you show this on the map? If not, what can you change about the map so that you can show the tree on it?

2. A rat's tale

On page 20 of your WorkBook there is a story about a rat.

As you read the story, answer the questions in each box.

Play this game

Ask your friend to choose one of the animals from this list:

Owl, eagle, crow, sparrow, cat, squirrel, mosquito, fly, spider, cobra, lizard, butterfly, frog, fish, cow, horse, sunbird, earthworm, moth.

Your friend will not tell you his or her choice right now.

Ask questions which have 'yes' or 'no' answers to find out what your friend chose.

Q1._____

Ans _____ (yes or no)

So the animal can be one of these -_____

Keep asking questions till you guess what your friend chose. Each time, write down the question, the answer and the list of animals.

Ask a question

Ask a question about any living thing around you. Think of how you would find the answer.

Classroom discussion

From your web, remove any two living things. Will the rest of the living things get affected? Which ones? How?

DID YOU KNOW?

1. A kind of bird called the dodo used to live on the island of Mauritius. This bird could not fly. Dodos were easily hunted by sailors, and dodos' eggs were eaten by rats and dogs which the sailors brought with them.

In 1681, the last dodo was killed; i.e. the dodo became extinct. The dodo ate the fruit

of a tree called Calvaria (also called tambalacoque). The seeds of the tree could sprout and grow into trees only after they passed through the dodo's digestive system. So after the dodo became extinct, no new Calvaria trees could grow on the island. There are only 13 Calvaria trees on the island now, and all are more than 300 years old. Scientists are now trying to make the seeds sprout by making another bird, the turkey, eat it. Some seeds have sprouted, but the plants are still too young to grow fruits of their own.

2. Some plants, like the sundew and the venus fly trap shown here, trap and digest insects.

The sundew flowers are very sticky. When insects land on them, they get stuck and cannot fly away.

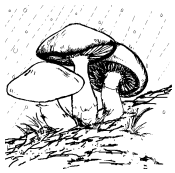
venus fly trap sundew

3. The cheetah became extinct in India about 50 years ago, because people hunted and killed all the cheetahs we had.

4. There are about 9000 kinds of birds in the world. 13% of them (about 1200) are found in India though it occupies less than 2% of land in the world! See how many different kinds of birds you can see in one morning in the area where you live.

CHAPTER **2**

SOIL



The compost pit

The rain had stopped this morning, and the sun was shining. The ground was still a little wet, but Mini and Apu didn't care!
They went to the playground with their new ball.

Mini threw the ball really hard, and Apu had to run very far, almost to the other side of the ground, to catch it. He missed; walking slowly back, out of breath, he noticed a mound of soil on the edge of the field. He went closer, and saw the pit from which the soil had been removed.

"Look, Mini, someone has dug a pit here! It's so deep - I don't think I can touch the bottom...look at how much mud they removed!"

He quickly lay down on the grass on the edge of the pit, and put his hand in. It was so deep, his fingers just touched the bottom.
"Careful Apu! Don't fall into it! And wait there - I am coming too!"

Apu didn't hear a word - he was already looking at all the wonderful things in the pit and in the mound of soil nearby.
''Look Mini!', he said excitedly. 'Look at this big earthworm. Oh, look there's something else moving here."

By now Mini had come running to look too. They saw lots of interesting things - earthworms, millipedes, snail shells, insects and many more...

Just then the gardener came with a heap of leaves and put them in the pit. He then covered it with some of the soil and sprinkled water over it.

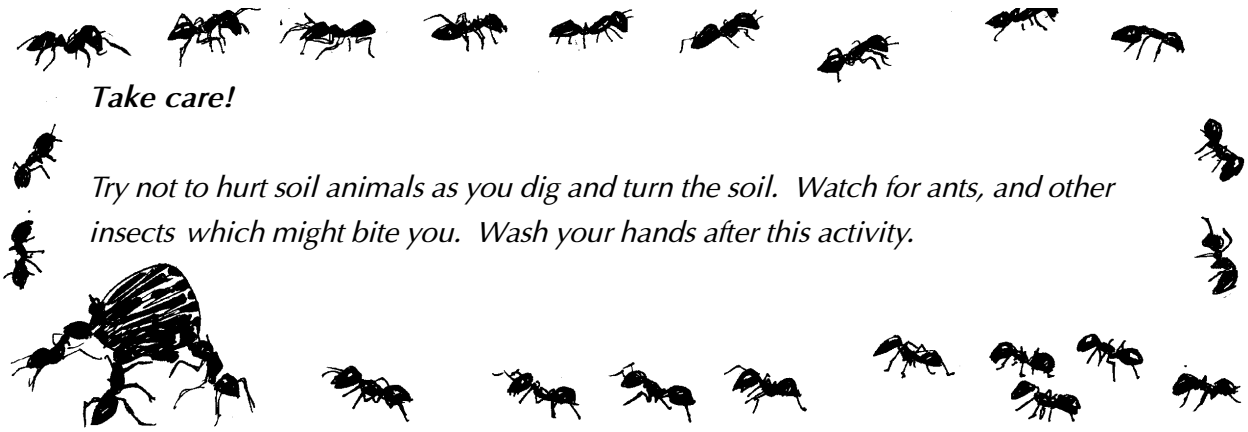
Apu and Mini were full of questions, as usual. 'Who dug the pit?' 'Why?' 'Why are you putting leaves in it?' 'What are you going to do with all the mud that was dug out?'

'I am putting leaves in here, but in just a few weeks I'll have some really nice compost; my plants will grow well in it. You see all these worms? They are going to help me!'

"How?" Apu asked immediately.
"What's compost?" asked Mini.
"You are going to learn all that soon." said the gardener.

1. Living things in the soil

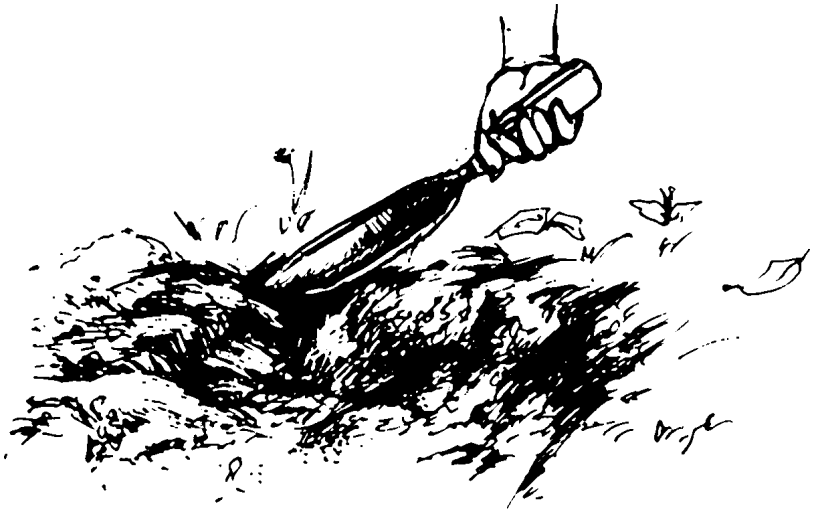
a. Find an area in your school ground where a tree, bush or other plants grow. Carefully examine all that you find there. Mark a square of side of about half a metre Loosen the soil in this square by digging a few centimetres deep.



Take care!

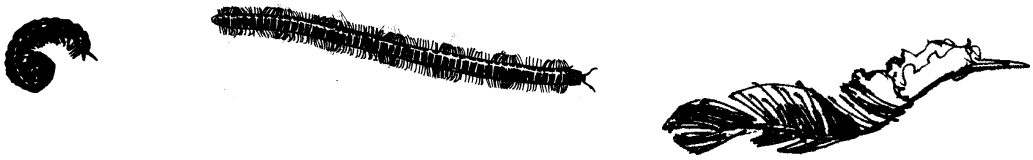
Try not to hurt soil animals as you dig and turn the soil. Watch for ants, and other insects which might bite you. Wash your hands after this activity.

Look for animals, plants and
their parts in the soil.
You may have to turn
the soil a little from
time to time.
If you have a hand lens, you
can see the soil creatures better.



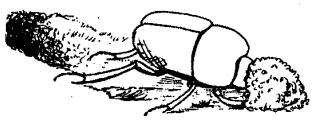
Draw them and write their descriptions on pages 24 and 25 of your WorkBook.

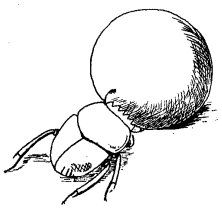
Write their names if you know them (in any language).



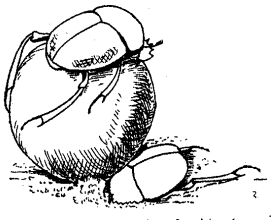
Write down anything interesting you observed about these animals and how they behaved. Did any of them curl up and lie still when disturbed? Was any of them carrying anything?
Many animals, like beetles, earthworms, millipedes and mites live in the soil - eat things found there, leave their faeces there, and lay their eggs in the soil.

Dung beetle
digging a hole



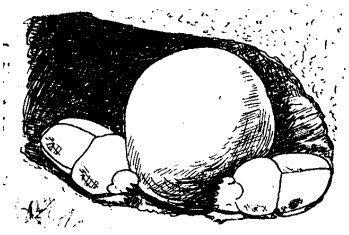


rolling a
dung ball



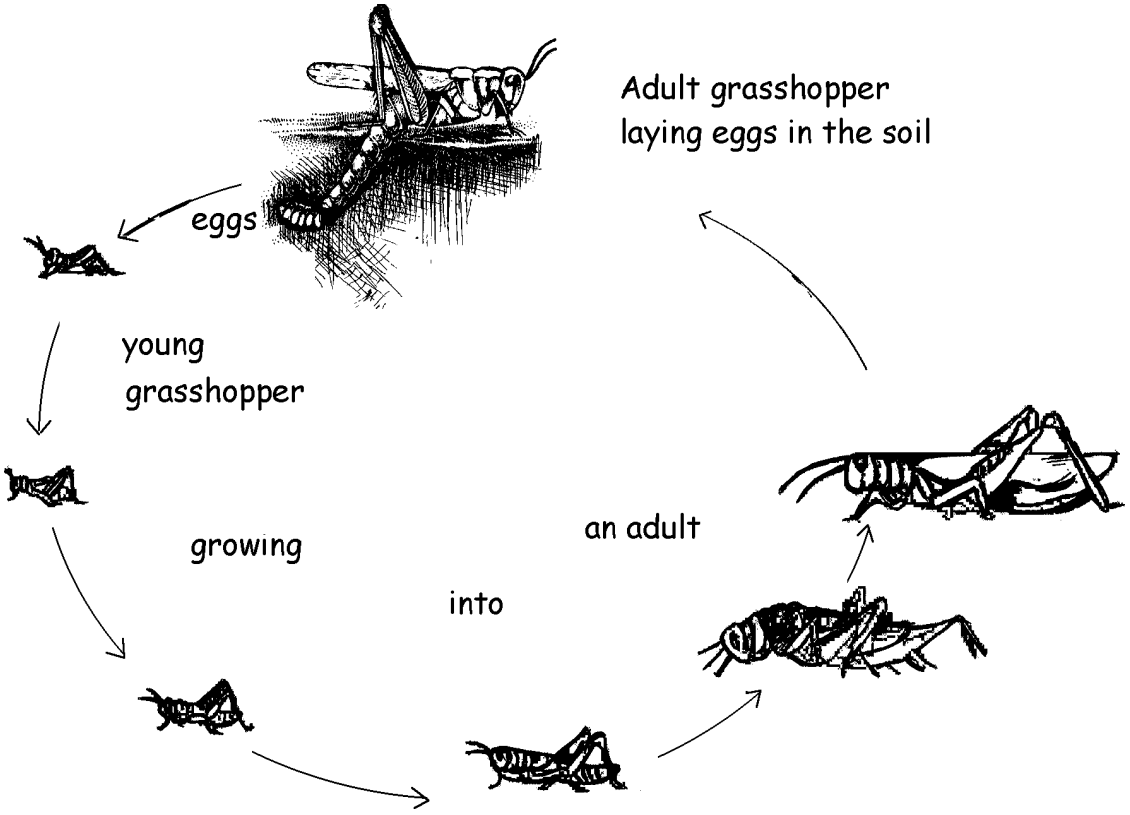
pushing the
dung ball into
the hole

lays eggs
inside the
dung ball



Eggs will hatch
into larvae
which eat the
dung

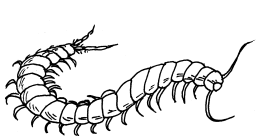
Some build their homes in the soil - guess which ones!
Some animals, like crickets and grasshoppers, some bees and wasps don't live in the soil, but lay their eggs in the soil.
When larvae hatch from the eggs, they too live and eat in the soil.



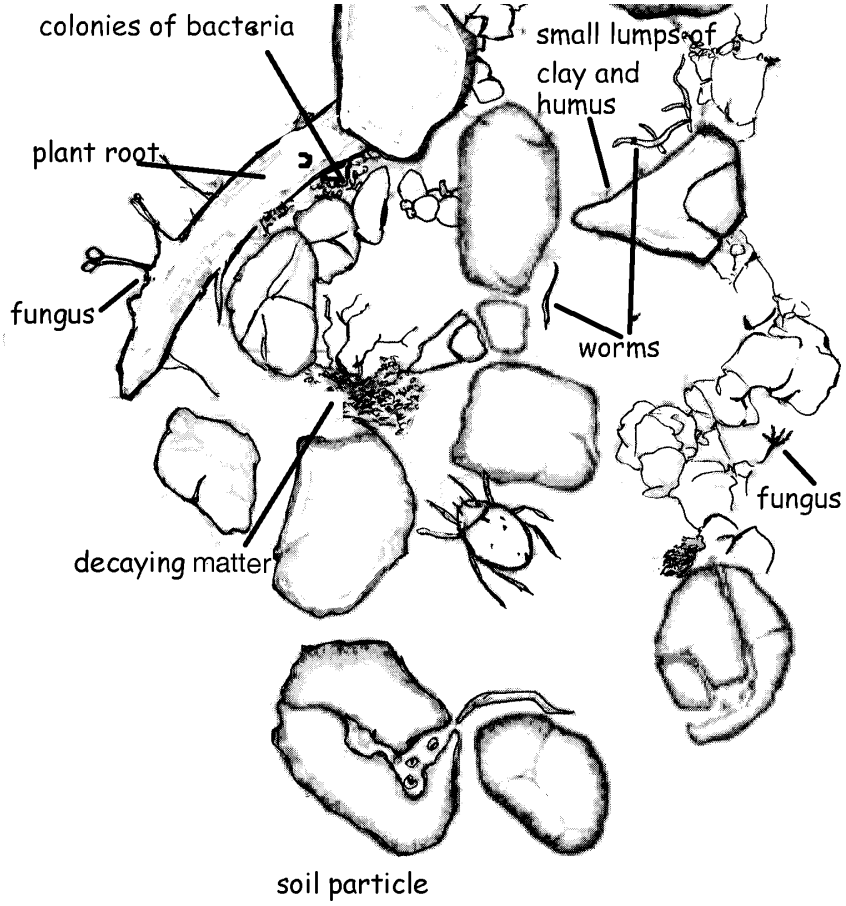
Many of the soil animals eat the dead and decaying plant and animal parts.
For example, earthworms eat decayed leaves along with mud.

Faeces of earthworms are rich in **nutrients** that plants need.

Some animals, like the centipede, hunt other animals in the soil.



The soil also has microbes, millions of them, of many kinds, which you can only see under a microscope. Many of these microbes - bacteria and fungi - live on the roots of plants. The food of many microbes is the dead and decaying parts of plants and animals and the faeces of animals.



The mushrooms which you see on the ground are parts of some kinds of fungi. Their other parts, which look like threads, are in the soil.

b. Last year you had buried banana peels in the soil. What happened to them? Could you recognise the peels after a week? After many weeks? In what ways did they change?

Collect some leaves which have fallen on the ground. They should all be of the same plant and of roughly the same size. Collect some fresh ones and some decaying ones. See which of you collects the most decayed leaf.
Arrange the leaves from the freshest to the most decayed one. Guess how it would look when even more decayed - draw it. How are the first and last leaf different?

Take two of the most decayed leaves; place one in the soil in the ground or a flower pot, where it is always moist. Keep the other in a dry place. After a few days see how the two leaves changed.

Think! Think!

What happens to the leaves which fall in dry weather and dry up?

The dead plant and animal parts keep decaying, and turn into dark lumps. You cannot recognise which plant or animal part it was. This dark, decayed matter is called **humus**. Humus also contains faeces of earthworms and other animals in the soil.

Plants grow well in soil which has humus.
Soil rich in humus is called **compost.**
When humus decays even more, the **minerals** from it, like potassium, magnesium, calcium etc. mix with the soil. These minerals are some of the nutrients that plants need.

The roots of plants take the minerals in along with water.
Our bodies too need minerals like iron, calcium, potassium, zinc, magnesium and many others.

Think! Think!

From where do we get the minerals our bodies need?

Write your answer in the oval on page 27 of your WorkBook. Now think - from where did **this** get minerals? Keep asking this question and answering it as many times as you can.

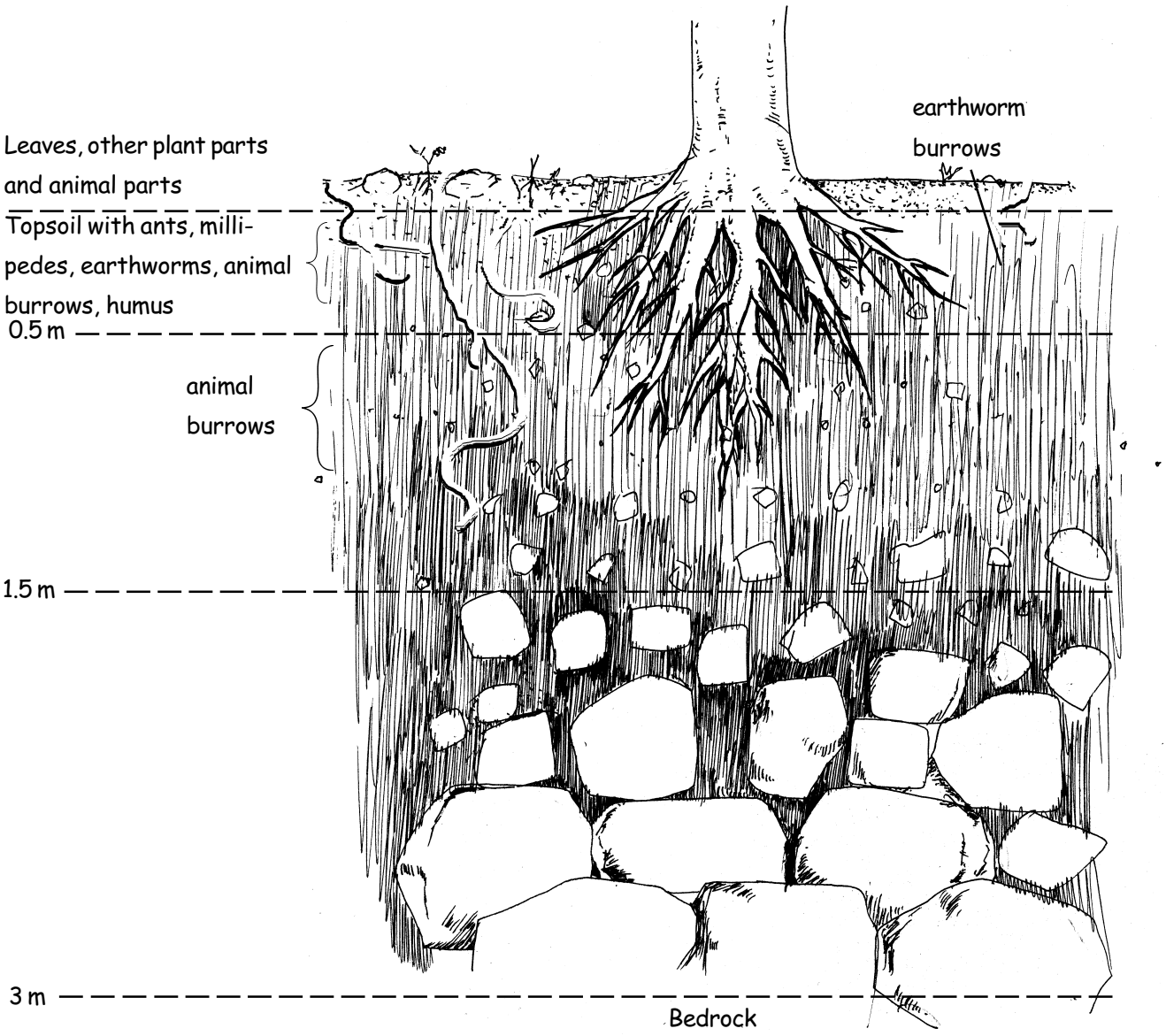
Think! Think!

Leaves fall on the ground. After some time, you don't see these leaves, even decayed ones, on the ground. Where do they go? How do they get mixed with the soil?

c. Earthworms make burrows in the soil. As they burrow, they mix the dead and decaying things from the surface into the soil.

Make a guess -
which other animals might mix the dead parts
of plants and animals from the surface into the soil?

Soil animals live in the soil at different depths. If you dig deep into the soil here is what you might find at different depths.



How deep have the roots of this tree grown into the soil?
How deep are the earthworm burrows? How deep do you find ants, snails?

If you keep digging the soil you may find small rocks, then bigger rocks in the soil. If you dig deeper, you will find only rock, no soil. This layer of rock under the soil is called **bedrock**. In some places bedrock may be only one or two metres deep, in other places more than 100 or 200 metres deep. Different places have different kinds of rock as bedrock.

2. Other things that make up soil

a. Collect a handful of soil from 3 different places.
Pack them separately and bring them to school.
Write about the soil you collected on page 28 of your WorkBook. For this activity you will need a dropper, a tea strainer, some water, a container like a bottle cap for measuring small amounts of soil, a larger plastic or metal container, old newspapers. Spread the newspapers on the desk to keep it from getting dirty.

Sift 3 capfuls of the soil through a tea strainer or a wire mesh. Look closely at what fell through the strainer - which soil had the largest, and which the smallest, particles?
Take a capful of soil and add water to it drop by drop. Keep adding drops of water until the water starts to flow out.
How many drops of water could it absorb (i.e. how many drops added before the water starts to separate from the soil)?

b. Look at the picture of soil on page 22. What is there in the gaps between the soil particles, where no microbes or animals are shown?

Take two cups or glasses which are alike. Put equal amounts of the same kind of soil in each. Press the soil down in one of the glasses.
You can press it down with the other glass.

Now add water to the glasses gently. Add enough water to completely cover the soil. Look carefully at the water - count the bubbles that come up in it.

Which glass had more bubbles? Where did the air in the bubbles come from?

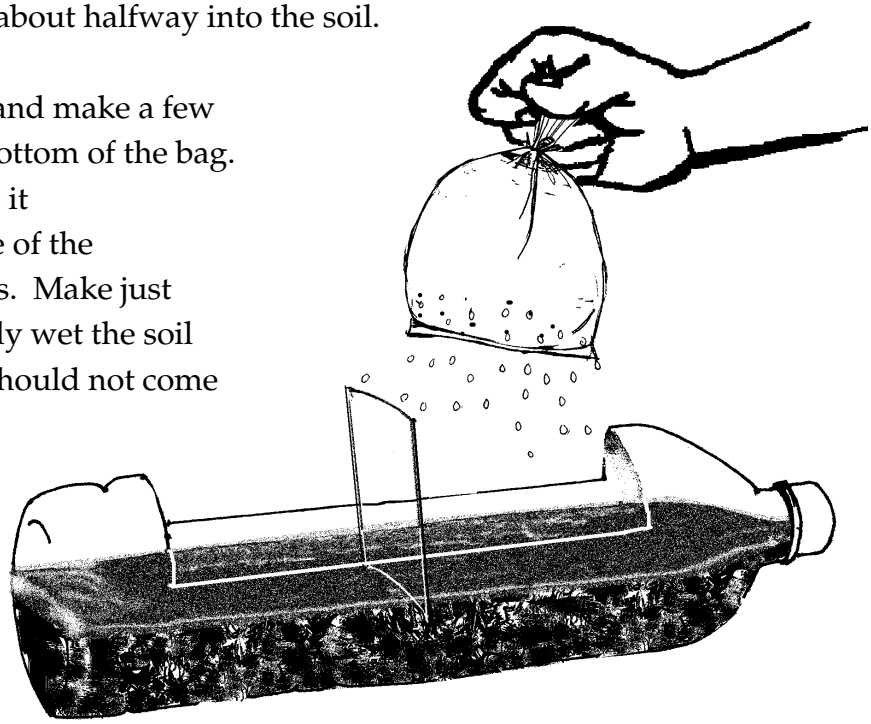
Plant roots breathe. They need air.
Other living things in the soil too need air.
When earthworms and other animals burrow or dig, they loosen the soil.
Which soil has more air - packed or loose? Why?

c. Take a large plastic bottle and lay it on its side. Keep the mouth of the bottle closed. Cut out a rectangle from the cylindrical part of the bottle as shown. Spread a layer of

small stones on the bottom of the bottle. Cover with fine soil until about half the bottle is filled.

Pack the soil down by pressing with your hand or some flat object. Take the piece of rectangle which you cut out. Put it back in the bottle vertically, as shown. Do not push it all the way down, just about halfway into the soil.

Take a small plastic bag and make a few holes with a pin in the bottom of the bag. Fill it with water and use it to make 'rain' on the side of the bottle where the mouth is. Make just enough rain to thoroughly wet the soil on this side. The water should not come up above the soil.



Watch the soil on both sides of the divider in the bottle. Make a drawing of your bottle. Show where the soil is. In your drawing show which part was wet after 5 minutes, then 10 minutes. Did water get to the other side of the plastic divider as well?

On the side on which water was not poured, dig a little 'well' by pressing the back of a pencil into the soil. Did you see water fill part of the well? If not, dig deeper.

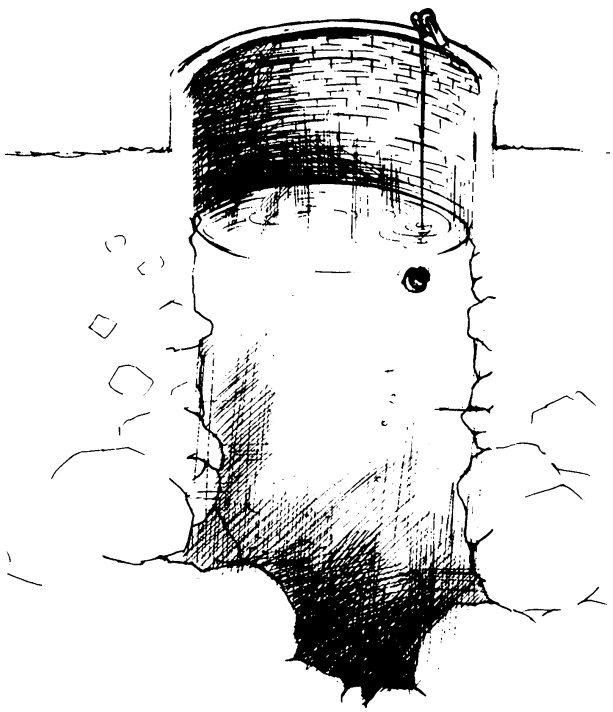
Add more water on the other side. When you added more water, did the level of water change?

Did the soil just above the water in the well get wet? Did the surface of the soil get wet on that side? How did water get into the well?
Open the bottle and tilt it slightly by putting a folded paper at its base end. Now make more rain on the same side as before. Did any water flow off from the surface? Was it clear water or did soil flow off too?

Did the water level in the well rise? Without changing the tilt of the bottle, can you do anything to stop the water from flowing off? Try your ideas. Did the water level in the well change when you stopped the water from flowing off?

When it rains, the soil soaks up some of the water. Some water just flows off on the surface, along with some soil, into streams, rivers and seas. Water soaked up by soil goes deep into the ground. Some kinds of bedrock too can soak up water - they are **porous.**

Even if the bedrock is not porous, it may have cracks and gaps in it. Water enters these cracks. If at the bottom there is rock in which water cannot enter, it starts to collect underground. This water is called **groundwater.**



Groundwater too flows slowly underground. The water in many streams and rivers comes from this flow. Groundwater from very far away may be flowing into the stream or river.

Suppose you use up the water in the well, and it doesn't rain for a long time.

What would happen to the level of water in the well? Can the water level in the well go down even if it rains? How?

Are there ways you can keep the rainwater from flowing off, and make it enter the ground? Give some ideas.

Think! Think!

Sheela thinks groundwater is like a lake or river of clear water underground. What do you think? How will you convince her that it is not a clear lake or river?

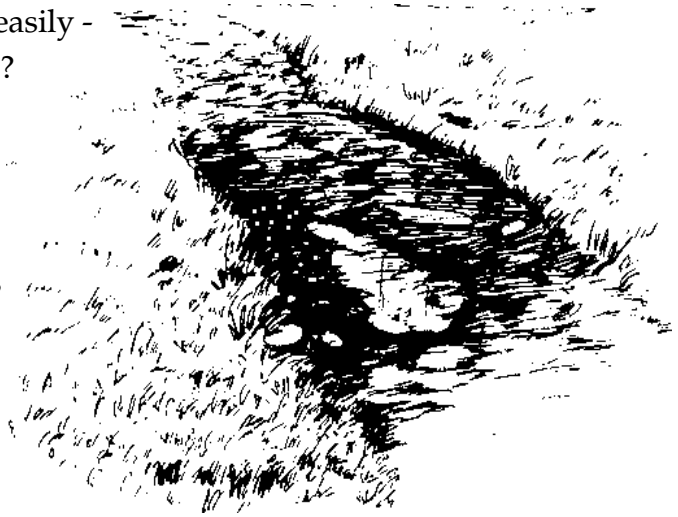
d. Top layers of the soil are rich in humus. Plants depend on it. If rains keep carrying off soil year after year from some place, plants cannot grow well there.

Cut out a small clod of a grassy patch of ground,
a square of side 10 cm.
Get a similar piece of bare ground.

Keep each in a large container - a *thali*, a bucket,
an old tray or something similar which can hold water.

Take a little water in a glass, and pour it slowly on the grassy clod.

Look at the water that flowed out in the tray. Pour the same amount of water slowly on the bare clod. Look at the water in the tray.
Which tray had more water? In which tray was the water muddier? Why?
From which place can soil flow off more easily - bare ground, or where many plants grow?



When it rains and the ground is wet,
walk on grass and on bare ground -
which is more slippery?
Did some of the mud slip as you walked?
On which path did this happen? Why?

e. In most places where there are farms,
fertilizers and pesticides are used.
These get into the soil. Can they get into the groundwater too? How?

Plastic in the ground decomposes slowly. Some chemicals in the plastic are poisonous. When they mix with the soil they get into the water.

When wastes from factories are dumped in the ground, harmful things in them can enter the groundwater.
Plants can take up such harmful things from the soil. They can cause harm to the animals who get their food from these plants.

Know these words

nutrients, minerals, humus, compost, burrow, bedrock, groundwater

EXERCISES

What's the same? What's different?

Have you travelled to a city or town far from where you live? Was the soil there different in any way?

In what way or ways can they be alike?

In what way or ways can they be different?

Interesting questions

1. Name some things which make up soil. Which of these are living things, which are not?
2. In which of these places do you think soil has more air?

On a path where people walk, and the soil is packed tight, or in a ploughed field?

3. Where would most plants grow better - in packed clay or loose soil? Why?
4. Name 3 things which are porous.
5. Does it have to rain into a well for the water in the well to rise?
6. Does water in different villages and towns taste different?

Why do you think this is so?

7. No one waters large trees in the forests or by the roadside, yet they don't dry up even in the dry season. How do they get water?
8. In which of these climates will leaves decay the fastest?

Cold and dry, Hot and dry,

Hot and humid, Cold and humid

9. Where else have you seen the word 'minerals'? Are some of them the same as the minerals which plants, our bodies and other animals need?

Complete the cycle

Look at the picture on page 34 of your WorkBook. 3 things which can happen to the rainwater that falls on land are shown. Choose any of these as a starting point. Think of what happens to the water after that, then after that...and so on till it falls back as rain. Can this water rain somewhere else, or will it rain right back here?

Classroom discussion

In what ways is it useful to make compost pits?

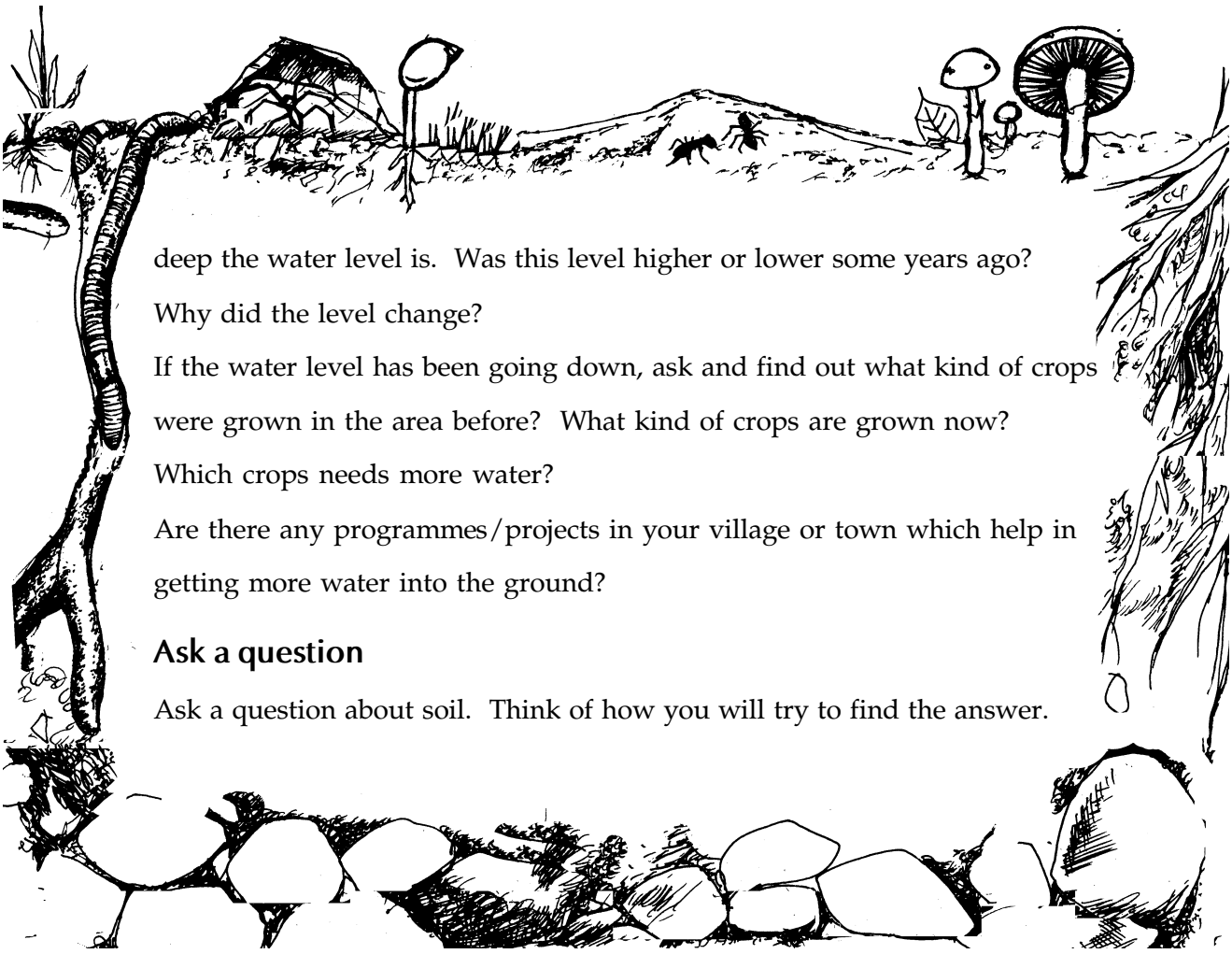
Which of these things would you put in it - glass bottles, vegetable peels, leaves, newspaper, spoilt food, plastic bags, fruit seeds? If you don't put them in the compost pit, where do you throw them? What happens to them after you throw them away?

Are there any difficulties in making compost pits where you live? Are there ways to solve them?

Start a compost pit in your school or near your house. Tell your class about this pit.

Ask and find out

Is there a well or borewell near your school or house? Ask and find out how deep (how many metres) they had to dig or drill to hit rock. Find out how



deep the water level is. Was this level higher or lower some years ago?

Why did the level change?

If the water level has been going down, ask and find out what kind of crops were grown in the area before? What kind of crops are grown now?

Which crops needs more water?

Are there any programmes/projects in your village or town which help in getting more water into the ground?

Ask a question

Ask a question about soil. Think of how you will try to find the answer.

DID YOU KNOW

1. Air in soil has less oxygen and more carbon dioxide than in the atmosphere.

2. About 5000 kinds of bacteria have been named and described. Experts think that there are many more kinds in the world - 50,000 may be even 3 million (one million = 10,00,000). 69,000 kinds of fungi are described but there may be 1.5 million kinds of fungi. One gram of soil from near roots can contain a billion (1000 million) bacteria of many different types.

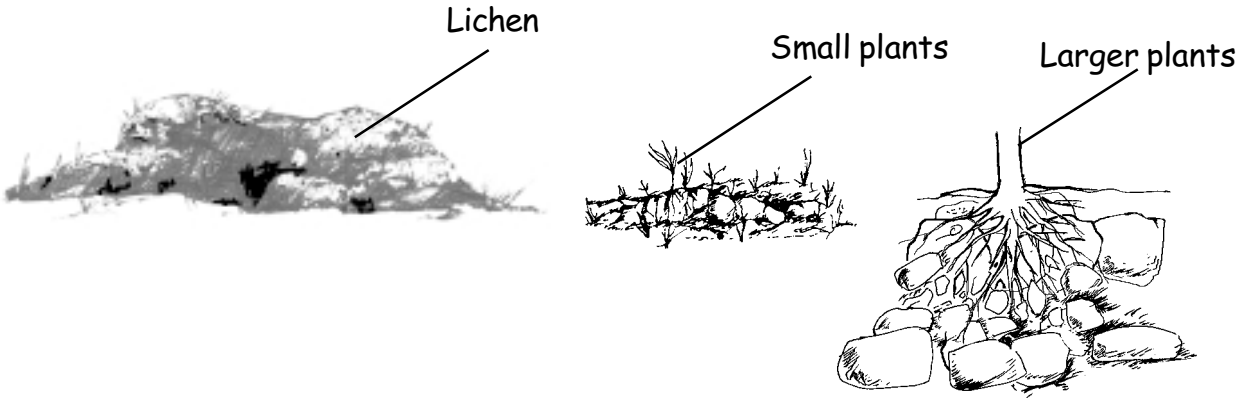
3. An earthworm can ingest up to 36 times its own weight of soil each day!

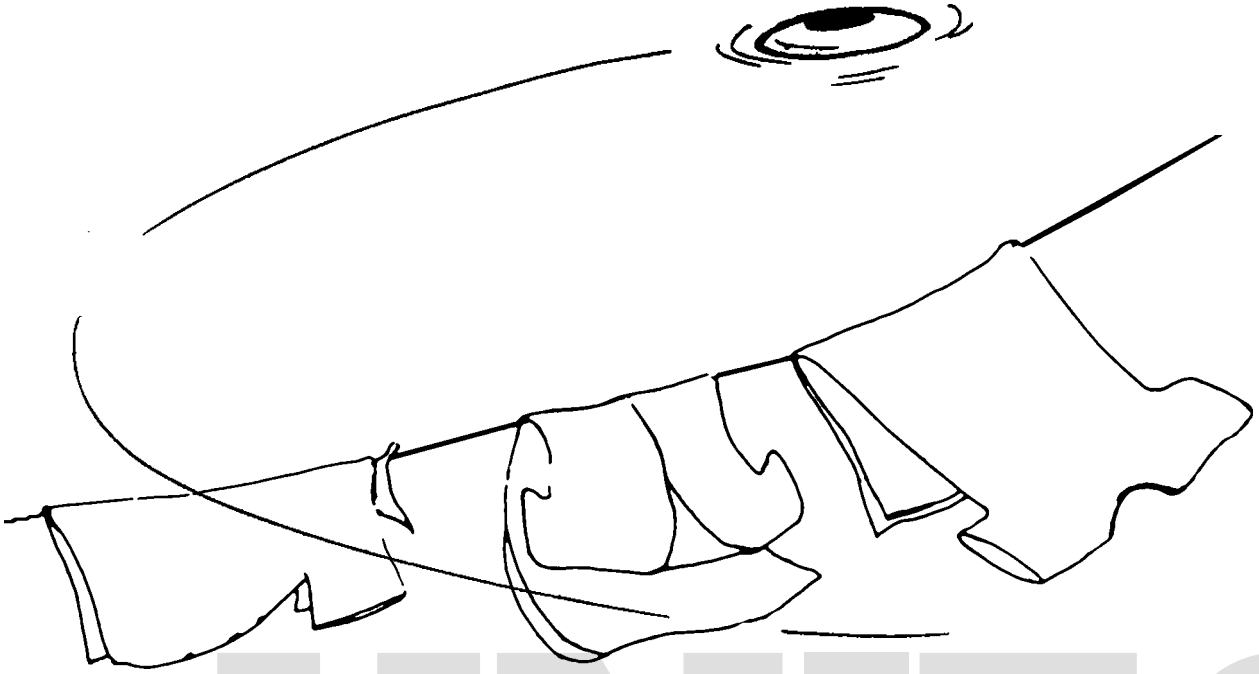
4. Soil forms from bedrock. The bedrock which is now covered by soil was once the

ground surface. First lichens - which are groups of fungi and small plants called algae - grow on the rock. They break up the surface of the bedrock into small grains of soil. Larger plants can grow in the layer of soil formed on the top. Their roots break more of the rock. The rock keeps breaking as more and more plants grow.

Some chemicals from humus also change the surface of the rocks and grains.

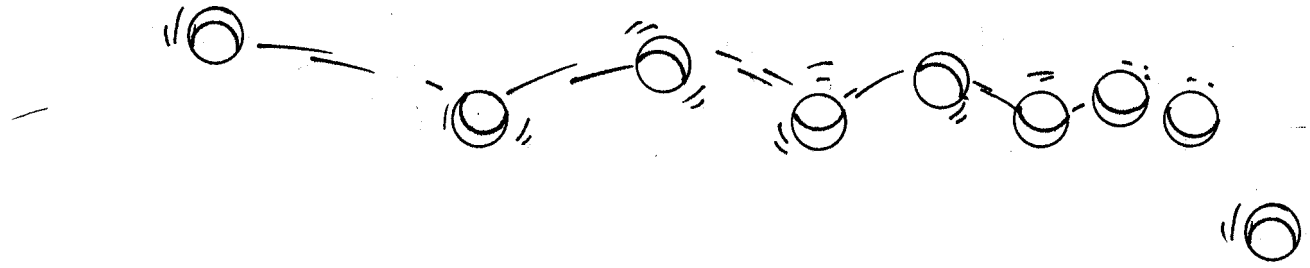
Creating a few centimetres of new topsoil from bedrock can take many hundreds of years - sometimes even a thousand years.

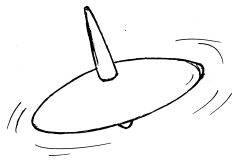




UNIT 2

MOVING THINGS





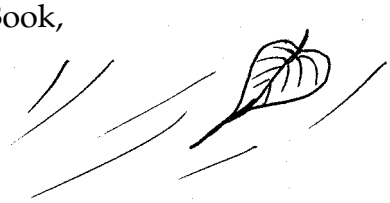
CHAPTER **3**

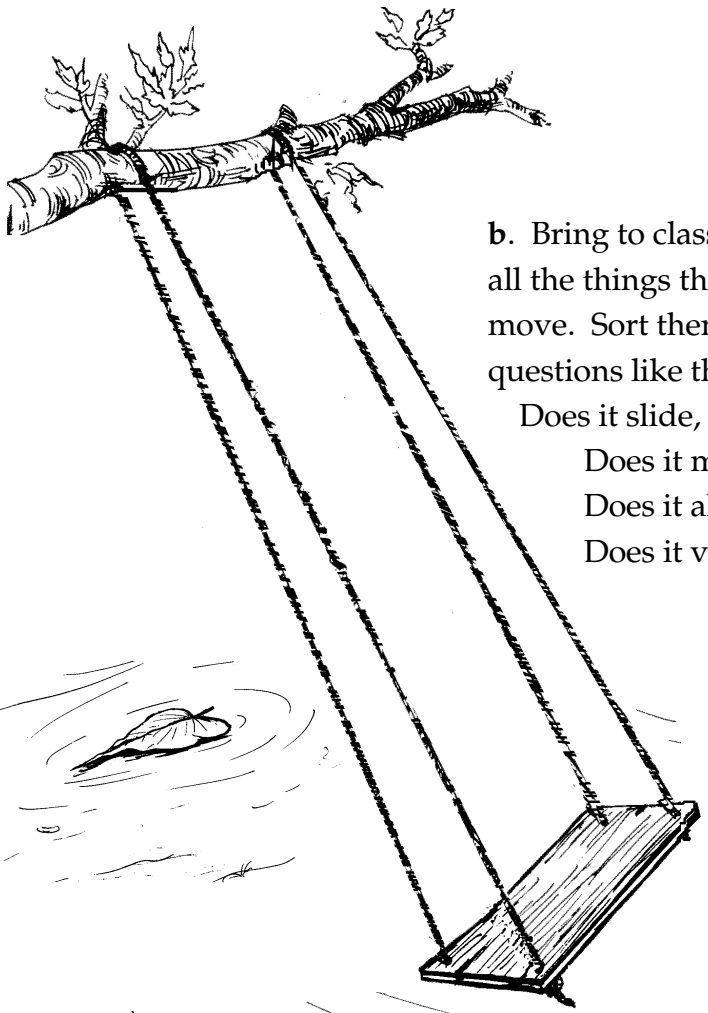
HOW THINGS MOVE

Describing movement

1. Different kinds of movement

a. Think of some things that move. On page 39 of your WorkBook list some words and phrases which describe how these things move. You may choose from the words or phrases given in your WorkBook, or use your own.





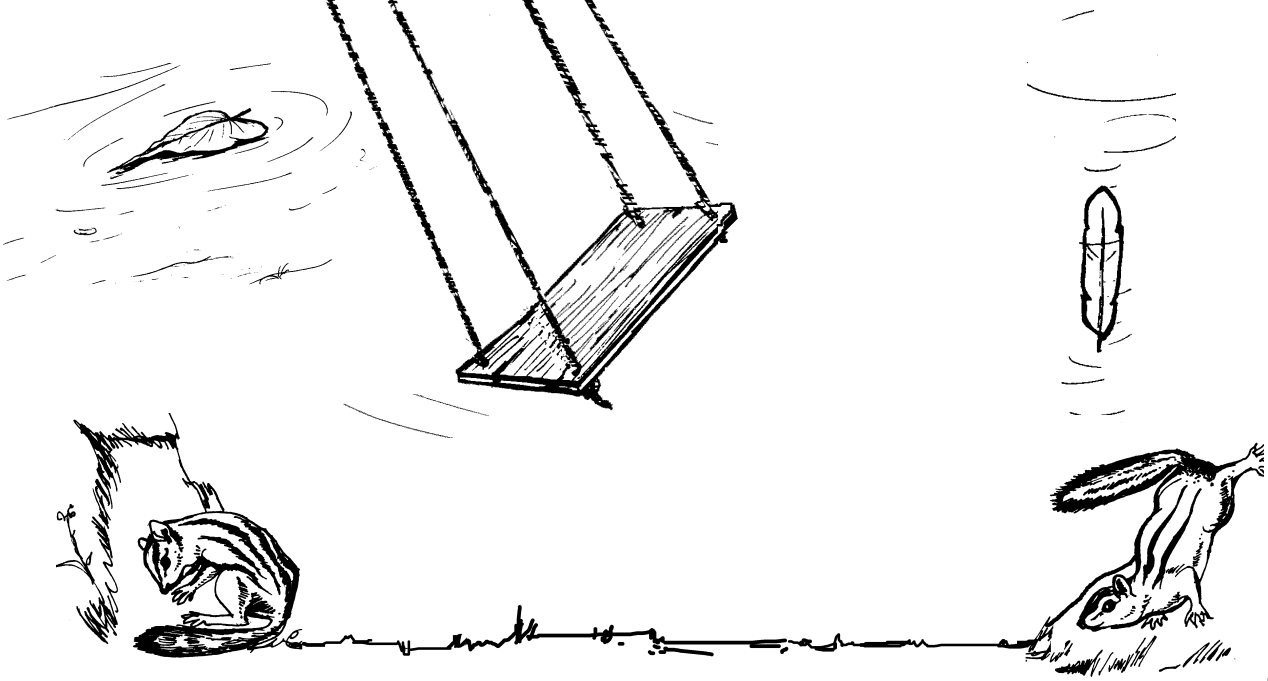
b. Bring to class some things that can move. Look at all the things that everyone brought. Watch how they move. Sort them into different groups by asking questions like these:

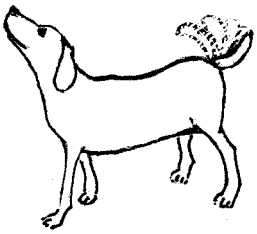
Does it slide, roll, spin, or move in some other way?

Does it move in a straight line or in a curve?

Does it also move up and down?

Does it vibrate?

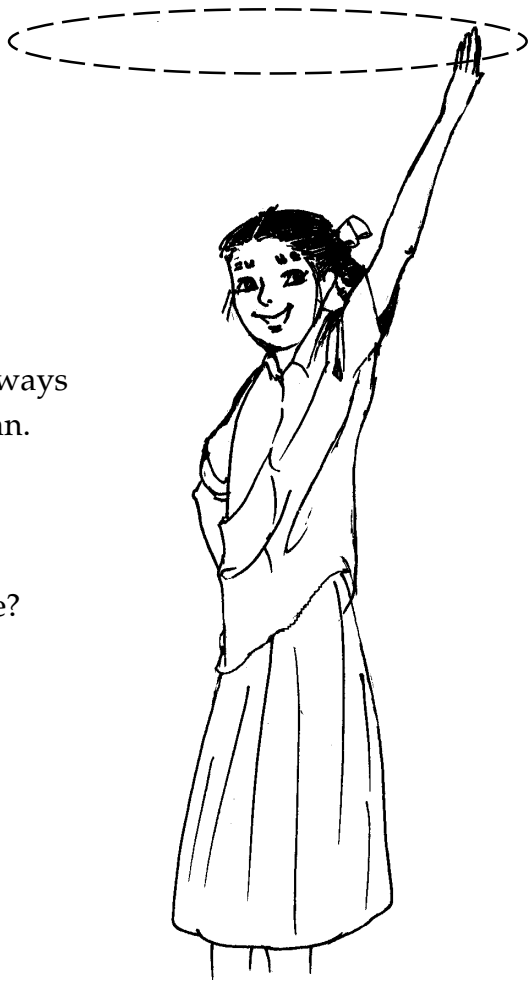




Give a name to each group. On page 40 of your WorkBook, write the names of the groups. For each group, write the names of things which you put in this group.

Think! Think!

Name some things which move but at the same time, remain in the same place.



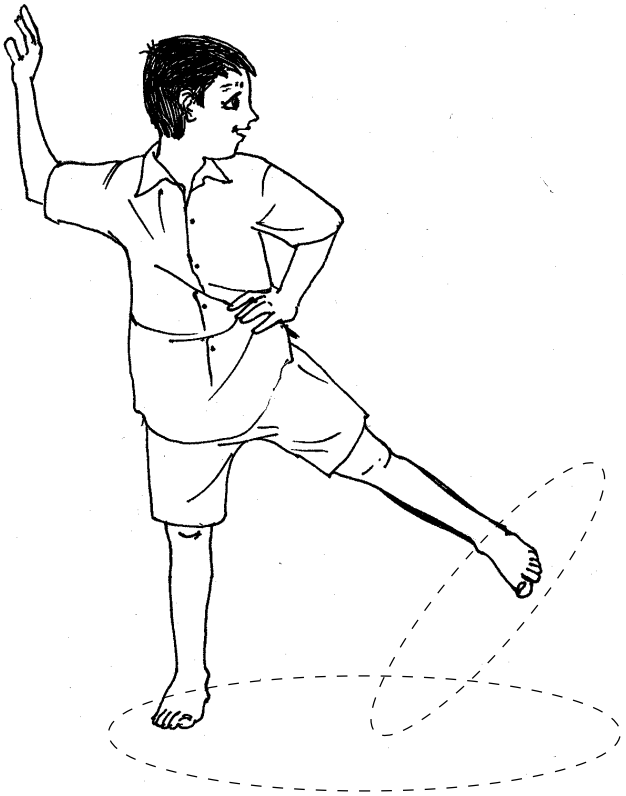
2. Movements of your body

a. Move your arm (from the shoulder) in as many ways as you can. Make as many different circles as you can.

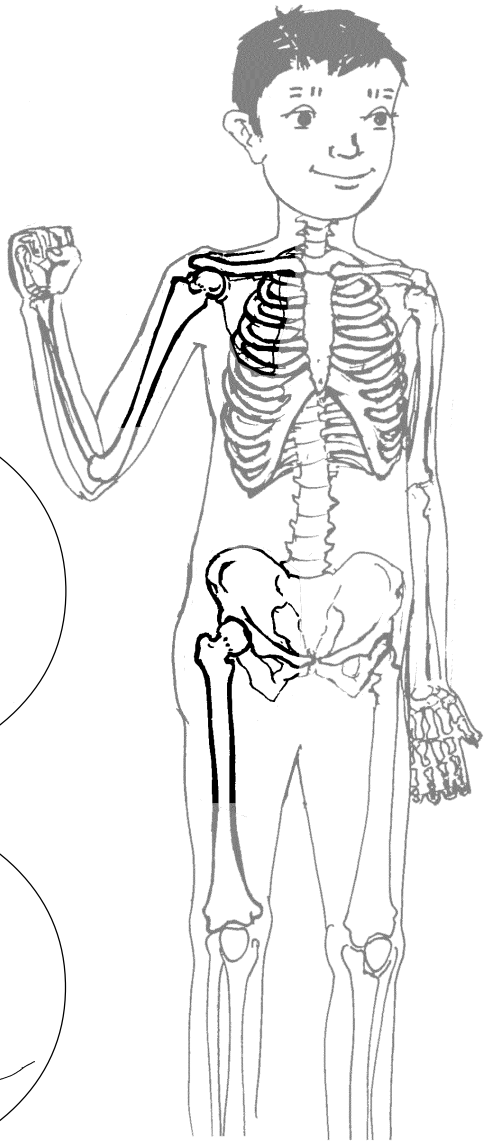
How many different vertical circles can you make?

How many different horizontal circles can you make?

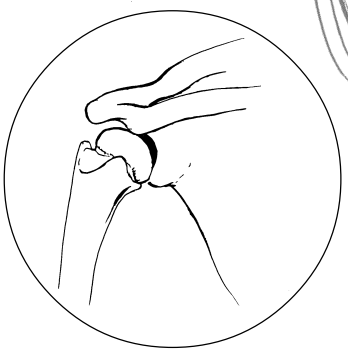
b. Try to move your leg from the hip in the same way you moved your arm.

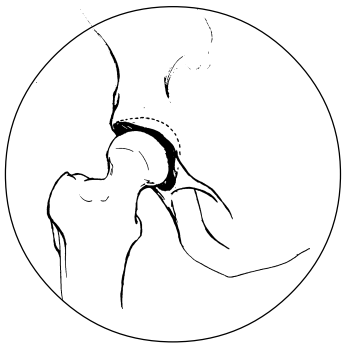


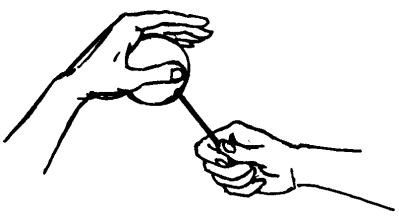
Can you move your leg (from the hip) in the same way? In which ways can you move your arm but not your leg? In which ways can you move your leg but not your arm?



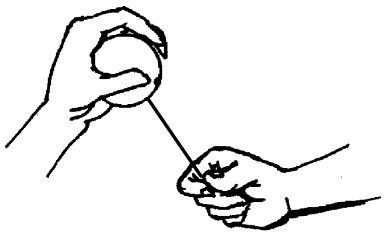
c. This is how the shoulder and hip joints are - they are called ball and socket joints.







shallow cup



deep cup

Take something round like a ball or *mosambi* or orange. Attach a stick firmly to it. Cup one palm - fit the ball in it. Now hold the stick and turn the ball. If you make the cup of your palm shallow, does the ball turn more or less? If you hold the ball more loosely, does it move more or less?

Make a guess - which socket is deeper, the shoulder or the hip? Why do you think so?

d. Describe the ways in which you can move

i) your head
ii) your arm at the elbow
iii) your leg at the knee

Do you think the elbow and knee joints are ball and socket joints too? Why do you think so?

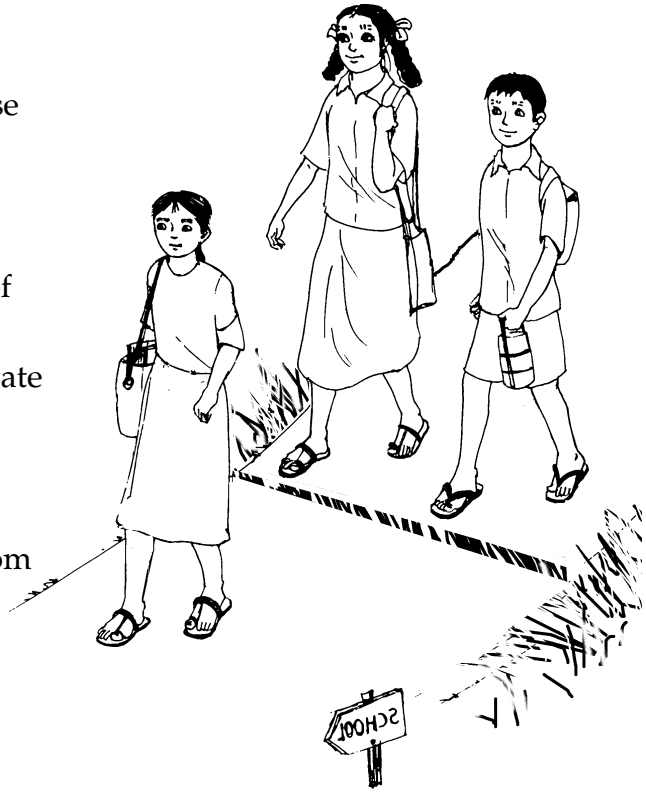
3. Slow or fast?

For this activity make your own 'measuring string' - on a long string make marks at every metre by tying knots or marking with a pen.
Now in the open ground mark out a race track and measure its length with your measuring string.

a. Hold a running race - run on the track with your friend, have the rest of the group measure the time by counting tik-tik 1, tik-tik 2.
Which of you needed more time to run from one end of the track to the other?
Who ran faster?

b. Now hold the race again. As you start the race, have your friends count tik-tik 1, tik-tik 2 .....till tik-tik 10. This time, each of you run for only 10 seconds. In 10 seconds, who ran more distance? Who ran faster?

c. Look at the picture on page 43 of your WorkBook. Read the story and answer these questions:



i) Mini and Apu are walking to school together. Asma and her mother are ahead of them, much closer to the gate. They all hear the first bell; and they all have to be at the gate just before the second bell rings. Mini, Apu and Asma start running.

Who is closer to the gate? Who is farther from the gate?
Who has to run more distance?
They all reach the gate at the same time.
Who ran slower?

ii) The next day, the first bell rings just as Asma reaches the gate. She doesn't have to run at all. But Mini and Apu, walking together, are far from the gate. They both start running. Mini reaches the gate 30 seconds before Apu.

Did Mini and Apu have to run the same distance? Who reached first?
Who took more time? Who ran faster?

d. Look at the picture on page 44 of your WorkBook and answer these questions.
In this picture, what is the distance between the palm tree and the flagpole?
Between the flagpole and the lamp post?
Between the bus stop and the tower?

i) A bus comes down the road. It takes 10 seconds to go from the palm tree to the flag-pole. It keeps moving at the same speed (it does not speed up or slow down) along the road.

Where will the bus be exactly 10 seconds after it crosses the flagpole? Draw the bus there and write 1a next to your drawing.
In your WorkBook, draw the bus where it will be exactly 20 and 30 seconds after it crosses the flagpole.

Write '1b'(for 20 seconds) next to your drawing and '1c' (for 30 seconds) next to your drawing.

ii) Another bus (bus no. 2) comes along. This bus also takes 10 seconds to go from the palm tree to the flagpole.

If the second bus has to be at the lamp post in less than 10 seconds after it crosses the flagpole, what should it do? (Speed up? Slow down? Do nothing?) Why?

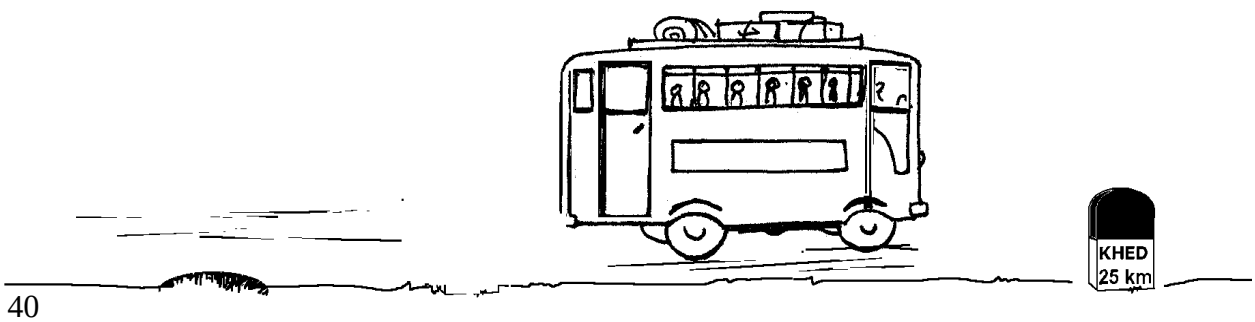
iii) One more bus comes along (a lot of buses today!) This bus (bus no. 3) too takes 10 seconds to go from the palm tree to the flagpole. But, when it reaches the flagpole, it starts going faster.

Draw where this bus can be 10 seconds after it crosses the flagpole. Write '3a' next to your drawing of this bus.

iv) If, instead of speeding up, the bus slows down at the flagpole, where can it be exactly 10 seconds after it crosses the flagpole?

v) Remember, the first bus travelled 100 metres in 10 seconds. How many metres did it travel in 1 sec?
Write your answer as _____ metres per second. This is the speed of the bus.

vi) Find out the speed of any bus or train or any other vehicle by which you travel.



Making things move, making them stop

4. How to slow things down and make them stop

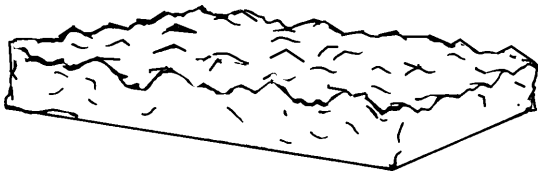
a. Take an object with at least one flat surface, like a wooden duster. Place it on the table or floor with the flat surface down, and give a gentle push. How far did it move before it stopped?

Think! Think!
What made it stop?

b. Friction slows things down

i) When magnified many times, this is what the surface of a duster or table looks like

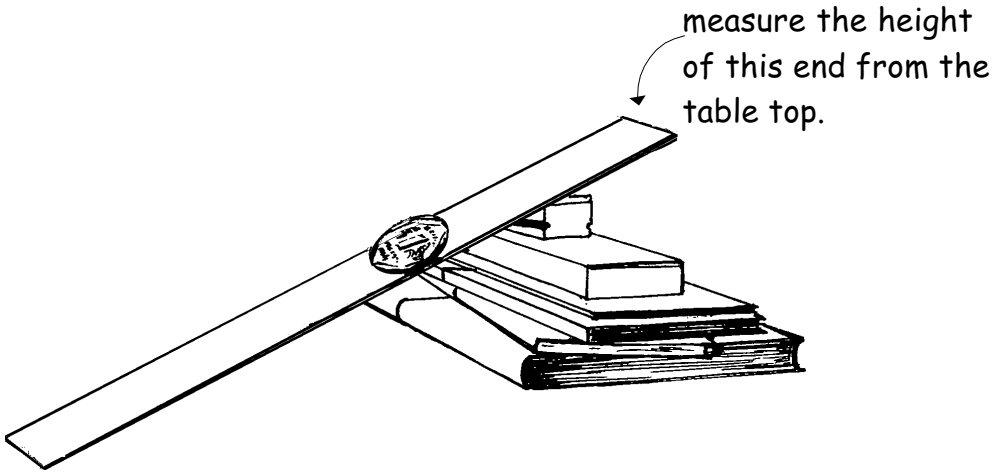
wood surface



Even surfaces that look very smooth, like glass, actually have tiny bumps and ridges. This is how the surface of a smooth sheet of glass looks when magnified many times.

When you try to slide a duster, coin or any other object on the table, the bumps hit against each other, get stuck, and make it difficult for it to slide.

ii) Take a ruler and a coin. Feel the flat side of the ruler with your finger. How smooth or rough is the surface?
Put the ruler on the table. The flat side of the ruler should be facing up. Lift one end of the ruler to a height of about 5 cms. Place a coin near this end.
Now keep increasing the height of this end until the coin just starts to slide down the ruler. Place some things like books and boxes under the ruler's end to keep it at this tilt. Without changing the tilt of the ruler, place a few other objects, like erasers, sharpeners (which have at least one flat surface) on the ruler. The flat surface should touch the ruler.
Which of these could slide easily? Which ones did not slide at all?
Between which object and the ruler was friction the least?



iii) Now remove the coin, and dust talcum powder on the ruler. Keep the tilt of the ruler as before. Spread the powder lightly with your finger. Put the coin back at the top end.
Describe how the coin moved now.
Place the other objects again on the ruler. Which of these could slide now?

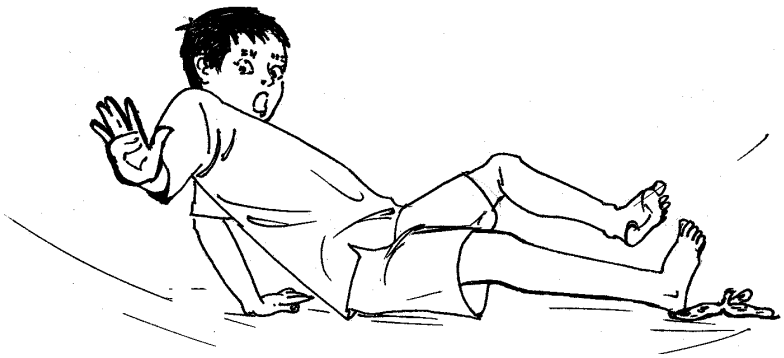
Feel the surface of the ruler now, with the powder on it. How did it feel?

iv) Repeat (ii) and (iii) with a ruler made of some other material (wooden, plastic, metal). Always keep the ruler at the same tilt as the first time.

Did anything slide down one kind of ruler but not down the other?

Think! Think!
Why did putting talcum powder make the coin slide easily?

Is sliding easy on a soapy surface? Why? Where have you experienced this?



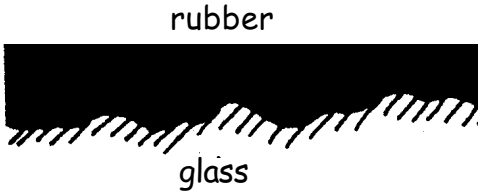
c. Things made of rubber

Even when an object made of rubber has a smooth surface, the friction between that object and any surface is very large.

Press your eraser, made of rubber, with your finger. What happened to the eraser?

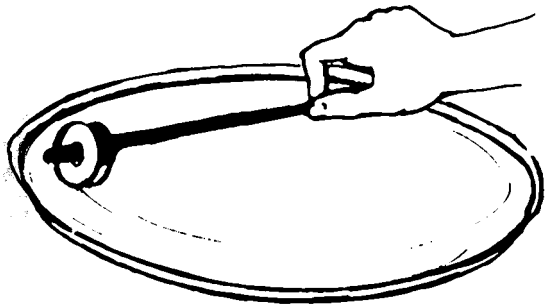
Rubber changes shape easily. When an object made of rubber is placed on any surface, the bottom surface changes shape, because of the rubber's weight. That makes sliding things made of rubber on any surface harder - there is more friction.

Think of things which are made of rubber - do you need to have more friction in these places? Why?



d. Friction and rolling:

i) Take a large plate or *thali* with a smooth, flat bottom. Take a thread reel, bobbin, or a plastic bottle cap with a hole in it, or a wheel from a toy car. Put a small stick, like a refill or pen, through the hole, and roll it on the *thali*. Watch closely how it rolls.



Now spread some soap solution evenly on the *thali* - it should feel slippery. Guess how these objects will move on the plate now. Now roll them again, like you did on the dry *thali*.

For each object, answer these questions in the last column on page 49 of your WorkBook. Was anything different in the way it moved now? Did it roll or slide? Or slip?

Was the friction between the plate and the things you rolled more or less after spreading soap water on the plate?

Why do you think so?

ii) Look at new tyres of bicycles or other vehicles.

Are they smooth or treaded?

Why do you think they have to be made that way?

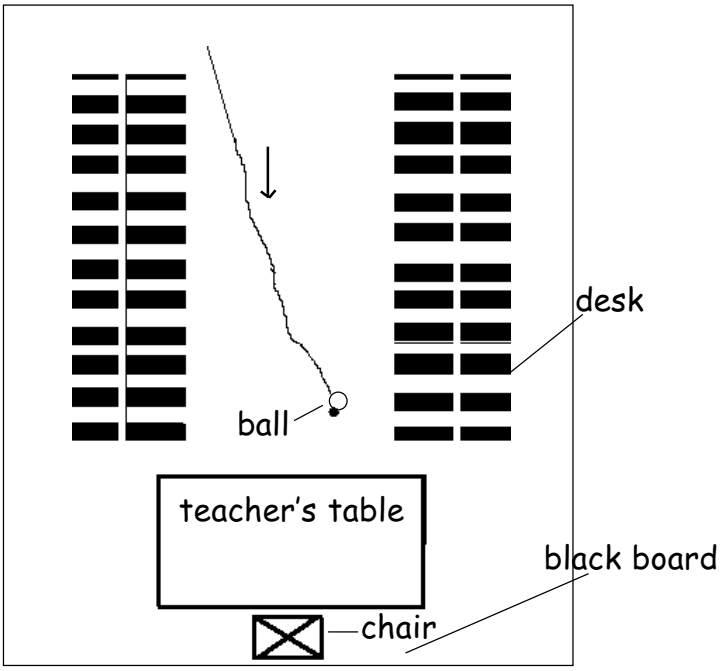
e. Try to write your name on smooth glossy (smooth and shiny) paper, like the back of a photograph, or old glossy calenders with a pencil. Write as you normally do. Write again with a ball pen, and sketch pen or fountain pen.
With which ones could you write easily? With which ones was it difficult? Why? In what ways does friction help us in writing? Does friction between the paper and the tip of the pencil help? Does friction between the pencil and your fingers help?

Think! Think!
Why do pencil leads and chalk pieces get shorter as you write with them?

f. Set a ball rolling in the classroom. Now do something to make it go slower and to make it stop. Don't make the ball bounce back, just make it go slower and stop. On page 50 of your WorkBook write down what you tried.
Does the ball slow down on its own too? Why?

5. How to make things move:

a. This is a map of Mini's classroom.
On page 50 of your WorkBook, draw a map of your classroom.
Roll a ball on the floor. In your map, show how the ball moved -
Where did it start?
Where did it come to a stop?
Which path did it go along?
Draw the path.
Did it move in a straight line?
If it didn't, how can you make it go in a straight line? Try it.
Did it also bounce up and down?
If it did, how can you make it move without bouncing?



b. Gently set a ball rolling on a long table or platform (if you don't have a long table or platform, roll it on the floor). Now make it move faster. Try as many different ways as you can to make it move faster.

c. Start something moving so it keeps moving along a circle. It should keep moving along the circle even after you take your hand off it.

Know these words

glossy, friction, smooth, polished, rough, bumpy, tread

EXERCISES

Name and draw

a) A ball that is not moving, and one that is moving. Your drawing should show it moving

b) A ball that is slowing down

c) A ball that is speeding up

d) A person who is not moving

e) A person who is moving

What's the same? What's different?

Give two similarities and two differences between:

a) The wheel of a moving bicycle and a ceiling fan that has been switched on.

b) A rubber ball and an eraser, both dropped from a table.

c) The way you can move your hand at the wrist, and the way you can move your arm at the elbow.

Interesting questions

1. Name at least three things or places
   a) which need to be rough; does the roughness in each case slow down movement or prevent movement?
   b) which should be smooth. Why?
2. Name some things or places where oil is used to make movement easier.

3. Which is easier to hold without slipping - a bar of wet soap or a comb? Why?

4. Would you want your bathroom floor of smooth polished stone or a rough surface? Why?

5. Look at how the brakes of a bicycle work and answer these questions:
   a) What are they made of?
   b) Which part of the wheel do they touch?
   c) How do you operate them?
   d) Does it matter if they touch the wheel lightly or press hard against them?

6. Suppose you push a wooden duster or some other object on the floor, and there is no friction at all. How far will the duster move? Will it slow down?

7. Name some parts of your body which move, or which you can move, without moving any bone.

8. a) Arrange these surfaces from the roughest to the smoothest:

Tar road, sheet of glass, wooden table, the floor of your classroom

b) Suppose each of the following is moving at its top speed.

Arrange from the slowest to the fastest:

bullock cart, car, plane, bicycle, bullet

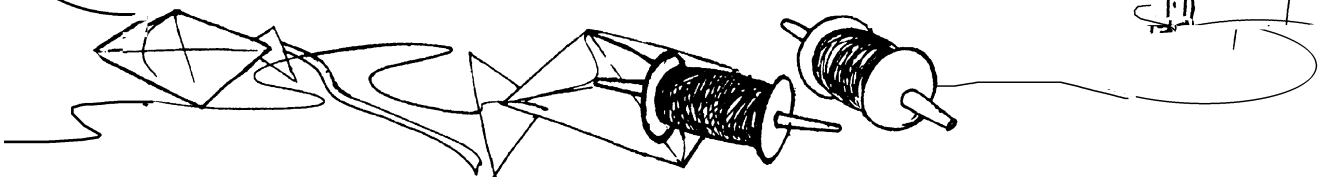
Classroom discussion

Think of places which are slippery to walk on -

Why is it difficult to walk?

Do you need more friction or less than there is between these surfaces and your foot?

How will the things you do everyday be different if there were no



friction?

Play with words

1. Write down some things that

vibrate, spin, roll, slide, wobble, walk, flutter, glide, bounce, swing, crawl

2. The words on the left describe the way some animals move.

Match the words with the animals.

scurrying	snakes
hopping	mice
slithering	kangaroos
crawling	elephants
soaring	monkeys
swinging	eagles
swaying	worms

Name at least 3 other animals and give words describing how they move.

Recall and write

a) The story of the hare and the tortoise

b) Suppose the hare does not stop to rest or sleep. Think of a way in which the tortoise can still win the race. Write a new story using your idea.

Figure it out

The hare and the tortoise decide to hold another race.

The tortoise says he wants to start closer to the finish line because, being a tortoise, he can only run slowly.

If he starts closer to the finish line the race would be fair. The hare agrees.

In this race either the hare or the tortoise can win. Look at the pictures on page 59 of your WorkBook and make a guess: who will win the race?

Now draw the hare and the tortoise where they will be after every 5 seconds to see who wins. Was your guess correct?

Did the hare run faster than the tortoise?

Write in your own words who won the race and how. Use these words in your description:

speed, distance, time, slow, fast.

The tortoise says he wants to race again. The hare readily agrees.

This time the tortoise starts even closer to the finish line. Again we do not know who will win. Look at the pictures and make a guess - who will reach the finish line first?

Now draw the hare and the tortoise where they will be after every 5 seconds to see who wins. Was your guess correct?

Did the hare run faster than the tortoise?

Write in your own words who won the race and how. Use these words in your description:

speed, distance, time, slow, fast.

Play this game

Your friend will think of a moving thing. Guess what it is by asking questions about how it moves. Do not ask questions about size, colour, use etc. Ask only about the way it moves.

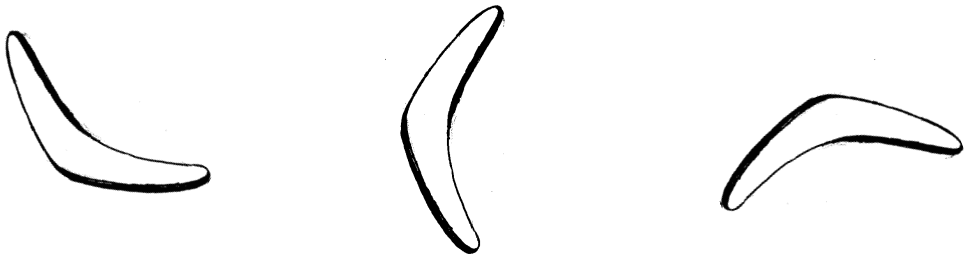
DID YOU KNOW?

1. The moon is about 400,000 km from the earth. In 1969 three astronauts went to the moon, in the spacecraft Apollo 11. They spent 21 hours on the moon, from where they collected about 20 kg of rocks and soil to bring to earth. This whole journey took 8 days - they left on the 16th of July and returned to earth on the 24th. In this journey, the speed of the spacecraft was sometimes as much as 38,000 km per hour.

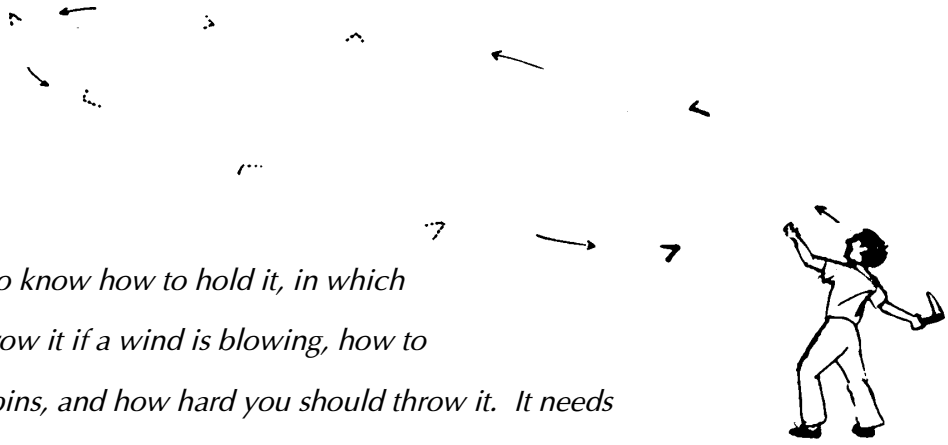
2. The spacecraft Pioneer 10 was launched from earth in March 1972 to take photographs of Jupiter and send them to earth by radio signals. It will keep moving away from the earth, heading generally for the red star Aldebaran. Pioneer 10 will take over 2 million years to reach Aldebaran!

3. Boomerangs:

In Australia, the native people, who had been living there for thousands of years, made boomerangs of wood for hunting. They also made a kind of boomerang, called the 'returning boomerang', which may not have been used for hunting, but was fun to throw.



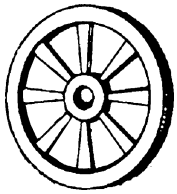
If you throw a returning boomerang, it will come back to you if it doesn't hit anything.



But you have to know how to hold it, in which direction to throw it if a wind is blowing, how to throw it so it spins, and how hard you should throw it. It needs a lot of practice to make a boomerang, and to learn how to throw it so it comes back!

CHAPTER **4**

MAKING A CART

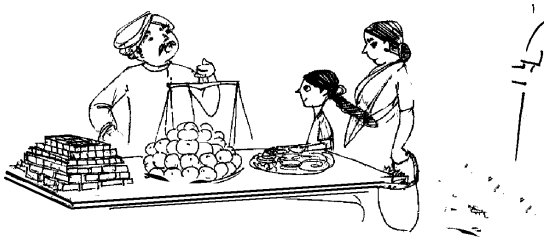


A day at the Mela

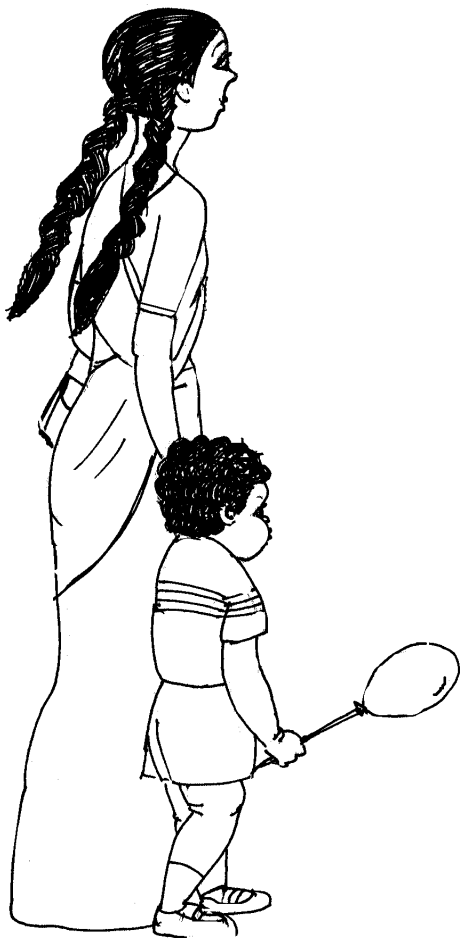
Mini and Apu were very excited - the *Mela* was coming quite close to their house, and they couldn't wait to go and look at all the things there. They went to the *Mela* on the very first day.

It was bustling with activity. There was a giant wheel and a merry-go-round; there were many vendors selling snacks, colourful clothes, bangles, caps, balloons of different shapes, pots, and many other things.

What attracted Mini and Apu the most were the toy sellers. They were selling musical instruments, games and puzzles, bows and arrows, dolls of wood and clay and plastic, catty-sticks (*guler*), pin-wheels, toys of reed, whistles - it seemed like they had every toy you would ever want!



Mini saw a beautiful toy cart, complete with wheels which actually turned. When she pulled it with the yoke, it moved just like a real cart does.



"That is such a lovely cart!" Mini said.
The toy seller looked at it and said with pride " Do you like it? My daughter made it. I don't think I can sell that one!''

Mini and Apu, always looking for something to do, decided to make a toy cart of their own. When they got home, they told Dada about the cart they had seen in the *mela*.

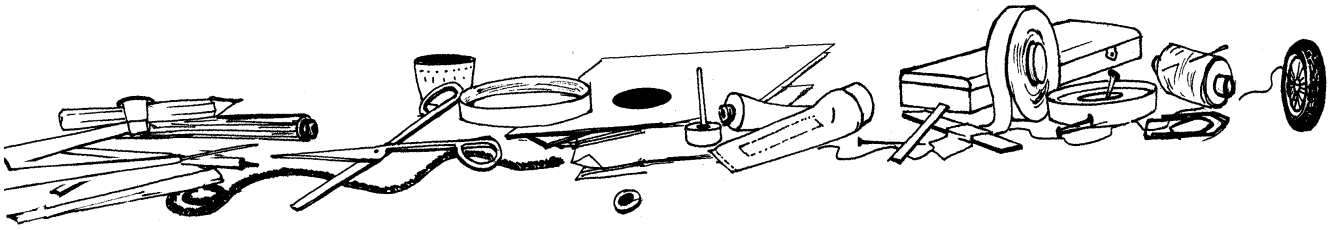
"We want to make one too, Dada."

"That's a good idea!" said Dada.
"It will keep you busy for some time!
'But, you must not buy anything for your cart.
Find things around the house which no one needs, and use them to make your cart."

Apu and Mini started rummaging for things - they needed something they could use to

make the wheels, to make other parts of the cart, something to attach the wheels to the cart body - they had to plan so many things!

They got busy, just as Dada had said.



1. Plan how you will make your cart. You can make any kind of cart, it does not have to be a bullock cart. You should only use material you can find easily, and which no one needs. Do **not** buy anything for this activity. Your cart should move.

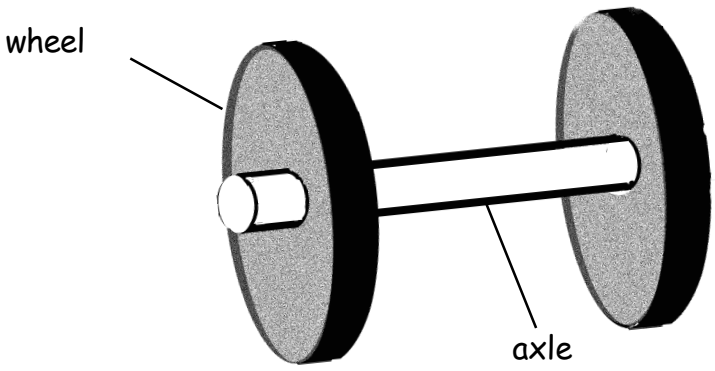
a. How many wheels will your cart have?

b. Think of some things you can use to make the wheels. If you think of something later, or find something better, you can use that.

i) You may want to cut circles, out of paper or cardboard. How would you do that?

ii) If you need to make holes in the centre of the wheels, how can you find the centre? On page 62 of your WorkBook you can see one way to find the centre of a circle.

c. The wheel rotates around an **axle** which passes through its centre.



i) Think of some things you can use to make your axle or axles. If you think of something later, or find something better, you can use that.

ii) How will you fix the wheels or axle to the cart body?

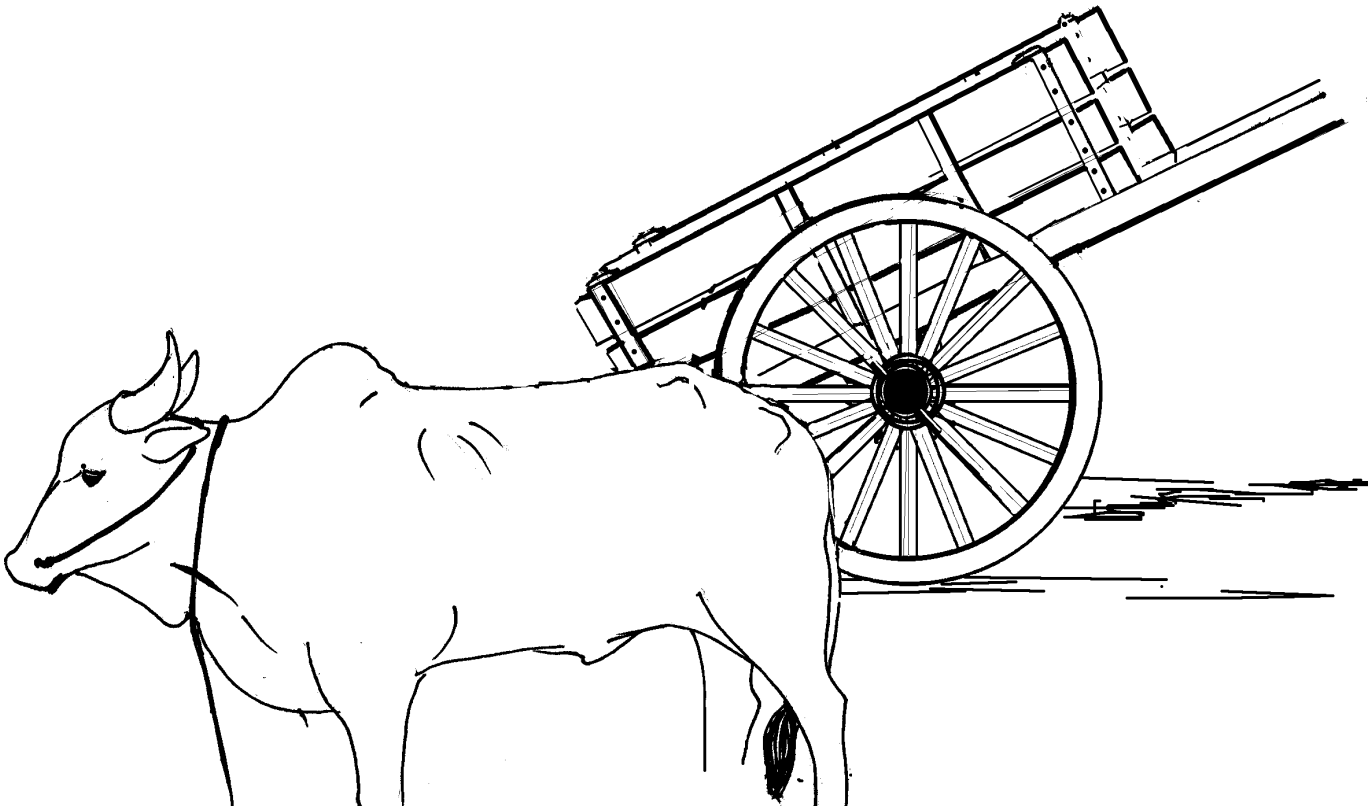
d. Think of some things you can use to make the cart body.

e. Are there some other things you may need to make your cart? What?
Bring to class all the things you collected to make your cart.

2. Now make your cart.

a. What did you make the wheels with? Was this in your list in 1b? If you used something which was not in your list, explain why.

b. What did you use as an axle? Was this in your list in 1c? If you used something which was not in your list, explain why.



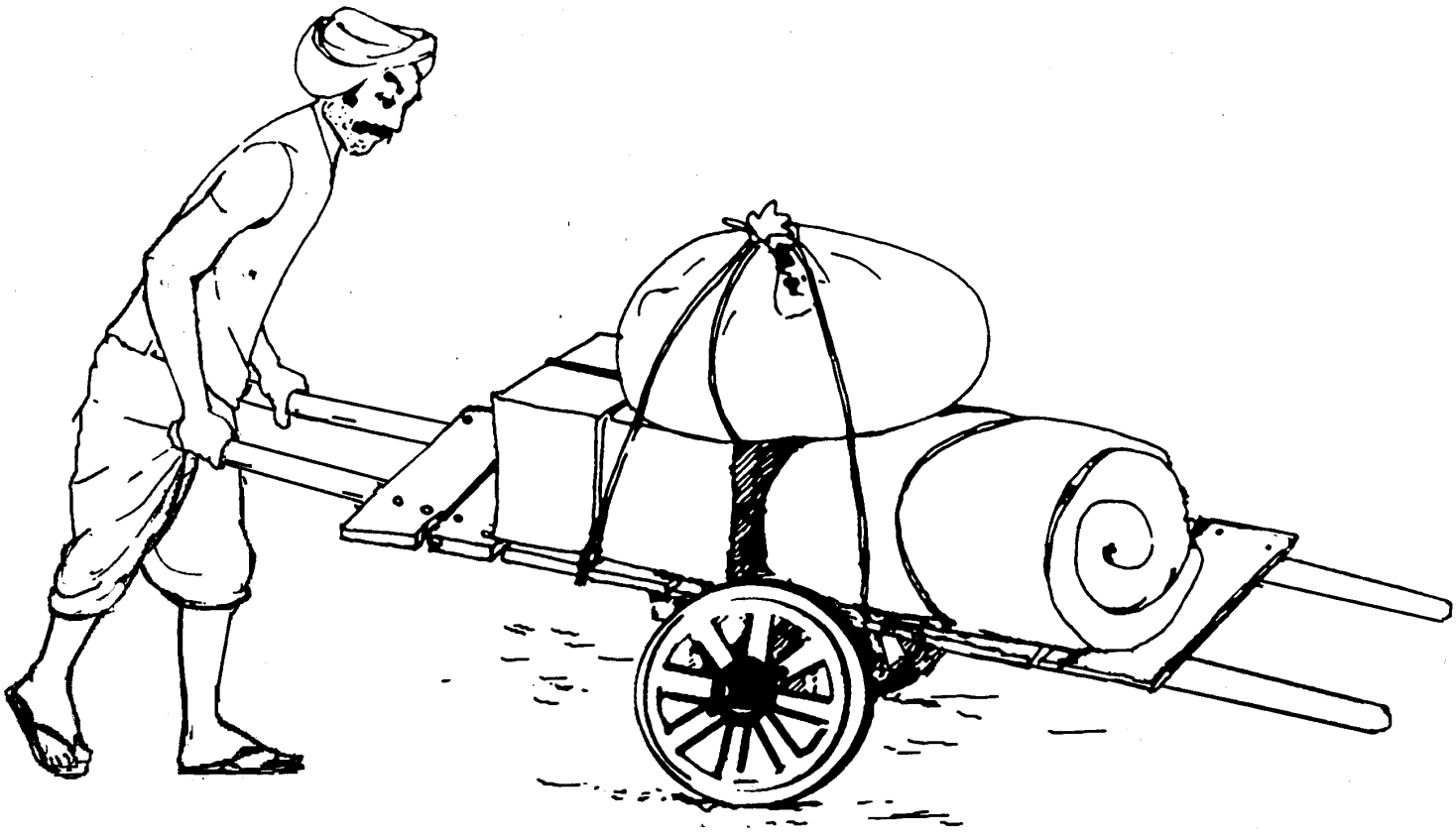
c. Set your cart in motion. Watch closely how it moves and answer these questions:

i) Do the wheels rotate smoothly? Do both wheels rotate when the cart moves? If they do not, what can you do to make the wheels rotate smoothly? Try it. If you need to make the surface of the axle smoother, you can use a nail file or sandpaper or something similar.
Do they wobble? If they wobble, what can you do to make them stop wobbling?

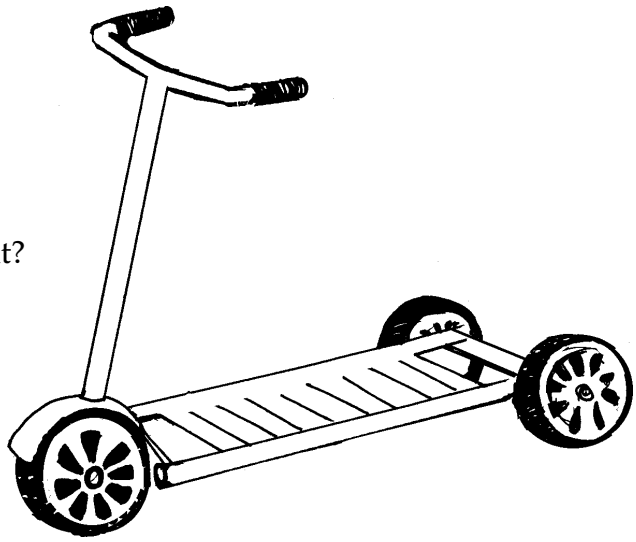
ii) When the wheels rotate, does the axle rotate too?

iii) Does it move in a straight line?

iv) Find something whose weight you know. Put it on your cart, and set it in motion. Guess - how much weight can your cart carry without any of it parts breaking or bending?



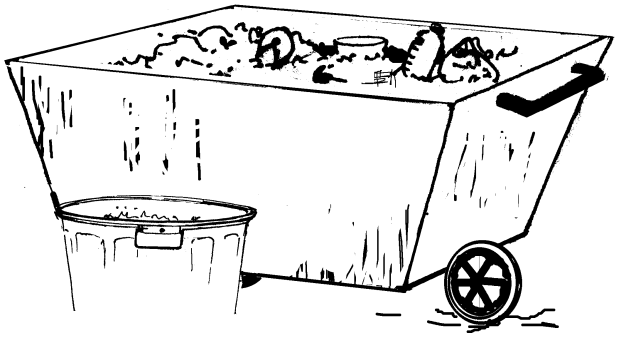
d. Compare your cart with a friend's cart.



i) Are the two carts similar in some ways?
How are they similar?

ii) Are they different? How are they different?

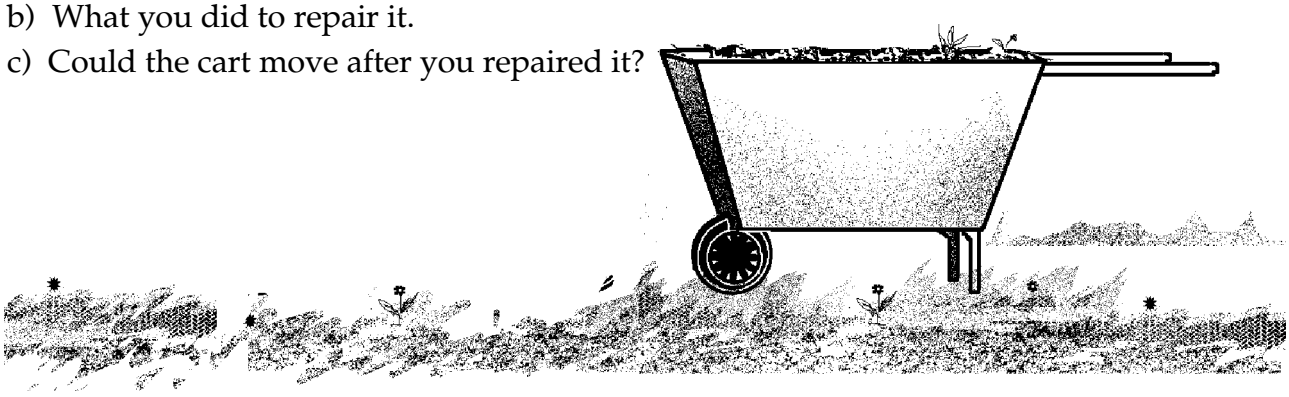
3. Look at all the carts in the class.



Sort them into carts which move and carts which do not.
Divide yourselves into groups; each group take a cart which does not move, and repair it.

On page 65 of your WorkBook, write down

a) Why the cart did not move; you can explain using a drawing of the cart or a part of the cart.
b) What you did to repair it.
c) Could the cart move after you repaired it?

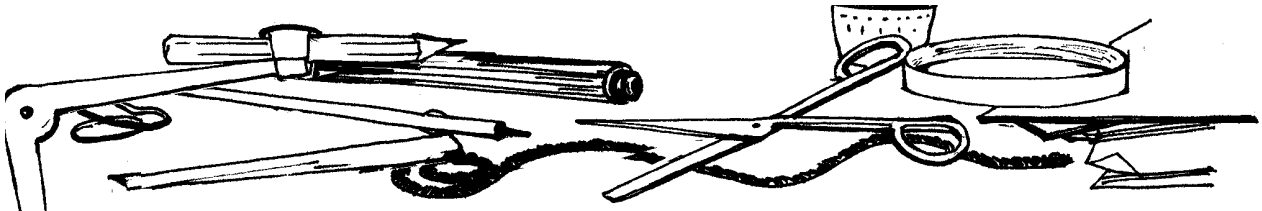


4. Write a set of instructions for someone (your friend, brother or sister) to make a cart. If you wish, you can use drawings to explain the instructions.

Write about
Things they could use as parts,
How to make a cart,
Problems that they may have,
and how to solve them.
If there is anything they should **not** do.

Know these words

Axle, yoke



EXERCISES

What's the same? What's different?

Give two similarities and two differences between a bicycle and a bullock cart.

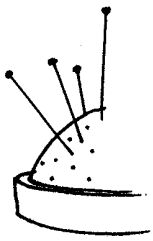
Name and draw

A cart you see often.

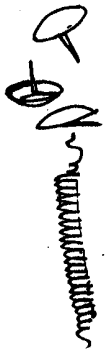
Interesting questions

1. Write about the carts you have seen
   a) which had only 1 wheel.
   b) which moves on 2 wheels.
   c) which moves on 3 wheels.
   d) which moves on 4 wheels.
   e) which moves on 5 wheels.

For each of the carts, write: Where did you see it? What was it used for? How was it pushed or pulled? Could it balance on its wheels when it was not moving, or was anything else used to support it? Could it balance on its wheels when it was moving?

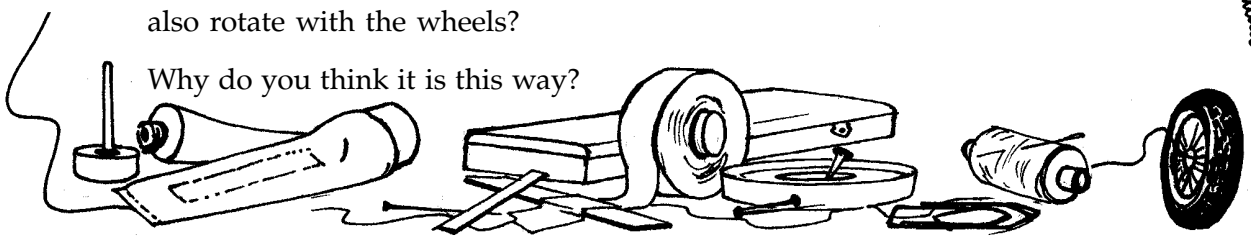


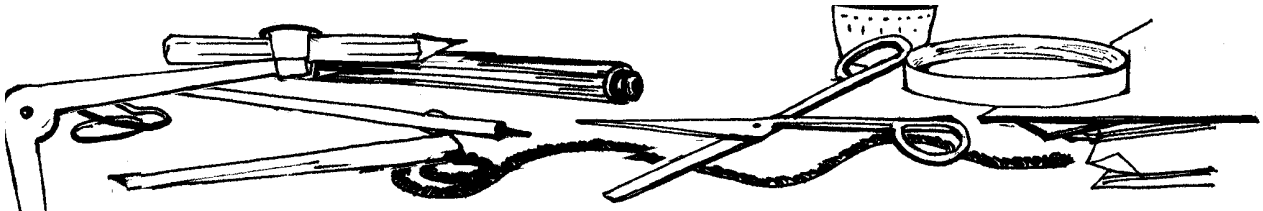
2. Look closely at how the wheels of a 4-wheeled push-cart ('*thela*') and a bullock cart are fixed, and how the carts move. Then answer these questions:



Bullock cart: Is the axle under the cart body, or above it? Does the axle also rotate with the wheels?

Why do you think it is this way?





4-wheeled push-cart (*'thela'*): How many axles does it have? Are the axles under the cart body, or above it? Do the axles also rotate with the wheels?

Ask and find out

How much weight can a bullock cart carry?

How much weight can a truck carry?

Classroom discussion

Look at how a bus or jeep is made to turn. Suppose a bus is turning to the left. Do only the front wheels turn to the left first? Or all the wheels at the same time?

When you want to turn the 4-wheeled cart, do you have to turn the whole cart or can you turn only the front wheels?

What is different between the way the cart and the bus turn? Why can't you turn a bus or jeep the way you turn a cart?

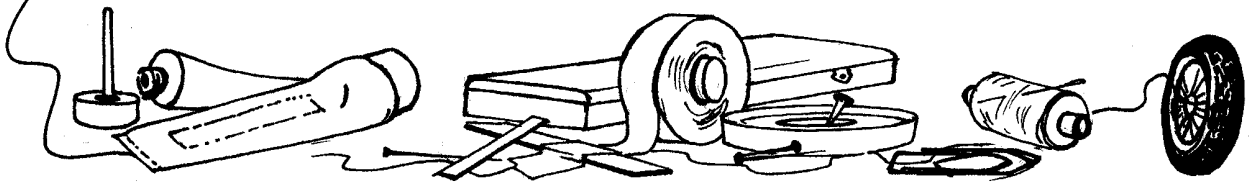
Figure it out

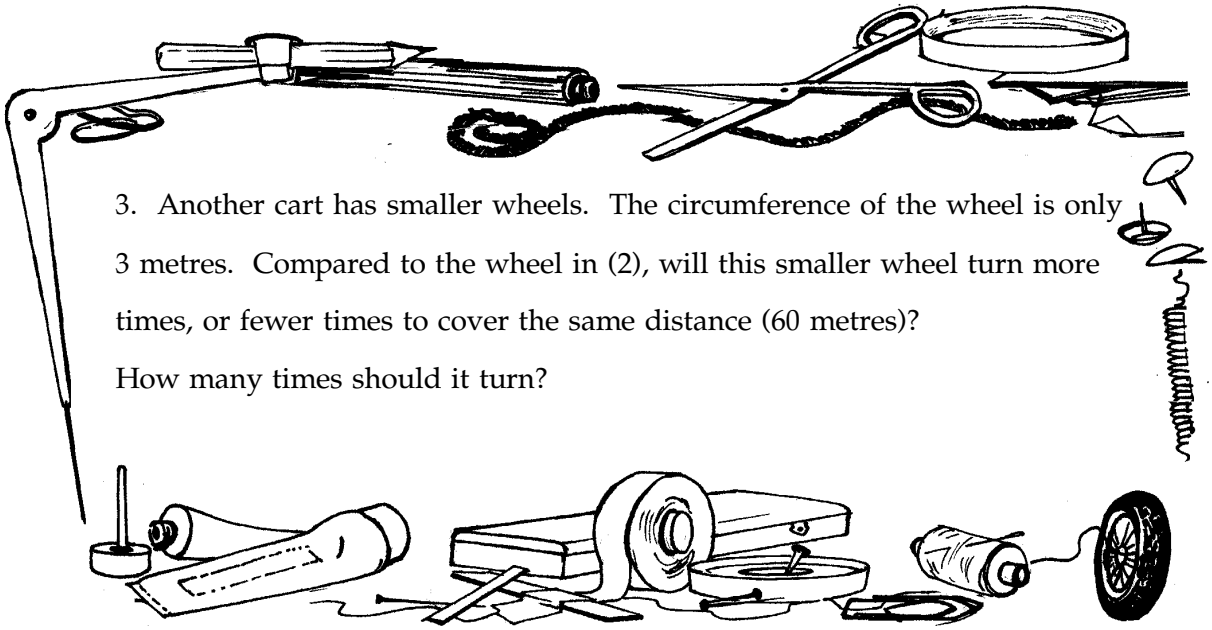
1. Take any cylindrical object like a tin can. Following the instructions on pages 70 and 71 of your WorkBook,

a) measure its circumference

b) figure out how much distance it moves in one turn as it rolls.

2. The circumference of a cart wheel is 6 metres. How many times does the wheel of the cart have to rotate if the cart has to travel 60 metres?



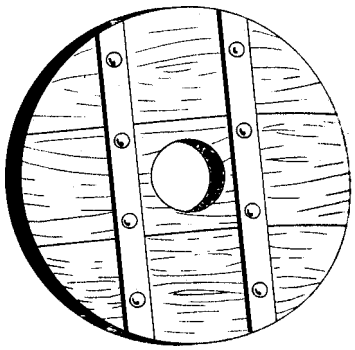


3. Another cart has smaller wheels. The circumference of the wheel is only 3 metres. Compared to the wheel in (2), will this smaller wheel turn more times, or fewer times to cover the same distance (60 metres)?
How many times should it turn?

DID YOU KNOW?

1. The earliest wheels that we know about were used 5500 years ago in Sumeria (the area now known as Iraq). Before that, people had to use sledges instead of carts to move things from one place to another.

Wheels were first made of discs of wood, without spokes. About 4000 years ago people started making wheels with spokes. Spoked wheels are strong, but lighter than disc wheels.



disc wheel

2. Traditional bullock carts carry a load of 500 to 1000 kgs. The bullock pulls this

weight with the yoke resting on its neck. The yoke rubs against its neck, chafing and hurting the animal, especially on a bumpy trip.

Scientists in India have designed new carts which are lighter, and have less wobbly wheels. Their wheels are made with rubber tyres. These carts move smoothly. The animals pulling these carts don't get hurt as much.

UNIT 3

EARTH AND ITS NEIGHBOURS

CHAPTER **5**

OUR EARTH

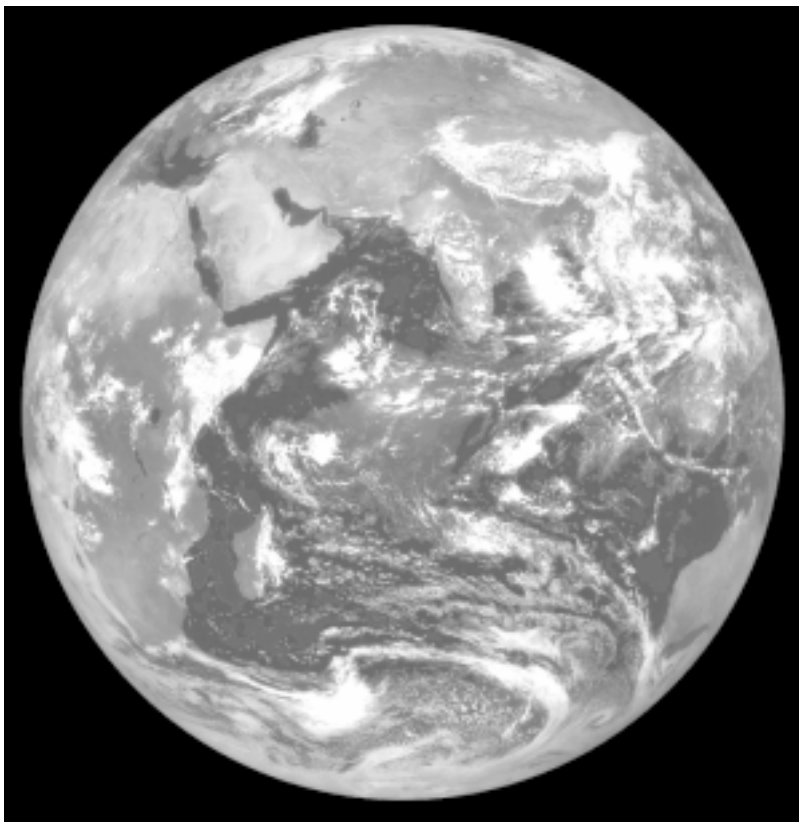
The planet on which we live

1. This big round earth

The earth is a very big ball. We live on this ball. The shape of a ball is called a **sphere.**

a. This is a photograph of Earth taken from a spacecraft. The spacecraft was very far from the earth when this photograph was taken. Describe what you see in this photograph.

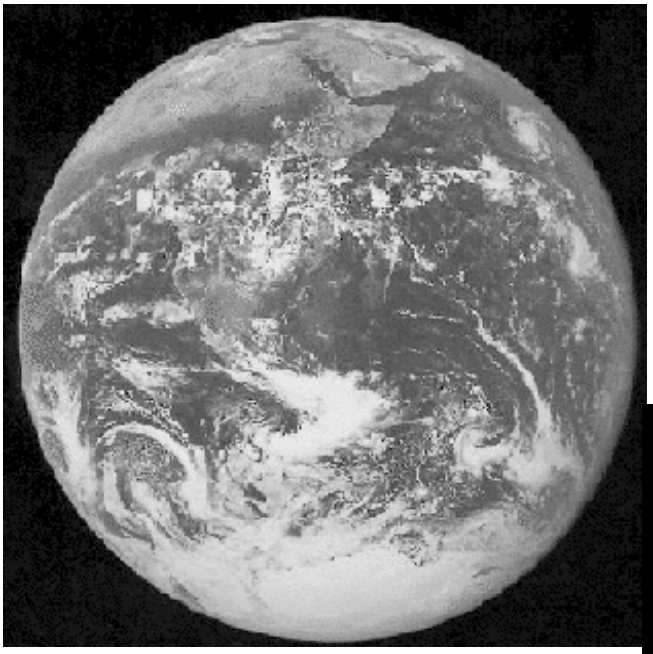
Picture 1



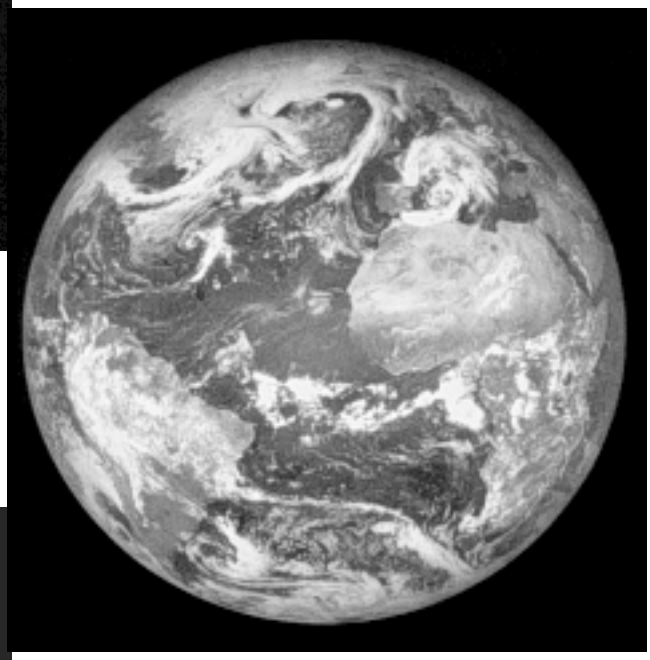
Make a guess -
what are the white things you see in the photograph?

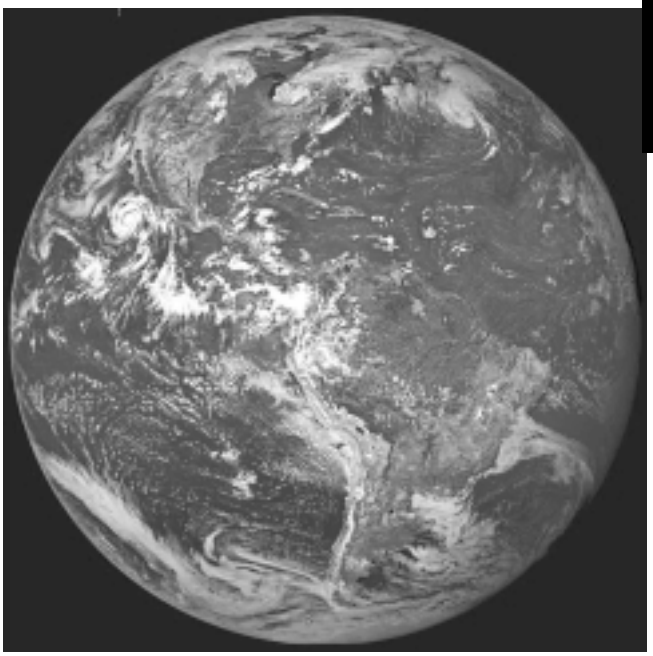
Look at a globe or an atlas. Then look at this photograph again. Which countries or continents are seen in this photograph?

b. Here are more pictures of the earth -
which countries, continents and oceans do you see in them?



Picture 2





Think! Think!

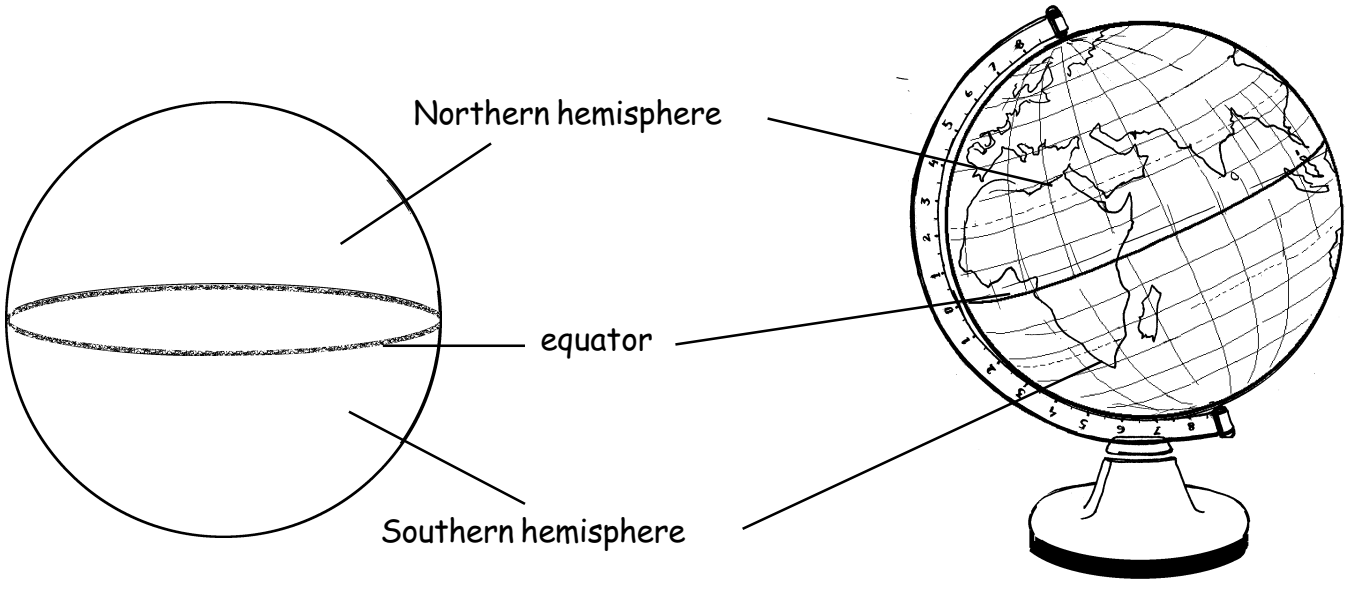
Why don't you see people, houses, trees and hills in these pictures?

c. Find a large tree in your school ground or anywhere nearby. Make a drawing of the tree - draw what is under and near the tree. Draw yourself or your friend under the tree. Draw this person in such a way that his or her height looks correct compared to the tree.
Does your drawing have as many leaves as the tree has?
Show an ant on one leaf of the tree. Is the ant of the right size compared to the leaf? To the tree?

The pictures of the earth on pages 63 and 64 are much, much, smaller than the earth. The diameter of the earth is 120 million times the diameter of the photograph of the earth on page 63.

2. A model of the earth

The globe is a model of the earth. It shows the different continents and oceans on the earth.



The **equator** is a circle that divides the globe into two halves. Half of a sphere is called a **hemisphere.** The two halves of the globe are called the Northern and Southern hemispheres.

Find the seven continents on the globe: Asia, Africa, Europe, Australia, Antarctica, North America, South America.
Find out the name of one or two countries in each continent.

Think! Think!

Vasundhara asked, "The earth around me is so bumpy - it is full of hills and valleys. Then why does the globe look so smooth?". How will you answer Vasundhara?

3. Make your own globe

a. Look at page 78 of your WorkBook to find out how to make a globe. Follow the instructions there to make your own globe. Show these parts of your globe:

The North Pole	The South Pole	Northern Hemisphere
Pacific Ocean	Atlantic Ocean	

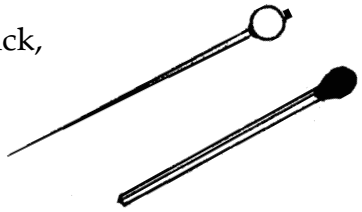
On the globe, show where your city is. From here, how would you reach the equator?

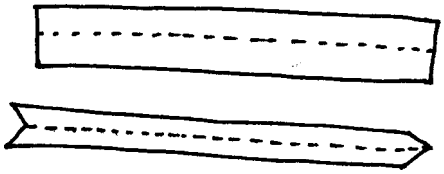
Think! Think!

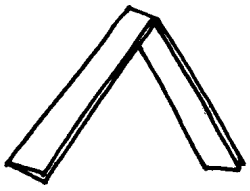
Prithvi said mischievously to Mini, " I know how to reach the equator - you go straight East, then you turn South, and then you get into a ship and keep going till you come to a blue line. That is the Equator."
Mini laughed loudly.

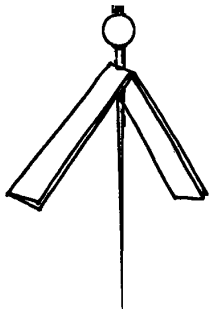
What do you think - are the equator, the North and South poles, and names of continents, countries, oceans etc marked on the earth too, as they are on the globe?

b. Make a small doll. You can make one with a matchstick, or use a common pin by sticking a bead for the head. Make the arms of the doll with a strip of stiff paper.

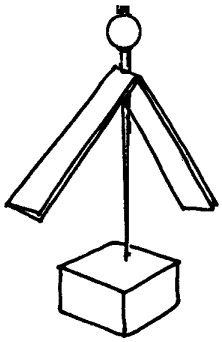








If you make one with a pin,
stick it into a small, thick piece of rubber. Be sure that the pin's point does not come out on the other side. This rubber is the 'feet' of your doll.



Now put your doll at these places on the globe:
Remember - wherever your place your doll, its feet should be on the ground!

North America	Antarctica	Russia
India	Near the north pole	Near the south pole
Anywhere on the equator	Australia	

For each place, answer the following questions:
In which direction would the doll have to look to see the ground near his or her feet?
If he or she throws a ball straight up, in which direction will it go?
In which direction will it fall?

Make your doll walk from the southwest part of North America to its northeast part.
Remember that your doll always has to have his/her feet on the ground!
Now make your doll walk from the northern edge of Africa to its southern tip. Again,

remember, your doll's feet should always be on the ground.

Turn to page 82 of your WorkBook.
Show how you placed the doll at the equator and near the south pole.

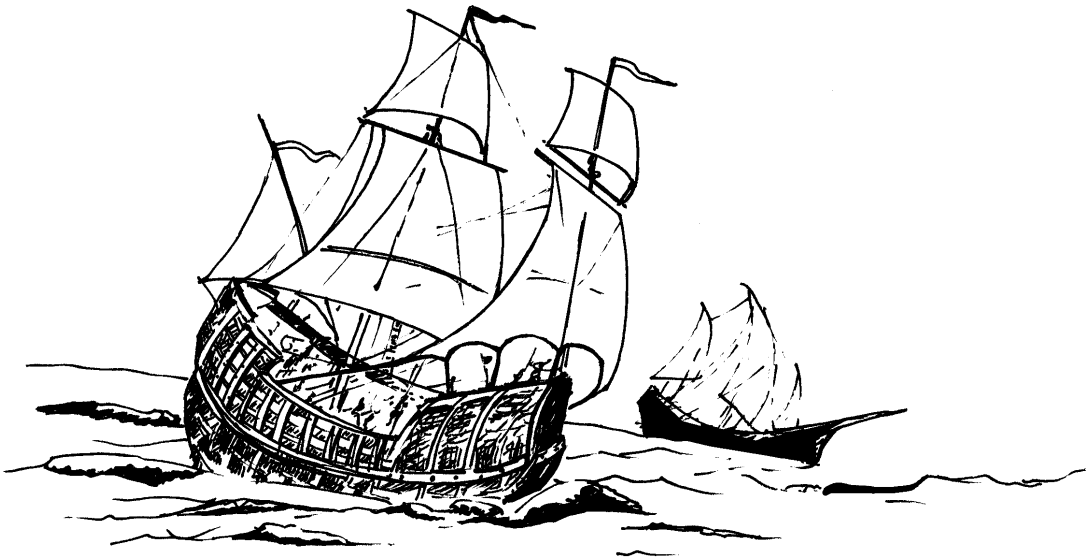
> ***Think! Think!***
> *Do you think your doll is of the right size compared to the globe?*
> *If not, should it be larger or smaller? Why?*

c. Take a string and mark a segment of about 8 cm on it. Collect many spheres of different sizes. First place the segment on the smallest sphere, as shown. Then place it on larger and larger ones. On which sphere did the string look the least curved? How would the string look if you took an even larger sphere? Make a guess - how big a sphere would you need to make it look straight?

Going around the earth

4. Magellan's story

Your teacher will read out the story of Magellan. Follow the path of Magellan's voyage on your globe.



Know these words

sphere, hemisphere, equator, continent

EXERCISES

Name and draw

Draw a map of the area surrounding your house. Draw what is to the east, west, north and south. Mark these directions clearly on the map. On your map, show in which direction you see sunrise. (If you face north, east is to your right and west is to your left.)

What's the same? What's different?

Give two similarities and two differences between the earth and the globe.

Interesting questions

1. a) Name the ocean which is
   i) to the east of South America
   ii) to the west of South America
   iii) to the west of North America
   iv) to east of Asia
   v) to the west of Australia

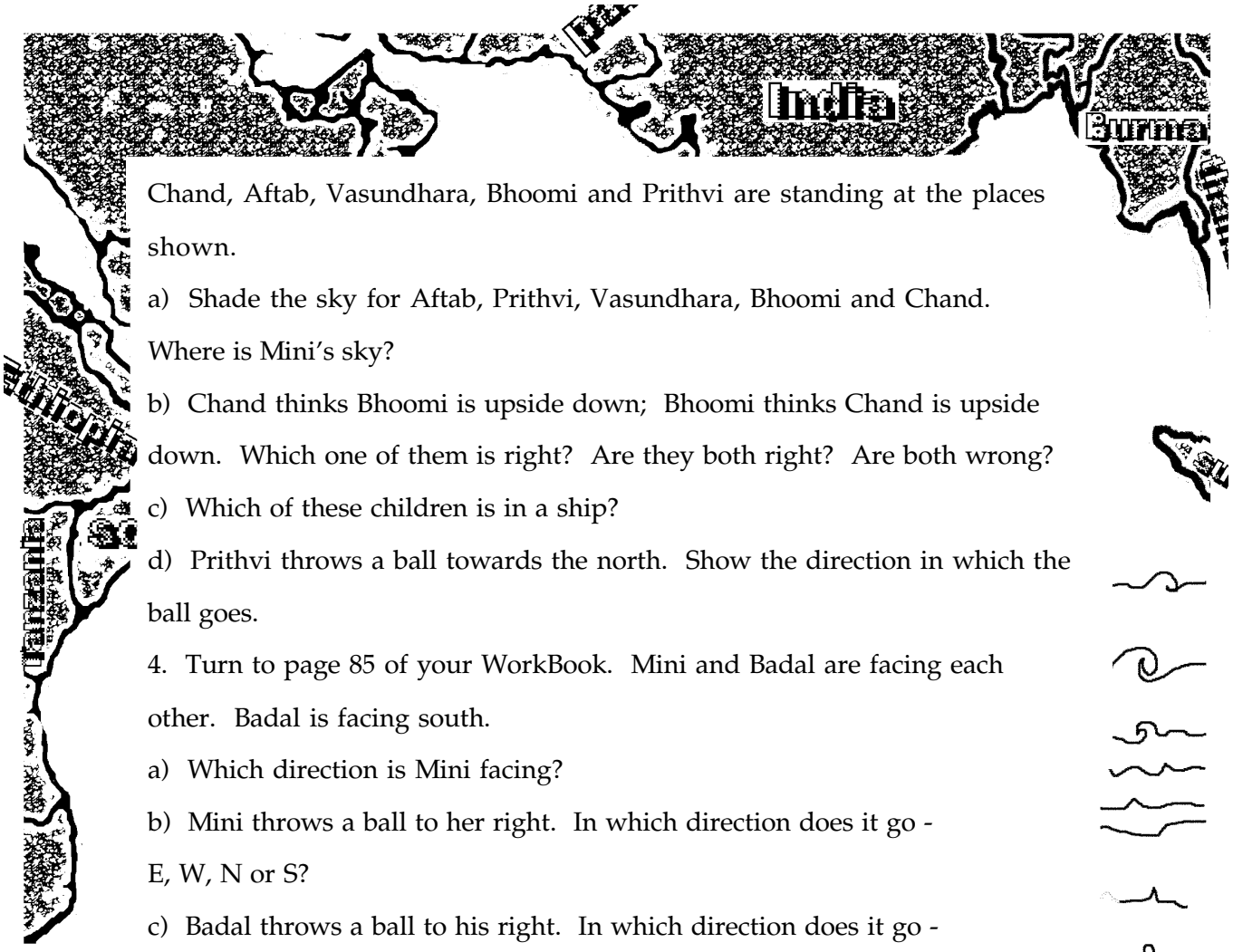
   b) Name a continent
   i) which lies only in the Southern hemisphere
   ii) which lies only in the Northern hemisphere
   iii) a part of which lies in the Northern hemisphere, and part of which lies in the Southern hemisphere

   c) Name two continents connected by land.

   d) Name a sea which is completely surrounded by land.

2. Which of these things is nearest in shape to the earth - a chapati, a puri, an orange or a banana?

3. Look at the picture of the earth on page 84 of your WorkBook. Mini,



Chand, Aftab, Vasundhara, Bhoomi and Prithvi are standing at the places shown.

a) Shade the sky for Aftab, Prithvi, Vasundhara, Bhoomi and Chand. Where is Mini's sky?

b) Chand thinks Bhoomi is upside down; Bhoomi thinks Chand is upside down. Which one of them is right? Are they both right? Are both wrong?

c) Which of these children is in a ship?

d) Prithvi throws a ball towards the north. Show the direction in which the ball goes.

4. Turn to page 85 of your WorkBook. Mini and Badal are facing each other. Badal is facing south.

a) Which direction is Mini facing?

b) Mini throws a ball to her right. In which direction does it go - E, W, N or S?

c) Badal throws a ball to his right. In which direction does it go - E, W, N or S?

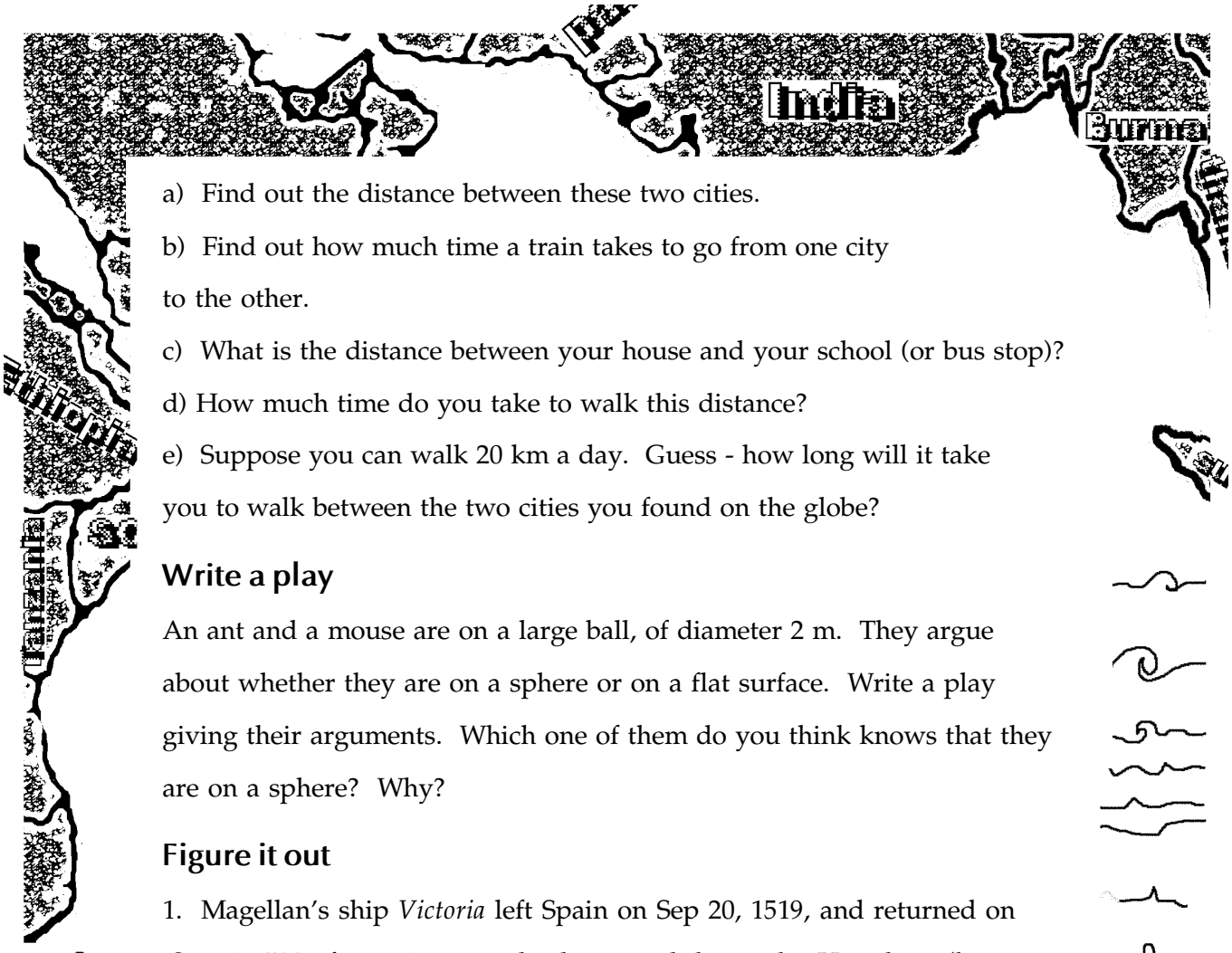
5. Did Magellan's ships ever travel eastward in their journey from Spain to the spice islands?

Classroom discussion

Akash has an interesting idea - he thinks that people live inside the earth, not on it. How will you convince Akash that we live **on** the earth?

Ask and find out

On the globe, find your town or a large city near your town. Find another city in India on the globe.



a) Find out the distance between these two cities.

b) Find out how much time a train takes to go from one city to the other.

c) What is the distance between your house and your school (or bus stop)?

d) How much time do you take to walk this distance?

e) Suppose you can walk 20 km a day. Guess - how long will it take you to walk between the two cities you found on the globe?

Write a play

An ant and a mouse are on a large ball, of diameter 2 m. They argue about whether they are on a sphere or on a flat surface. Write a play giving their arguments. Which one of them do you think knows that they are on a sphere? Why?

Figure it out

1. Magellan's ship *Victoria* left Spain on Sep 20, 1519, and returned on Sep 6, 1522 after going completely around the earth. How long (how many years, months, days) did this journey take?

2. There are about 1,000,000,000 people in India. If about 5 people can live in 1 house, how many houses would you need?

If you make tiny toy houses, each measuring a square 1 cm by 1 cm, would you be able to place all these houses in India shown on your globe?

3. The radius of the earth is about 7000 km. Mt Everest is about 9 km tall. How many times the height of Everest is the earth's radius?

Act it out

1. Do this activity outdoors. Draw a line 5 metres long. Ask your friend

to stand 1 m from the centre of this line. Walk on this line. Keep looking at your friend as you walk. Now ask your friend to stand 4 metres from this line. Again walk along the same line as before; again keep looking at your friend as you walk.

When did you have have to turn your head more - when your friend was closer or farther away?

What if your friend is even farther away?

What is the farthest thing you can see (a tree, a hill, a building) in the direction in which your friend is standing? When you walk along the same line, looking at it, do you have to turn your head more or less?

How much do you have to turn your head when you look at the moon or stars as you walk?

2. Hold a ball close to your eye; take a small object, like your eraser and hold it on the other side of the ball. Now, very slowly, move it on the ball so you can see it. Describe what you see - did the eraser come into view all at once? Why or why not?

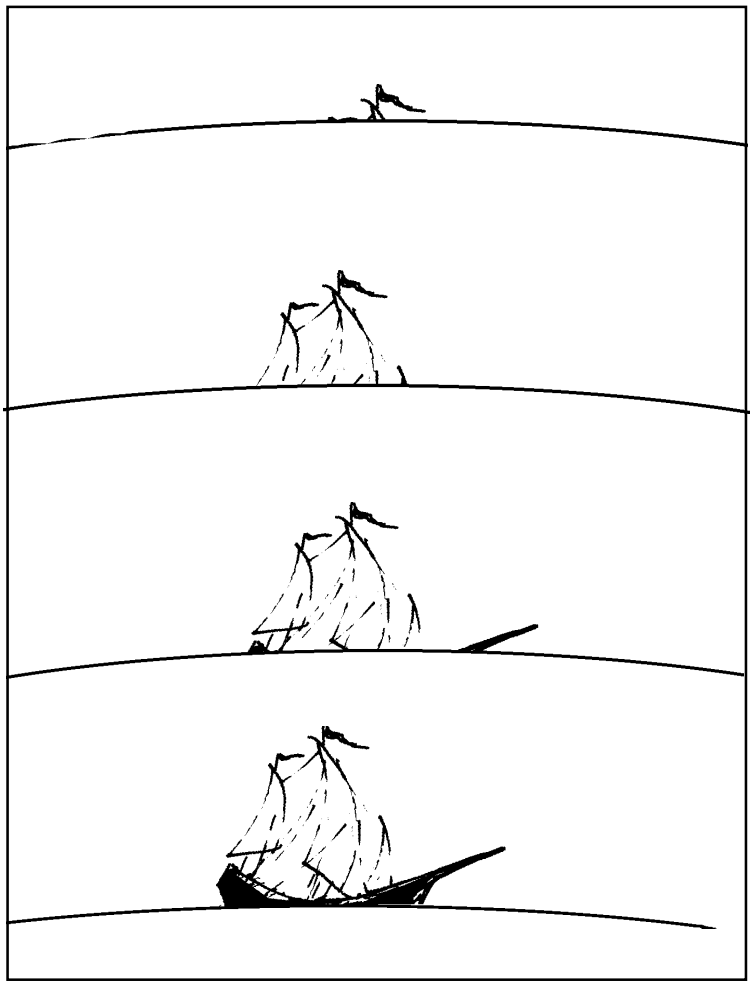
Ask a question

Ask a question about the earth. Think of how you will find the answer.

DID YOU KNOW?

1. Long before Magellan went around the earth, people knew that the earth was round. People living near the sea guessed this because, when they watched ships coming in to port, they could first see only the tall

mast (flag-pole). They could see more and more of the ship as it moved closer to the port.



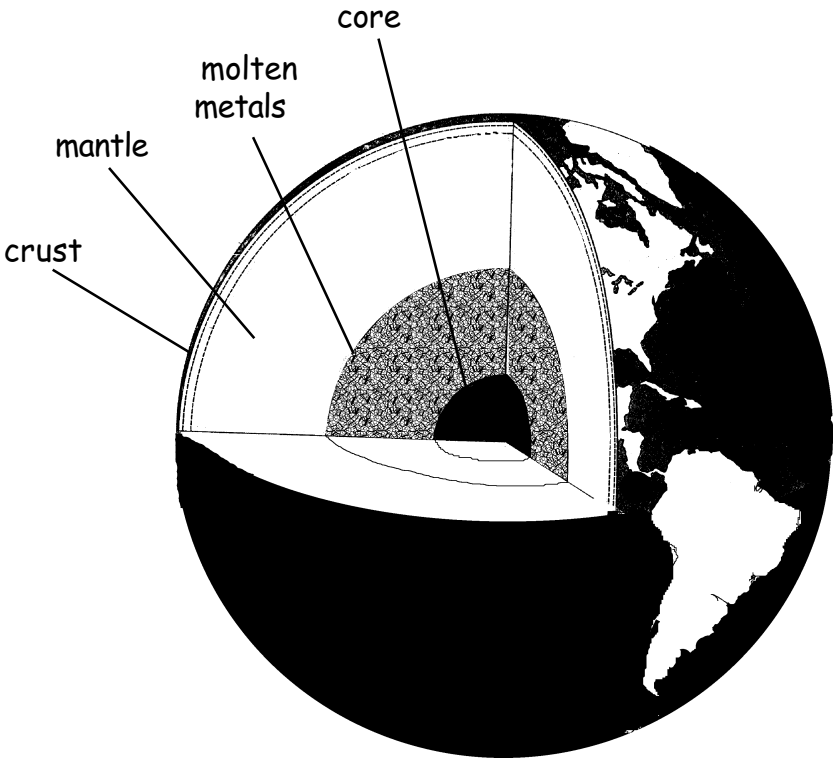
2. At the centre of the earth there is a hot solid ***core.*** *The diameter of the core is about 2400 km. Geologists think the temperature at the earth's centre is 6000 degrees celsius!*

Surrounding the core there are metals which have melted because of the heat.

Around this liquid part there is the solid ***mantle****. It is made of very hard rocks. These rocks move slowly, about 1 cm per year.*

Around the mantle is the ***crust*** *- the top 12 to 60 km of the earth.*

No one so far has dug more than 15 km deep into the ground. The rocks at that depth are so hard that drilling machines get damaged quickly. Ocean beds are about 4 to 5 km below the ocean surface.



3. Every object is attracted to other objects. This attraction is stronger when the amount of matter in the objects is more. It is also stronger when the objects are closer to each other. We call this attraction 'gravity'.

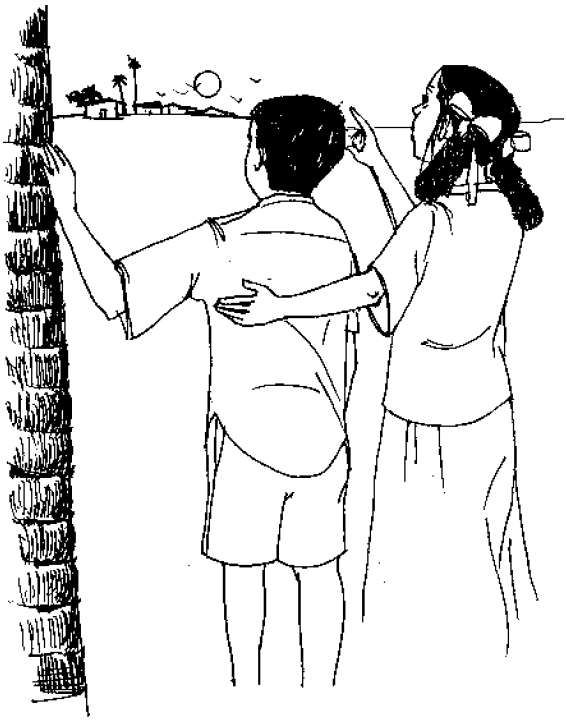
We don't notice this attraction between the things in our daily lives, because the amount of matter in them is small and so this attraction is very weak.

But when one of the objects is very massive, like the earth, (6,000 billion billion metric tons!), we can easily see the attraction between it and other objects - between the earth and us, for example. It is because of this attraction that we, and other objects, stay on the earth.

CHAPTER **6**

DAY AND NIGHT

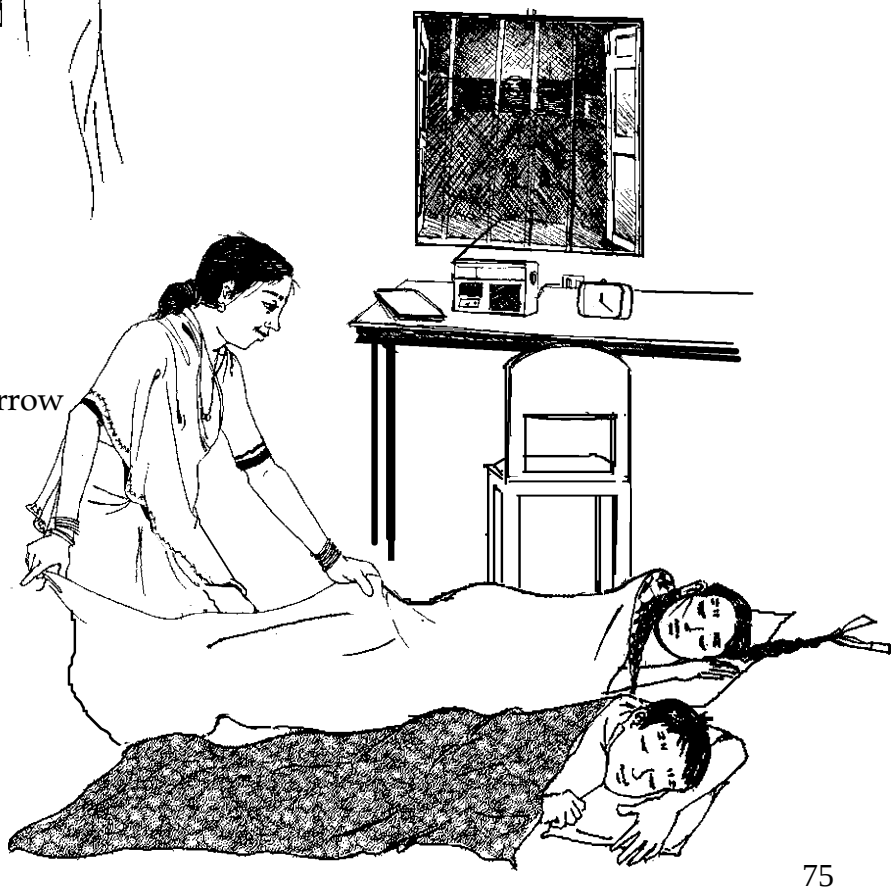
Apu and Mini were outside, munching on some snacks and watching the sunset.
"I love watching sunsets!" Mini said.
"Me too," said Apu. "Let's call Amma quickly - or she'll miss this."
He ran in to call her. She came out just in time.



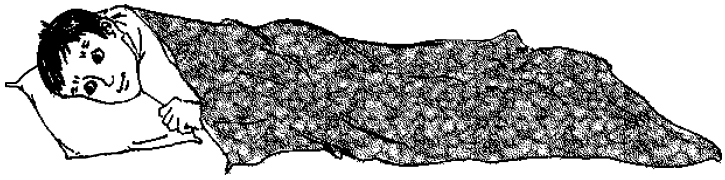
"That really is beautiful!" Amma said.

"You know, I saw the sunrise too this morning but you two were fast asleep at that time!'' said Amma.

"Will you wake me up tomorrow Amma? I want to see it too," said Apu.
"Does it look the same?"



"See for yourself if it looks the same or different," Amma smiled. "But remember to look in that direction," said Amma, pointing to the east.



Apu woke up early the next day and ran out to see the sunrise. He wondered - "Last evening I saw the sun there, now I see it here. How did this happen, Amma?''

The sun is on the horizon
far in the east

Where was it before that,
Why couldn't we see it all night?

In the middle of the day it's high in the sky
Then slowly more westward till it's low in the sky
Then no longer in view till it appears again
Over in the east to start a new day.

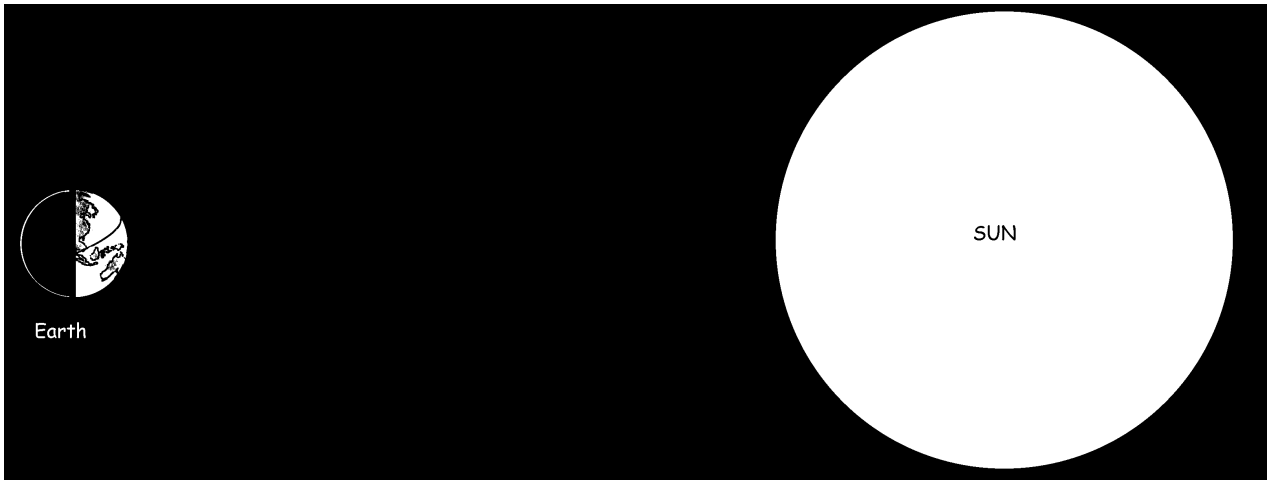
How did this happen, how indeed?

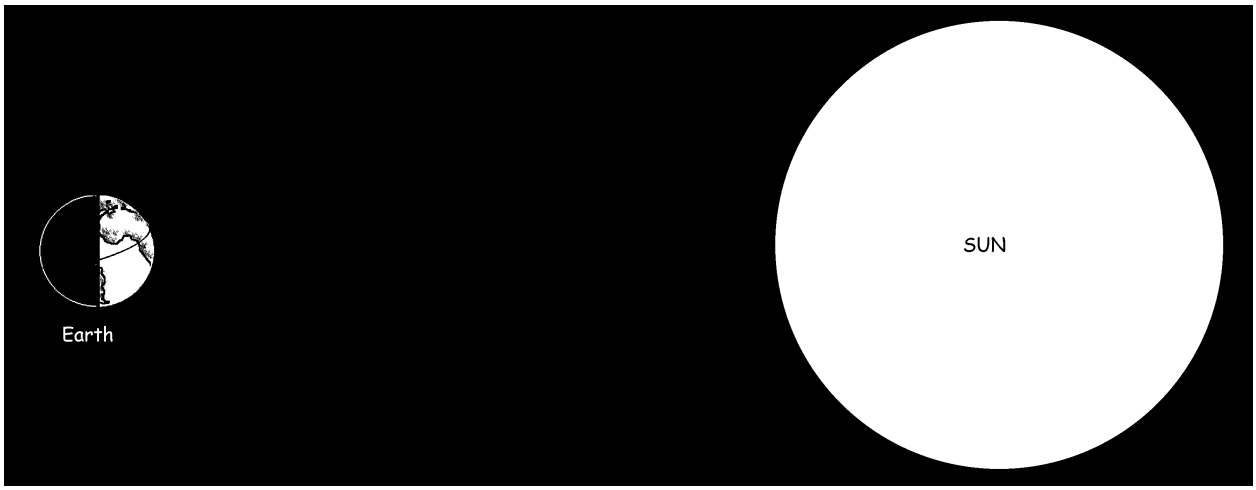
The spinning earth

1. a. The earth rotates (spins). It makes one complete turn in one day (24 hours). As it rotates, different parts of the earth face the sun.

It is daytime on the half which faces the sun. It is night-time on the other half of the earth, which faces away from the sun.

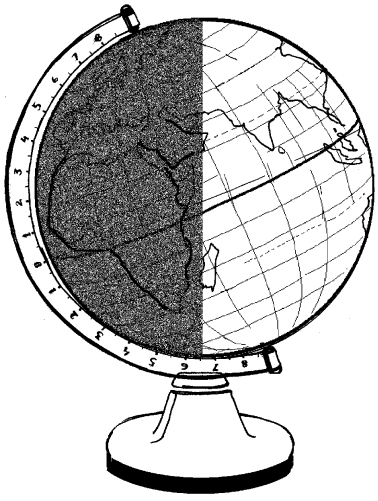
Look at the pictures on the next page. The first picture shows that it is daytime in Asia. On which continent is it daytime in the second picture? Where would this continent be in the first picture?
In each picture, do you see all parts of the earth which have daytime?

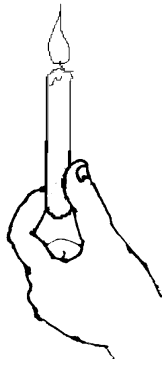




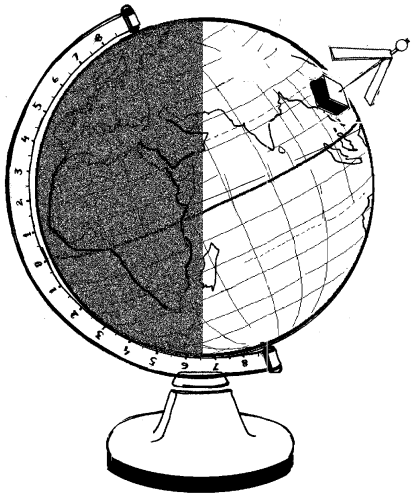
The pictures on this page are **not** to scale. The sun is much bigger than the earth, and much farther away from the earth. If we draw the pictures to scale, it will not fit on this page.

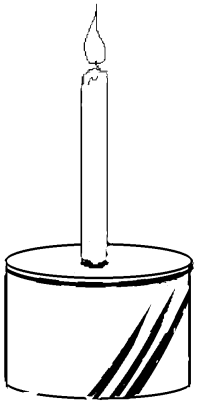
b. Your teacher will show how we have day and night using a globe and a candle.





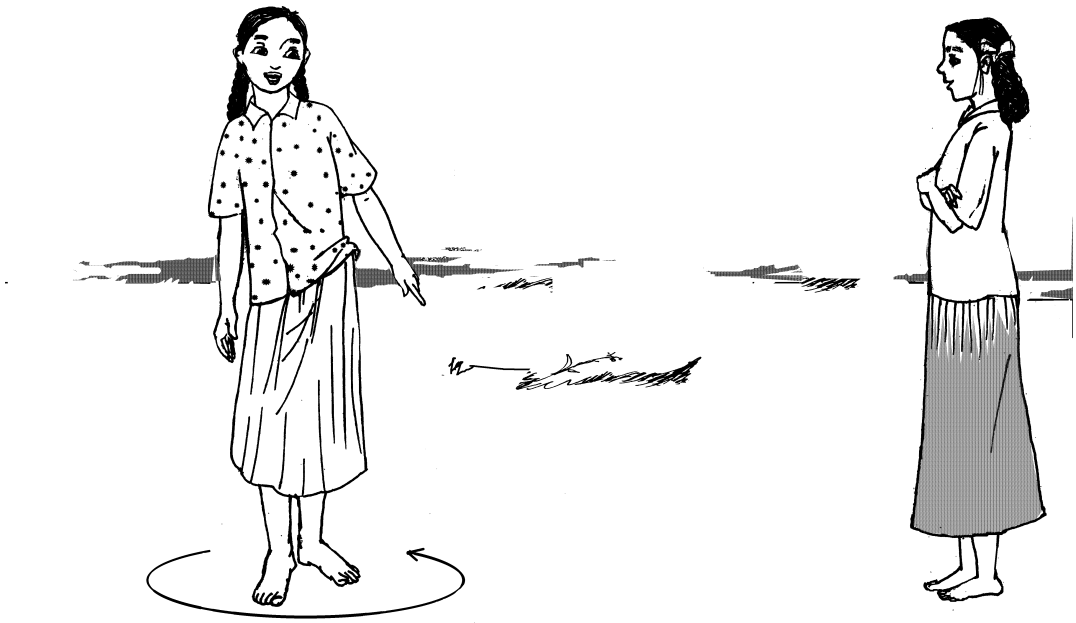
On the part of the globe which is lit by the candle, it is daytime. On the part of the globe which is not lit by the candle, it is night-time.
In the same way, on the part of the earth that is lit by the sun's light, it is day time.





Your teacher will place a pin or matchstick doll at some point on the globe. As the globe turns, tell your teacher if it is night or day for this 'person' on the globe.
As the globe rotates, tell your teacher when it is sunrise for the person on the globe. When is it noon? Sunset? Midnight?

c. Pretend that you and your friend are the earth and the sun. Ask your friend to be the sun. You be the earth. Stand a few feet from your friend, facing him or her.



Now slowly turn around; make one complete turn so you face your friend again. As you turn, note when you are able to see your friend (the sun). Keep looking straight ahead, do not turn your head to see her or him! (You can move your eyes, though).

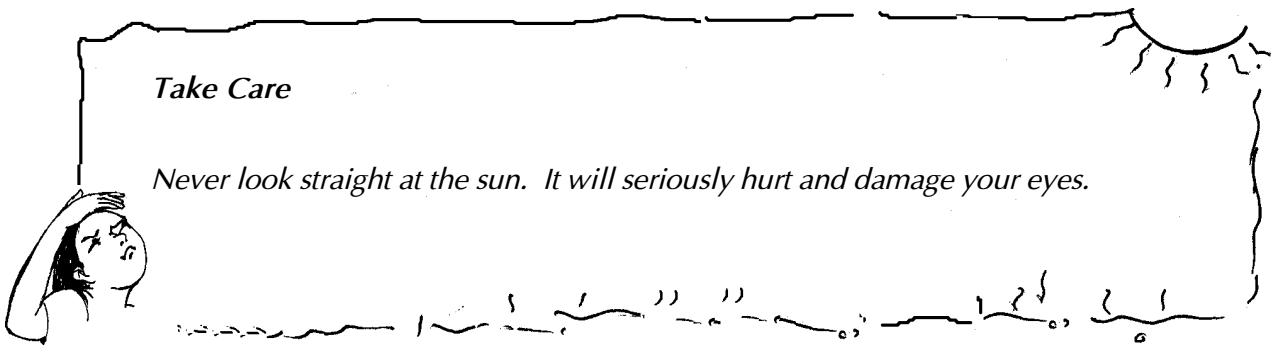
Turn 2 or 3 times more, and as you turn call out 'sunrise', 'sunset', 'noon', and 'midnight' at the correct points. If you call out something wrong (ask your teacher to be the judge) switch places with your friend - you be the sun and she or he gets to be the earth.

2. From sunrise to sunset

a. Draw a map like the one you have drawn on page 83 of your WorkBook.
This time, stand at a place where your view is not blocked by nearby buildings or trees.
You should be able to see very far in almost all directions - E, W, N and S.
What are the farthest things you can see in each direction? Show these on your map.
These things are on your **horizon.**

b. In your classroom, look straight up, so you can see what is overhead.
Tell your teacher what you see straight overhead.

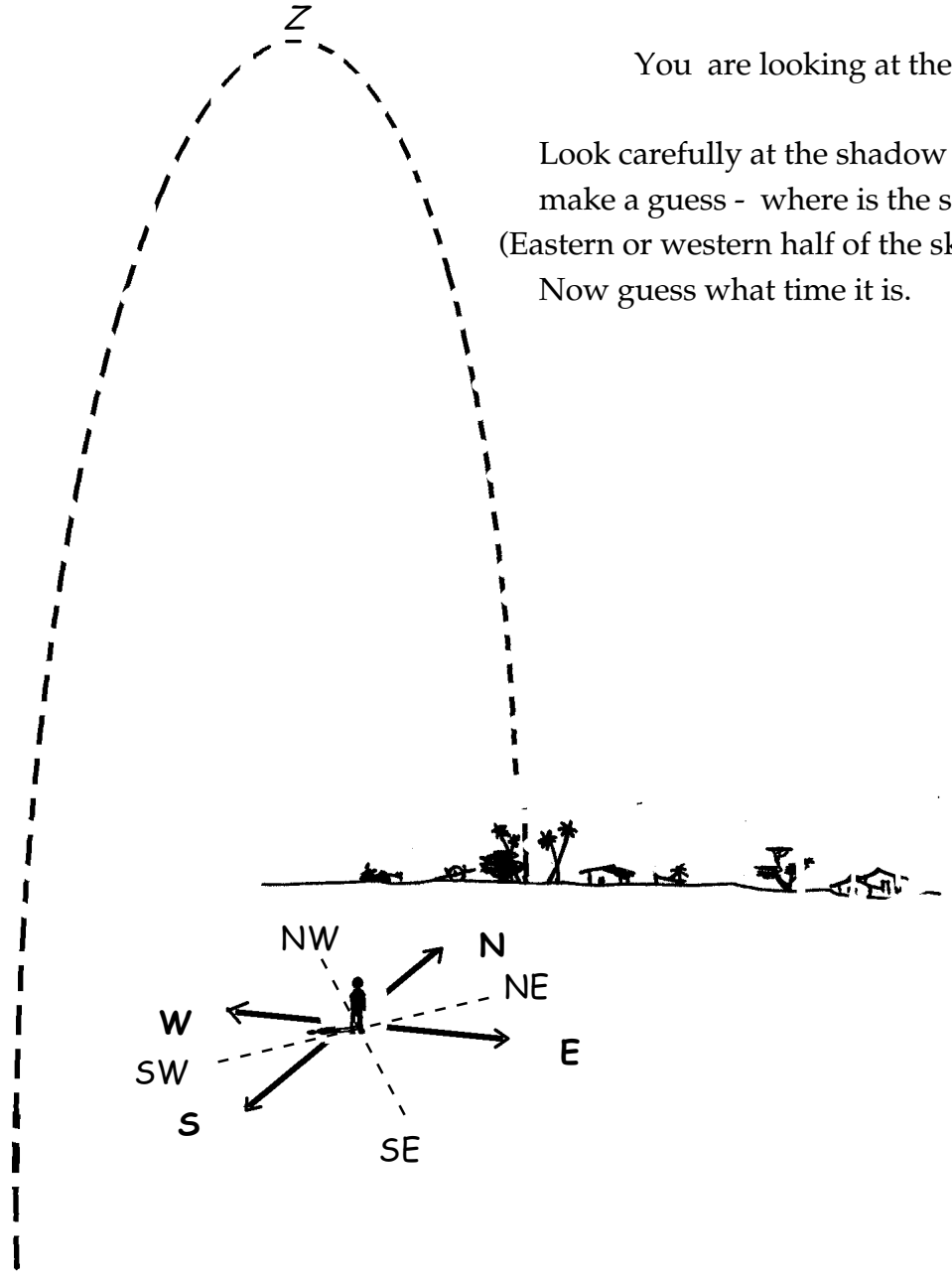
Now do this activity outdoors:
stand facing north, looking straight ahead.
Which direction (to your right or to your left) is east?
Which direction is west?



Take Care

Never look straight at the sun. It will seriously hurt and damage your eyes.

Now slowly raise your head till you see straight overhead.



You are looking at the **zenith.**

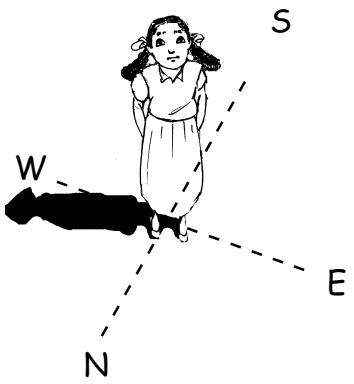
Look carefully at the shadow of this child and make a guess - where is the sun?
(Eastern or western half of the sky? High or low?)
Now guess what time it is.

Everything on the right of this dotted curve is in the eastern half of the sky. Everything on the left is in the western half of the sky.

Stand facing south, looking straight ahead. Which direction (to your right or to your left) is east? Which direction is west? Now slowly raise your head till you see straight overhead.

western half
of the sky

eastern half of
the sky



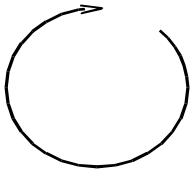
Everything on the left of the dotted curve is in the eastern half of the sky. Everything on the right is in the western half of the sky.

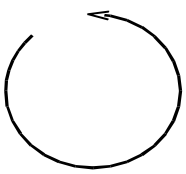
c. Complete this paragraph:

As the earth rotates, the sun comes into view on the horizon in the east (it rises); then we see it higher and higher above the horizon in the eastern half of the sky. Then, after _____ (what time?) it is in the western half of the sky. Then it is seen _____(higher or lower?) in the western sky until it goes out of our view in the west (it sets).

Think! Think!
In which direction does the earth rotate? East to west, or west to east?

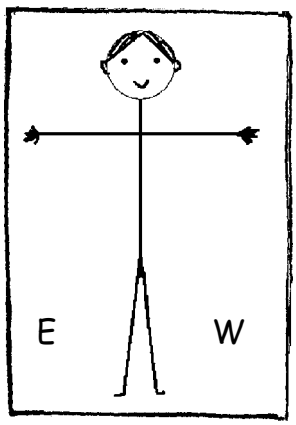
Slowly spin the globe to show what you think. Place a doll (or imagine one) at some point on the globe. What direction is east for this 'person'? As you turn the globe, will this person on the globe see the sun rise in the east? As seen from the top, did you have to spin the globe clockwise or anti-clockwise ?

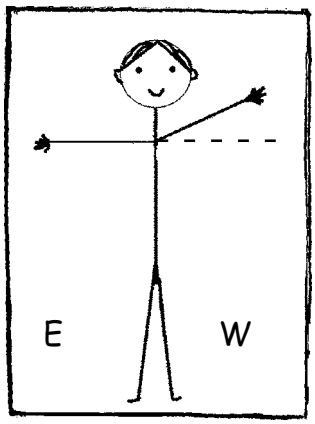
clockwise 

anti-clockwise 

3. Watching the moon and stars

a. Mini observed the moon at 7 O'clock one evening. She stood facing north and saw the moon in the western half of the sky. She made the following drawings to show her teacher where she had seen the moon at 7 pm.





Look at the moon on any day or night. Mark the place where you were standing. Stand facing north or south. Note where you see the moon - you can note its position with respect to a nearby tree or building or hill etc. Is the moon in the eastern or western half of the sky?
On page 92 of your WorkBook show how high the moon was by pointing the arm of the figure. Mark east and west in the drawing.

After one or two hours, stand in the **same** place again, facing in the same direction as before, and look at the moon. Note in which direction it is, and how high it is.

Show your teacher how you were standing - facing which direction - and where the moon was the first and the second time you saw it.

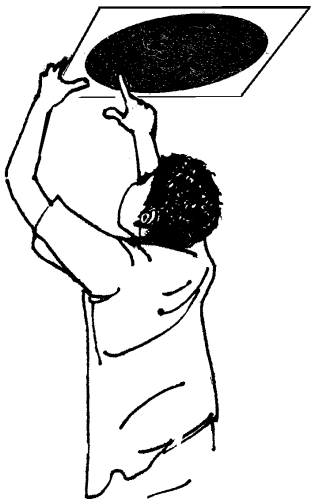
Do this activity on three different days or nights.

Think! Think!

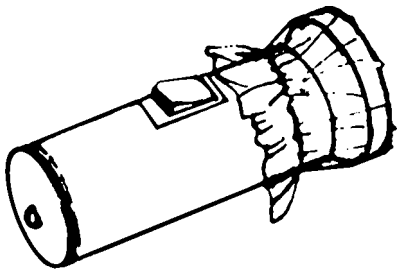
Mini and Apu see a crescent moon at 8 pm, near the horizon in the west. Mini thinks the moon is going to set soon, Apu thinks it is rising. How can they figure out who is right?

b. Look at some of the constellations you learned about in class IV. Maps of the sky at different times of the year are on pages 92 - 98. You can use these maps to help you find the constellations.
Two sets of maps are given - for big towns and cities and for rural areas. From cities and towns you cannot see the fainter stars (except when there is a power cut!) So these maps show only the brighter stars.
You will not see the stars on the edges of the maps - they are too low in the sky.

Note that these maps are upside-down!
Hold the map upside down, over your head, pointing N to the North.
Then the stars and constellations on the map will appear as they do in the sky.



When the moon is bright, you will not see the faint stars shown in the map. Choose a night when the moon is not bright, or not up, to observe the sky.



If you go out in the dark from a brightly lit room, you will not be able to see the fainter stars.
Wait for some time - several minutes - to let your eyes adjust to the darkness.

You can use the star maps outside if you have a torch and red transparent paper like cellophane paper.

Wrap the paper on the torch as shown, then use the torch to read the map.

Look first soon after dark. For each constellation, note in which part of the sky you see it - in the east, west, north or south? Or between any two of these directions - SE, SW, etc? Is it in the eastern or western half of the sky? How high above the horizon did you see it?
Show your teacher how you were standing - facing which direction - and where the constellation was the first and the second time you saw it.

Look at the same constellations again after one or two hours. Stand in the same place as you did before. Were they in a different part of the sky?
In which direction?
Where were they compared to the horizon
(higher than before, lower than before or the same)?
Is it in the eastern or western half of the sky now?
Learn to recognise some more constellations in the sky using the star maps.

c. Stand in the centre of the classroom or playground with a friend as the sun and you as the earth.

Have all your classmates stand all around you, far away; pretend that they are stars. Now turn as you did before (section 1b). Pick any 'star' from among your friends.

Does it appear and disappear from view as you turn?
Look at some other stars too as you turn. Are some of them in the same part of your 'sky' as the sun? Are you able to see the sun and the stars at the same time?

Think! Think!

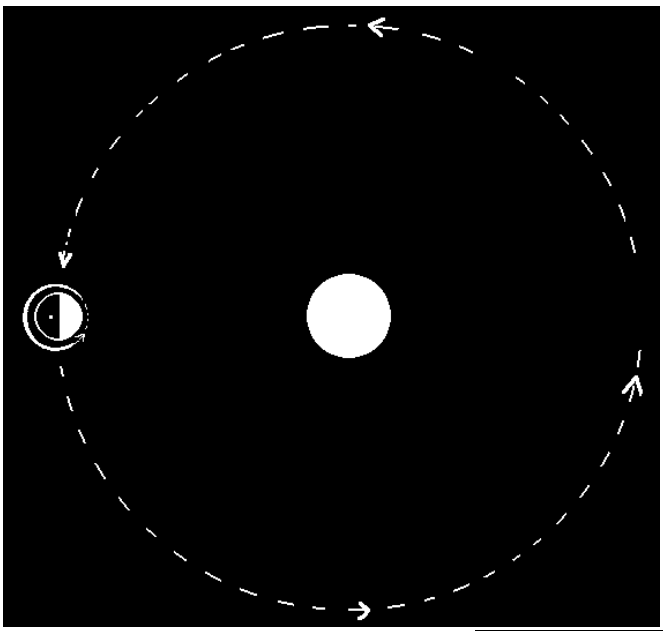
Why don't you see stars in the daytime?

The revolving earth

4. The earth goes around the sun

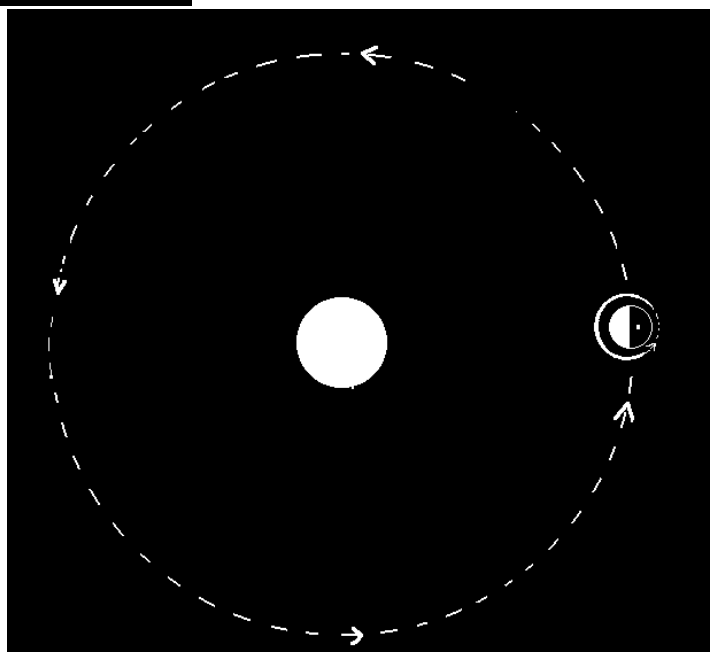
The earth spins, and revolves around the sun at the same time. It takes the earth a year to make one complete revolution around the sun.

The earth's path around the sun is shown in this drawing. It is like a circle.

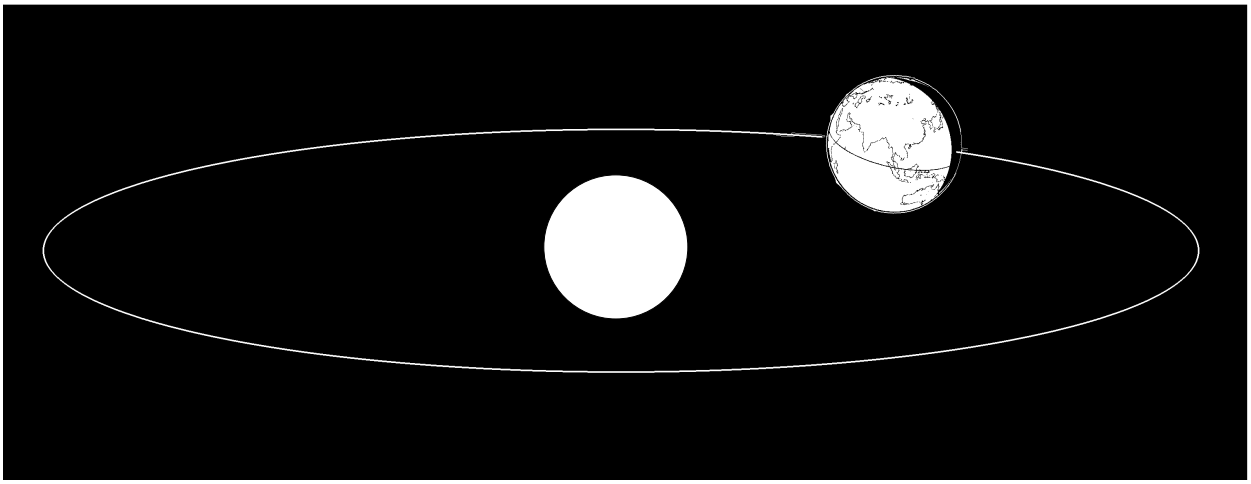


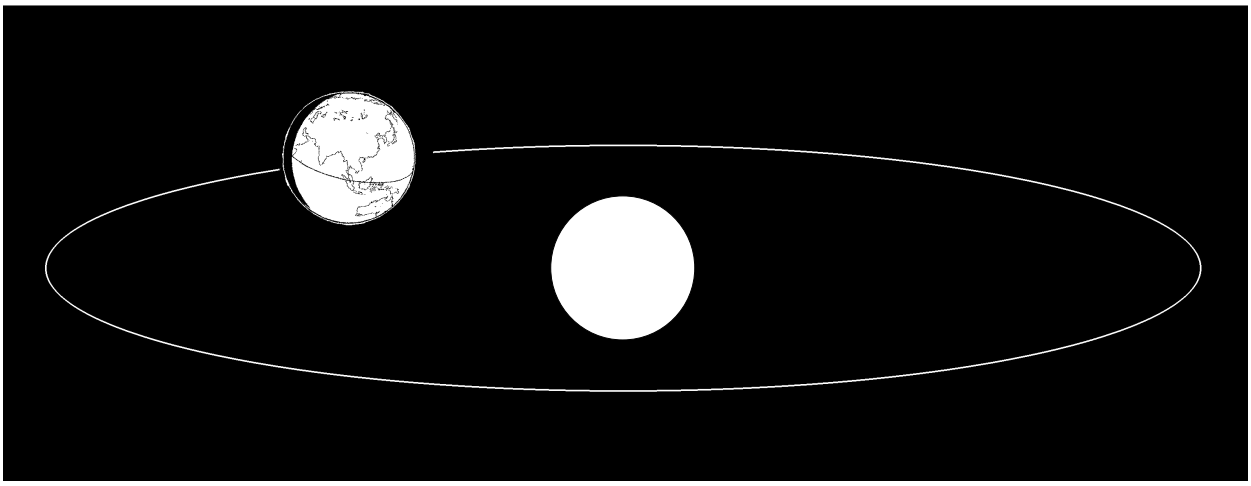
This is the earth's **orbit.**

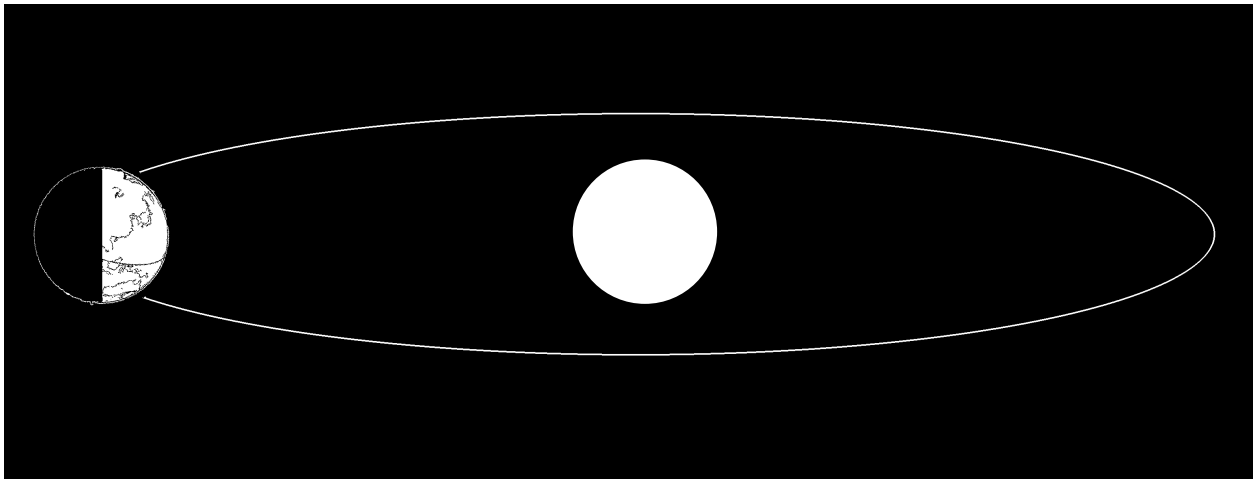
Six months later,
the earth is at a different position in the orbit.
Where would the earth be
3 months later? A year later?
Show this on page 96 of your WorkBook

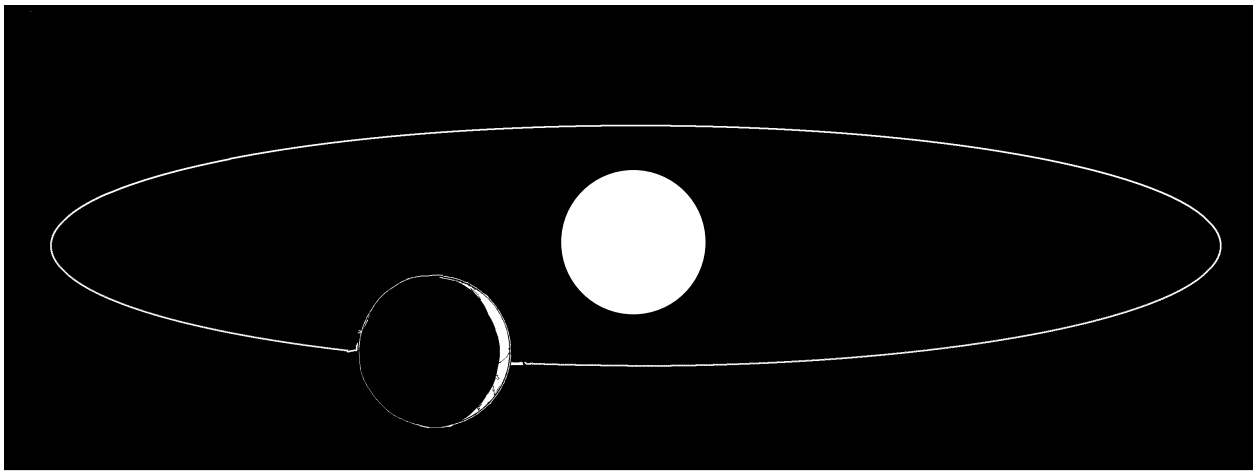


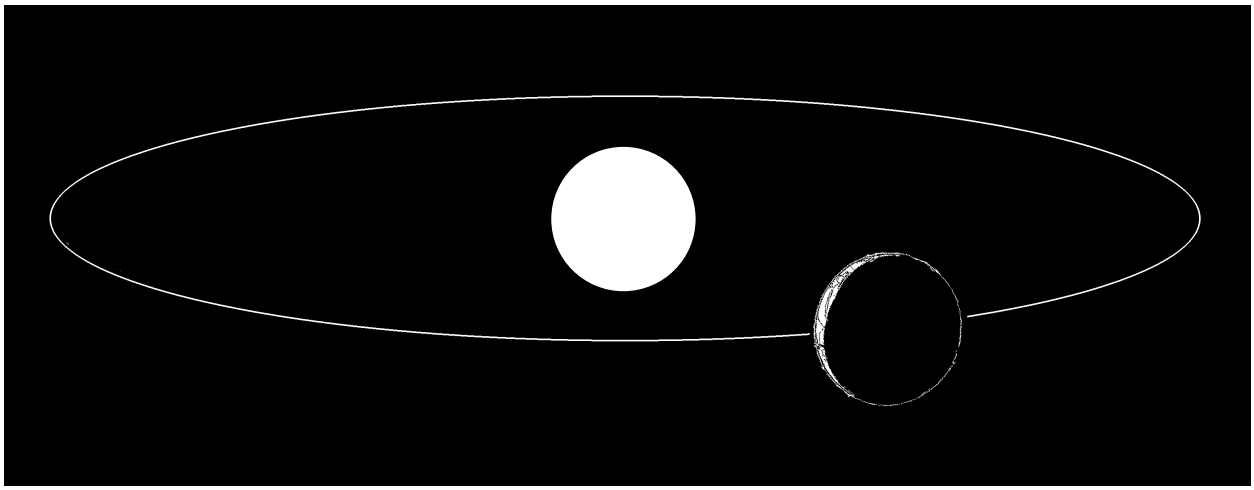
Here are side views of the earth's orbit, with the earth, at different times of the year. These drawings are not to scale - the sun's diameter is about 100 times the earth's diameter.

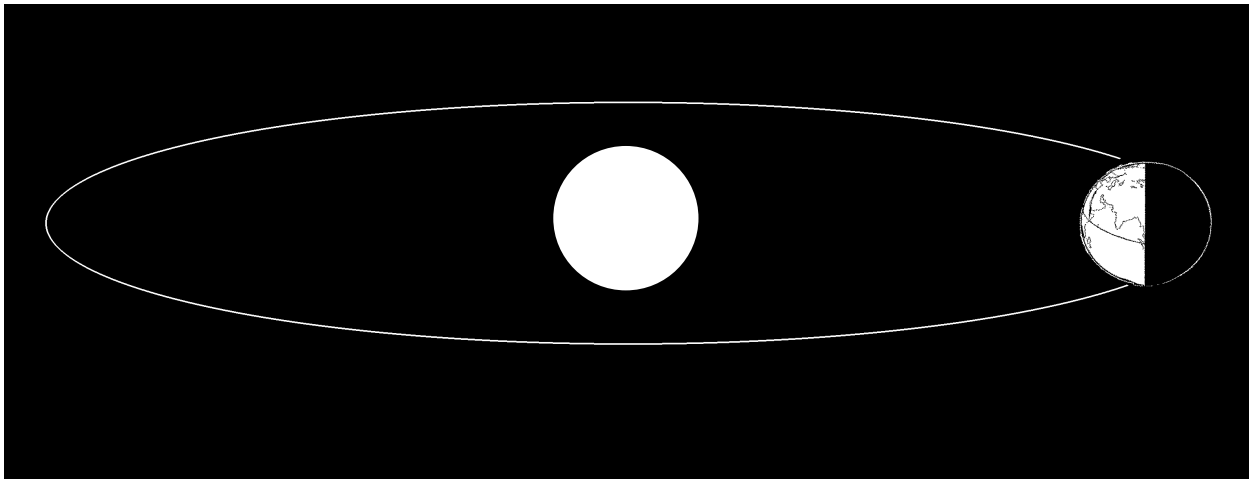




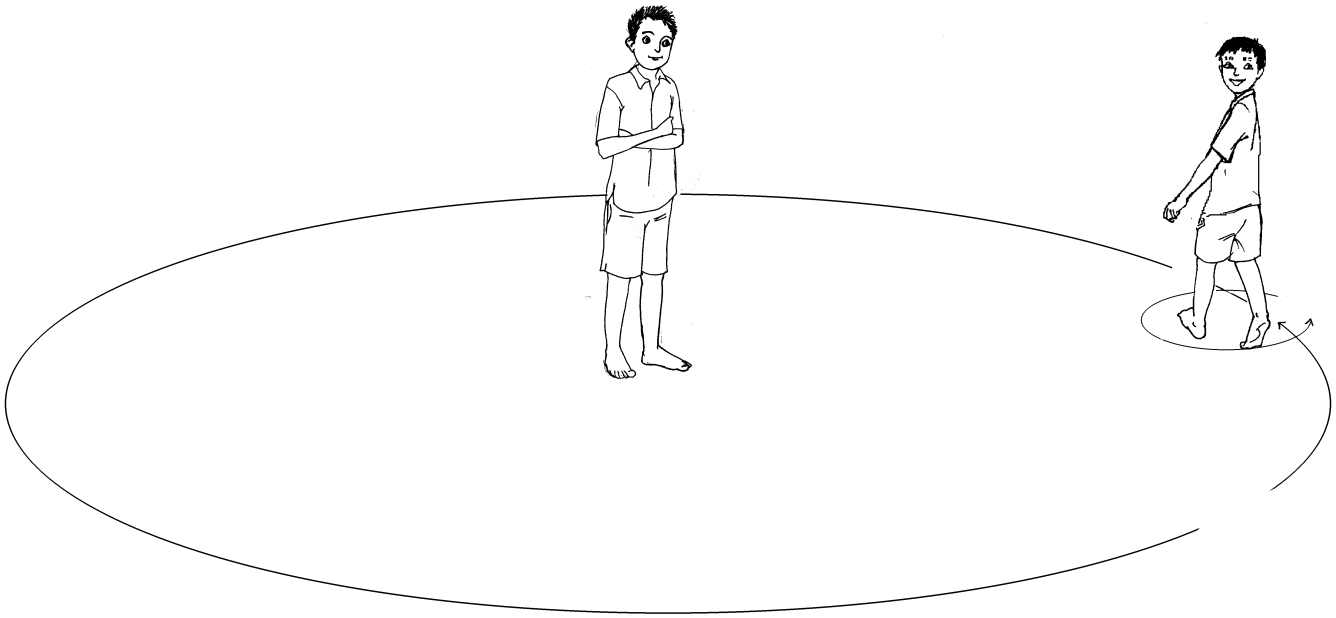








Again ask a friend to be the sun. You be the earth. Walk along a circle around your friend, the way the earth revolves around the sun.
Remember - you should spin at the same time!



How many rotations does the earth complete while it revolves around the sun once?
Did you spin as many times as the earth does?

Know these words

horizon, zenith, rotate, revolve, revolution, clockwise, anti-clockwise, orbit.

EXERCISES

What's the same? What's different?

Give two similarities and two differences between

a) Sunrise and sunset

b) Your shadow early in the morning and late in the evening

Interesting questions

1. Name some things you see in the sky, other than the moon, sun and stars which appear to rise and set.
2. Why is it hotter during the day than it is at night?
3. Hold a pencil upright. Using a torch, make shadows of different lengths. Where do you have to hold the torch to make the shadow the shortest?
4. Suppose the sun is at the zenith. If you fix a stick upright, in which direction will its shadow be? How long will the shadow be?
5. Does the moon ever rise in the west? Why do you think so?
6. Answer the following questions with the help of a globe:

a) Suppose Akash sees the sun rising in Kolkata. At the same time, would Vasundhara in Mumbai see the sun rising too? If not, would she have to wait, or would the sun have already risen in Mumbai?

b) A cricket match in England starts at 9:30 am. When you watch it live on TV from India, what time would it be here - earlier or later than 9:30?

c) Suppose it is 7 am in India, and Apu and Mini are just waking up. For the following children, guess what time it would be in their countries - much

earlier or later than 7 am? Or a little earlier or later then 7 am? What time of day or night would that be?

Then guess what these children would be doing at that moment - match them with the activities on the right as shown:

i) Hakim and Arida in Senegal (NW Africa)	waking up
ii) Akihiro and Keiko in Japan	sleeping
iii) Gonzalo and Maria in Chile	studying in school
iv) Emil and Eva in Sweden	having dinner
v) Mini and Apu in India	

Classroom discussion

Do stars rise and set? Do they appear to move from east to west?

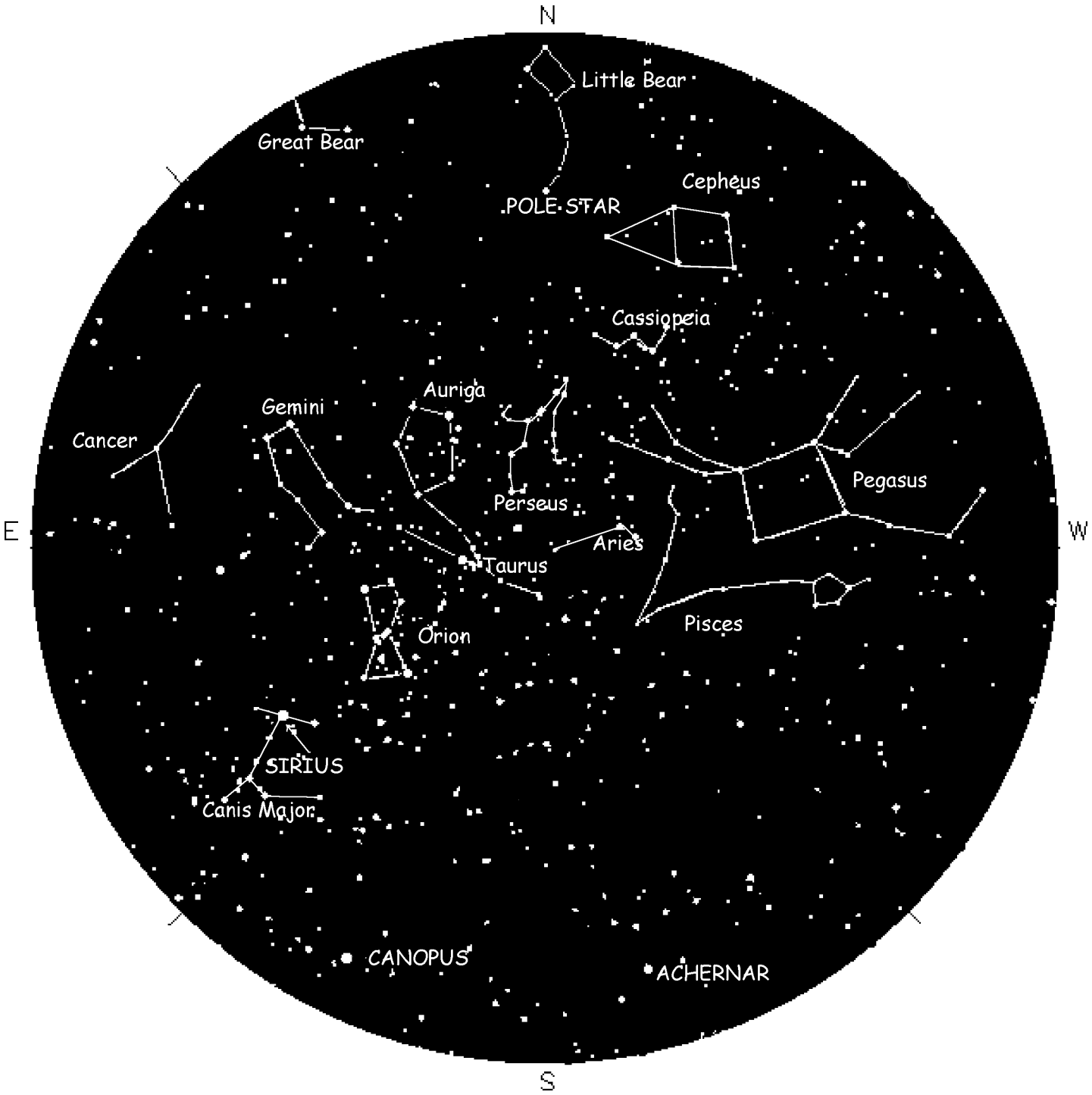
Do they disappear below the horizon in the west like the sun does?

Figure it out

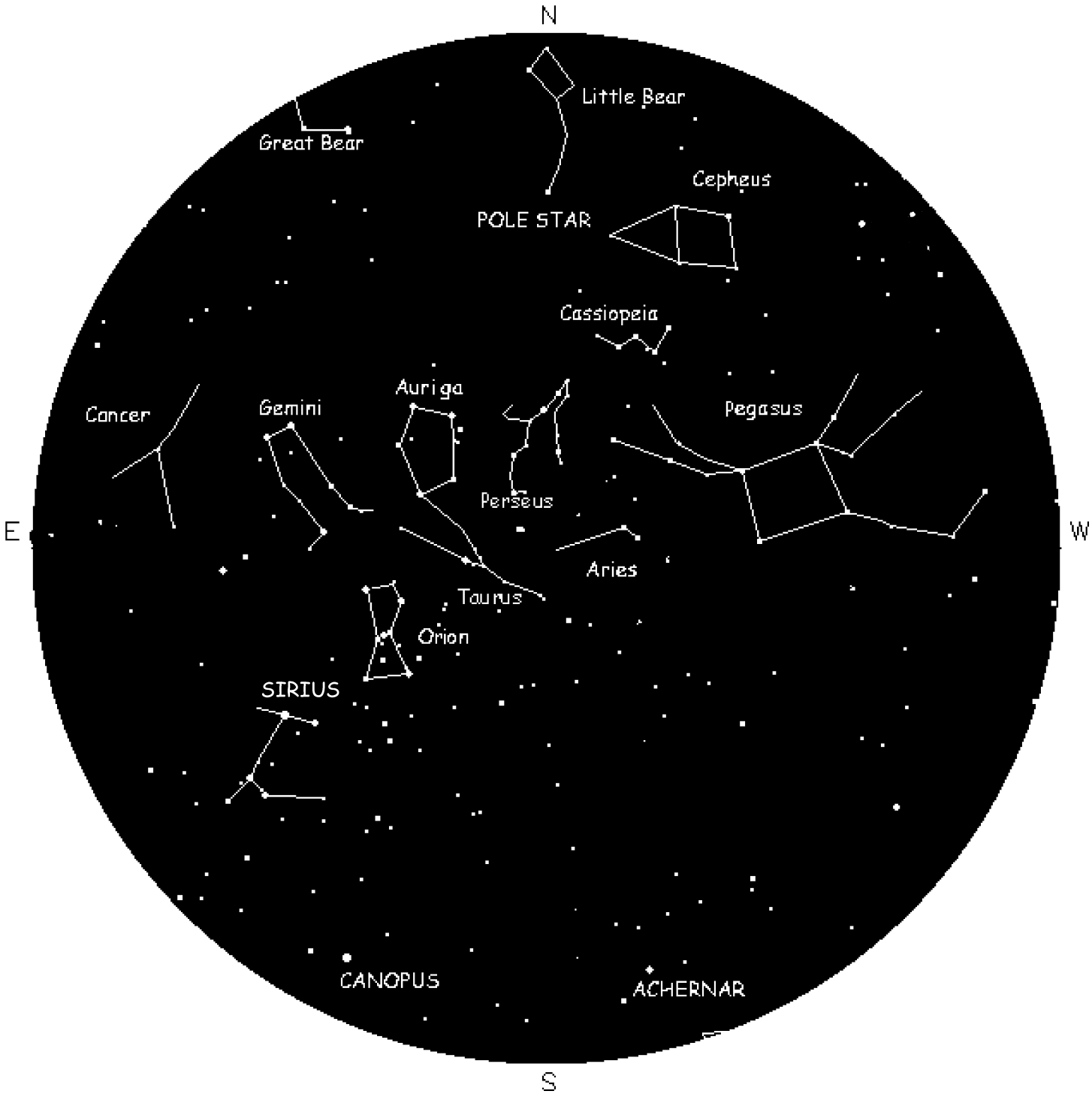
Is the sun overhead at noon everyday? How can you find out, without looking directly at the sun? Try your ideas. You may want to make something to try to answer this question. What materials do you need for this?

DID YOU KNOW?

1. All of India follows only one time - the Indian Standard Time. Russia is such a vast country, that when it is morning in its western parts, it is already evening in the eastern parts. They have 11 different standard time zones across the country. Each zone has its own standard time. The part of the United States between Canada and Mexico has 4 time zones.

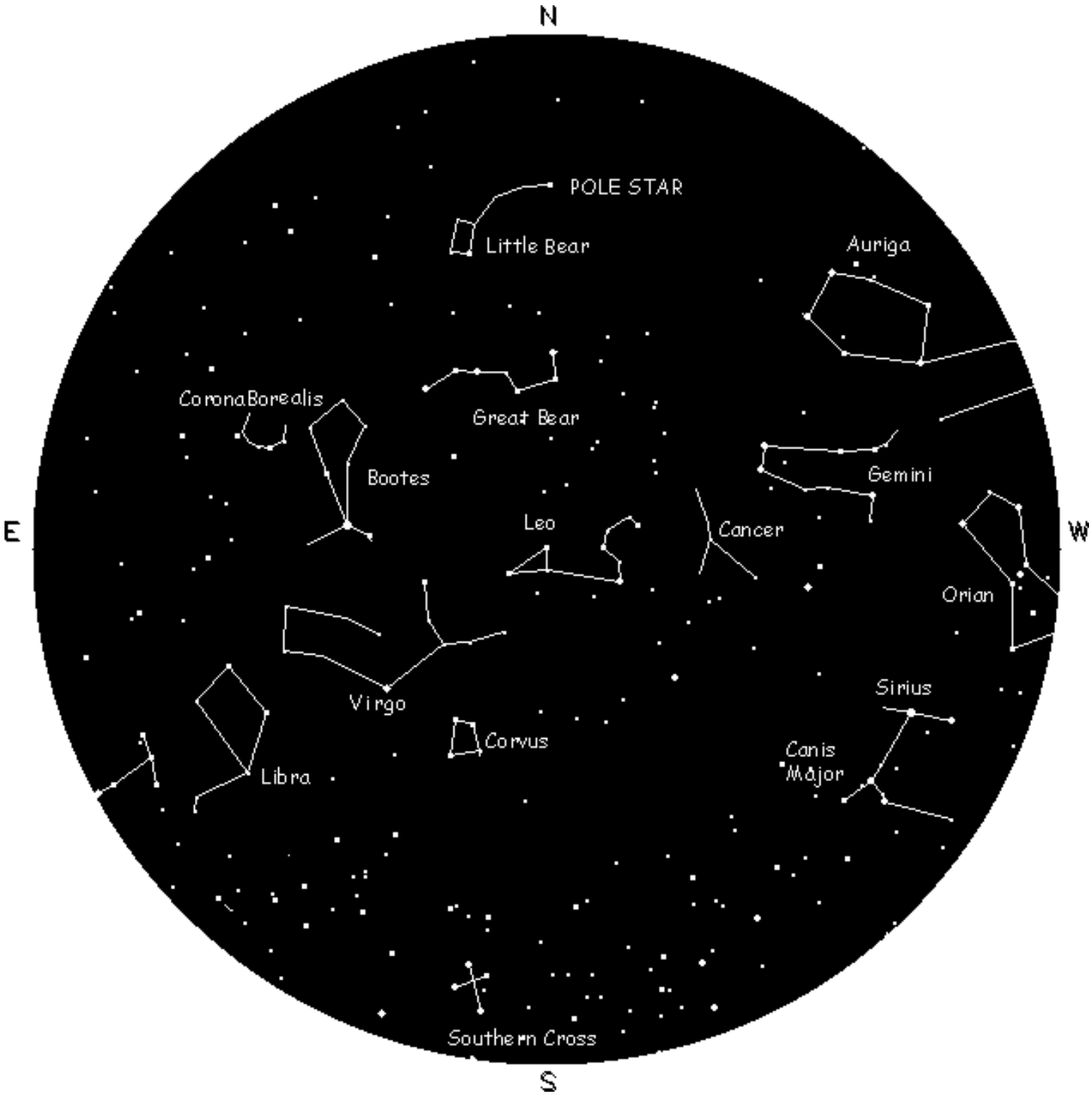


The sky on January 15 at 8.00 pm

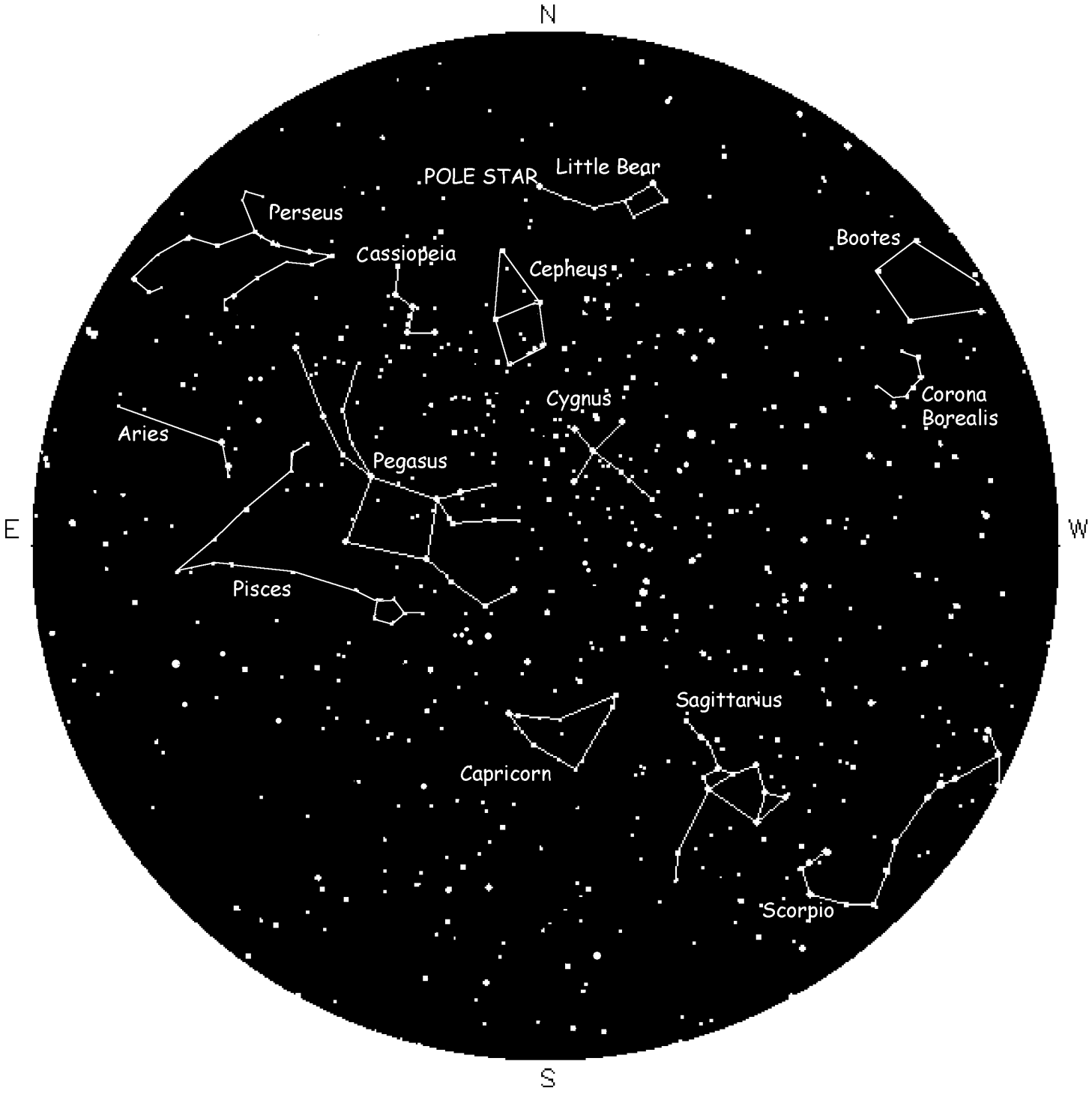


The sky on January 15 at 8.00 pm
Seen from the city

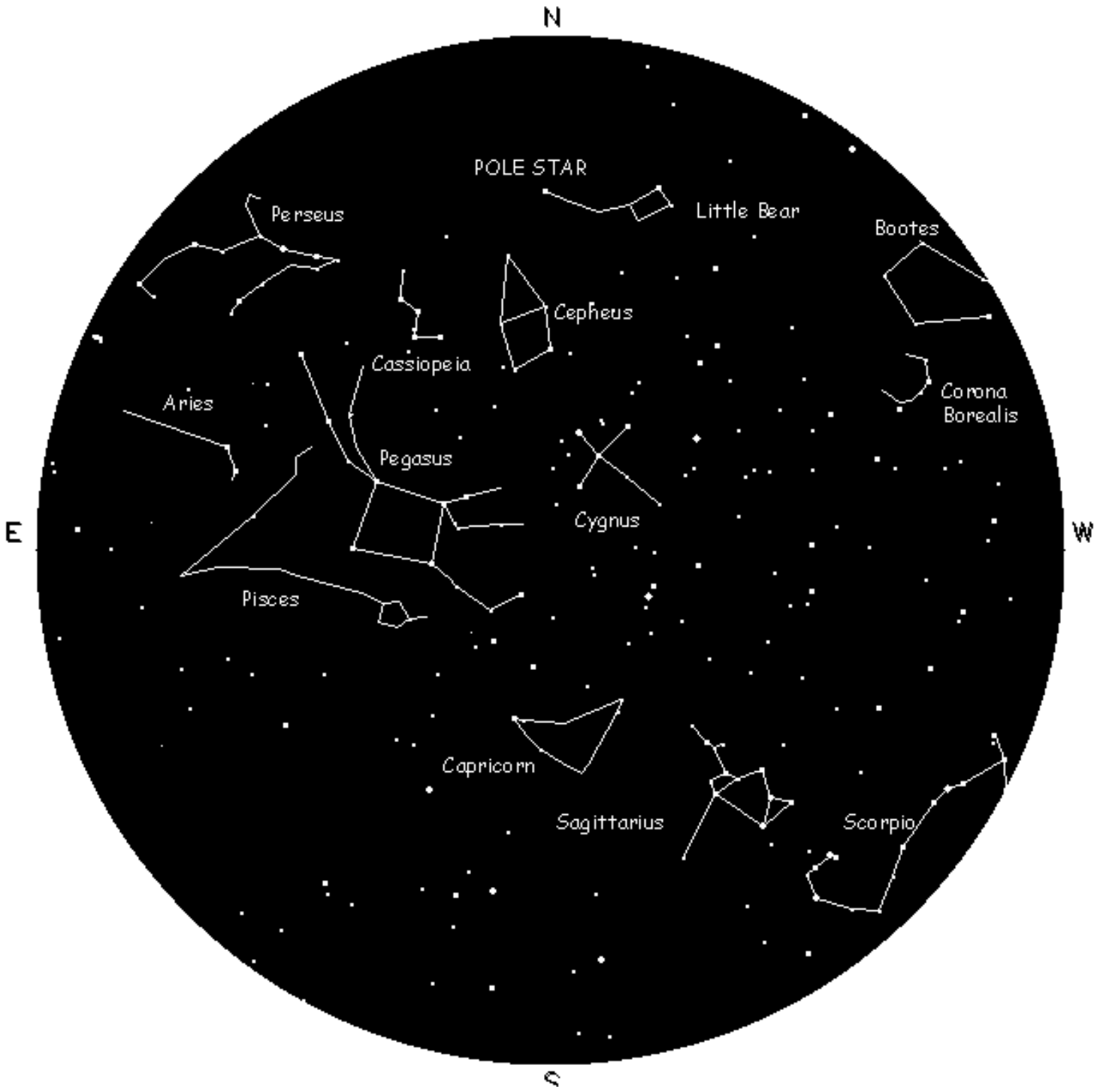
The sky on May 15 at 8.00 pm



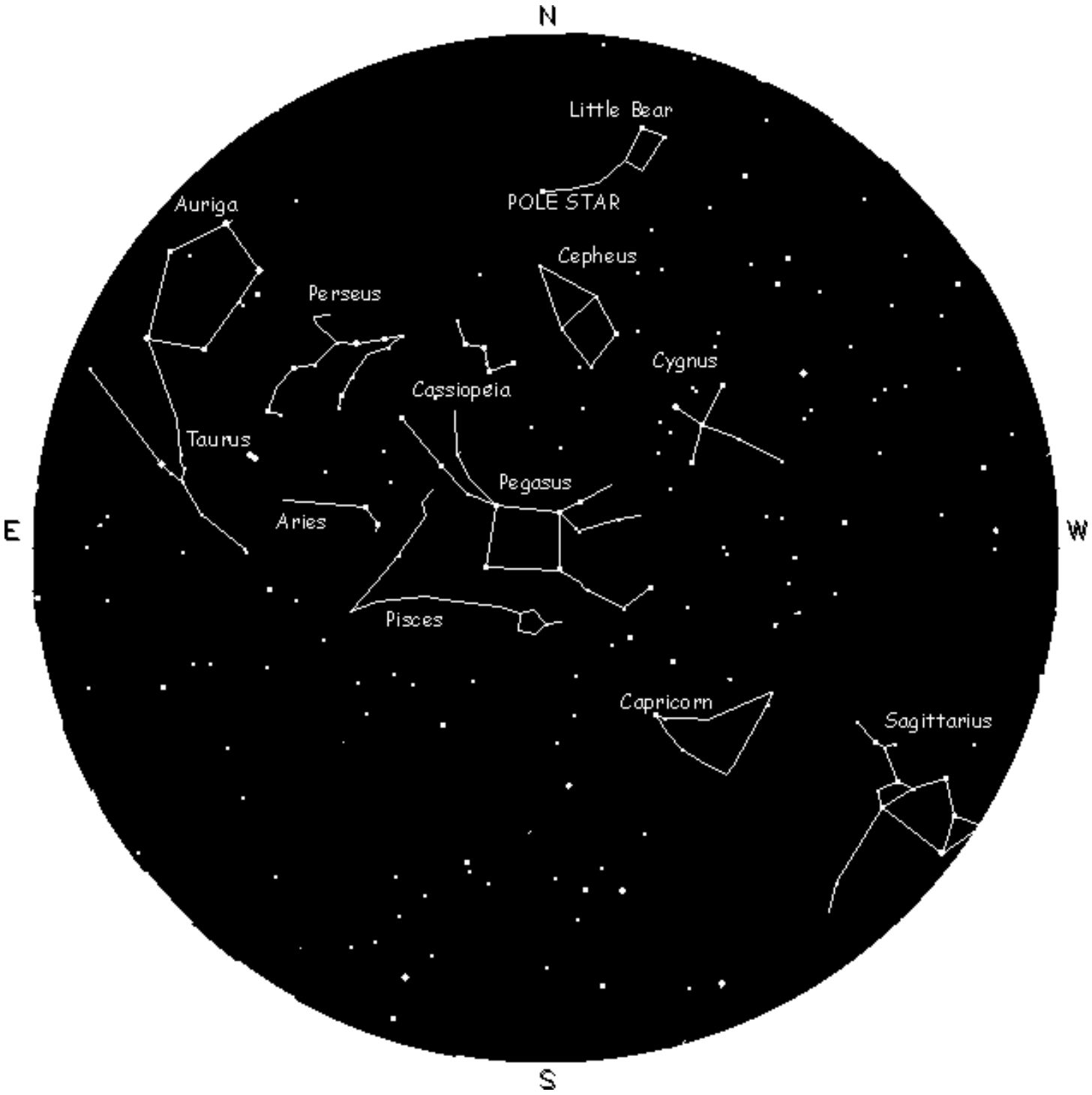
The sky on May 15 at 8.00 pm
Seen from the city



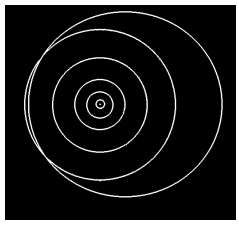
The sky on October 15 at 8.00 pm



The sky on October 15 at 8.00 pm
Seen from the city



The sky on October 15 at 10.00 pm
Seen from the city



CHAPTER **7**

EARTH'S NEIGHBOURS

Earth's nearest neighbour

1. The Moon

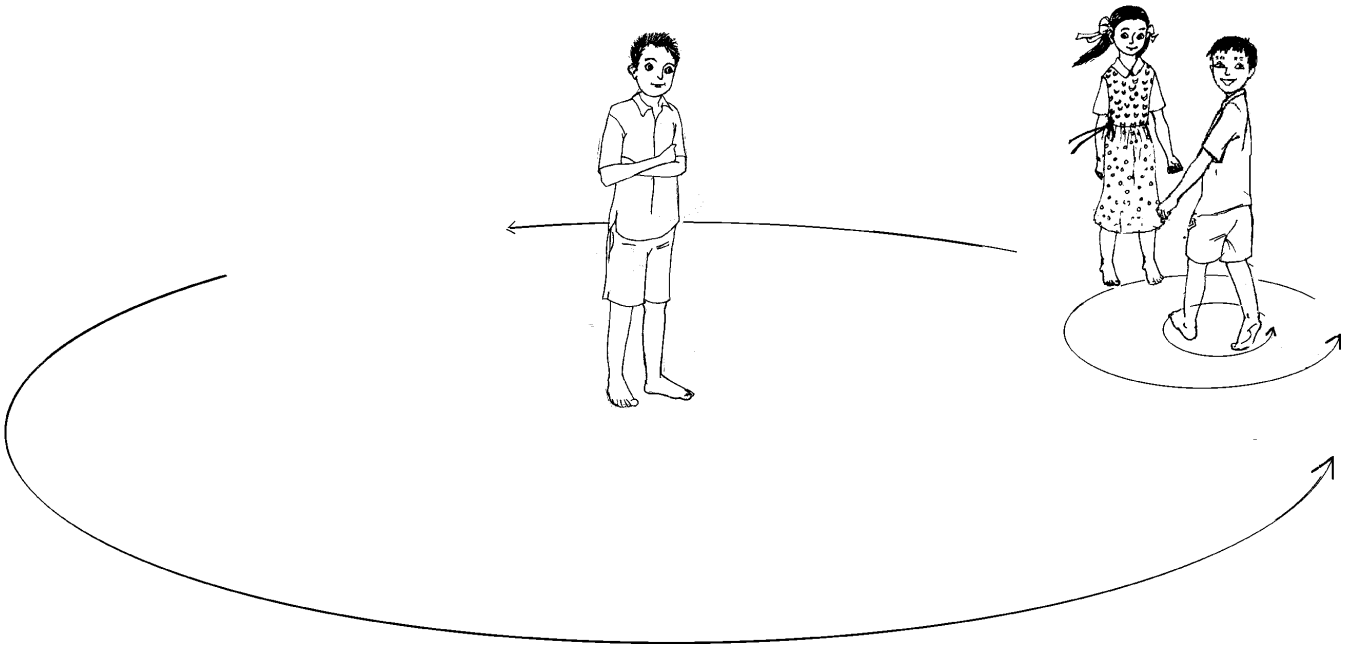
a. The moon is Earth's nearest neighbour. It revolves around the earth. It takes a little less than one month to go around the earth. It also rotates very slowly.
Together, Earth and moon go around the sun.

Ask your friend to stand in one place as the earth, as Apu  did in the drawing below.

Pretend to be the moon, like Chandrika.  Stand facing the earth and slowly start to go around the earth; remember to spin slowly at the same time. Always face the earth as you go around.

Now get someone to be the sun like Ravi.  Have the earth go around the sun.

The earth should spin at the same time. You, the moon, go around the earth.



The moon is smaller than the earth. Earth's diameter is about 4 times as large as the moon's diameter.

Make a drawing of the earth and moon. Draw the orbit of the moon. In your drawing the size of the moon should be correct compared to the earth. The distance to the moon is about 40 times the earth's diameter. In your drawing, if you show the correct distance, will it fit on the page of your book? If not, how big a sheet would you need to fit the drawing on it?

b. Here is a picture of the moon.

The dark areas are made of dark rocks. These rocks formed from volcanoes on the moon a long time ago.

Many years ago, people thought these were seas, so they named them 'Sea of Tranquility', 'Sea of Serenity' etc. We now know that there is no water on the moon.

Look at the moon when it is a full moon or almost a full moon. Do you see these dark areas? On page 101 your WorkBook, show where you saw the dark areas.

This photograph is a close-up of the moon's surface taken by astronauts from Apollo 17.

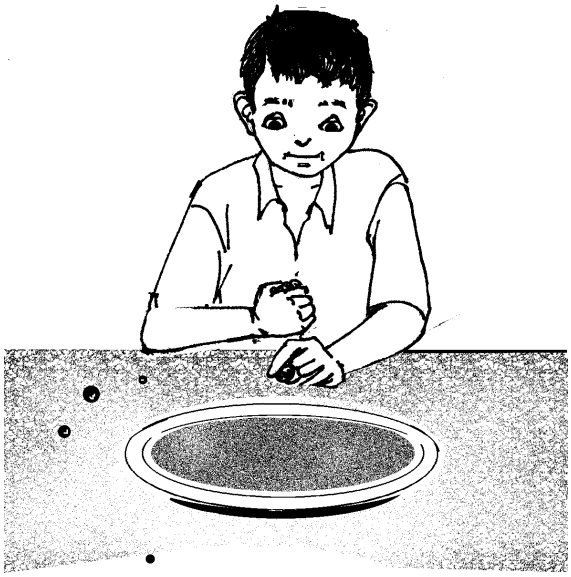
Here is another close-up taken by the Hubble Space Telescope.

What do you see in these photographs?

The craters on the moon formed when **meteors** hit the moon's surface.

You will learn about meteors in section 3.

c. Make craters
Take a plate of dry sand.
Make the surface smooth with your finger.
Take some heavy marbles or ball bearings (*chharra*).
Now drop these in the plate.
Do your craters look like the craters on the moon?
Moon is made up of rocks and sand, just like the earth.
Astronauts have brought back rocks and soil from the moon.



Our other neighbours

2. The planets

a. There are eight planets that go around the sun. Earth is one of them. The others are Mercury, Venus, Mars, Jupiter, Saturn, Uranus and Neptune. Until August 2006, Pluto was counted as one of the planets - it was the ninth one. But Pluto is tiny compared to these eight planets, and different in many other ways. Astronomers have decided that it will be called a **dwarf planet**. We can see Mercury, Venus, Mars, Jupiter and Saturn in the sky without telescopes. They are so far away that, without telescopes, they look like shining dots. They look like stars, but do not twinkle. We need telescopes to see Uranus, Neptune and Pluto. Like Earth, all planets rotate.

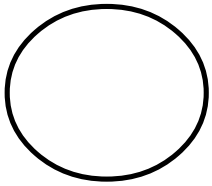
Name some planets you have seen. For each planet, answer these questions:
When did you see it? (time and date)
Where in the sky was it when you saw it? (near which constellation? Or in which direction, and how high in the sky?)
Describe it (faint or bright? How bright compared to some stars you know like the stars of the Great Bear or Sirius? What was its color? Was it twinkling or not?)

Mercury is closest to the sun. Then, nearest to the farthest from the sun are Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto.

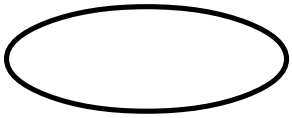
Think! Think!

Apu asked Mini mischievously - there is one planet you never see up in the sky, even with a telescope. Which one is it?
What do you think Mini's answer should be?

b. The orbits of all planets and dwarf planets are like stretched circles - like this. This shape is called an **ellipse**.

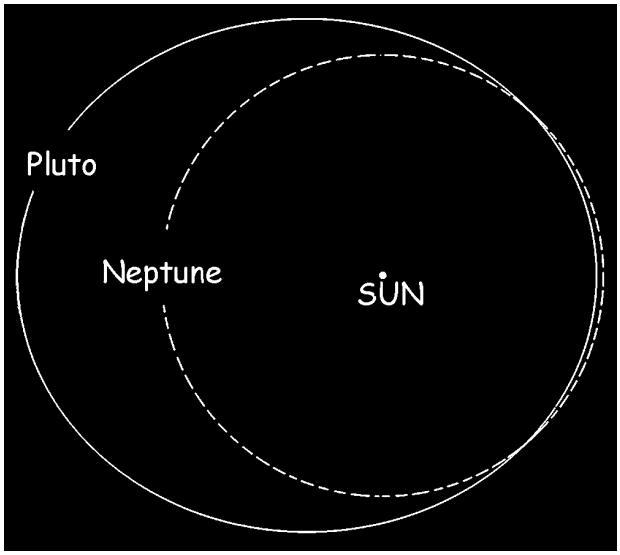


Ellipses can be almost like circles, like Earth's orbit or thinner, like this



or even thinner, like this

Here are the orbits of Neptune and Pluto, drawn to scale. The orbit of Pluto is a much more stretched circle than that of the planets. The orbits of planets are almost like circles. The orbits of other planets are almost like circles.



Look carefully at the orbits in the picture. Can Pluto ever be closer to the sun than Neptune?

c. Draw the orbits of the planets and Pluto to scale. You can draw all the orbits as circles.
The distance of Mercury from the sun is 58 million km. If we measure the distances of the other planets from the sun in units of the Mercury-Sun distance, they are

Mercury 1	Venus 1.9	Earth 2.6
Mars 3.9	Jupiter 13.4	Saturn 24.6
Uranus 49.5	Neptune 78	Pluto 102

Decide how many centimetres you will take as the distance between Mercury and Sun. Then how many centimetres will the distance between the sun and the other planets be in your model? Write this in the table on page 102 of your WorkBook.

Now draw a dot for the sun and draw the orbits around it. The planets are so small compared to the size of the orbits that you cannot show them in this drawing. Just write the name of the planet on the orbit.

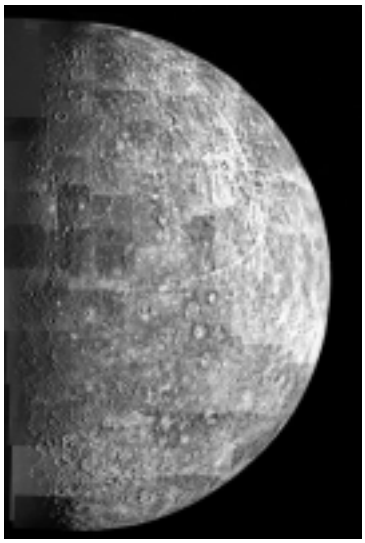
Make a guess - how far is the nearest star (other than the sun) in this model?

Think! Think!
What is the Earth-Sun distance in kilometres?
This is called 1 Astronomical Unit (AU) .
Distances to planets are usually measured in this unit.

Planets go around the sun, satellites go around the planets.

Like the earth's moon, some planets have their own moons.

d. The planets are all different from each other. No planet is exactly like any other, as these photographs show. They were taken by spacecraft which went close to the planets, or by powerful telescopes.

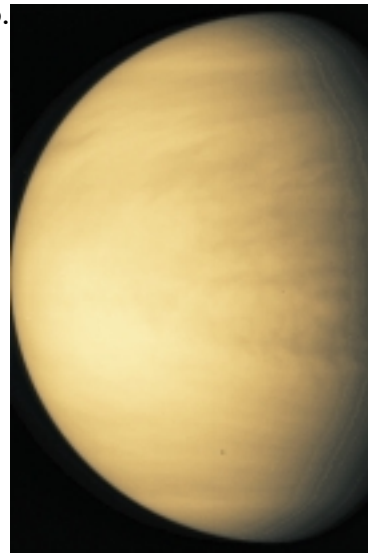


This photograph of Mercury was taken by the spacecraft Mariner 10.

Mercury is smaller than the earth. Its surface is like the moon's surface, with many craters.
There is no air on Mercury.

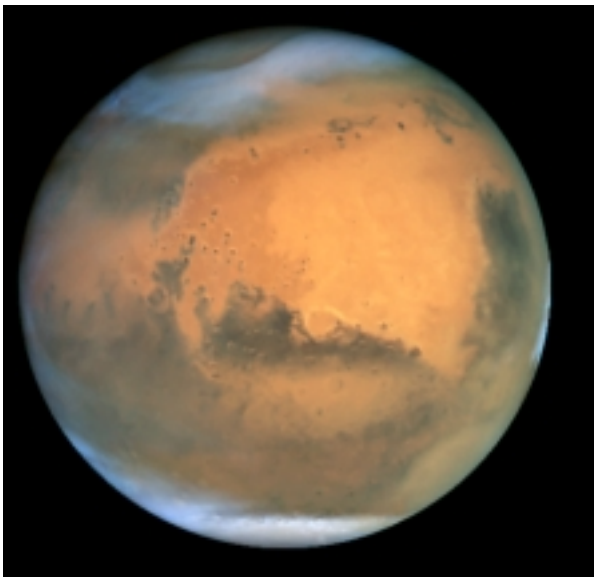
It gets very hot in the part facing the sun, where the temperature is about 230 degrees Celsius (°C).
The part facing away from the sun gets very cold - much colder than the icy continent of Antarctica on Earth.

This photograph of Venus was taken by the spacecraft Galileo.
Venus is about the same size as the earth.



If you look at its rotation from the north, it is in the clockwise direction. It takes longer to complete one rotation than it does to complete one revolution around the sun!

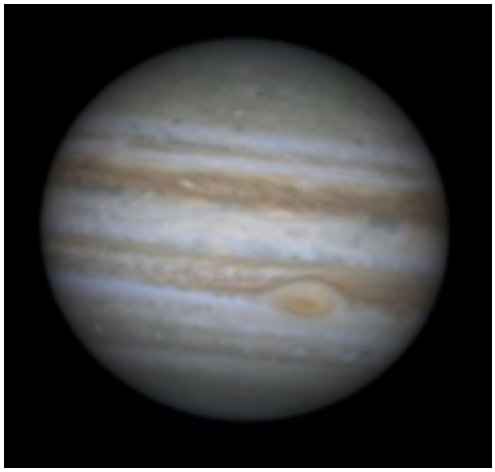
The air on Venus is made up mostly of carbon dioxide (96%).
It has small amounts of water vapour and some acids.
Its surface is hidden by thick clouds.
Spacecraft had to land on Venus to take photographs of its surface.
It is so hot on Venus that these spacecraft were quickly destroyed after landing, but managed to photograph the surface before that. They show that it is made up of rocks.
You can sometimes see Venus as a bright object in the east before sunrise, and sometimes in the west soon after sunset. It is called 'morning star' or 'evening star', though it is a planet, not a star.
Look for Venus in the sky. Did you see it in the morning or evening?
This photograph of Mars was taken by Hubble Space Telescope. The diameter of Mars is about half the diameter of the earth.



The air on Mars is made up mostly of carbon dioxide.
It also has some nitrogen, and some other gases, but almost no oxygen or water vapour.
It has ice at its poles. The ice is made of water and also carbon dioxide.
The warmest temperature is about 20 °C, the coldest is much colder than ice.

The soil on Mars is red. There are huge dust storms on Mars; some storms have been photographed by spacecraft. Mars also has craters on it.
Look for Mars in the sky. It looks red. Mars has two satellites - Phobos and Deimos, which go around it.

Jupiter is the largest and most massive of all planets - its diameter is about 11 times the diameter of the earth. But it rotates very fast - once in about 10 hours!

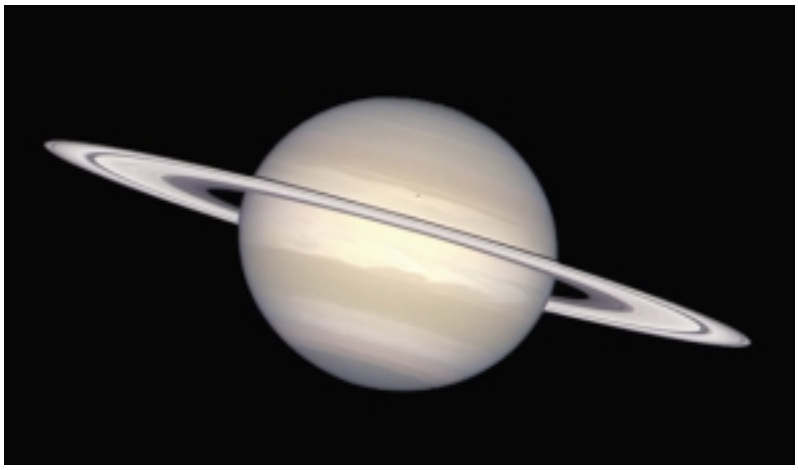


Jupiter is made mostly of hydrogen and helium gases.
It does not have a solid rock surface.

This photograph taken by Cassini spacecraft shows a storm on Jupiter - known as the Great Red Spot, which has been seen for more than 300 years.

It is colder on Jupiter than on Mars.
Jupiter has many satellites - more than any other planet. There are 4 large satellites and many small ones. Some are as small as 2 to 4 km across. New satellites are constantly being discovered.

This photograph of Saturn was taken by the Hubble Telescope.
Saturn is the second largest planet. It has very bright rings. The rings are made up of small particles of ice.

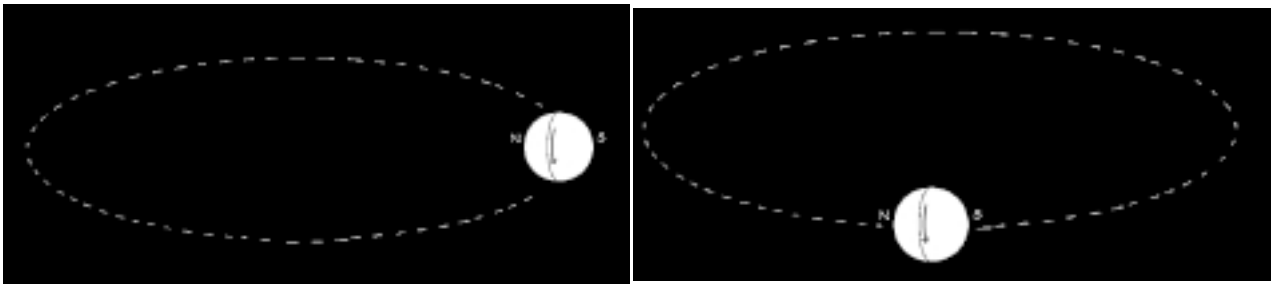


Jupiter, Neptune and Uranus too have rings around them, but they are not as bright as Saturn's rings.

Saturn itself is made up mostly of hydrogen and helium. It is colder than Jupiter.
Saturn too has many satellites. Titan is the largest. It was discovered more than 350 years ago.

This photograph of Uranus is taken by Voyager 2 spacecraft. Uranus is the third largest planet. Like upiter and Saturn, Uranus too does not have a solid rock surface. It is made up mostly of hydrogen, some helium, water vapour and other gases. The centre of the planet is all liquid.
It is even colder on Uranus than it is on Saturn.

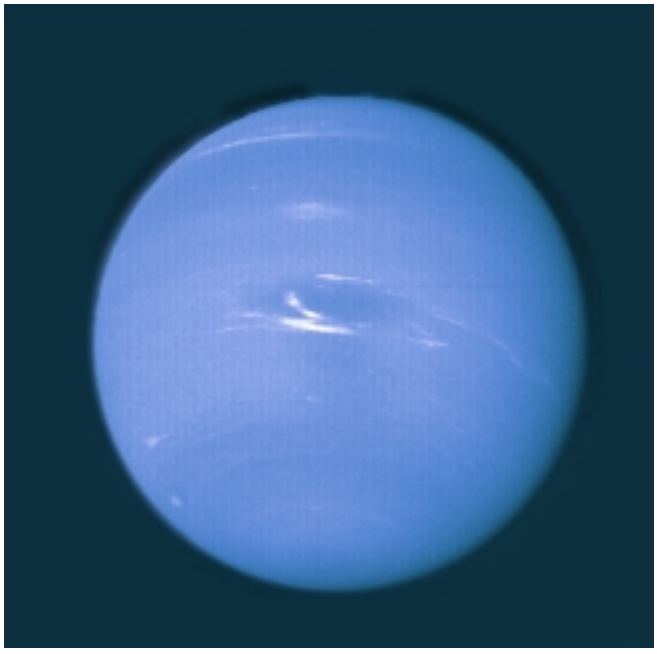
Unlike other planets, the equator of Uranus is tilted about 90 degrees to its orbit. It too has many moons; the largest is Titania.

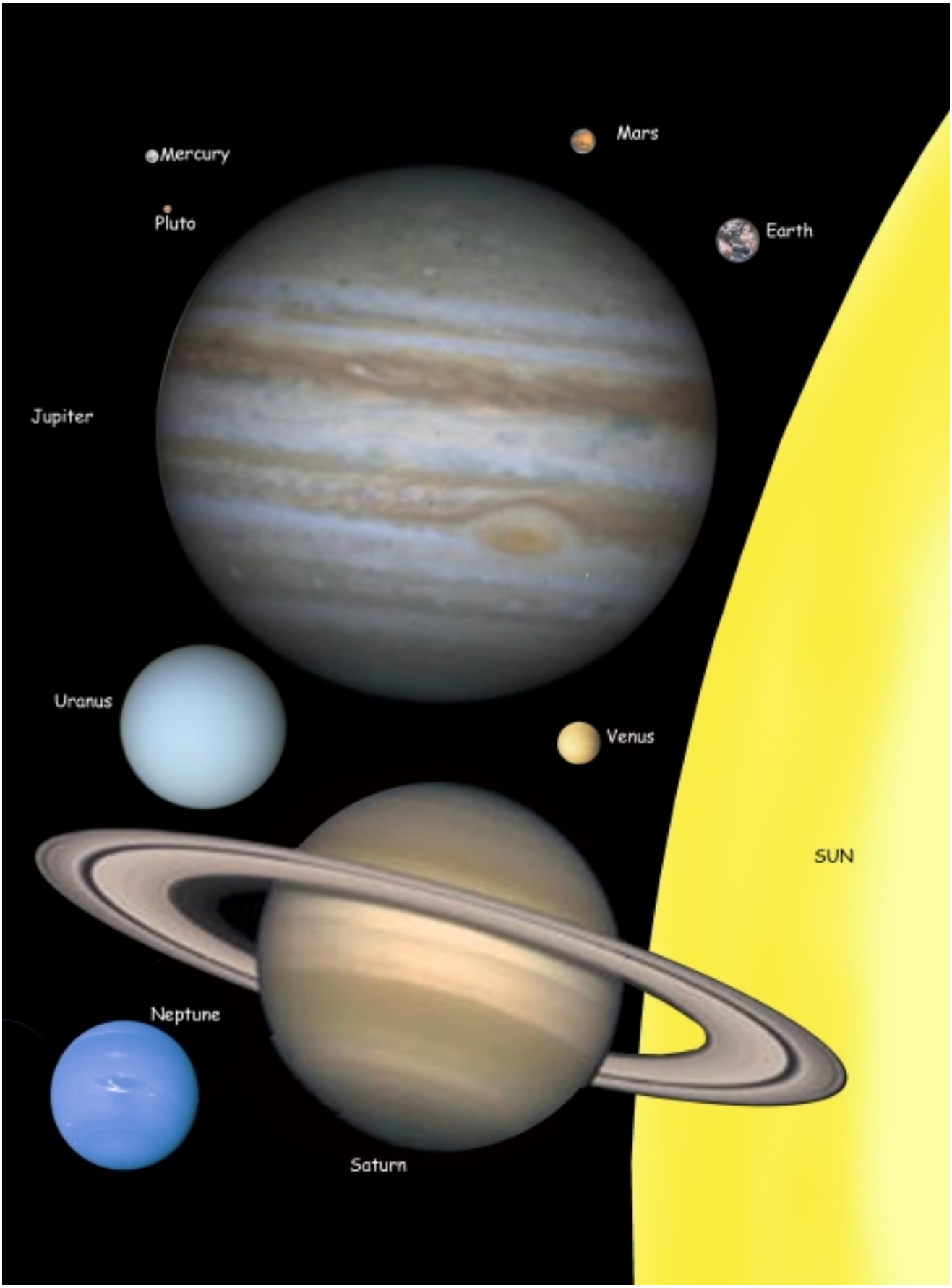


Uranus was discovered in 1781.

Neptune is the fourth largest planet.
It is even colder than Uranus.

Neptune too is made of mostly hydrogen and helium and other gases like methane.
It does not have a solid rock surface - no astronaut or spacecraft can land on this planet or others like it.
It has at least 8 moons.
Neptune was discovered in 1846.




Mercury
Mars
Pluto
Earth
Jupiter
Uranus
Venus
SUN
Neptune
Saturn

Pluto is a dwarf planet; it is even smaller than our moon. It is made of rocks and ice.

Pluto has never been photographed from close by a spacecraft. In January 2006, a spacecraft called New Horizons took off for Pluto, and will reach close to it in 2015.

Pluto was discovered in 1930. The other dwarf planets are Ceres and Xena. This list will get longer as more objects are discovered and named. When Xena was discovered recently, people thought it may be the 10th planet, until astronomers decided it was a dwarf planet.

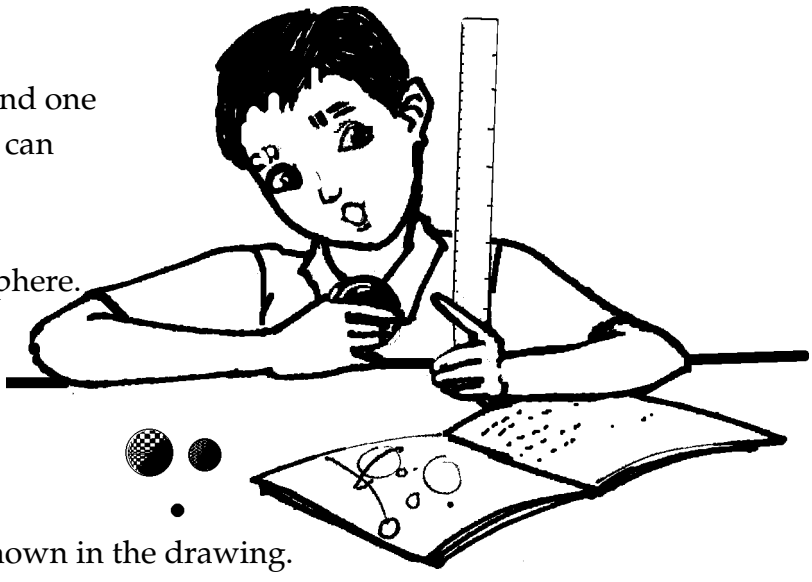
e. Make a model of the planets and Pluto.

The planets are all much smaller than the sun. If the sun were a ball of diameter 1 m, the sizes of the planets would be as shown on the previous page.

The diameters of the planets would be (in cm)

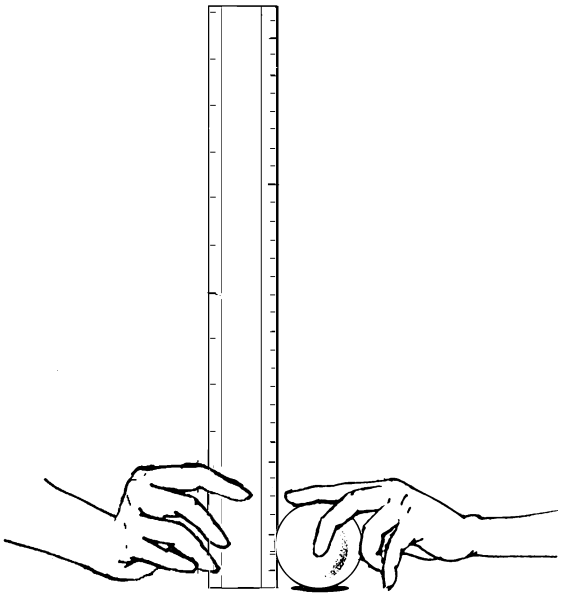
Jupiter 10.3	Saturn 8.67	Mars 0.49
Earth 0.91	Venus 0.87	Mercury 0.35
Uranus 3.6	Neptune 3.5	Pluto 0.17

Find spheres of different sizes, and find one of the right size for each planet. You can choose from balls, beads, even round fruits, dried peas, mustard, pepper ... anything that is almost a sphere.

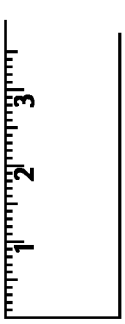


Carefully measure the diameter as shown in the drawing.

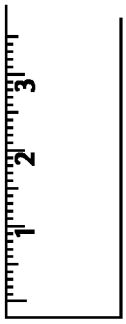
Is the diameter the mark you read on the scale,
or do you have to make a correction?



Look carefully at your scale.
Which of these scales has markings like yours?



(I)



(II)

For which kind of scale would you have to make a correction to find the correct diameter? How will you make that correction - will you add or subtract the length of the blank strip to the reading on the scale?

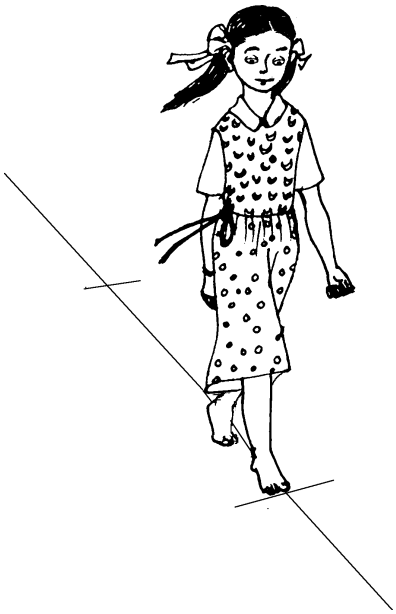
For the smaller planets, you can directly put the sphere on the picture to see if it fits.

After you have all the model planets, do the following activity outdoors.

Get one student to be the sun.
Some of you act as planets, and go around the sun along with your satellites. Each planet hold your model planet in your hand. Venus spins in the opposite direction compared to other planets. How should Uranus spin? Do not spin that way, just tell you teacher what you think.

If you did this to scale, Earth would have to be 100 m from the sun.

Mark a metre on the ground. Walking as you normally do, count how many steps you take to cover a distance of 1 m.
If you measure a metre this way, will your measurement be exact? Why or why not?



How many steps do you have to take to cover 100 metres?

Find a point on the ground which is 100 m from the sun. That is where the model Earth would have to be.

3. Other objects

In addition to the planets, comets, asteroids and meteoroids too go around the sun in different orbits.

Comets are made of rock and frozen water and carbon dioxide and other gases. Many comets go around the sun in orbits which are thin ellipses.

When a comet comes close to the sun, some of it evaporates to form beautiful tails.

Many comets get very bright when they come close to the sun. Then we can see them without using telescopes.

Asteroids are small and rocky. Their orbits are between the orbits of Jupiter and Mars. You cannot see them without telescopes.

Meteoroids are even smaller pieces of rock and dust.
As earth moves in its orbit, and there are meteoroids in its path, they rush into the air at high speeds - between 10 and 30 km per second.
They burn in the air high up, and we see them as meteors - or 'shooting stars'.

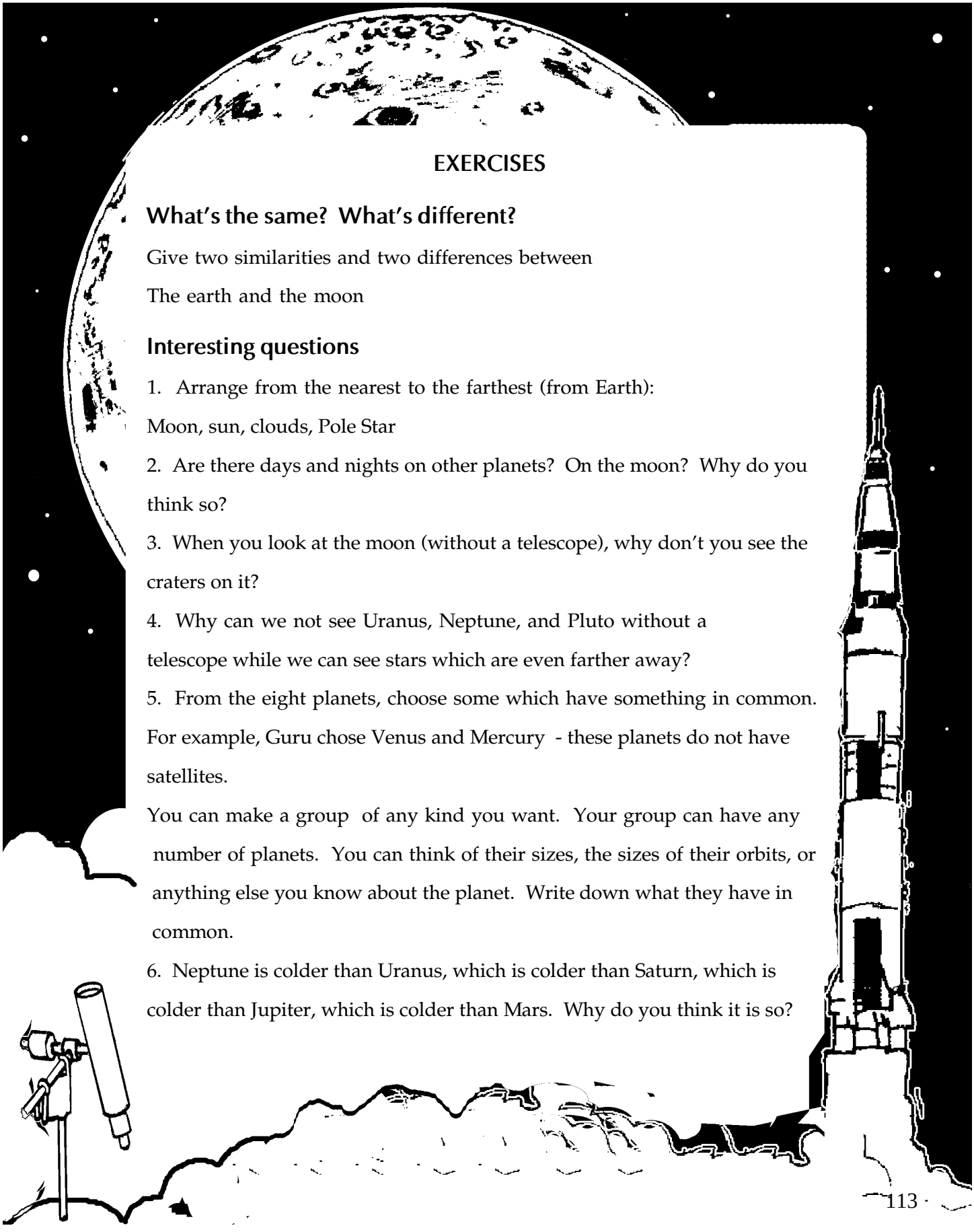
Many times in a year, you can see lots of meteors - sometimes as many as hundreds per hour. These are called meteor showers.

Tell you teacher about any meteors you have seen.
Some meteors are large and do not all burn up in the air. Then they strike the earth. Some are big enough to make large craters, but they are very rare.

The sun, the planets, their satellites (moons), the asteroids, comets and meteoroids together make up the **solar system**.

Know these words

satellite, meteor, comet, solar system, ellipse, asteroid



EXERCISES

What's the same? What's different?

Give two similarities and two differences between

The earth and the moon

Interesting questions

1. Arrange from the nearest to the farthest (from Earth):

Moon, sun, clouds, Pole Star

2. Are there days and nights on other planets? On the moon? Why do you think so?

3. When you look at the moon (without a telescope), why don't you see the craters on it?

4. Why can we not see Uranus, Neptune, and Pluto without a telescope while we can see stars which are even farther away?

5. From the eight planets, choose some which have something in common. For example, Guru chose Venus and Mercury - these planets do not have satellites.

You can make a group of any kind you want. Your group can have any number of planets. You can think of their sizes, the sizes of their orbits, or anything else you know about the planet. Write down what they have in common.

6. Neptune is colder than Uranus, which is colder than Saturn, which is colder than Jupiter, which is colder than Mars. Why do you think it is so?

Talk and write

There is one planet about which nothing is written in section 2d. Which one is it? Write a few sentences about this planet.

Ask and find out

Watch for news reports of comets or meteor showers. Look for meteor showers at the predicted time. If there are any bright comets you learned about from news reports, look for them.

Play with words

The planets, from the closest to the farthest from Sun are:

Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune

The first letters of the planets, in this order, are

M_____ V_____ E_____ M_____ J_____ S_____ U_____ N_____

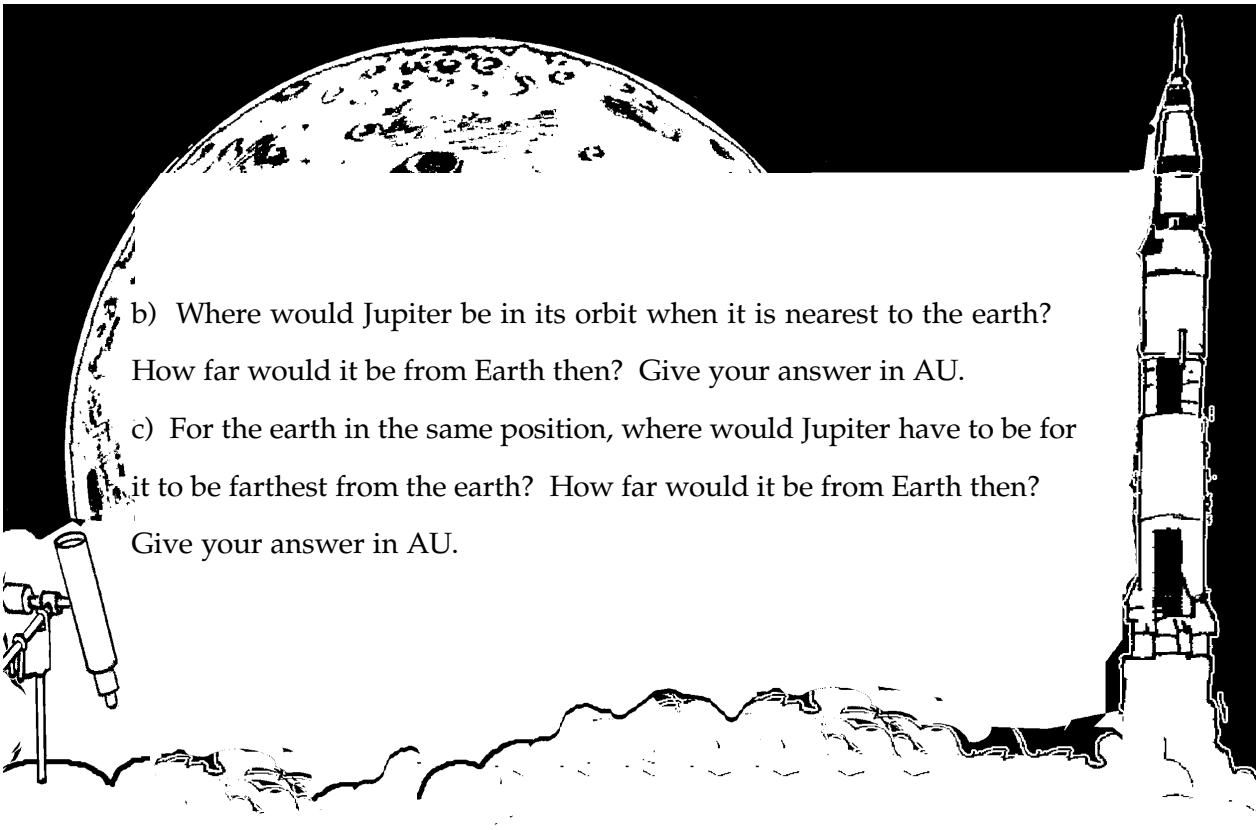
Make a sentence by writing words, each word starting with the letter as shown above.

If you can remember any such sentence, you can remember the order of the planets!

Figure it out

The orbits of Earth and Jupiter are shown on page 108 of your WorkBook. The position of the earth in its orbit is marked. The distance between the sun and Earth is called 1 Astronomical Unit, or AU.

a) How many AU is Jupiter from the sun?



b) Where would Jupiter be in its orbit when it is nearest to the earth? How far would it be from Earth then? Give your answer in AU.

c) For the earth in the same position, where would Jupiter have to be for it to be farthest from the earth? How far would it be from Earth then? Give your answer in AU.

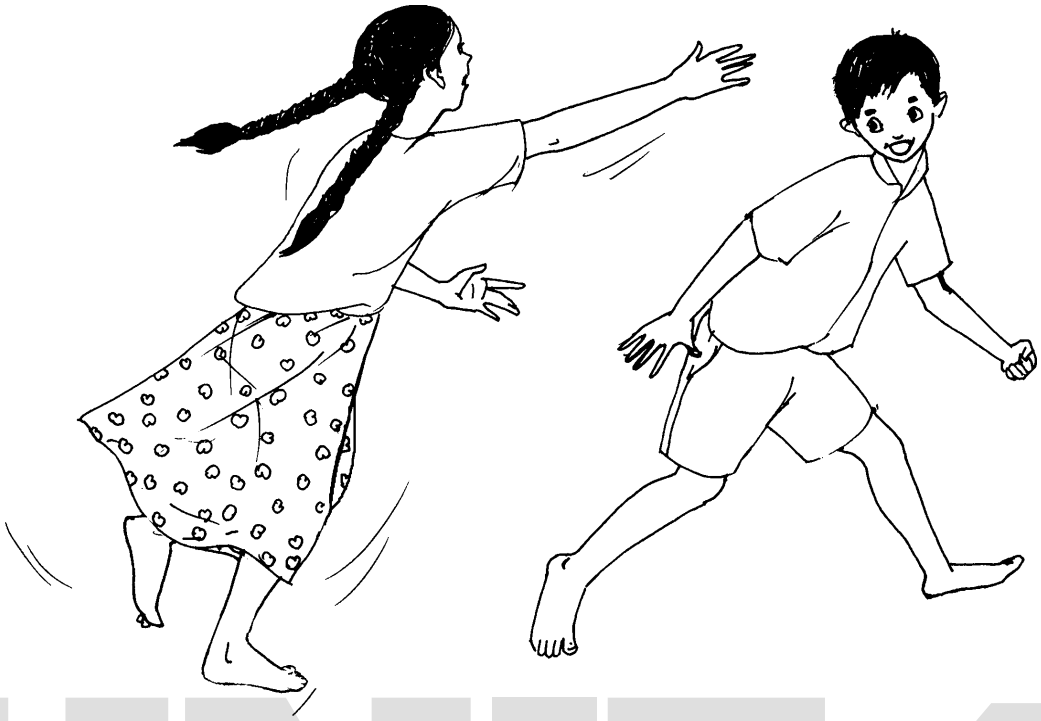
DID YOU KNOW?

1. Our Sun is a star which is very close to us. Astronomers have discovered that there are planets around other stars too, which are very far from us. The first such discovery was of a planet around a star named 51 Pegasi, in the constellation of Pegasus.

2. The largest mountain in the Solar system is Olympus Mons on Mars - it is 25 km high! Mt. Everest, the tallest mountain on Earth is slightly more than 8.8 km high.

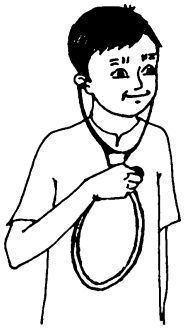
3. There are some meteor craters on earth too - we know of about 120 meteor craters so far. Like the craters on the moon, they were formed when meteors hit the surface. There is one such crater in Lonar, Maharashtra. It is now a lake. Lonar crater was formed when a meteor hit the area 50, 000 years ago.

4. An Italian scientist named Galileo was the first to see the 4 large moons of Jupiter - Io, Europa, Ganymede and Callisto. He saw them through his telescope about 400 years ago, and discovered that they go around the planet. The spacecraft 'Galileo' was named after him.



UNIT 4

OUR BODIES



CHAPTER **8**

WHAT IS IN OUR BODIES?

Lub dub lub dub lub dub

All night, all day
While you sleep, while you play
From before you are born
till the moment you die
never stopping, always working.....

Lub dub lub dub lub dub

Faster than the clock ticks!
Even faster when you exercise!

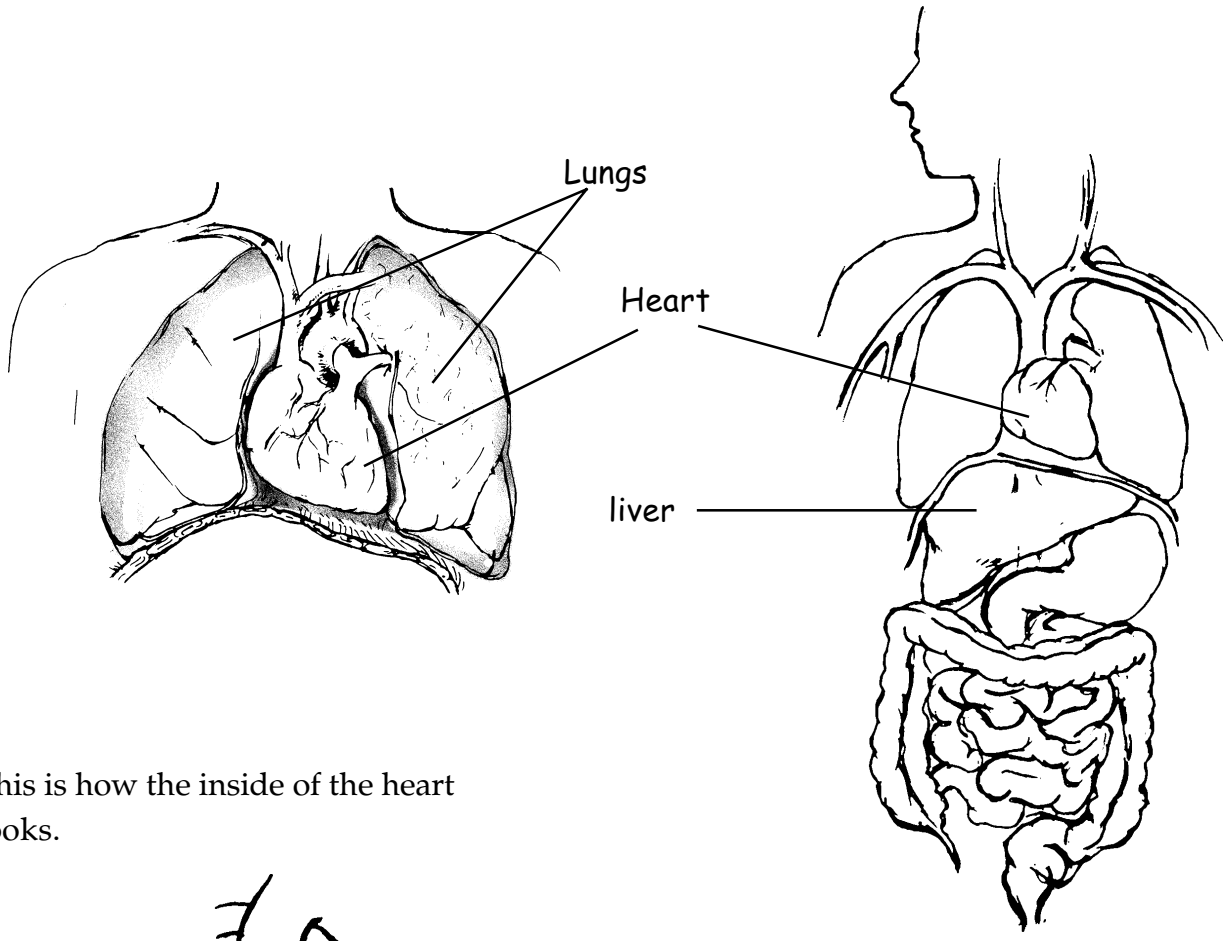
Lub dub lub dub lub dub lub dub lub dub

What is it? .....

1. a. Your heart
Feel with your hand where in your chest your heart is.
Ask your friend to place her or his ear there and
listen to your heart.
Listen to your friend's heart.
How would you describe the sound?
Count the number of times your friend's heart beats in 15 seconds.
Ask your friend to run fast for a few minutes (or run in place in your class). Count his or her heart rate again.
Run fast for a few minutes yourself, and ask your friend to again count your heartbeats.

Your heart is about the size of your fist.

About 2/3 of it is in the left side of the chest, 1/3 in the right side.



This is how the inside of the heart looks.

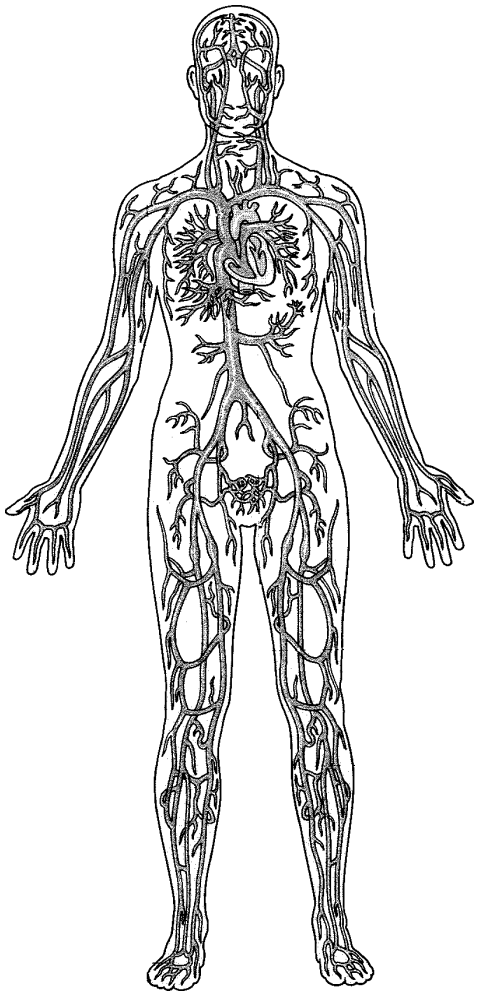
Blood cannot flow directly from one side to the other.
Each side is divided into two chambers - the upper and the lower.
The heart has four chambers in all.

Think! Think!

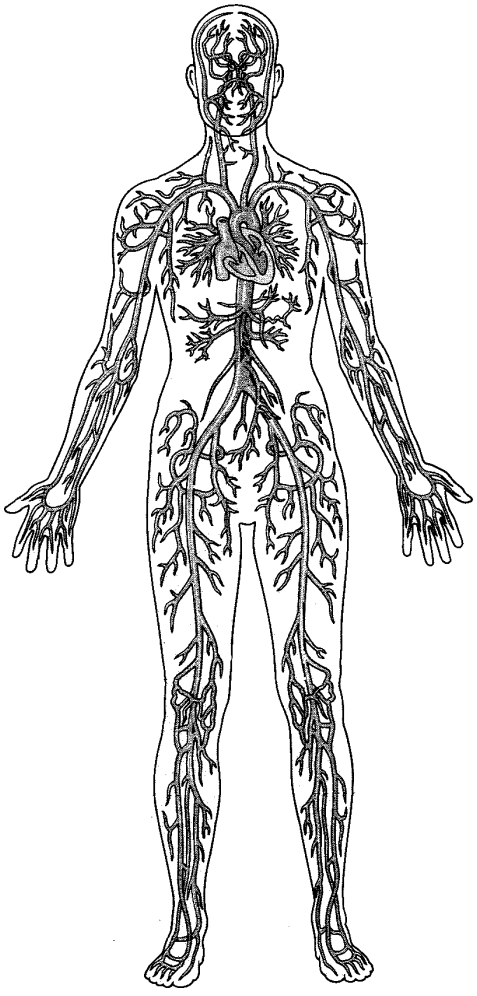
This drawing of the heart is labelled correctly. It is the heart of the person facing you. Whose left is shown here - your left or the left side of the person who is facing you ?

b. The heart pumps blood. It makes the blood flow through the body. Blood is continuously flowing in our bodies.

It flows from the heart to the lungs, back to the heart, then to every part of our body, then to the heart, then to the lungs...and so on.
Blood flows in tubes.
The tubes which carry blood away from the heart - to the lungs and to the other parts of the body - are called **arteries.**
Tubes which carry blood to the heart - from the lungs and other parts of the body - are called **veins**.



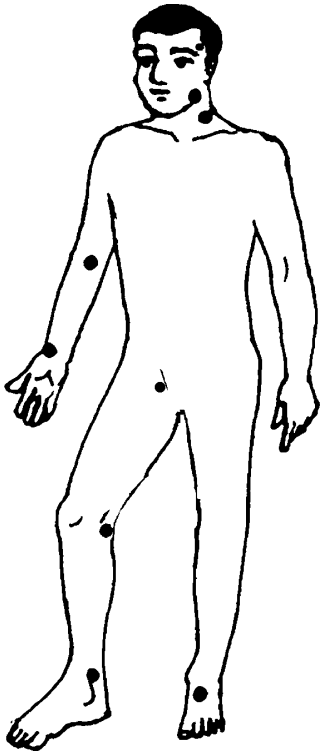
Main veins



Main arteries

You can see some of the veins in the body. Look at the back of your hand or of someone older. You should be able to see some veins there. Draw the outline of the hand. Then draw the veins you could see.
Look carefully at how they branch or join together.
Could you see veins anywhere else in the body? Where?

Arteries are deeper under the skin.
You cannot see them the way you can see veins.
In some places the arteries are closer to the skin -
in the wrist, in the neck and other spots shown in this drawing.
If you place your finger at these spots, you can feel the pulse.



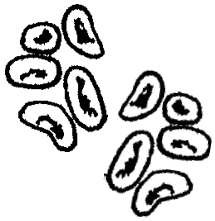
Find your friend's pulse on his (or her) wrist.
Listen to his (or her) heart, and at the
same time feel his (or her) pulse.
How many heartbeats (lub dub) did
you hear each time you felt a pulse?

Think! Think!

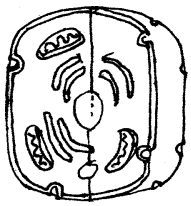
Why are heart rates and pulse rates the same?

2. Our bodies are made of cells.

Cells are so small that you need a microscope to see them. The liver cell shown below measures 30 micrometres. 1000 micrometres make a millimetre.
On your ruler, look at how long a millimetre is.
If you divide this into 1000 parts, each
part would be 1 micrometre long.

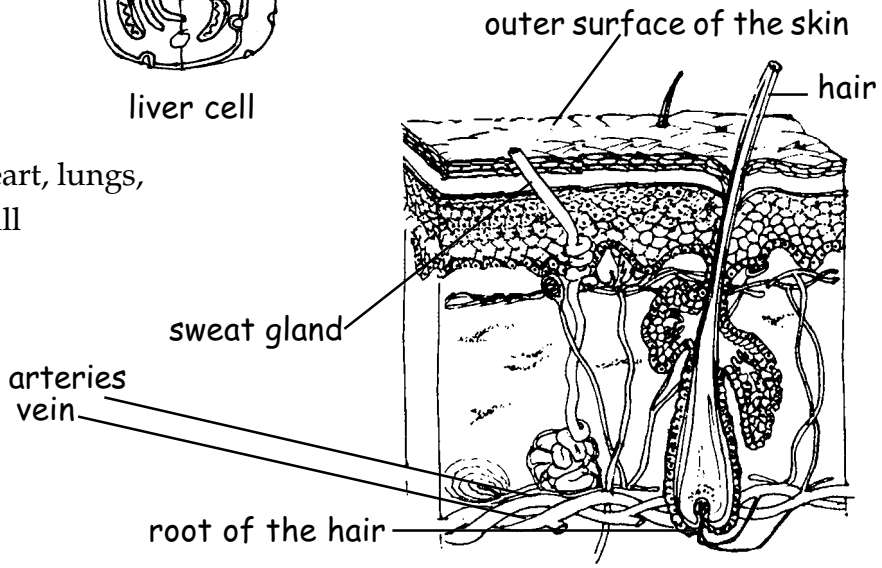


red blood cells



liver cell

All our organs such as heart, lungs,
digestive system, skin ... all
are made of cells.

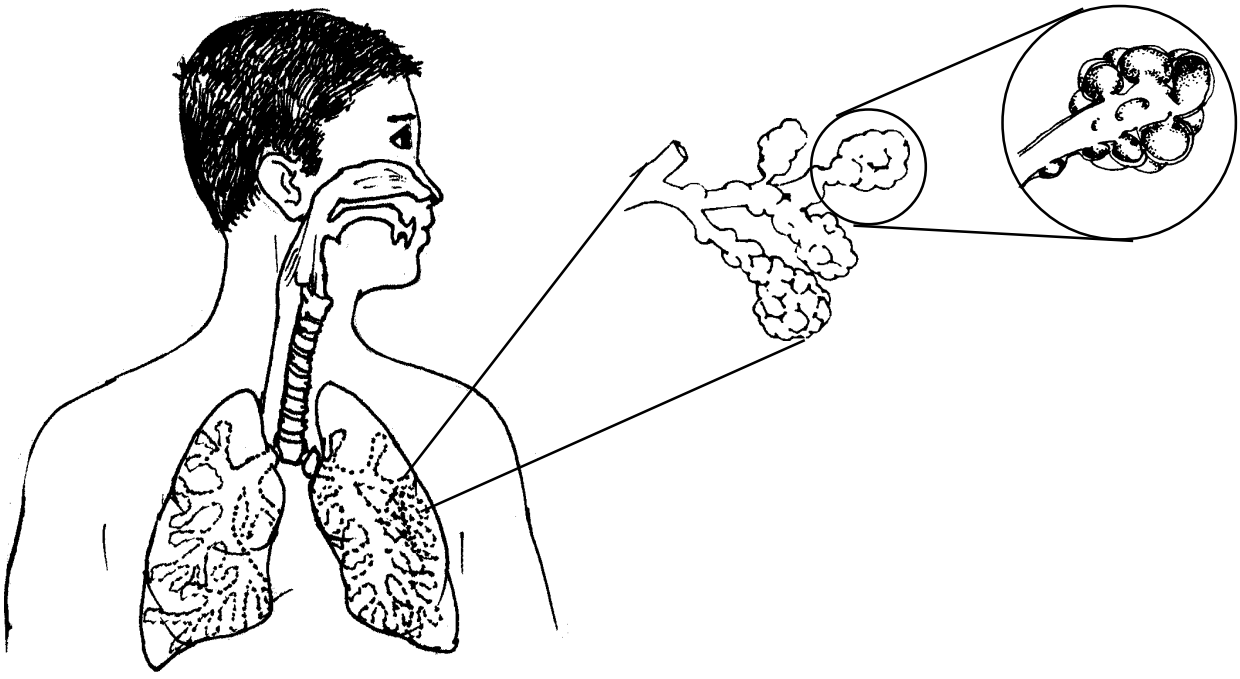


All living things are made of cells. Bacteria, and some of the other microbes you learned about last year, are made of just one cell each! Make a guess - how many cells are there in your body?
The part of the nails which can be cut without pain, are made up of dead cells. All hair seen above the skin is made of dead cells.

b. All the living cells in our bodies need oxygen. We get oxygen from the air when we breathe.
Measure your friend's chest as he or she breathes in, and then breathes out.
Ask your friend to measure your chest as you breathe in, and then breathe out.

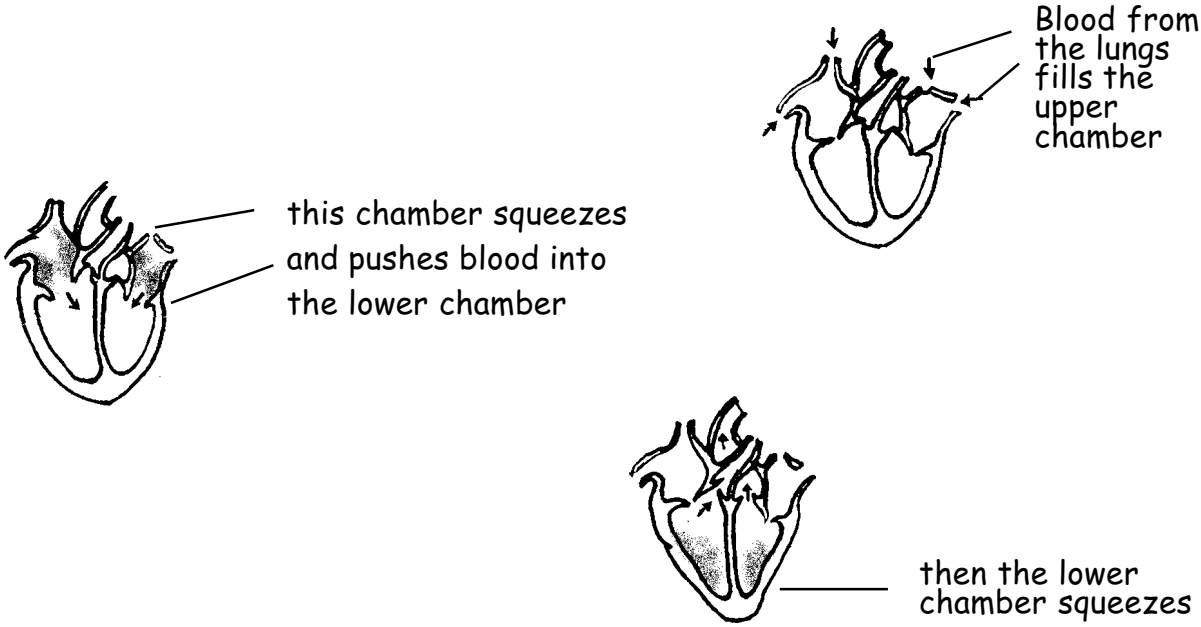
Think! Think!
Do you think lungs are hollow like bags and balloons, or like sponges?
Have you ever felt the lungs of any animal? If you have, tell your class what they felt like.

When we breathe in, our chests expand. Lungs expand and air fills the lungs.
There are many tiny air sacs in the lungs.
The air fills these air sacs.

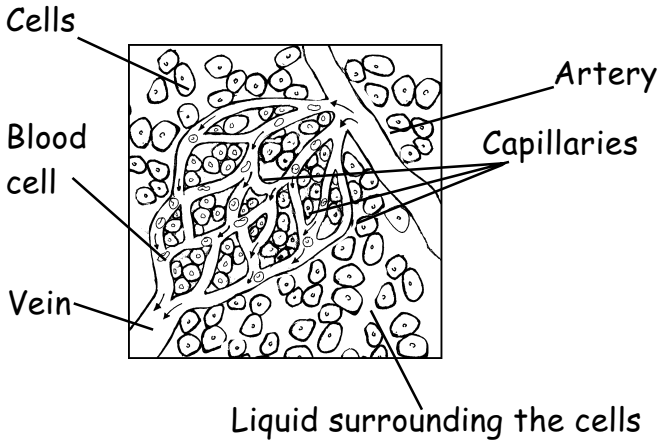


The lungs have arteries which branch into thinner and thinner tubes. These tubes are called **capillaries**. The oxygen in the air mixes with blood in the capillaries.
This blood, rich in oxygen, flows to veins in the lungs, and then to the left side of the heart.

These drawings show what happens to the blood after this.



When the lower chamber squeezes, it pushes the blood through the arteries to all parts of the body. The arteries branch into thinner and thinner tubes (capillaries). Capillaries are so thin, their walls are made of just one layer of cells. Blood flows through them to all the cells in the body.



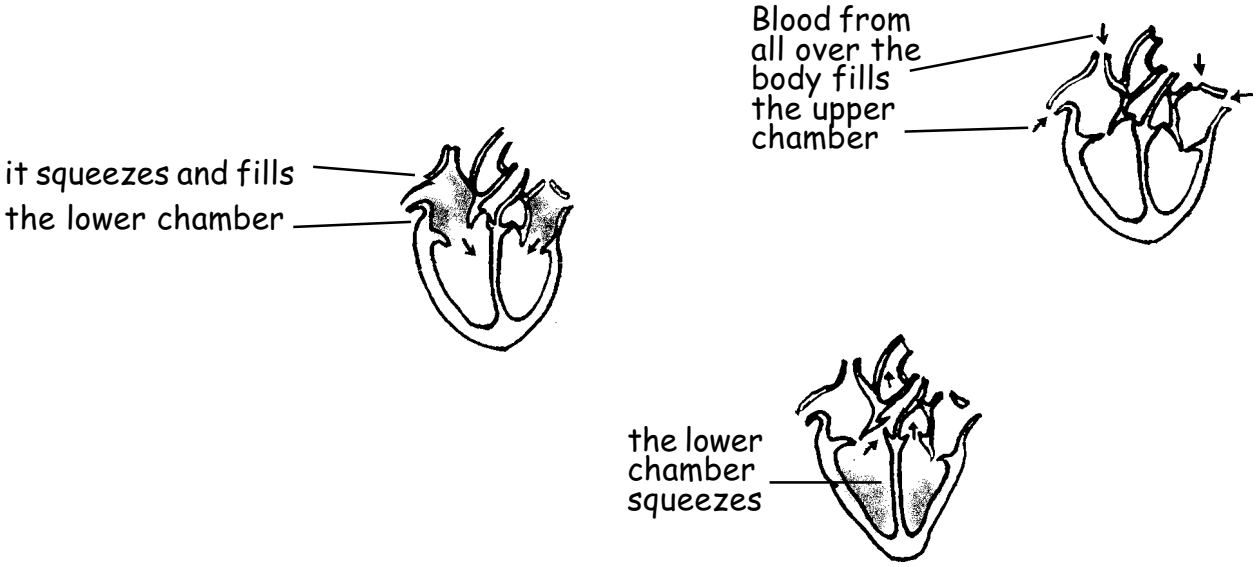
In the cells, the oxygen is used up and carbon dioxide is made. Carbon dioxide mixes with the blood in tiny veins (capillaries), which flows to larger veins.

Look at your drawing of the veins in the hand. On it draw arrows to show which way the blood flows in all the veins you have drawn.

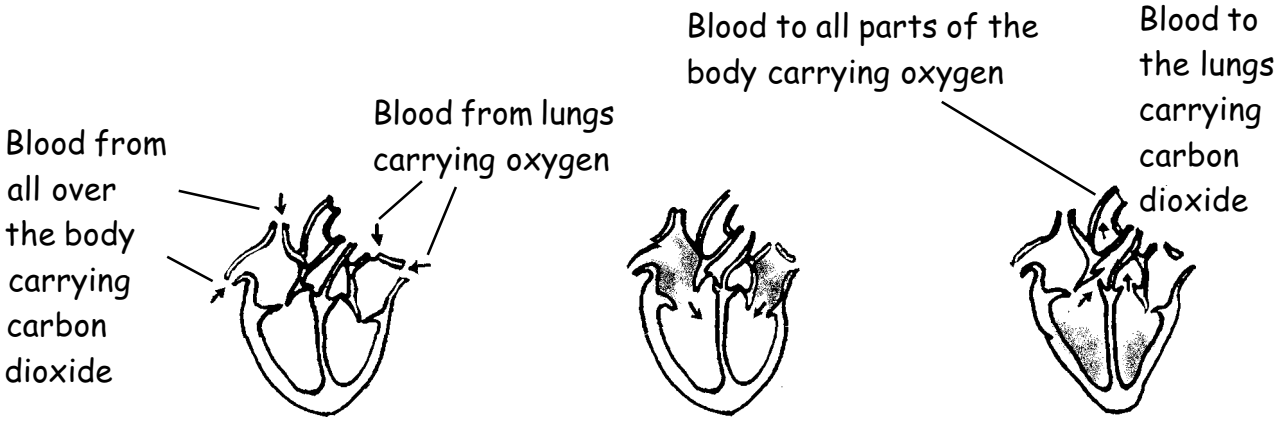
Think! Think!

Look at the picture of the veins in the body on page 121. Do you think blood from different parts of your body mixes as it enters the heart?

The blood, rich in carbon dioxide, flows back to the right side of the heart.
When the lower chamber squeezes, the blood in it flows to the lungs.



In the lungs, the blood gives up carbon dioxide and takes in oxygen. Write down where the blood goes after that.
This is what happens in one 'Lub dub' cycle:



Think! Think!

Does a blood cell which was in some part of your body, for example, your eye, come always right back to the eye after it goes through the heart and lung?

Blood carries many things to all the cells of the body. Living cells need nutrients. Blood carries the nutrients we get from food. Blood carries wastes produced by cells to

the skin and kidneys - they remove it from the blood when it flows through them.
These wastes are taken out of the body as sweat and urine.
If there are poisonous gases in the air we breathe, blood carries that too to all the cells.

Play the game described on page 129.

c. How the heart makes the blood flow
For this activity you will need: a clear plastic bag, a clear plastic tube about 1 metre long, a red liquid, and a container like a mug, to catch spills.

Fill the bag with some red liquid. You can use water with a few drops of red ink or some other red liquid.

Put one end of the tube into the bag; make sure this end is in the liquid.
Tie the end of the bag or use a rubber band. Make sure it is closed securely.

Squeeze the bag once so the liquid fills the tube. Close the end of the tube with your finger.
Hold the bag at chest level,
and the other end of the tube near your head.
Take your finger off the end.

What is the level of the liquid in the tube?
How can you make it reach the level of your head?
Squeeze the bag and see what happens
to the level of the liquid.

Draw the bag and tube.
In your drawing show the level of the liquid
before you squeezed the bag.

Show the level to which the liquid reached after you squeezed the bag.
Tell your class how this model is similar to the real heart, and how it is different from the real heart. Think of as many answers as you can.

Think! Think!

Would the blood from the lungs reach the cells in your head, ears, neck or shoulders if your heart did not pump it?

Would it reach your legs, stomach, intestines?

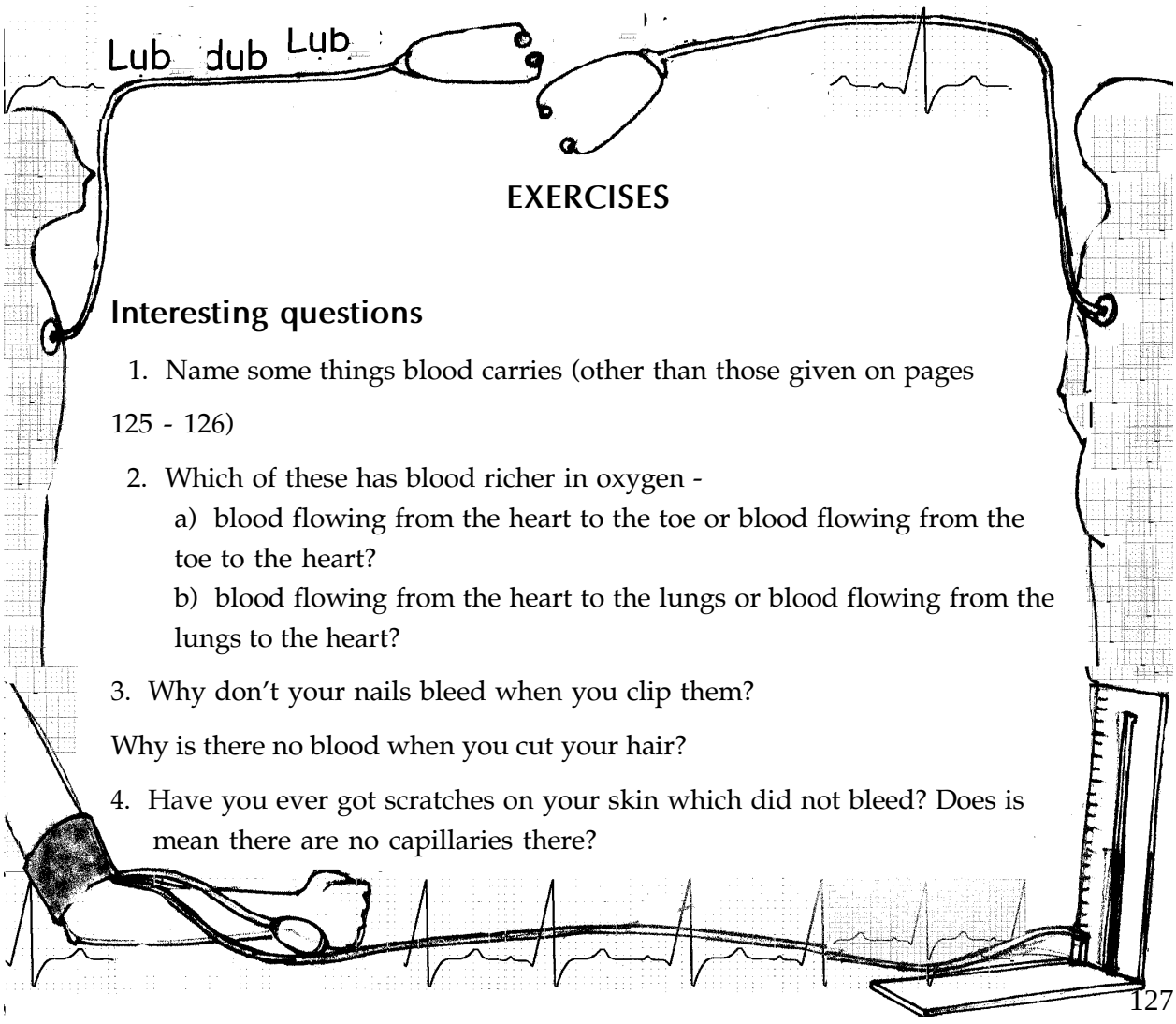
These parts do not have pumps - then how does the blood from these parts come back up to your heart?

Know these words

Artery, vein, chamber, capillary

circulate, circulation

When blood flows from parts of the body to the heart, lungs, heart and then again to the rest of the body, we say blood **circulates.**

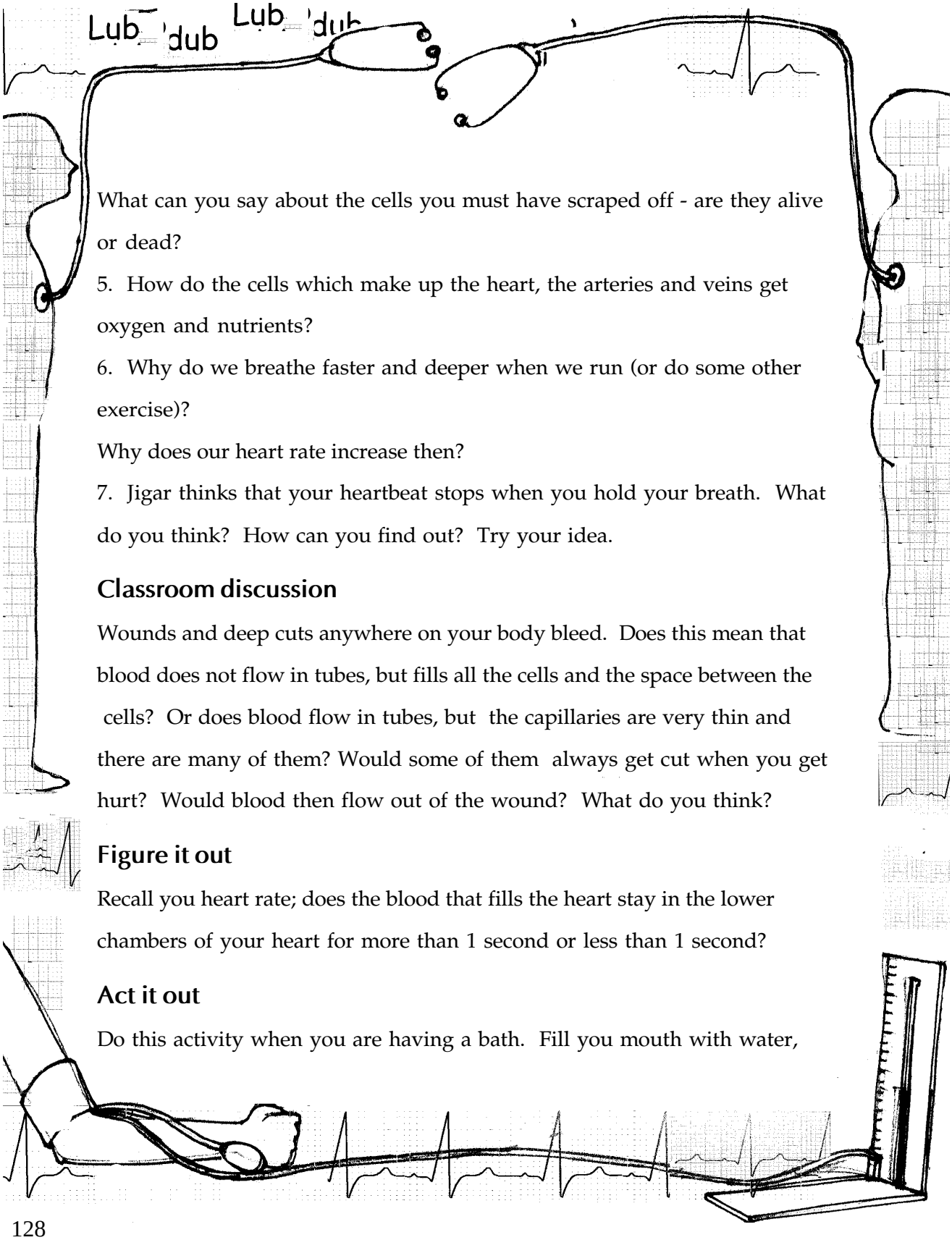


EXERCISES

Interesting questions

1. Name some things blood carries (other than those given on pages 125 - 126)
2. Which of these has blood richer in oxygen -
   a) blood flowing from the heart to the toe or blood flowing from the toe to the heart?
   b) blood flowing from the heart to the lungs or blood flowing from the lungs to the heart?
3. Why don't your nails bleed when you clip them?

   Why is there no blood when you cut your hair?
4. Have you ever got scratches on your skin which did not bleed? Does is mean there are no capillaries there?



What can you say about the cells you must have scraped off - are they alive or dead?

5. How do the cells which make up the heart, the arteries and veins get oxygen and nutrients?

6. Why do we breathe faster and deeper when we run (or do some other exercise)?

Why does our heart rate increase then?

7. Jigar thinks that your heartbeat stops when you hold your breath. What do you think? How can you find out? Try your idea.

Classroom discussion

Wounds and deep cuts anywhere on your body bleed. Does this mean that blood does not flow in tubes, but fills all the cells and the space between the cells? Or does blood flow in tubes, but the capillaries are very thin and there are many of them? Would some of them always get cut when you get hurt? Would blood then flow out of the wound? What do you think?

Figure it out

Recall you heart rate; does the blood that fills the heart stay in the lower chambers of your heart for more than 1 second or less than 1 second?

Act it out

Do this activity when you are having a bath. Fill you mouth with water,

look up, then open your mouth and let the water flow out. Again fill your mouth with water, look up, and squeeze your cheeks with your hand. Was there anything different in the way the water came out?

Play with words

Write a poem on heart

Play this game

Take some leaves or beads or seeds - about 100 of them - pretend they are oxygen molecules.

Use something else as molecules of carbon dioxide.

On the playground, draw a large human figure - head, neck, arms, heart and lungs in the proper places.

Some students should stand at different body parts - at the hand, the head, the toe etc. They will be acting as that body part. A few students act as the heart - form a circle by joining their hands. Some act as the lungs.

All the students acting as the different parts of the body should have a few carbon dioxide molecules in their hands.

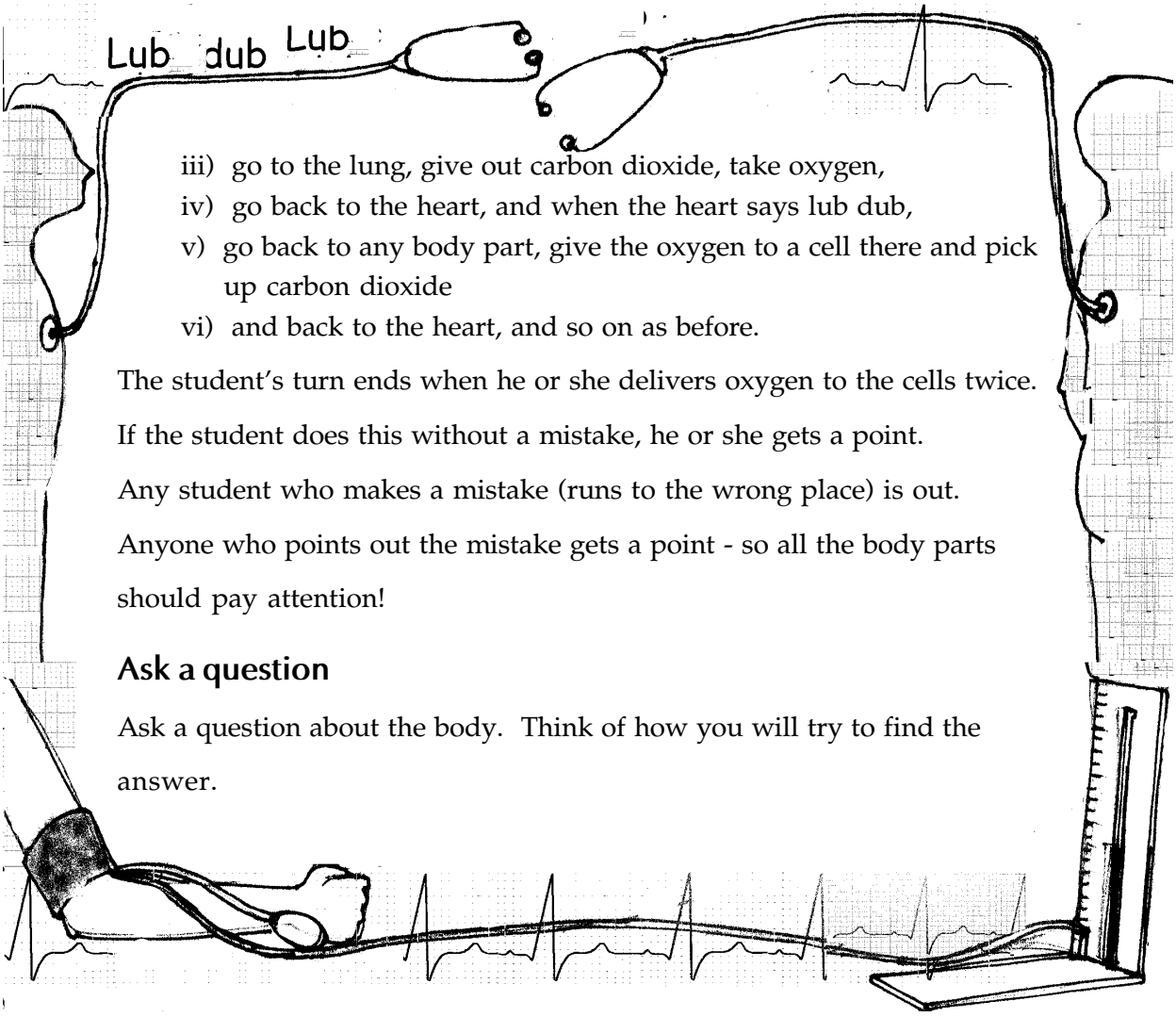
The teacher will hand the 'lungs' oxygen, and take away carbon dioxide from them.

The teacher will pick a student as blood. Take turns to act as blood.

When the teacher says 'go', that student should

i) run to one body part, take carbon dioxide from the student (cell) there,

ii) run into the heart. After the heart says 'lubdub',



iii) go to the lung, give out carbon dioxide, take oxygen,
iv) go back to the heart, and when the heart says lub dub,
v) go back to any body part, give the oxygen to a cell there and pick up carbon dioxide
vi) and back to the heart, and so on as before.

The student's turn ends when he or she delivers oxygen to the cells twice.

If the student does this without a mistake, he or she gets a point.

Any student who makes a mistake (runs to the wrong place) is out.

Anyone who points out the mistake gets a point - so all the body parts should pay attention!

Ask a question

Ask a question about the body. Think of how you will try to find the answer.

DID YOU KNOW

1. An adult's body has about 50 million million (50 trillion) cells. Every minute, about 30,000 dead cells are shed from the skin.

2. Larger animals have more cells, but the cell size remains about the same.

3. There are about 5 litres of blood in an adult human body. The heart pumps about 80 ml with each heartbeat.

CHAPTER **9**

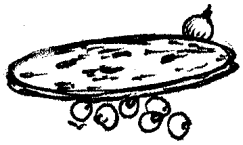
STAYING HEALTHY

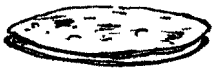
Eating well

1. To keep healthy, our bodies need many nutrients. We need starches, proteins, **vitamins** and minerals. We get them from the food we eat. Choose your food well to get all the nutrients your body needs!

a. Starches give us energy. Cereals like *jowar*, *bajra*, wheat, *ragi* and rice contain a lot of starches.

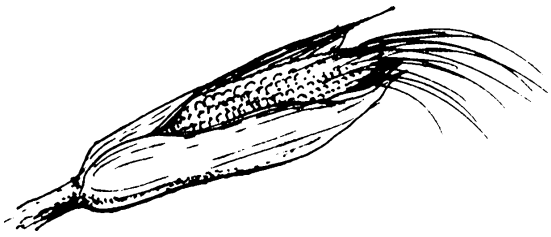
Are there any other cereals which are eaten in your area? Bring this cereal (or these cereals) to class and show it to everyone. Tell your class the name of the cereal and what is made from it.

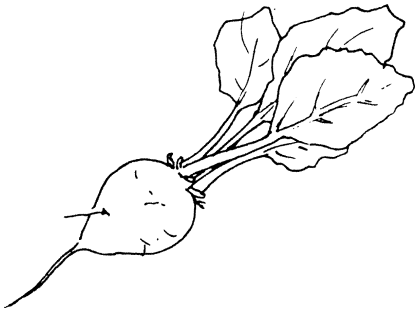




Many vegetables like potatoes, sweet potatoes, plantains, tapioca contain a lot of starches.

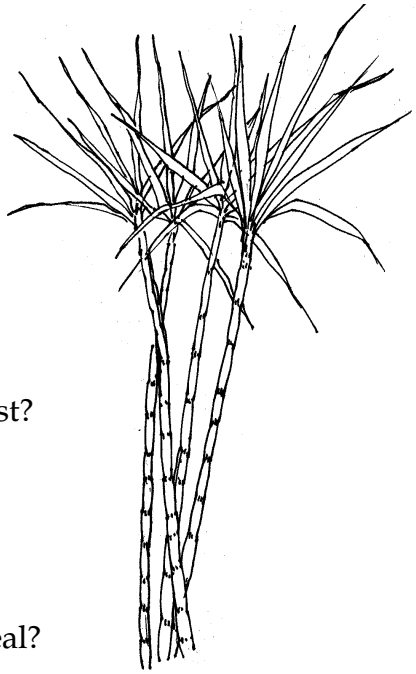
Starches and sugars are called **carbohydrates** (pronounced as carbo-high-drates). They give us energy.





Most cereals also contain other nutrients which our bodies need. They contain protein, they contain minerals like iron and calcium. They contain some **vitamins** too. Look at the table on page 117 of your WorkBook. It shows some of the things that cereals contain. It shows how much of these nutrients are in 100 grams of cereal.

The weight of minerals is very small compared to the weight of cereals. It is measured in milligrams. 1000 milligrams = 1 gram. We write mg for milligrams, g for grams. About 70 to 110 grains of rice weigh 1 gram.



Think! Think!

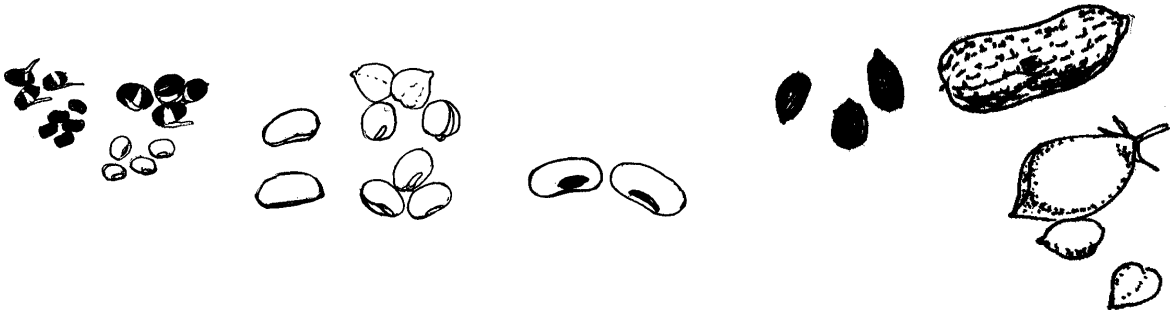
Why is the number of rice grains in 1 gram of rice not exact?

What makes up most of the weight of cereals?
Which of these cereals has the most iron? Which has the least?
Which of these cereals has the most calcium? Which has the least?
Which cereals have the most protein? Which has the least?
Which cereal is the least nutritious?
What cereals do you eat? What is made from them?

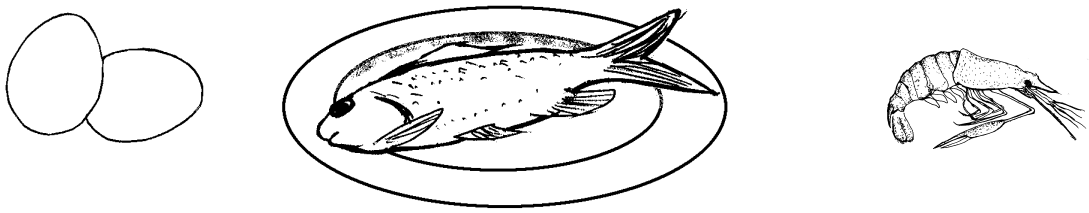
Make a guess - how many grams of cereals do you eat at one meal?

Guess the weight of the cereals before cooking. Does cooked cereal weigh more or less? Why?

b. Proteins are body builders.
Pulses like *dals* (name some), *chana*, *rajma* and *lobia* contain protein. Pulses also have starch in them. How can you check if they do?



Meat, fish and eggs are rich in protein.



Milk and things made from milk too are rich in protein. Name some things made from milk. When we eat these foods, the proteins in them get broken down into smaller parts in our digestive systems.

These broken down proteins are absorbed by the intestines. They are carried to the different cells of the body (how?).

The cells use these to make other kinds of proteins that make up the body. Cells of hair, nails, muscles and blood contain large amounts of proteins.

100 grams of mutton, with most of the fat removed, contains 74 grams of water, about 21 grams of protein and 4 grams of fat.
Other things make up the rest (how many grams)?

Other than water, what makes up most of the weight of meat?

Think! Think!

Do you think the muscles of our bodies are similar to the muscles of other animals?
Do you think our muscles too are made up of a lot of protein?

Have you grown taller and heavier since last year? How do you know this?
By how much? Where did this extra weight come from?

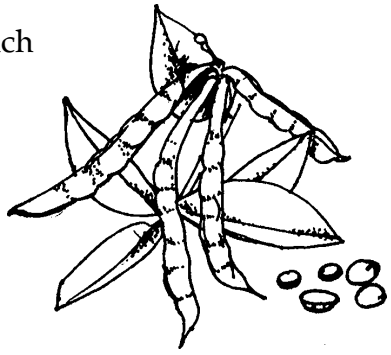
New cells grow in your body as your body grows. The body needs proteins to make new cells.

Think! Think!

Are there parts of an adult's body which keep growing? Name them.

Our bodies constantly lose cells. Many cells die. Dead cells are shed from the skin and from the intestines. Other cells which die are eaten up by special cells in the body. New cells grow to take their place.

What kinds of food do you and your family eat which contain proteins?
If you eat only vegetarian food,
you must eat cereals along with pulses
to get all the proteins your body needs.



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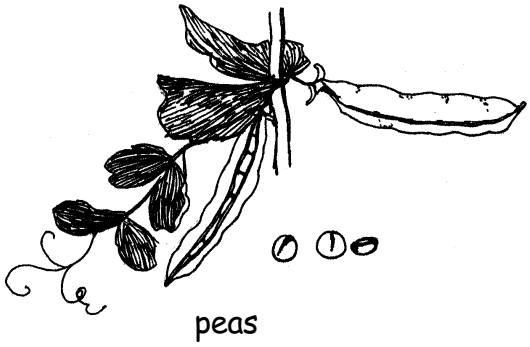
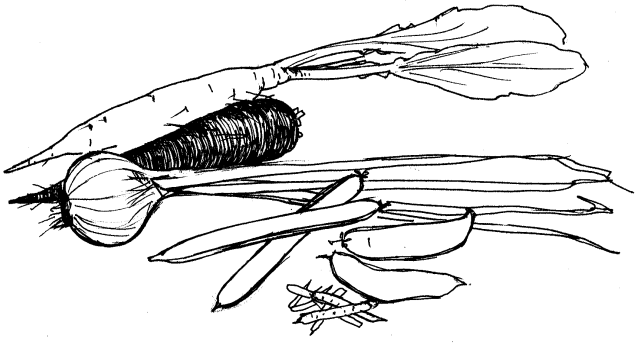


peas

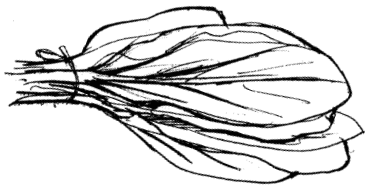
c. Our bodies need **vitamins** and **minerals**. Some vitamins help our bodies to use up the starch and protein we eat.

Minerals, along with proteins, make up a large part of our bodies. Bones have calcium and phosphorus. The red cells in our blood, which carry oxygen to the cells of our bodies, have iron.



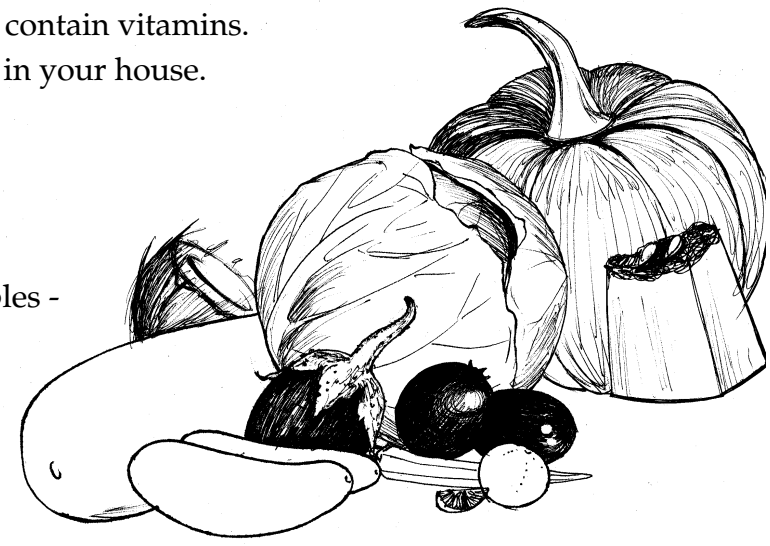
Green leafy vegetables contain a lot of iron. Eat plenty of these tasty vegetables. They have a lot of vitamin A too. What dishes do you eat made from leafy vegetables?

Fresh green leaves
tied up in a bunch
washed well, chopped up
cooked with dals (or by themselves)
Add a dash of lemon
And..Mmmmmm slurpy good!



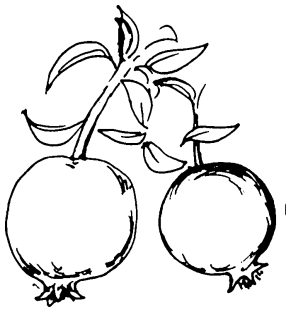
Sprouts, and fermented foods too contain vitamins.
Name some fermented food eaten in your house.
Name some cereals and pulses
you eat after sprouting.

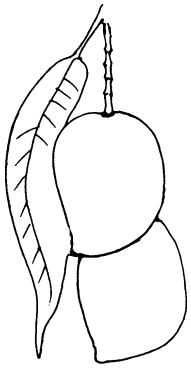
Eat lots of fresh fruits and vegetables -
they have minerals and
vitamins which our bodies need.



We measure the cereals we eat in grams. Recall how many grams of cereals you eat every day. We measure minerals and vitamins in milligrams.

Though we need only small amounts of vitamins and minerals, we can get sick if we don't get them.





For example, if we don't get enough vitamin A (which we get from leafy vegetables and yellow and orange fruits and vegetables), we can slowly become blind. If we don't get enough iron (found in leafy vegetables, meat and some cereals), the blood cannot carry oxygen to the cells. If we don't get enough calcium (found in milk, leafy vegetables), our bones become weak. If we don't get enough iodine (from vegetables, sea food and iodised salt) we get a disease called goitre.
Vitamins also help us fight diseases caused by microbes.

We also need to eat some fats as part of our food. Some vitamins like vitamin A dissolve in fat, and then get absorbed by the intestines. Butter, ghee and oils are fats.

What cooking oil do you use at home?

Take a few seeds from which that oil is pressed. Crush them between sheets of paper. See if you find oil smears on the paper. Which of these has oil you can press out - polished rice, groundnut, *til*, potato, *moong dal*, clove?
Does milk contain fat? How can you find out? Try your idea.

Remember this

Our bodies need many different minerals and vitamins. No single food we eat has all the nutrients we need. To get all the nutrients, eat a variety of foods - eat different cereals, *dals* and vegetable and fruits. Eat plenty of fruits, vegetables and sprouts. Eat cereals which are rich in minerals such as *ragi*, *bajra*, and *jowar*. If you eat mainly rice, choose parboiled rice, or rice which is not polished much.

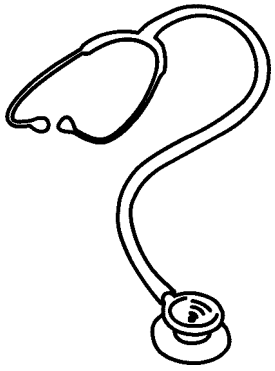
e. You should eat starches, protein and vegetables every day.

Look at pages 119-120 of your WorkBook.
In each plate, some dishes have been served.
Add one or two dishes to the plate to make the meal complete.

How diseases spread

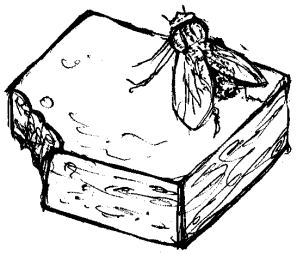
2. Getting Sick

a. Recall the last time you were ill.
On page 121 of your WorkBook, answer these questions:
When did you fall ill?
How did you know you were ill?
Describe some things which you experienced because of the illness - fever, vomiting, pain or anything else?
Did you go to a doctor?
Did you find out what had made you ill?
Is there anything else you want to say about the experience?
Did others in your family fall sick around the same time?
Did they have the same illness?
Who got sick first?
How do you think that so many people got sick around the same time (or one after another)?

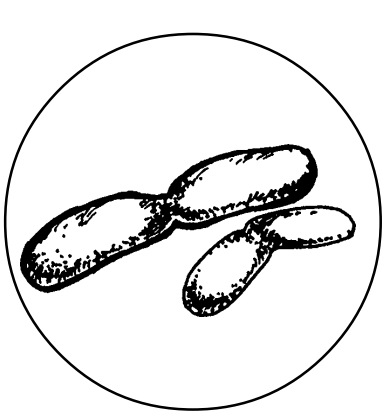


b. Did you ever catch a cold or flu when everyone in class had it too? Why do you think many people got sick one after another?

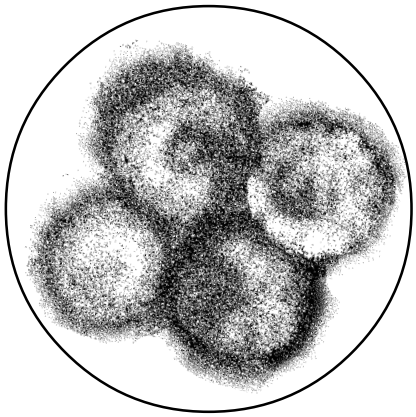
c. Look for stories in the newspaper of diseases spreading through a city or town or locality. It is usually called an outbreak, such as an 'outbreak of cholera'. Find out what causes this disease.
Ask and find out if this happens every year.
Does this happen in the same season every year?
If so, in which season?



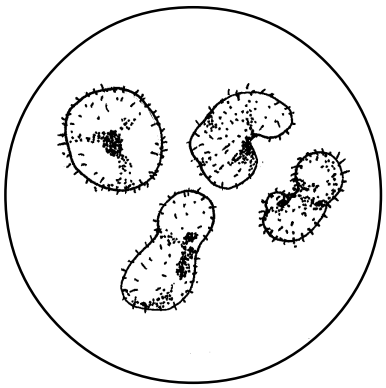
3. Many diseases are caused by microbes. You learned about some of these microbes last year. Here are pictures of some microbes which cause common diseases:



Cholera



Cold



Flu

You cannot see them without a microscope, but they are there - in the air, and in un-clean food and water. Anyone who breathes them in, or eats or drinks such food and water can get sick.

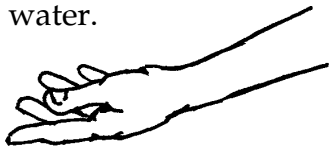
Think! Think!

From where do these microbes get into the air, water and food? How do they get into the air? How do they get into your food and water?

a. Microbes which cause diseases like tuberculosis (TB), flu and cold get into the air from someone who has these diseases. Guess how. Think of two things they can do to prevent the microbes from getting into the air.

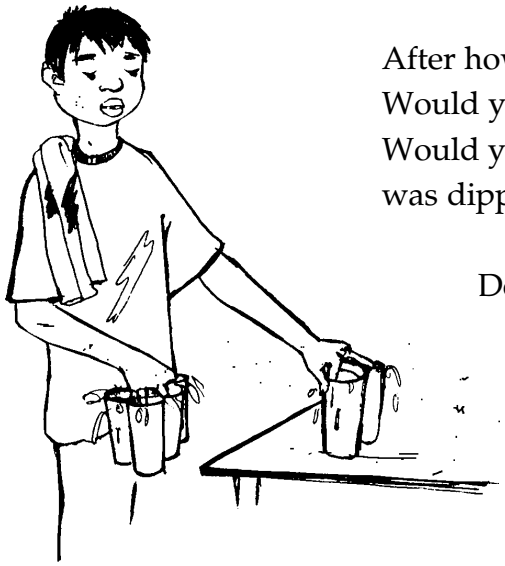
b. If you handle food and water with dirty hands, microbes can get into food and water.

i) Get two clean glasses. Fill about three fourths of each glass with water.
Look at your hands in class. Do they look clean?



Keep one glass with the teacher. Pass the other around. Each of the students who said their hands were clean should dip one hand in the glass. Compare the water with the one in the teacher's glass each time.

Did the water look any different after one person dipped his hand in it?
After two people dipped their hands in it?

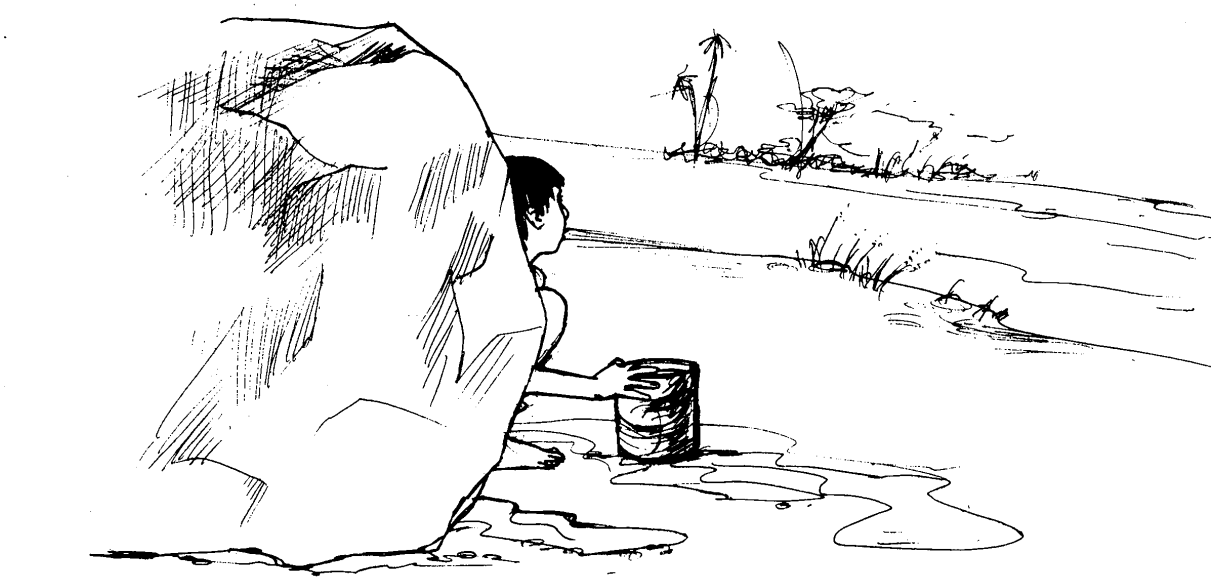


After how many people dipped their hands did it look dirty?
Would you drink this water?
Would you have drunk this water after the first time a hand was dipped in it?

Do you think everyone's hands really were clean?

Look at the water pot on page 122 of your WorkBook.
What would you choose to take
water from the pot - the glass or the dipper? Why?

ii) Microbes which cause cholera, jaundice, polio and some other diseases often get into our water and food. People who have these microbes in their bodies pass some of them in their stools. Stools passed in the open can easily get into water bodies.
Can they enter into the groundwater too?



Sometimes, sewage and water pipes have leaks. In the rainy season, rainwater covers the pipes. Sewage water, with the microbes in it flows into this water, and into the drinking water pipes. If you drink this water without boiling, you can get sick.
Boil drinking water in the rainy season; bring the water to a vigorous boil, then keep it boiling for at least one minute. Boil water whenever there is an outbreak of any diseases whose germs spread by water.

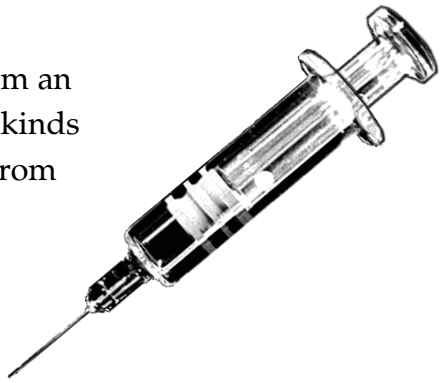
If someone doesn't wash dirty hands with soap after passing stools, and touches food, the microbes get from the stools into the food. Don't eat any food touched or served with dirty hands !

Some diseases of the skin caused by fungus, such as ringworm (caused by a fungus, not a worm!) spread by touch.

normal eye

red eye

The microbes get on the clothes of the infected person. If you share these clothes, your skin can get infected too.
Some other diseases too,
such as red eye, measles and chickenpox spread by touch. Make a guess -
how can the microbes causing red eye spread by touch?



Diseases can also spread if a person gets an injection from an infected needle. Microbes which cause AIDS and some kinds of jaundice only spread when blood and other liquids from an infected person enter our bodies.

This can happen if the same injection needle is used for everyone without first boiling it.

Microbes also spread when flies  sit on stools and other places where they are found, and then sit on your food. Flies can also spread microbes which cause red eye when they fly from a red eye to a healthy eye.

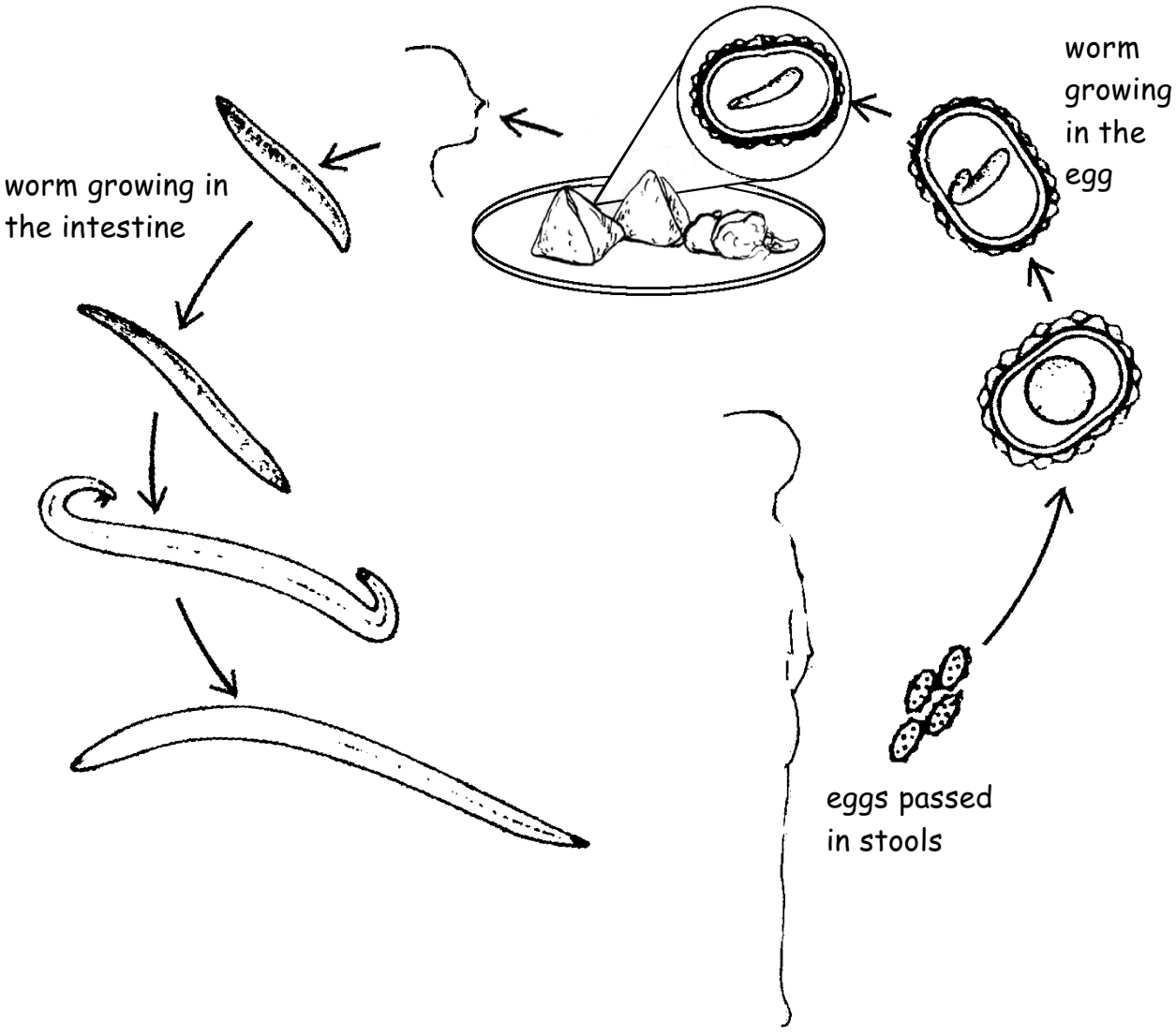
If mosquitoes  bite someone with malaria or dengue, then bite others, others can get these diseases too.
Rats spread diseases too, such as plague.

4. a. Some diseases are caused by larger animals - like worms which live in intestines. The drawing shows one such worm - the roundworm. 

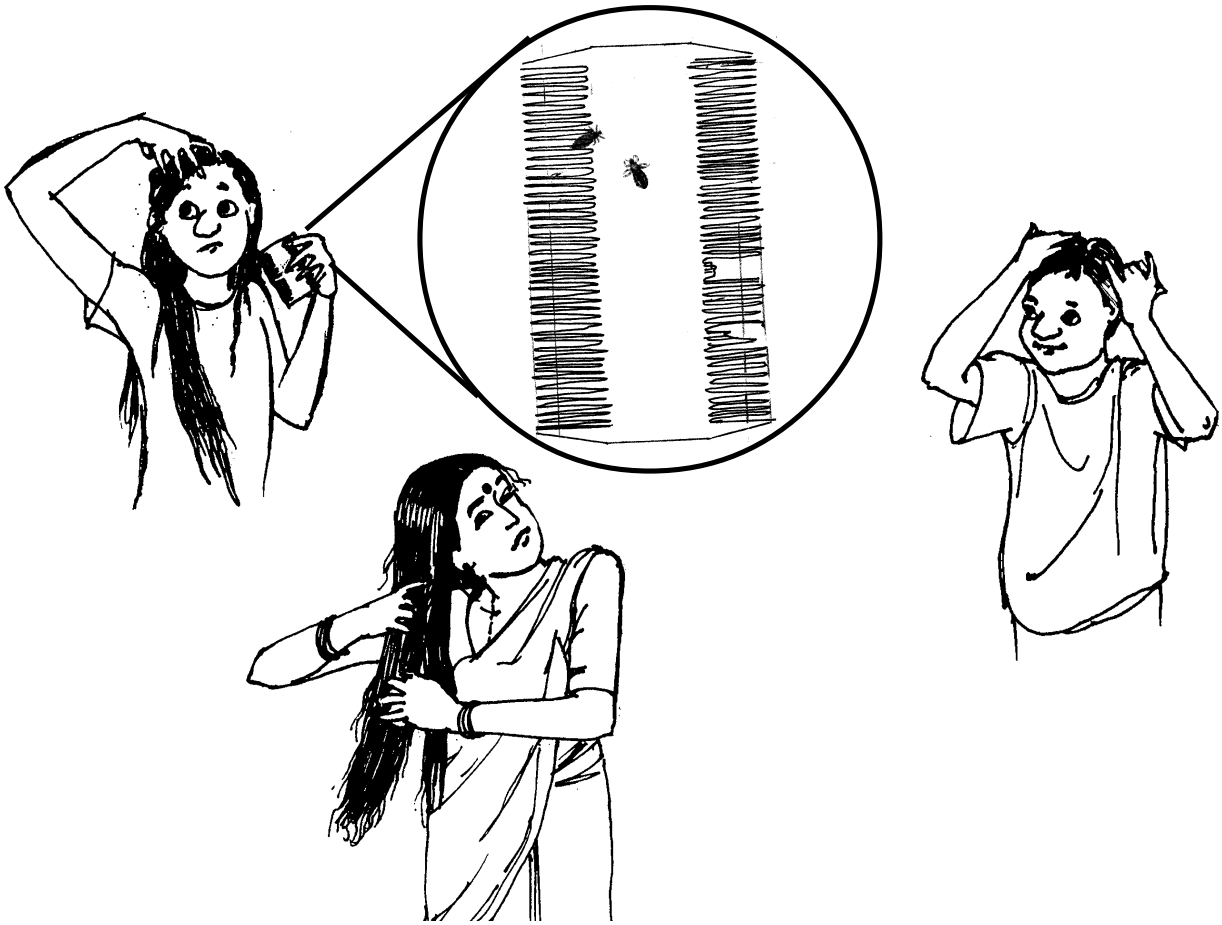
If you eat food which has its eggs,  they get into your intestine, hatch and grow there.

They eat the fully digested food in the intestine, and suck blood. They take away the nutrients your body needs!
The female worm lays thousands of eggs in the intestine every day.

These tiny eggs are passed in the stools. The eggs are so small, about 20 of them can fit side by side in 1 mm. These eggs then can get into food, and if someone eats this food, the eggs now enter that person's intestine and grow and lay eggs which are passed in the stools.
How can the eggs get from the stools into someone's food?
Have you or anyone in your family ever had worms? How did you (or they) know you (or they) had worms? Did you get help from a doctor?



b. Lice can spread from one person to another if they share combs, caps and hair bands, or sit or play with their heads close together.



Remember this

Always wash your hands before eating or handling food, and eat nothing others handle with unclean hands. Don't eat any food on which flies have been sitting. Wash vegetables and fruits well before eating them.

5. Not all diseases are caused by microbes. People who smoke, or chew tobacco can become seriously ill. If the air where we live or work is not clean, if our food and water contain harmful chemicals, we can become seriously ill.
To be healthy we need exercise, clean air, water and food. Our food should have all the nutrients for our bodies.

Know these words

vitamins, minerals, proteins, carbohydrate, nutrients, nutritious,
contaminate, contamination: When food and water have harmful chemicals or microbes in them we say they are **contaminated**.

EXERCISES

Interesting questions

1. Name 5 leafy vegetables available in your area. You can write their names in any language. Which of these do you like the most? How often do you eat it?

2. If you eat 50 g of leafy vegetables a day, you'll get enough vitamin **A.** How many grams does a bunch of palak or any other leafy vegetable weigh? How many people can share this bunch so each person can have at least 50 g?

3. The table on page 123 of your WorkBook, shows the amount of vitamins in 100 g each of apple, banana and guava. Which of these grows near your city or town? Which one is cheaper? Which one would you buy? Why?

4. Did you or anyone in your family ever have to take vitamin, iron or calcium tablets or tonic? How much of these was in each dose?

5. Does everyone in your family eat together? If not, who eats last? Do you think this person (or persons) gets enough food? What can be done so every one gets a fair share?

6. Name a plant or plants you can grow for fruits or vegetables. These plants should need only a small place, be easy to grow and give enough fruits or vegetables for your family for at least one meal at a time.

7. a) Point out in which of these cases we should wash our hands before eating or handling food. Why?

After a trip to the toilet; after travel in crowded buses; after sneezing or coughing into your hands; after playing; after returning from school.

b) The drawings on page 124 of your WorkBook, show a man who has just returned from the toilet, and who later shares a papaya with the boy. But there are things he should do before he cuts the papaya. Number them in the correct order. Write your number in the circle next to each drawing. There are things the boy should do before he takes the papaya. In the same way, number them in order too.

8. Name some things sold outside your school which you or your friends buy and eat. Which of these are good for you? Do you think they are clean (do you often find flies on them, are the hands of the person who sells them clean, do people cough or sneeze on them)? If you buy fruits, do you wash them before you eat them?

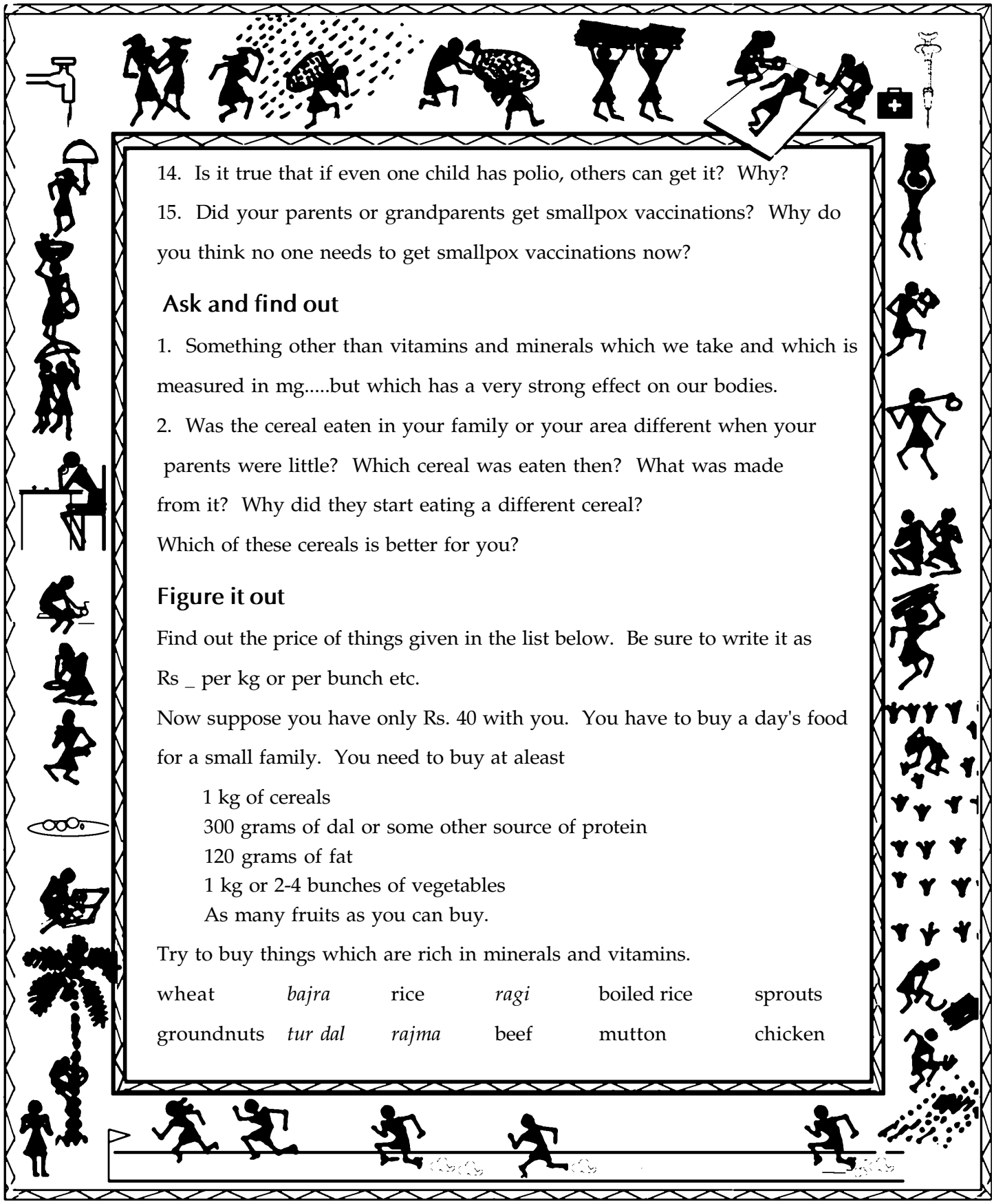
9. Think of a guava growing on a tree in a field. Think of all the steps in its journey to the market and finally to your hand when you buy it. How can this guava get germs on it? Explain to your friend why he or she should wash the guava well before eating it.

10. Name some places or things which attract flies. What can you do to keep flies away from your area?

11. Did you or anyone you know had to get blood or stool tested? Why was this test needed?

12. Circle the diseases which spread from one person to another:
diabetes, heart disease, anaemia, cataract, polio, hepatitis, flu, cold, cancer.

13. Suppose someone in your house has a cold. How can you catch it? What can they do to prevent it from spreading to others in the family?



14. Is it true that if even one child has polio, others can get it? Why?

15. Did your parents or grandparents get smallpox vaccinations? Why do you think no one needs to get smallpox vaccinations now?

Ask and find out

1. Something other than vitamins and minerals which we take and which is measured in mg.....but which has a very strong effect on our bodies.

2. Was the cereal eaten in your family or your area different when your parents were little? Which cereal was eaten then? What was made from it? Why did they start eating a different cereal?
Which of these cereals is better for you?

Figure it out

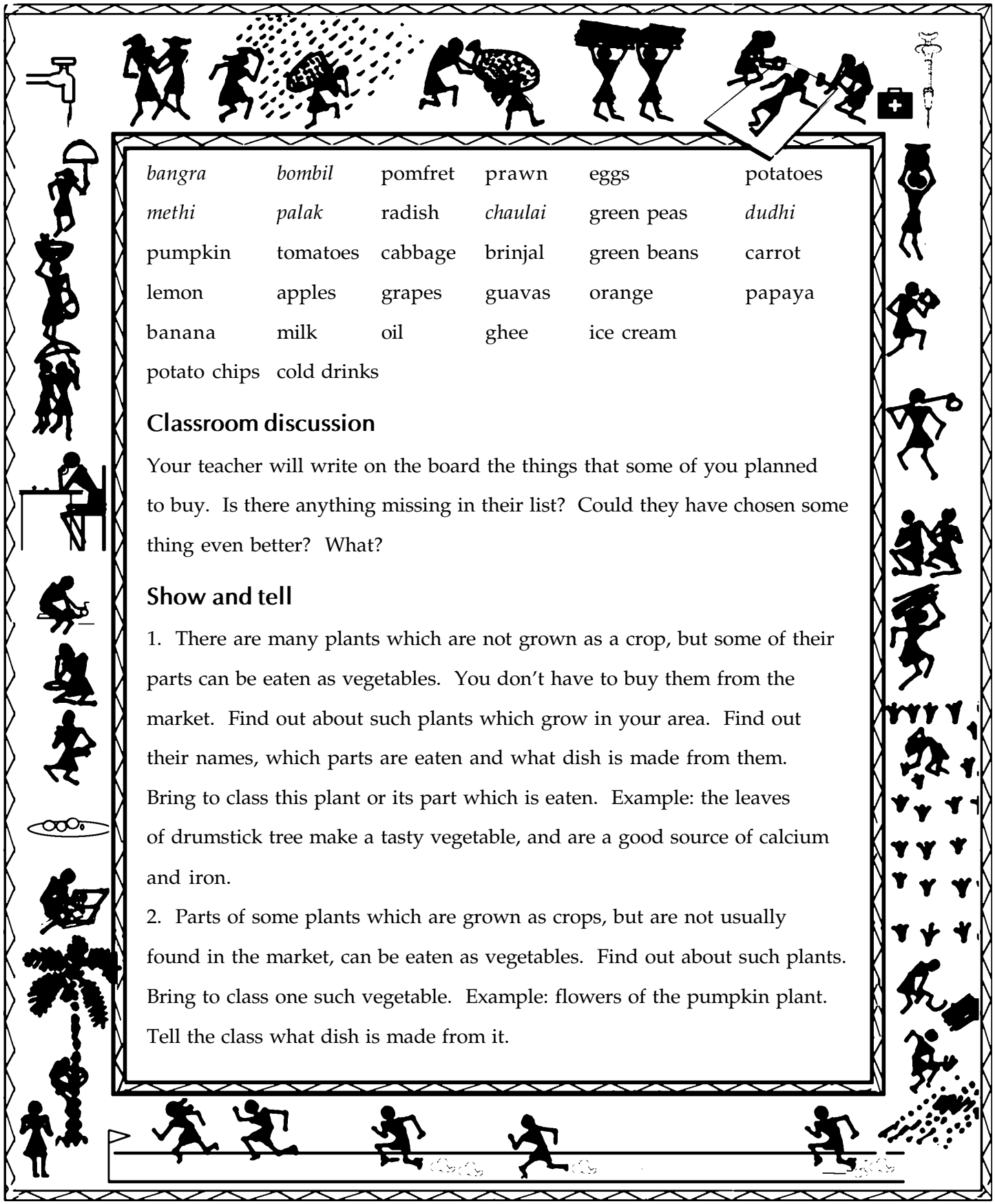
Find out the price of things given in the list below. Be sure to write it as Rs _ per kg or per bunch etc.

Now suppose you have only Rs. 40 with you. You have to buy a day's food for a small family. You need to buy at aleast

1 kg of cereals
300 grams of dal or some other source of protein
120 grams of fat
1 kg or 2-4 bunches of vegetables
As many fruits as you can buy.

Try to buy things which are rich in minerals and vitamins.

wheat	*bajra*	rice	*ragi*	boiled rice	sprouts
groundnuts	*tur dal*	*rajma*	beef	mutton	chicken



bangra	*bombil*	pomfret	prawn	eggs	potatoes
methi	*palak*	radish	*chaulai*	green peas	*dudhi*
pumpkin	tomatoes	cabbage	brinjal	green beans	carrot
lemon	apples	grapes	guavas	orange	papaya
banana	milk	oil	ghee	ice cream	
potato chips	cold drinks				

Classroom discussion

Your teacher will write on the board the things that some of you planned to buy. Is there anything missing in their list? Could they have chosen some thing even better? What?

Show and tell

1. There are many plants which are not grown as a crop, but some of their parts can be eaten as vegetables. You don't have to buy them from the market. Find out about such plants which grow in your area. Find out their names, which parts are eaten and what dish is made from them. Bring to class this plant or its part which is eaten. Example: the leaves of drumstick tree make a tasty vegetable, and are a good source of calcium and iron.

2. Parts of some plants which are grown as crops, but are not usually found in the market, can be eaten as vegetables. Find out about such plants. Bring to class one such vegetable. Example: flowers of the pumpkin plant. Tell the class what dish is made from it.

Recall and write

Did you or anyone you know ever have a scratch, wound or a fracture? How long did it take for the wound to heal? Where did this new skin and muscle come from?

Play with words

a) Use some of these words to describe each of the food items below: crisp, crunchy, tangy, chewy, light, fluffy, soft, tasty, slurpy, creamy. You may also use other words if you like.

Sprouts, *roti*, *idli*, mango, dried and roasted *chana*, groundnuts, orange, cucumber, curd (*dahi*). Add three of your favourite foods to this list.

b) Read the story and tell your teacher which one you would rather buy.

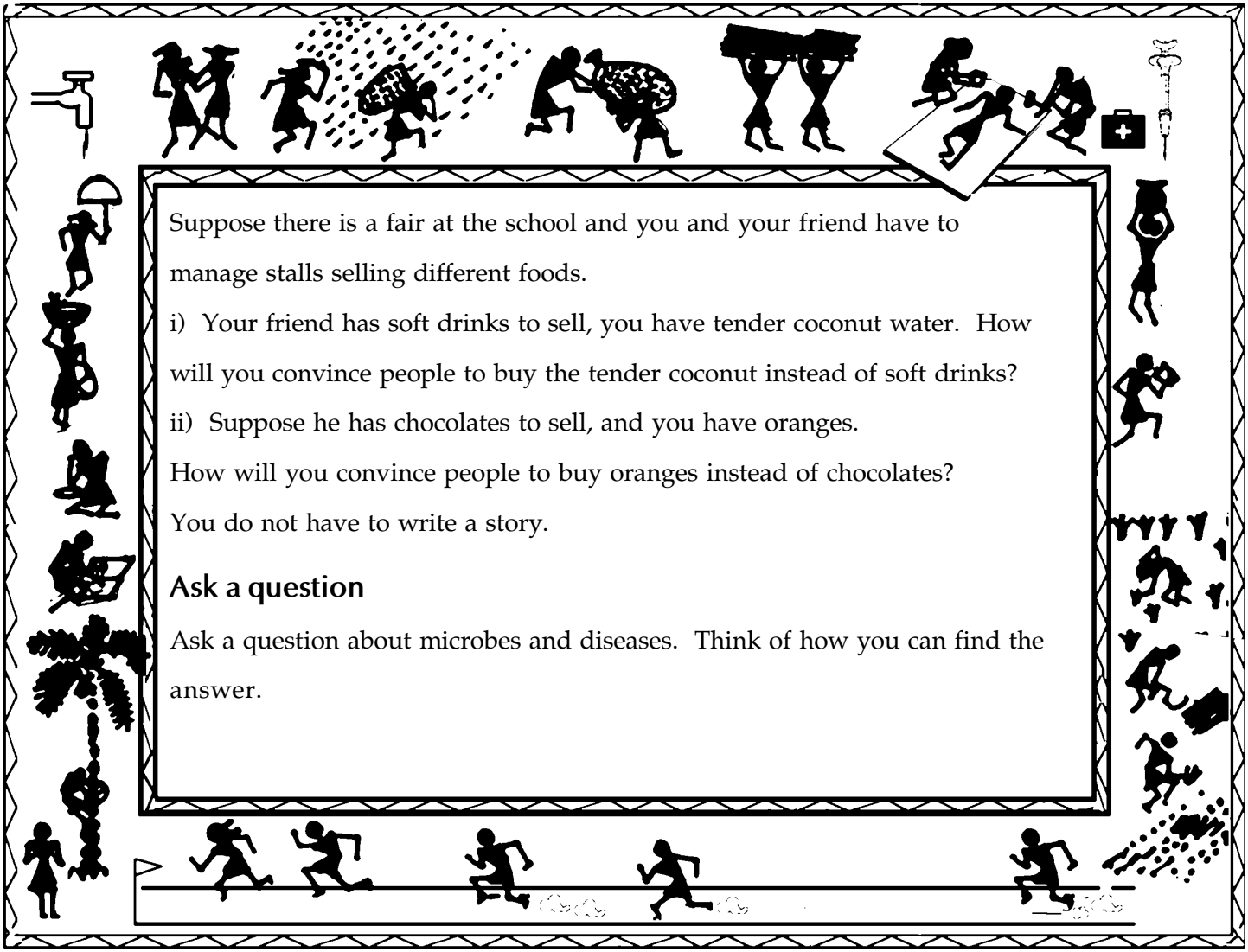
Sunita and Meena each had a rupee to spend. After school, Sunita bought an orange with her rupee and Meena bought an ice candy with hers - she loved to suck the sweet frozen candy in the plastic packet.

As Sunita starts peeling her orange, the lovely smell spreads all around, making everyone at the bus stop want to eat one too. Meena tries to tear the plastic of her ice candy, and finally tears it open with her teeth, and spits out the bit in her mouth. She gets a scolding for it!

After sometime, while Sunita is still enjoying her fresh, sweet and tangy orange, Meena is sucking on only ice left in the plastic packet.

That packet was not very clean, and she gets an upset tummy the next day.

But Sunita is fine and goes to play while Meena has to go to the doctor.



Suppose there is a fair at the school and you and your friend have to manage stalls selling different foods.

i) Your friend has soft drinks to sell, you have tender coconut water. How will you convince people to buy the tender coconut instead of soft drinks?

ii) Suppose he has chocolates to sell, and you have oranges.

How will you convince people to buy oranges instead of chocolates?

You do not have to write a story.

Ask a question

Ask a question about microbes and diseases. Think of how you can find the answer.

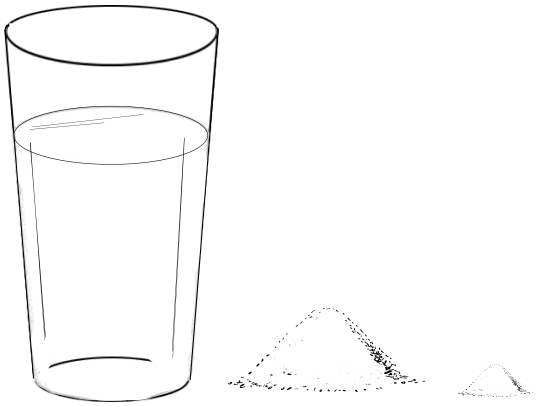
DID YOU KNOW

1. Vitamin C is found in fresh fruits and vegetables. Sailors who travelled by ship for long periods could not get fresh fruits and vegetables for many days. They suffered from a disease called scurvy caused by not having enough vitamin C. But at that time no one knew what caused the disease. James Lind, a surgeon on the ship Salisbury, tried to find out what could cure them. He chose 12 sailors who had the disease, and treated them with different things; two of these sailors were given oranges and lemons. They got much better, the others did not. Almost two hundred years later it was discovered that it was vitamin C in lemons which helped to prevent scurvy.
During times of drought, when you cannot get fresh fruits and vegetables, the only way to get enough of this vitamin is from sprouts.

2. Getting vitamins and minerals from food is always better than getting it from tablets and tonics - unless a doctor asks you to.

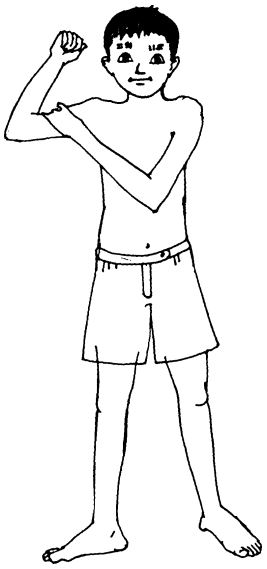
3. In many parts of the world, diseases became fewer when people started to keep their surroundings clean, when they had sewage systems and learned how important it was to wash hands and keep food and water clean.

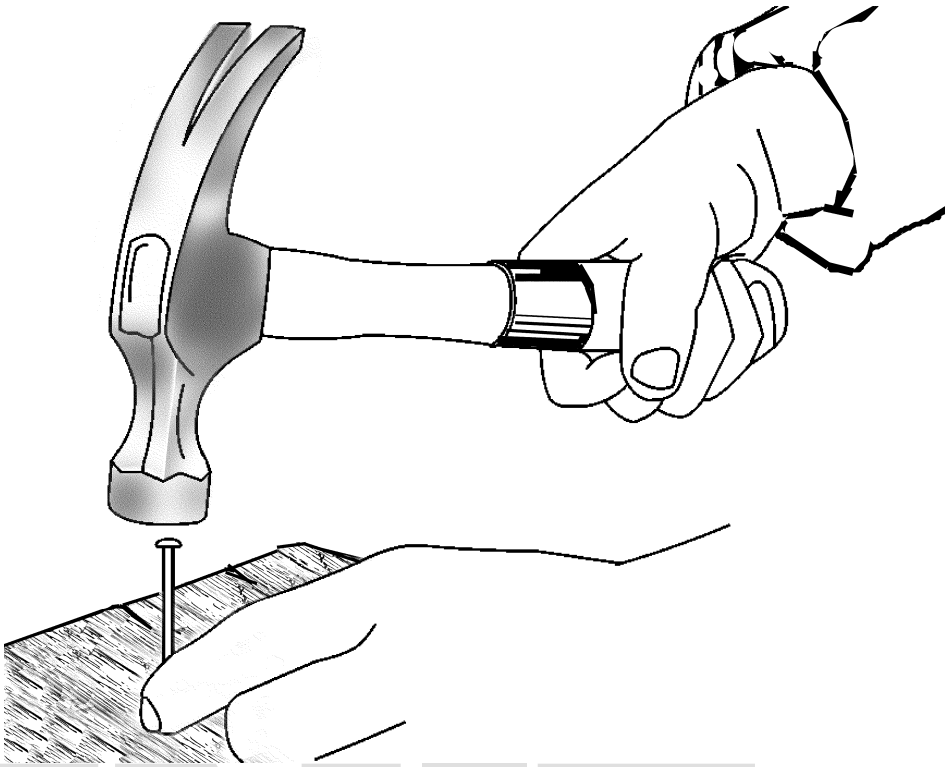
4. When people have diarrhoea, and pass watery stools often, their bodies lose a lot of water. They can become very seriously ill if they don't take water to make up for what they lose. A little salt and sugar should be added to the water - a pinch of salt and a teaspoon of sugar for every glass of clean water. This can save their lives. This water should be given in small quantities many times.



water Sugar salt

5. Just by eating a lot of protein you can't build strong muscles - you need to exercise those muscles!
In the same way, eating a lot of starch doesn't make you very energetic - you may become fat if you eat more than your body uses up!





UNIT 5

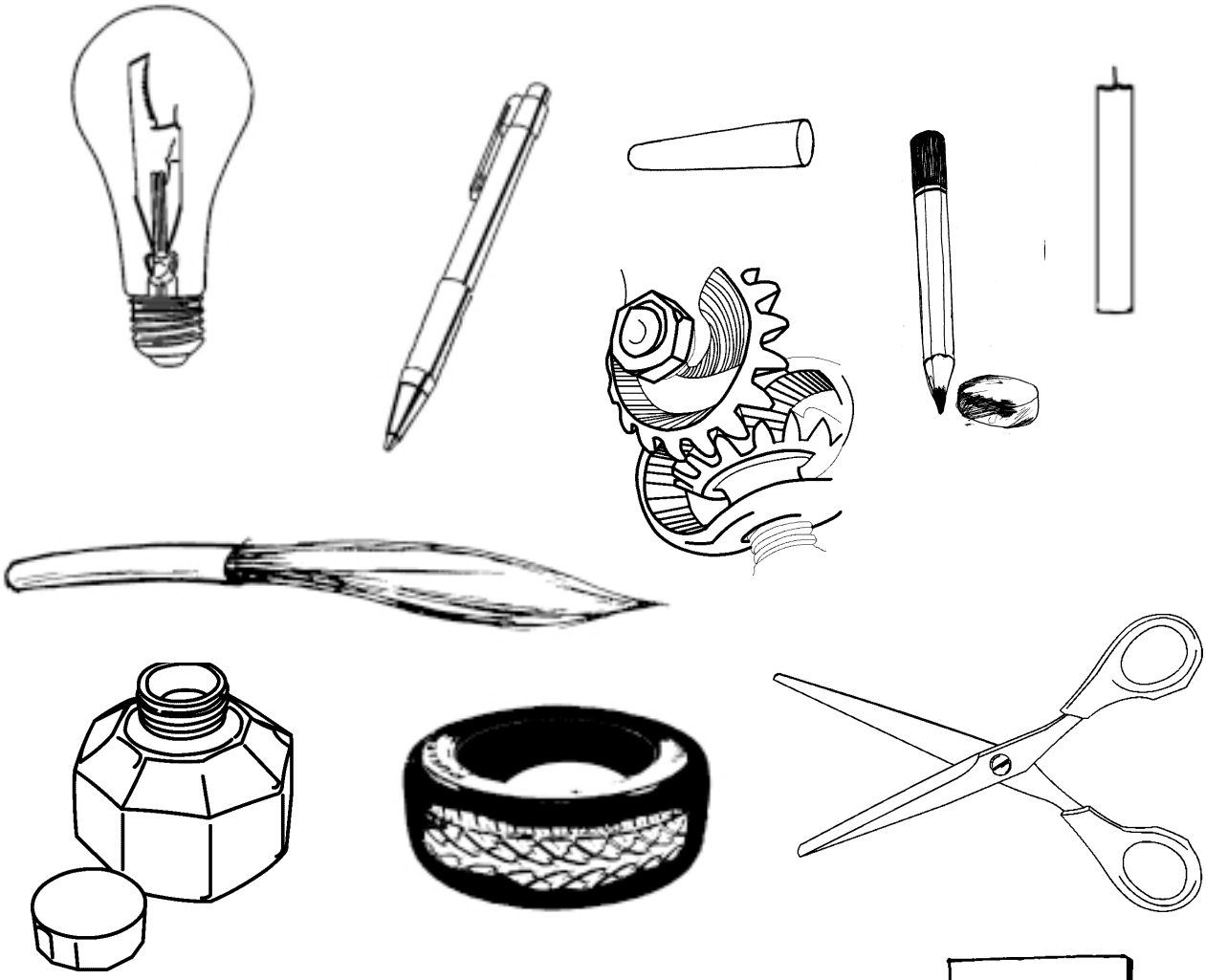
MATERIALS

Chapter 10 The things we use

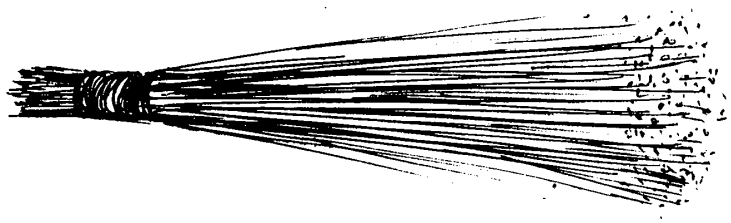
CHAPTER **10**

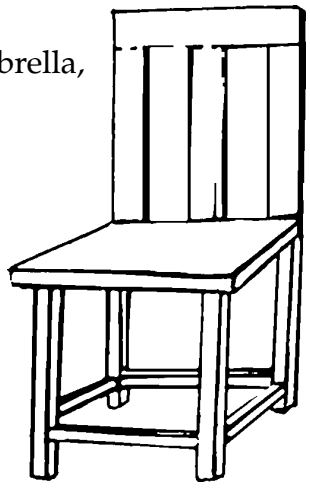
THE THINGS WE USE

1. We use things made of many different materials.



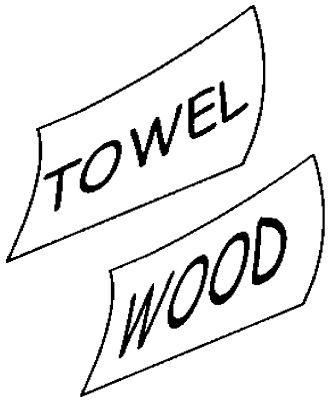
a. Choose any one thing that you have with you - like an umbrella, a pencil, a bag, etc. Look at it closely. Is this thing made of many parts? What is each of these parts made of? Write this down on page 133 of your WorkBook.





b. Why we choose different materials to make different things.

Here's a list of materials: paper, clay, wool, gold, wood, plastic, wax, leather, glass, cotton, rubber



Write each on a slip of paper and fold it.
Put the folded slips in a box or bowl.

Here's a list of things:
Broom, pencil, umbrella, spectacle lenses, towel, road surface, bat, chair, bell, shoes/slippers, plate

Write each on a slip of paper and fold it. Put the folded slips in a different box or bowl.

Divide the class into two groups. One student from the first group should pick a slip from the first bowl (material). One student from the second group pick a slip from the second bowl (thing). Read the slips and put them back in the bowls. The student who has picked the thing has to tell if that thing can be made from the material that the first group picked, and why or why not.

The group gets a point if the student gives answers.
If no one in the second group can answer, the first one can try and win the point.

Switch bowls for the second round.

c. Think of a picnic you have been on, or plan one. Think of everything you do from the time you wake up to the time you return.

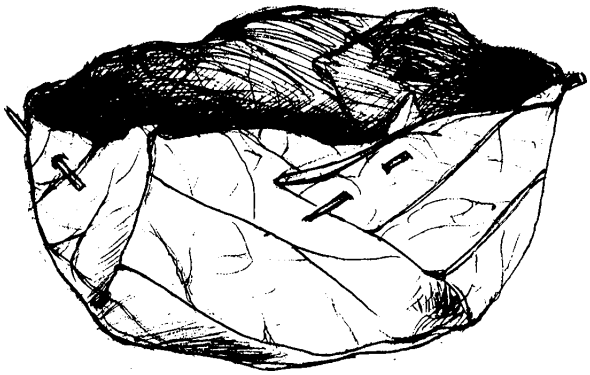
What different things do you use all day and what are they made of? What do you use to pack food and drinks? What do you use to eat and drink from? What do you do with the leftovers and with the used containers, plates and glasses, and things like wrappers and packets?

If you throw them away, what happens to them after you throw them in the garbage?
Which ones will decompose without adding harmful things to our soil and water?
Which ones will not decompose?
Does anyone collect them from the garbage?
Guess what they do with them.

Why do you think there is trash outside the bin even though the bin is not full?

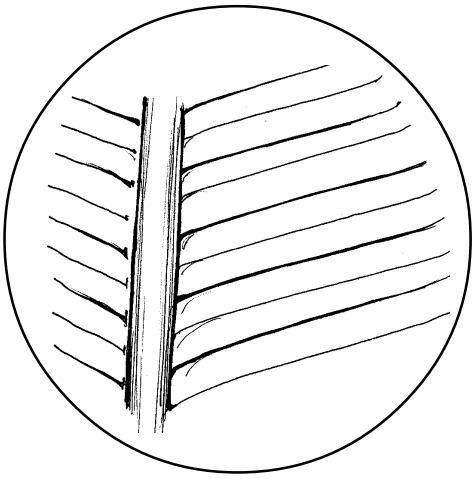
Suppose you didn't throw all kinds of waste in the same bin. Will it be easier for the people who collect some of them? How?

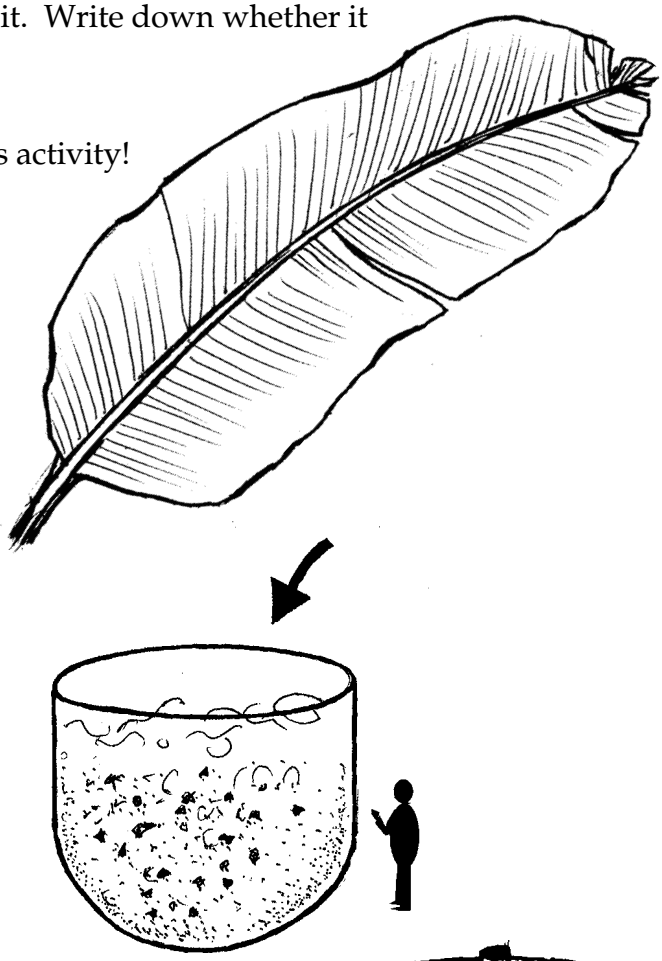
d. Make a cup with a leaf:
You may use a leaf and small sticks as pins if you need any.
What kind of a leaf did you use?
Write down the name of the plant from which you plucked the leaf if you know it.
Was it soft or stiff, thin or thick?
On pages 134-135 of your WorkBook write down how to make a leaf cup. What kind of leaves are easy to work with?
What kind are difficult to make into cups?



Can you use leaves of banana or canna? Try it. Write down whether it worked, and why if it didn't.

Remember to wash your hands well after this activity!



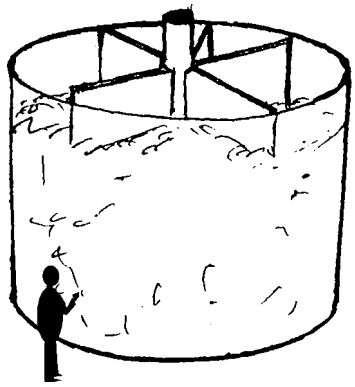


2. From materials to a final product

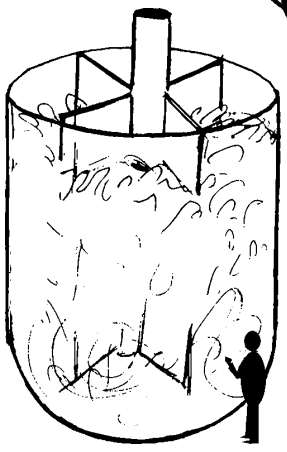
a. This is how paper is made from wood in factories:

i) Wood is chopped into small pieces, about the size of a matchbox.

These pieces are put into a tank along with hot water and chemicals.



ii) After some hours wood turns into a soft cottony pulp; to this pulp lots of water is added to rinse the pulp so that the chemicals are removed.



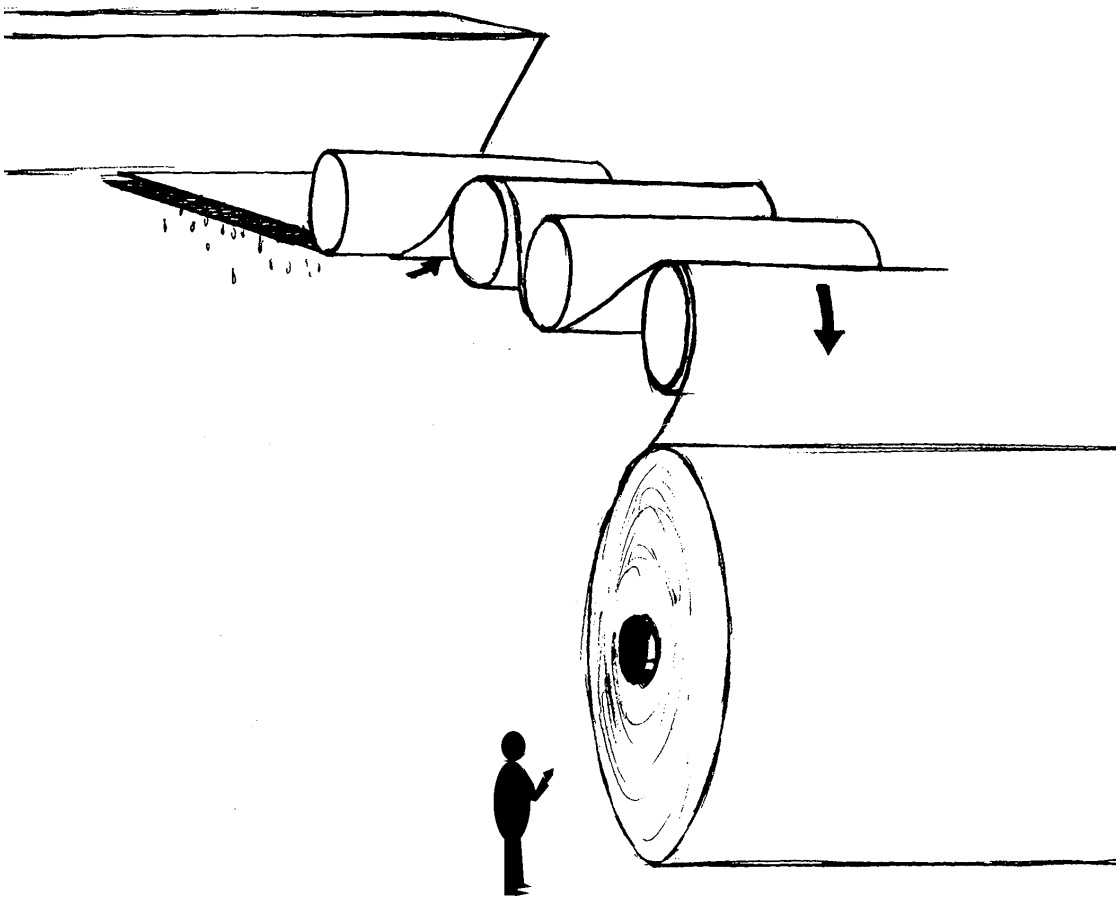
iii) Then the pulp is bleached white by adding some chemicals.

iv) This pulp is then spread on a wire mesh to make thin sheets. These sheets are pressed to remove water.

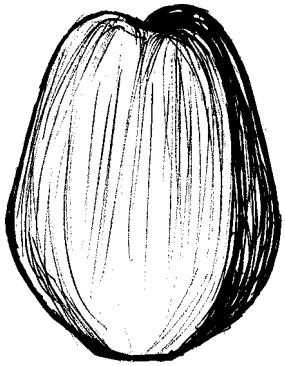
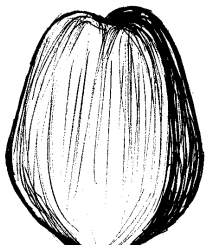
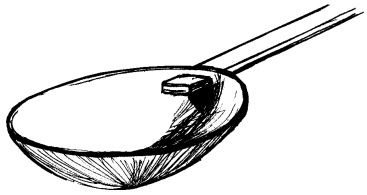
v) This pulp sheet (which is still a little moist) is passed through one roller after another to remove all the water.

vi) The paper is then passed over heated rollers to make it absolutely dry.

vii) The finished paper is rolled up and then the rolls are cut to the size we need.



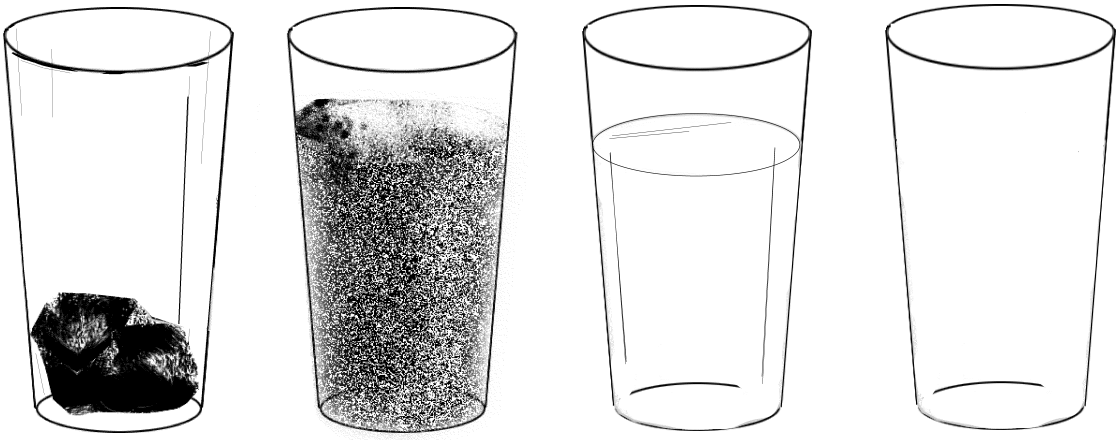
b. Now write a picture story of how to make a spoon from a coconut shell on pages 135 - 136 of your WorkBook.

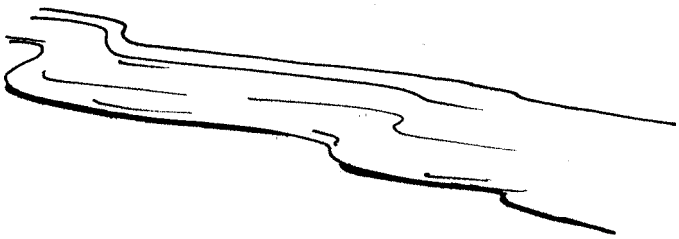
3. Solids, liquids, gases

Think of a stone, a handful of fine sand, water and water vapour.

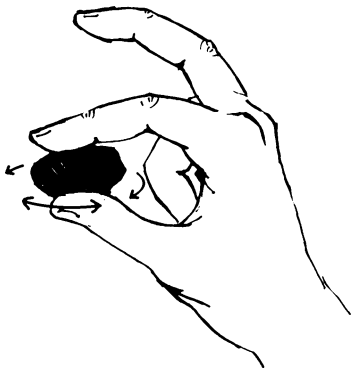
If you put each of these in a glass, which will take up the shape of the glass?



Which of them can you make into a heap -
stones, sand, water, water vapour?
Which one (or which ones) can you never make into a heap?
Which one (or which ones) can flow?



Which one expands to fill all the space it can get?
Which of these can you hold between two fingers and turn as shown?



Know these words

bleach, moist, mesh,
recycle: when something, such as paper, is made into something which can be used again, it is **recycled**;
bio-degradable: things such as plant and animal parts or things made only of these parts, which rot are called **bio-degradable.**

EXERCISES

Interesting questions

1. a) Name some things which you have seen sometimes as a solid and sometimes as a liquid.

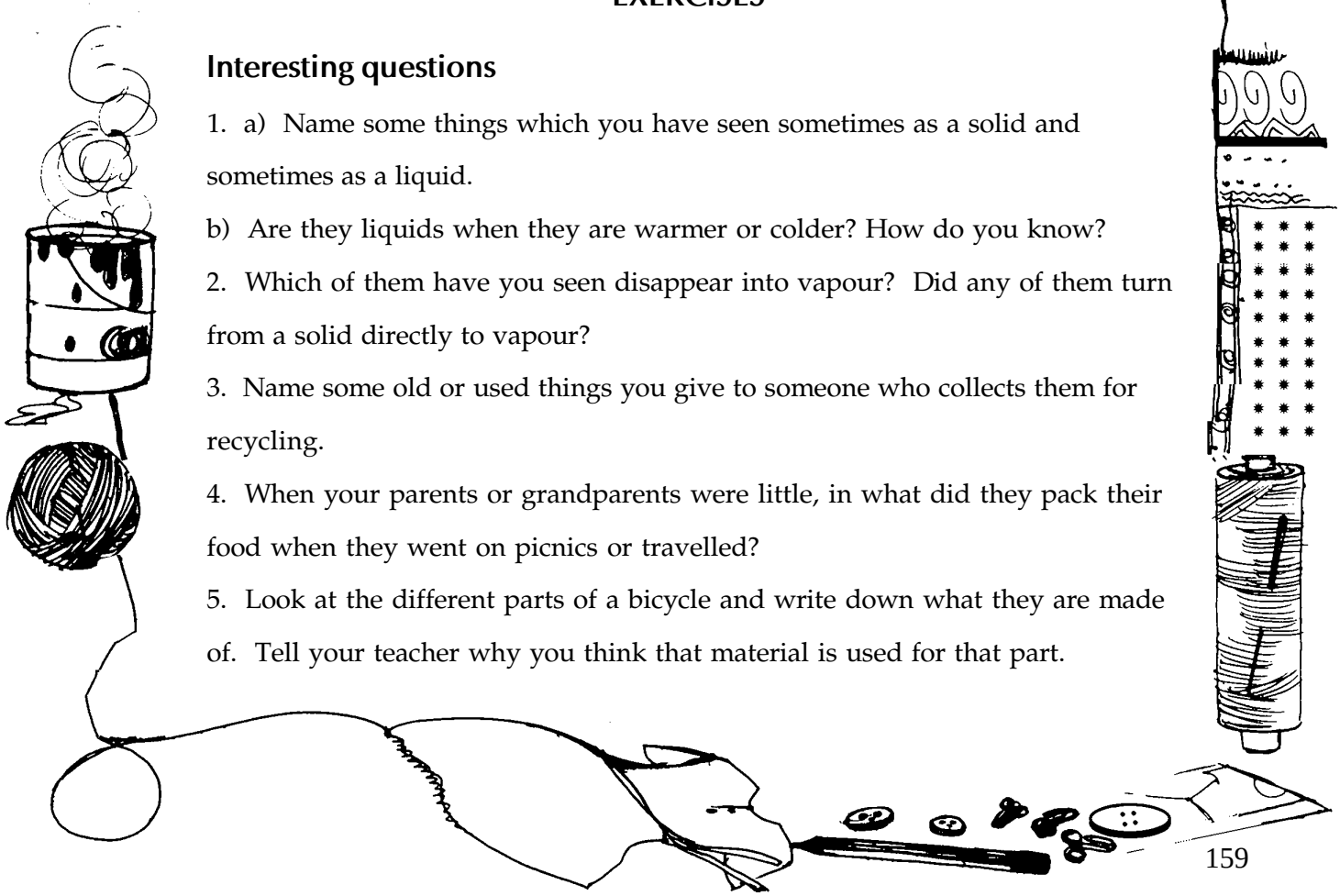
b) Are they liquids when they are warmer or colder? How do you know?

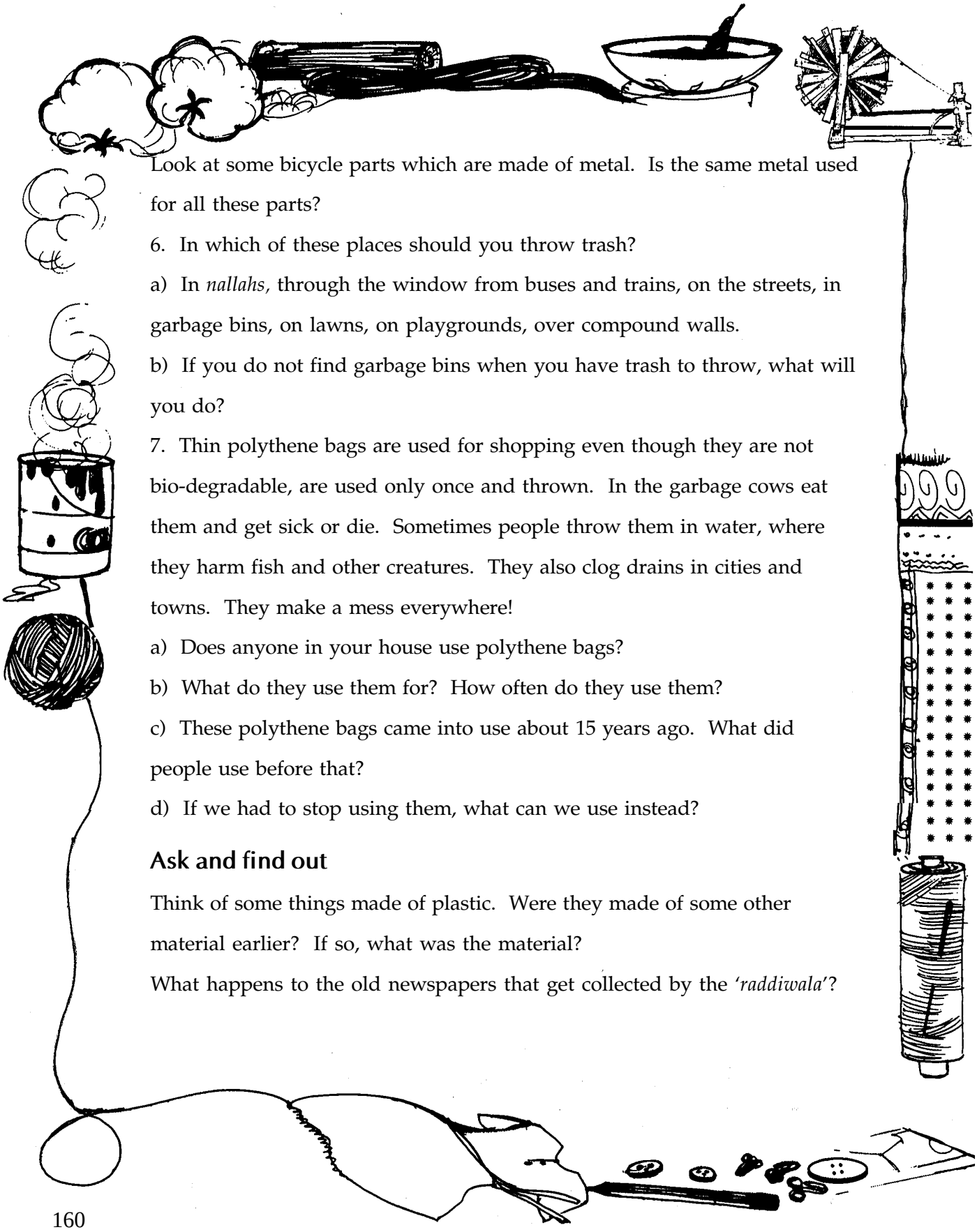
2. Which of them have you seen disappear into vapour? Did any of them turn from a solid directly to vapour?

3. Name some old or used things you give to someone who collects them for recycling.

4. When your parents or grandparents were little, in what did they pack their food when they went on picnics or travelled?

5. Look at the different parts of a bicycle and write down what they are made of. Tell your teacher why you think that material is used for that part.





Look at some bicycle parts which are made of metal. Is the same metal used for all these parts?

6. In which of these places should you throw trash?

a) In *nallahs,* through the window from buses and trains, on the streets, in garbage bins, on lawns, on playgrounds, over compound walls.

b) If you do not find garbage bins when you have trash to throw, what will you do?

7. Thin polythene bags are used for shopping even though they are not bio-degradable, are used only once and thrown. In the garbage cows eat them and get sick or die. Sometimes people throw them in water, where they harm fish and other creatures. They also clog drains in cities and towns. They make a mess everywhere!

a) Does anyone in your house use polythene bags?

b) What do they use them for? How often do they use them?

c) These polythene bags came into use about 15 years ago. What did people use before that?

d) If we had to stop using them, what can we use instead?

Ask and find out

Think of some things made of plastic. Were they made of some other material earlier? If so, what was the material?

What happens to the old newspapers that get collected by the '*raddiwala*'?

Play with words

1. Name
   3 things which are soft and 3 things which are hard
   3 things which are smooth and 3 things which are rough
   3 things which absorb water
   3 things which dissolve in water

2. Name
   Some things which are made into a pulp
   Some things which are gritty
   Some things which can be crumpled
   Some things which can crumble

3. Name some things
   which can be twisted, and some which cannot be twisted
   which can bend and some which cannot bend
   which can be folded and some which cannot be folded.

Classroom discussion

1. Is sand soft or hard?

2. Did you ever see anyone collecting garbage from garbage bins?

Were the bins smelly? What things in the bin make them smell?

What can you do so that they can pick up the things they collect without rummaging through garbage bins?

Do you think it would help to have separate bins for dry waste and bio-degradable waste? How?

How does the garbage from your house go to the garbage bin on the streets, and where does it go from there? How often is it collected?

What can be done with bio-degradable waste?

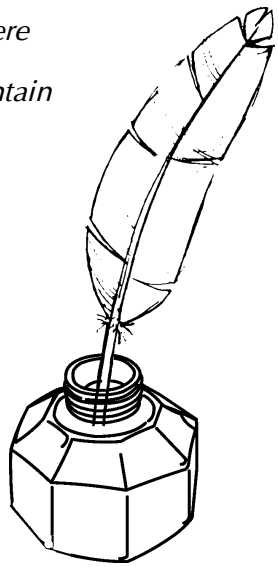
DID YOU KNOW

1. Glass is made from sand, soda and lime which are mixed and heated to a very high temperature to melt them. Glass was first made many thousands of years ago.

2. It takes 12 kg of wood to make enough paper for a book like this. Factories which make paper use a lot of water, and can pollute rivers and streams. Save trees and water - do not waste paper!

3. In 1987, a small city in New York found that it had no place to dump its garbage - all the garbage dumps were full! In March that year, a barge carrying 3,200 metric tons of garbage went south, all along the coast looking for a place to dump it. Not a single city in the country agreed to take that garbage. So the barge went to Mexico, but they too refused to take the garbage. So it went all the way back, and finally, in October they burned the garbage and dumped the 430 metric tons of ash in the city.

4. For hundreds of years before pens were invented, people wrote with quill feathers by dipping their tips in ink. Metallic pens with nibs were made in 1828, but they too had to be dipped in ink for writing. Fountain pens were first made in 1884, with tubes which were filled with ink. Ball point pens, which have been made for about 50 years now, have tiny balls at the tip which roll on paper, and ink flows around this ball while writing. Felt tip pens such as sketch pens have porous tips which are always wet with ink and you can write on even smooth surfaces like glass with them.



OUTLINE OF SMALL SCIENCE

CLASS 3

Unit 1: The Living World

- Chapter 1. So many living things!
- Chapter 2. Looking at plants
- Chapter 3. Grow your own plant
- Chapter 4. Looking at animals

Unit 2: Our Bodies, Our Food

- Chapter 5. Our Bodies
- Chapter 6. Our Food
- Chapter 7. Our Teeth
- Chapter 8. Taking care of our body

Unit 3: Measurement

- Chapter 9. How many, how much?
- Chapter 10. How long, how high, how far?

Unit 4: Making Houses

- Chapter 11. Houses of all kinds
- Chapter 12. Make your own house

CLASS 4

Unit 1: Sky and Weather

- Chapter 1. Sun, wind, clouds and rain
- Chapter 2. Day sky, night sky

Unit 2: Air

- Chapter 3. Fun with air!
- Chapter 4. What's in the air?

Unit 3: Water

- Chapter 5. Fun with water!
- Chapter 6. Water and life
- Chapter 7. Water and us

Unit 4: Food

Chapter 8. Where our food comes from

Chapter 9. Food in our bodies

Chapter 10. What is thrown out

CLASS 5

Unit 1: The Web of Life

Chapter 1. Living together

Chapter 2. Soil

Unit 2: Moving Things

Chapter 3. How things move

Chapter 4. Making a cart

Unit 3: Earth and its Neighbours

Chapter 5. Our earth

Chapter 6. Day and night

Chapter 7. Earth's neighbours

Unit 4: Our Bodies

Chapter 8. What is in our bodies

Chapter 9. Staying healthy

Unit 5: Materials

Chapter 10. The things we use

Note: The topics begin with everyday experiences and immediate surroundings in Class 3, moving gradually outwards. Classes 4 and 5 make increasing use of measurement concepts.