Science and Elementary Technology

For Rwanda Schools

Pupil's Book

Primary 6

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Unit 1 Mechanical and blacksmith tools

1. Look at the picture below carefully.



Fig 1.1

2. Describe the situation shown in the picture.
3. Who is the right person recommended to help in such situation?
4. What kind of tools are required in such situation?

1.1 Mechanics tools

Find out

1. Who a mechanic is.
2. How to use and maintain mechanical tools.
3. Where does a mechanic store his or her tools.
4. What will happen if mechanics were not in our society today?

a) Identification of mechanic tools

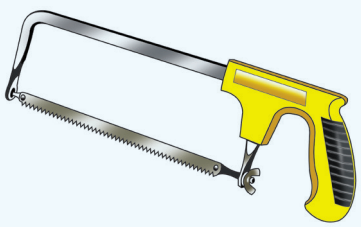
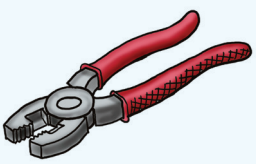
Activity 1.1 **Identifying mechanics tools**

1. Visit a nearby mechanics garage. Look at the people working in the garage. What tools are they using? Which of these tools do you know?
2. List down the tools the mechanics are using. What are the tools being used for?
3. Come up with a table like this.

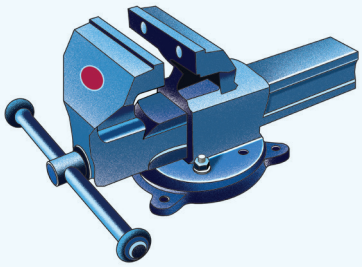
Name of tool	Drawing

A **mechanic** is a person who enable our machines to **work properly.**

Table 1.1 Common mechanics tools and their uses

1. Open-ended and closed-ended spanners 	2. Hand drill 
3. Hack saw 	4. Pliers 

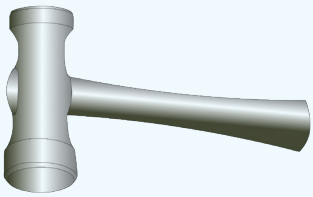
5. Bench vice



6. Screw driver



7. Mechanics hammer



b) Uses of mechanics tools

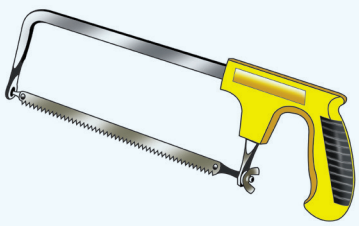
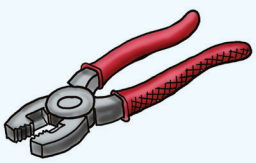
Activity 1.2 **Practicing use of mechanics tools**

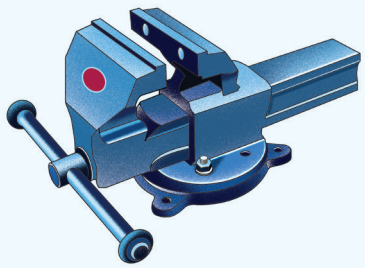
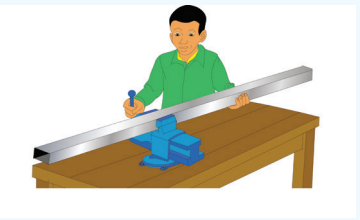
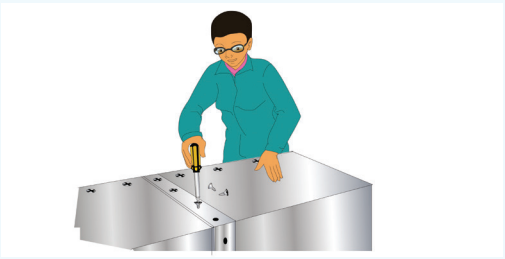
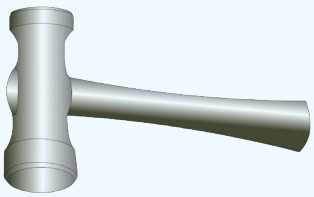
1. Visit a garage while it is operating.
2. Observe the tools being used and how the mechanic uses them. Come up with a table like this.

Name of tool	Drawing	Used for

3. Use the tools yourself (You will be guided by the mechanic). What challenges did you encounter?

Table 1.2 Common mechanics tools and their uses

Tool	Use
1. Open and closed - ended spanners 	Fastening of nuts and bolts. 
2. Hand drill 	Making holes into wood or metals. 
3. Hack saw 	Cutting metals 
4. Pliers 	Holding metals or parts of machines and cutting wires. 

5. Bench vice 	For immobilizing or holding metals or parts of machines. 
6. Screw driver 	Driving screws into metals to make them hold together. 
7. Mechanics hammer 	Driving bolts into machine parts or for breaking or shaping metals. 

Remember!

Tools can harm us. Be very careful while at the workshop. Do not hurt yourself or others while using tools.

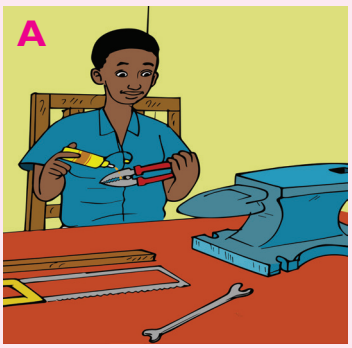
c) Maintenance of mechanics tools

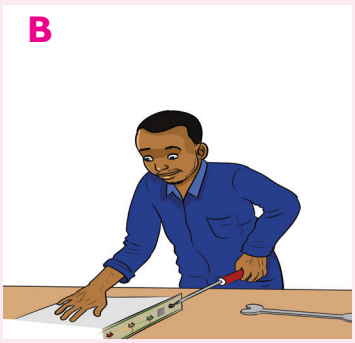
Find out

How to maintain mechanics tools.

Activity 1.3 Repairing and maintaining mechanics tools

1. Look at the following pictures.





2. Discuss what is taking place in the above pictures.

Some ways of maintaining mechanics tools are:

- Cleaning
- Oiling /Greasing
- Repairing
- Keeping the tools in a clean, dry and safe place.
- Keeping tools in **toolbox** after use.
- Using tools for the purpose they are made for.

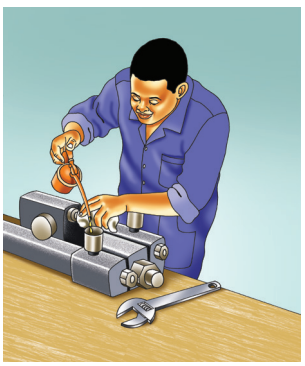


Fig 1.2 Oiling parts of a bench vice

Work to do

The maintenance practices mentioned above do not apply to all mechanics tools. Come up with a table on which maintenance practice applies to which tool.

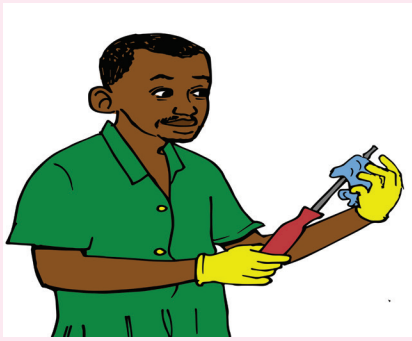
d) Storage of mechanics tools

Find out

How to store mechanics tools correctly. Write short notes and compare with your friend's findings.

Activity 1.4 Storing of mechanics tools

1. Look at the following picture.



2. Discuss what is being done in the picture above.

Before storage, mechanics tools should first be thoroughly cleaned, dried using a clean piece of cloth then stored either in a cool and dry place or in a toolbox as shown below.



Fig 1.3 Storing tools in a toolbox

e) Dangers when using mechanics tools

Find out

The dangers when using mechanics tools.

Activity 1. 5 Identifying dangers when using mechanical tools

1. Look at the following picture.



2. Describe the danger shown above in the picture.

Some dangers that we face while working in a mechanics workshop include:

- Being **hit** by moving objects.
- Cutting or **hurting** ourselves as we use the tools.
- Getting cuts or **bruises** by objects lying in the garage.
- **Dangerous chemicals** getting into our eyes, nose or mouth.



Fig 1.4 We can get hurt when working with mechanics tools

f) Precautions to take when using mechanics tools

Activity 1.6 **Precautions to take when using mechanics tools**

1. Look at the following picture.



2. Describe how you can dress appropriately when working in a garage to avoid accidents.

To avoid the dangers associated with use of mechanics tools, we should always:

- Keep mechanics tools safely and properly after use.
- Wear protective clothing such as **overall, mouth masks, gloves, gumboots** among others to protect us as we work.
- Use tools carefully and for the right purpose to avoid injury.
- Avoid directing chemicals to other workshop users.

Work to do

Find out other dangers related to working in a mechanics workshop apart from the ones above. How can we avoid them? Come up with a table like this.

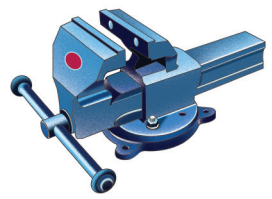
Danger	How to avoid it

Remember!

Always buy original tools. Counterfeits may be cheap but break down very quickly. In the long run, they are more expensive!

Self –Test 1.1

1. What do you think would happen if there were no mechanics to repair or fix broken down machines?
2. Which mechanic tools is used for:
   a) Replacing a car tyre?
   b) Unscrewing nuts?
3. Name the mechanics tools below.



(a)



(b)



(c)

4. What are some of the dangers that we face in a mechanics workshop?
5. Name three protective clothing that a mechanic should put on?

1.2 Blacksmith tools

Find out

1. Who a blacksmith is.
2. What tools a blacksmith uses.
3. Where a blacksmith works.
4. What will happen if we did not have blacksmiths in our society.
5. How to use blacksmith tools.

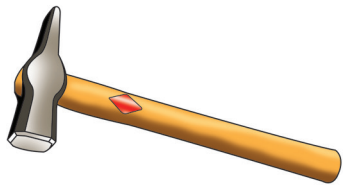
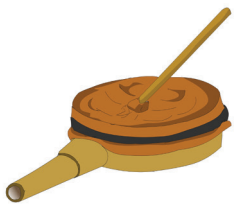
a) Common blacksmith tools

Activity 1. 7 **Identifying blacksmith tools**

1. Visit a nearby blacksmith workshop. Look at the people working in the workshop.What tools are they using? Which of these tools do you know?

Blacksmiths are people who make or repair tools made of iron by hand. They heat metals until **red-hot** then they beat them with a blacksmith hammer into desired shapes.

Table 1.3: Common black smith tools

1. Blacksmith hammer 	2. Anvil 
3. Bellow 	4. Pincers 
5. Tongs 	

N.B Some tools that we use at home that are made by blacksmiths include **knives, axes, machetes, saucepans** among others.

b) Uses of blacksmith tools

Find out

The specific uses of blacksmith tools.

Activity 1. 8 Practicing the use of blacksmith tools

1. Visit a blacksmith workshop.

A



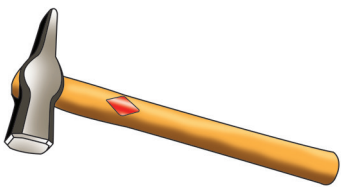
B

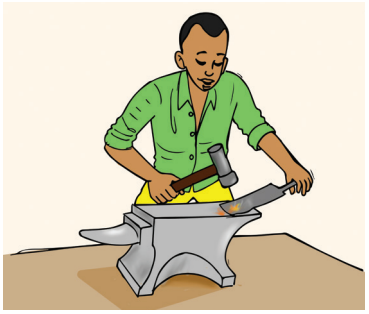
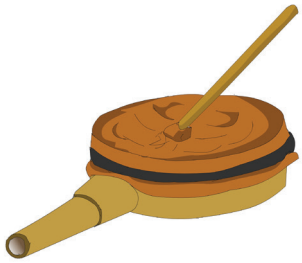


2. Observe the tools being used and how the blacksmith uses them.

3. Try using the blacksmith tools yourself.

Table 1.4 Common blacksmith tools and their uses

Tool	Use
1. Blacksmith hammer 	Hitting metals to give the desired shapes. 

2. Anvil 	Bending red-hot metals from the fire by hitting. 
3. Bellow 	Blowing air into the fire. 
4. Pincers 	Cutting pieces of protruding metals. 
5. Tongs 	Holding hot metals. 

c) Maintenance of blacksmith tools

Activity 1.9 **Practicing maintenance of blacksmith tools**

1. Apply oil on the anvil and blacksmith hammer. What is the importance of this practice?
2. Leave a blacksmith hammer outside the house over night. Do you notice anything on the blacksmith hammer after two days?

Some ways of maintaining blacksmith tools are:

- Cleaning thoroughly after use.
- Tools with metallic parts such as anvil, hammer and tong should be oiled or greased.
- Keeping in a dry place to avoid rusting.



Fig 1.5 Cleaning tools

d) Storage of blacksmith tools

Find out

1. Correct practice on storage of blacksmith tools.
2. Conditions needed for proper storage of blacksmith tools.

Activity 1.10 **Storage of blacksmith tools**

1. Look at the following picture.



2. Describe how blacksmith tools are stored in the picture above.

Before storage blacksmith tools should be cleaned, wiped dry and stored in a toolbox or hanged on a wall.

e) Identifying dangers when using blacksmith tools

Activity 1.11 **Identifying dangers of blacksmith tools**

1. Look at the following illustration.



2. Describe the danger shown in the picture above.

Some dangers that we face while working in a blacksmith workshop include:

- Being **hit** by moving objects.
- Cutting or **hurting** ourselves as we use the tools.
- Getting **bruises** by objects lying in the workshop.
- Dangerous metal particles **getting into our** eyes, nose or mouth as we work.
- Getting **burnt** by fire or hot metals.

f) Precautions to take when using blacksmith tools

Activity 1.12 **Protecting the body when using blacksmith tools**

1. Look at the following picture.



2. Describe how you can dress apporpiately in a blacksmith workshop to avoid accidents.

To avoid dangers associated with use of blacksmith tools, we should always:

- Keep blacksmith tools **safely** and properly after use.
- Wear **protective clothing** such as overall, mouth masks, gloves, and gumboots to protect us as we work.
- Use tools **carefully** to avoid injury.

In general, blacksmiths need to **protect themselves against fire** or hot metals which may cause burns or scalds to their skins as they work.



Work to do

Find out other dangers related to working in a blacksmith workshop apart from the ones above. How can we avoid them? Come up with a table like this.

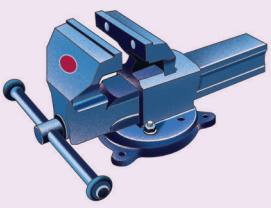
Danger	How to avoid it

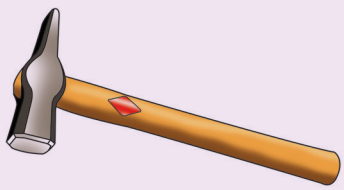
Self –Test 1.2

1. Mention five main tools used by blacksmiths.
2. Which tools do you use at home that are made by blacksmiths?
3. Why should we wear googles when dealing with blacksmiths tools?

UNIT TEST 1

1. Why are these people important in our society?
   a) Mechanic
   b) Blacksmith
2. Match the tool with its use in the table below using a line.

Tool	Use
	Blowing air into fire.
	Making holes into metals.
	Holding metals when being cut.
	Hitting metals to give desired shape.
	Shaping metals.

	Fastening or loosening nuts.

3. Mutoni was heard by a friend complaining how dirty a blacksmith job is. What advice can you give Mutoni?
4. Why do you think it is necessary for mechanics and blacksmiths to put on protective clothes?

5. What is wrong with the picture below?



6. Give at least 3 important tools that we use in our homes that are produced by blacksmiths.
7. Bring some blacksmith tools such as anvil, tong and pincers to school. Practice maintaining them. What did you do to each tool?

Unit 2 Simple machines

1. Look at the picture below showing people working in a construction site.



Fig 2.1

2. Is it easier to move materials as shown in the picture?
3. Suggest what you can use to move the materials shown in the picture faster.

2.1 Definition of simple machine

Find out

1. What a simple machine is.
2. The difference between working with and without a simple machine.

Activity 2.1 **Carrying heavy weight**

1. Look at the following pictures.



A



B

2. Which one above finds it easier to carry the load? Explain why?

Simple machines are simple devices that make work easier. Examples include wheelbarrow, hammer, screwdriver, spade among others.

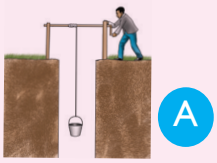
2.2 Types of simple machines

Find out

How different simple machines are used to do work.

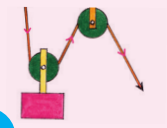
Activity 2.2 Identifying simple machines

1. Look at the following pictures.


A


B


C


D


E


F

2. Name the types of simple machines shown above.

Simple machines are of **different types.** The various categories of simple machines are:

- **Levers** e.g wheelbarrow,crow bar
- **Wheel and axle** e.g windlass
- **Pulleys** e.g elevator, cargo lift
- **Inclined planes** e.g ladder
- **Wedges** e.g metallic saw
- **Screws** e.g screwdriver

a) Levers

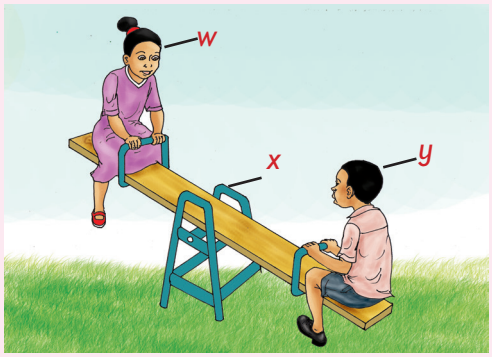
Activity 2.3 Uses of simple machines

1. Discuss how each group of levers is used. Write a report and present the report to the rest of the class.

Classes	Use
First class	
second class	
Third class	

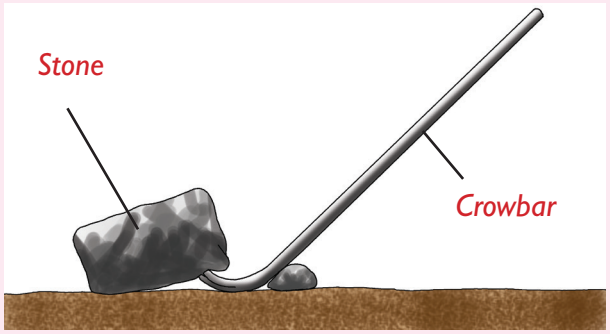
Activity 2.4 Practicing the use of levers

1. Practice playing on a see-saw as shown below with a friend.



   a) Why did you go down and your friend up?
   b) Change positions along the wooden plank. What happens?

2. Now, try moving a stone using a crowbar as shown below.



   Were you able to move the stone? Now try moving the stone without the crowbar? Was it easier? Why?

3. Which point on the see-saw is:
   a) Effort?
   b) Load?
   c) Pivot or fulcrum?

   How about on the crowbar?

4. What does your findings tell you about levers?

Definition

A **lever** is a stiff bar with a fixed turning point called a fulcrum or pivot. A lever was one of the first simple machines to be discovered in life.

Parts of the lever

A lever is made up of effort, fulcrum and load. These parts are shown in the diagram below.

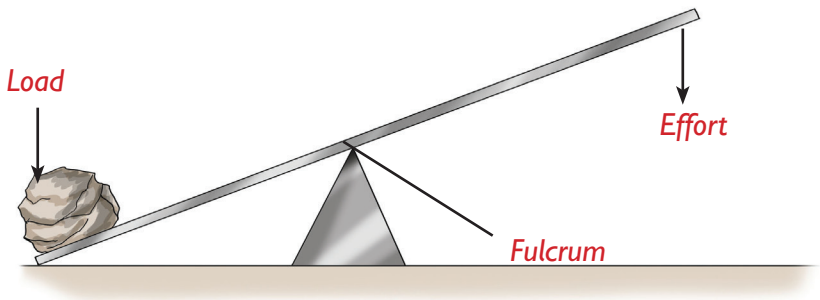


Fig 2.2 Parts of a lever

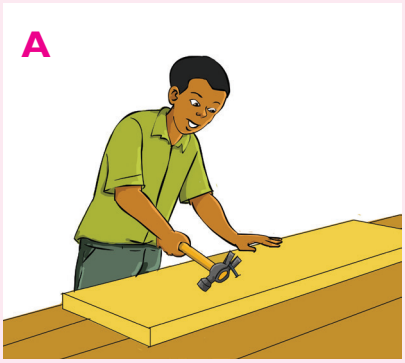
Depending on the position of these parts, levers are put into different categories.

Classes of levers

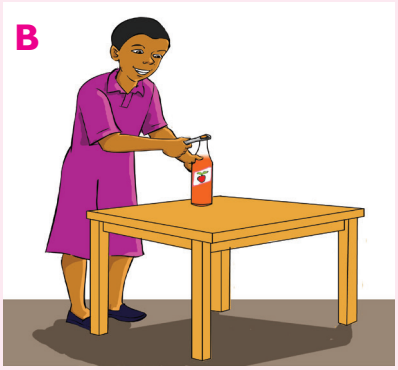
Activity 2.5 **Identifying classes of levers based on the position of the effort, fulcrum or load**

1. Do the following:
   a) Try removing a piece of nail from wood as shown below.

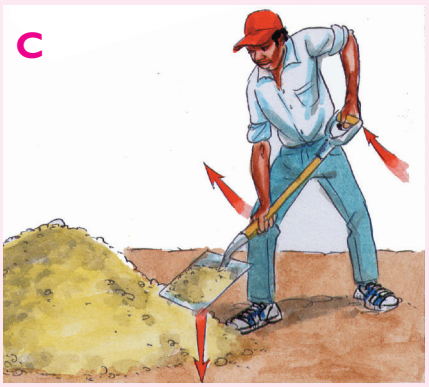
A



b) Open a bottle of soda using a bottle opener as shown below.



c) Scoop sand using a spade as shown below.



Study questions

In the three cases above,

i) Where did you apply energy to lift the load?
ii) Where was the turning point?
iii) What was the position of the load?

2. Draw a diagram to show the parts of the lever in the positions above.
3. Find out more about the types of levers based on the positions of the three parts above. Come up with a table on classes of levers as shown below.

Classes of lever	Examples

- The turning point of a lever is called **pivot** or (**fulcrum**).
- The force applied to the lever is called **effort**.
- The resistance against which the force is applied is called **load**.

Levers are put into three classes depending on the position of the fulcrum, effort or load.

i) First class levers

In first class levers, **the fulcrum is between the load and the effort.** The pictures below are examples of first class levers.

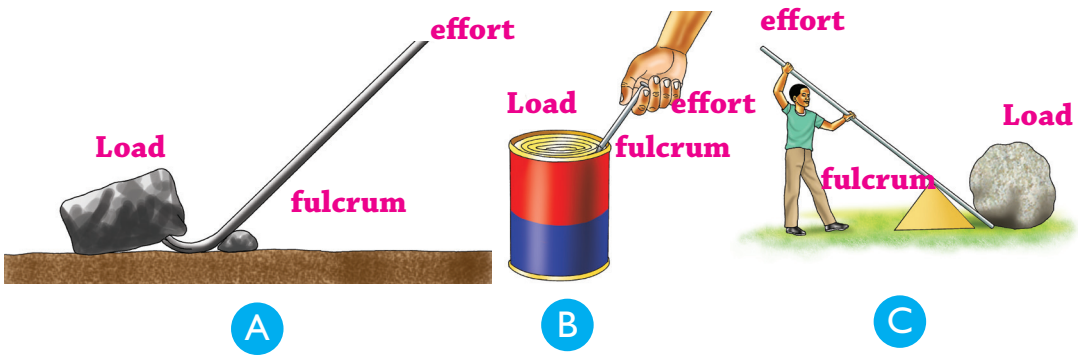


Fig 2.3 Examples of first class levers in use

Work to do

Find out other machines which belong to this category. Write the list down in your notebook.

ii) Second class levers

In this class of levers, the **load is between the effort and the fulcrum**.

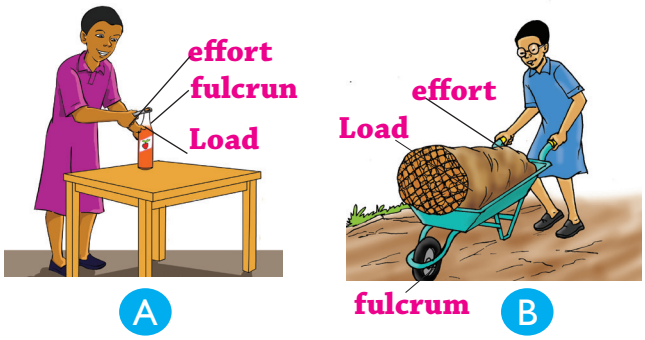


Fig 2.4 Examples of a second class lever in use

Examples of levers in this class include paper cutter, nut-cracker, wheelbarrow and bottle opener in use.

Work to do

Find out other machines which belong to this category. Write down the list in your notebook.

iii) Third-class levers

In this class, the **effort is between the load and the fulcrum**. The pictures below are examples of third-class levers.

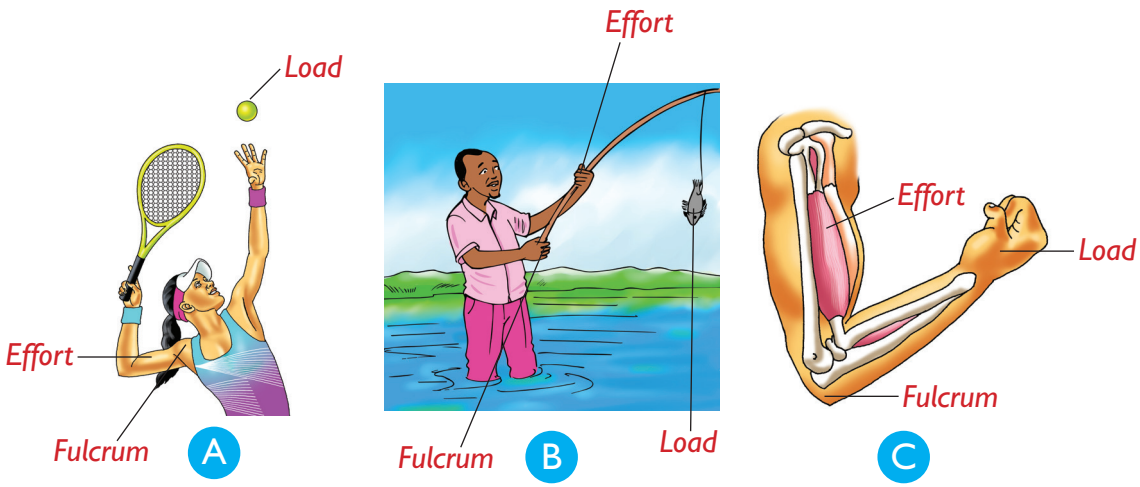


Fig 2.5 Examples of third class levers

Examples of levers in this class include a tennis racket, fishing rod, baseball bat, the human arm, a broom, tweezers and a spade in use.

Work to do

Find out other machines which belong to this category. Write down the list in your notebook.

b) Wheel and axle

- The **wheel** and **axle** is a simple machine that has two wheels, one large and smaller one fixed together. Examples include a door handle, a steering wheel and a windlass.

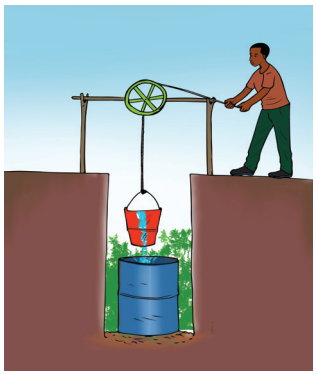
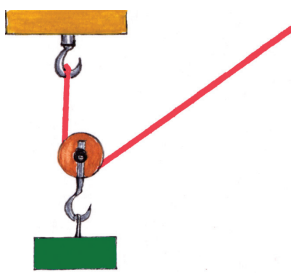


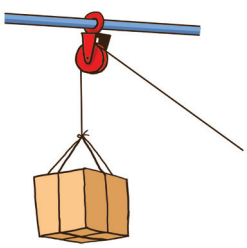
Fig 2.6 Windlass is an example of wheel and axle

c) Pulleys

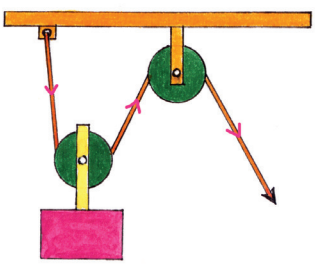
- **Pulleys** - a pulley is a wheel that rotates around an axle which has a groove where a rope or a string fits.
- Types of pulleys include: A **single fixed pulley**, **movable pulley** and **the block** and **tackle pulley system**.



(a) Movable pulley



(b) Single-fixed pulley



(c) Block and tackle pulley

Fig 2.7 Different types of pulleys

d) Inclined plane

- **Inclined plane** - this is any device with a sloping surface. Examples of inclined planes are: staircase, a ladder, a meandering road on a steep hill, a ramp among others.

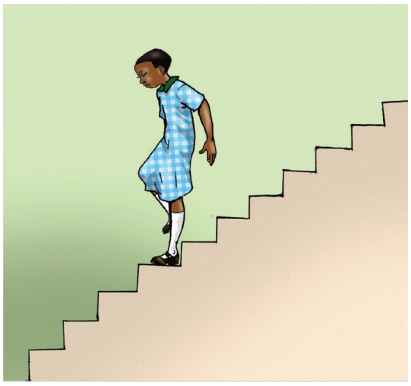


Fig 2.8 Stair case is an example of an inclined plane

e) Wedges

- **Wedges** - a wedge is an object with one sharp cutting edge. Examples of wedges are knife, razorblade, axe and chisel.



(a) Knife *(b) Chisel*

Fig 2.9 Knife and chisel are examples of wedges

f) Screw

- **Screws** – A screw is a metal rod with a raised thread running round it.
- Screws are used to hold and join pieces of metals or wood together.
- Screws are also used in jacks to raise heavy objects like cars.



Fig 2.10 Screw jack in use

2.3 Dangers when using simple machines

Find out

The dangers of using simple machines.

Activity 2.6 **Dangers when using simple machines**

1. Which dangers do you face when using simple machines? Discuss in groups and write a report. Choose one group member to present the report in class

Some dangers that we face when using simple machines include:

- We can get **pricked** by pointed parts of the machines.

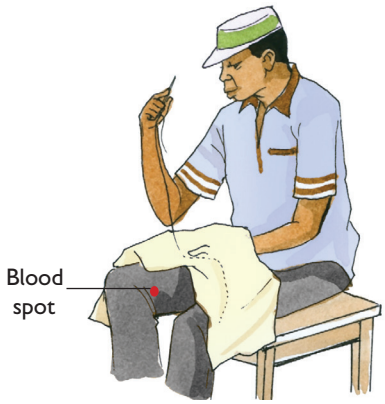


Fig 2.11 We can get pricked when using a needle

- Machines with sharp edges can **cut** our skin.



Fig 2.12 We can get cut when using machines such as a plane

- We can **fall** when using inclined planes such as ladder.



Fig 2.13 We can fall when using a ladder

- We can get **hurt** while using machines like bicycle.



Fig 2.14 We can get hurt when using a bicycle

Remember!

We should always buy quality machines and tools. Cheap tools or machines may cause accidents. They may also get spoilt quickly , this makes it expensive in the long run.

2.4 Safety in using simple machines

Find out

How to use simple machine safely without any danger?

Activity 2.7 **Identifying protective methods when using simple machines**

1. How can we avoid the dangers associated with the use of simple machine?
2. Discuss in your group and write short notes.
3. Compare your report with that of other classmates.

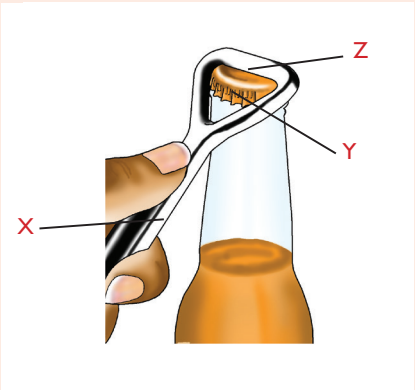
- We should always be **careful** when using simple machines to avoid accidents.
- We should always **wear protective** clothing when using simple machines.
- Protective clothings include overalls, goggles, gumboots, gloves, mouth and nose masks among others.



Fig 2.15 Well dressed workers

Self –Test 2.1

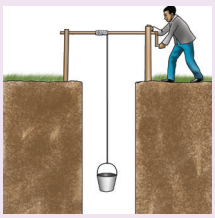
1. What is a lever?
2. Look at the diagram below. Can you label the parts named X, Y and Z?



3. How would you know whether a given machine is:
   a) First class lever? b) Second class lever?
   c) Third class lever?
4. A ladder is an example of _____. (lever, inclined plane)

UNIT TEST 2

1. What is the importance of the invention of simple machines by early human beings?
2. Where do we apply simple machines in our daily lives.
3. Give three examples of simple machines where wheel and axle is applied.
4. In which category of simple machines does the one shown below belong to?



5. Given the following list of simple machines: wheelbarrow, nut cracker, tweezers, tong, pliers and a pair of scissors. Put them into three groups as shown in the following table.

1st class levers	2nd class levers	3rd class levers

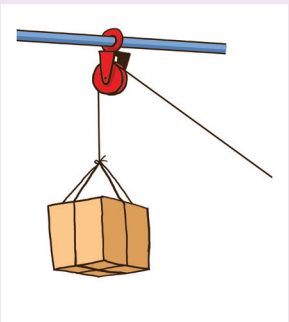
6. Name parts of your body that act as levers.
7. Go for a tour around your school. Observe how the roads are constructed on steep slopes. Why do you think the roads are constructed like that?
8. What is the use of screws and bolts? What type of simple machines are they?
9. How would you advise primary 6 pupils using simple machines with sharp edges?
10. The diagram below shows a claw hammer being used to remove a nail from a piece of wood.



Based on the diagram, the hammer is _____ class of lever.

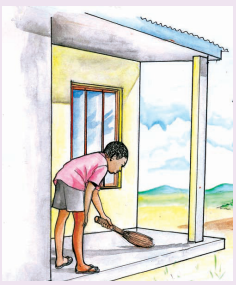
11. Write **true** or **false**:
    a) A simple machine uses a single applied force to do work against a single load. _____
    b) A simple machine enables people to do work with less effort and at greater speed. _____
    c) Life became very safe when early human beings discovered the use of simple machines. _____
    d) The force applied on a simple machine is always greater than the work done. _____
    e) Most levers are examples of simple machines.

12. Which type of simple machine is shown below?



A. Lever
B. Wedge
C. Screw
D. Single fixed pulley

13. Mugabo sweeps the class floor every morning using a broom as shown below. To which class of lever is the broom?

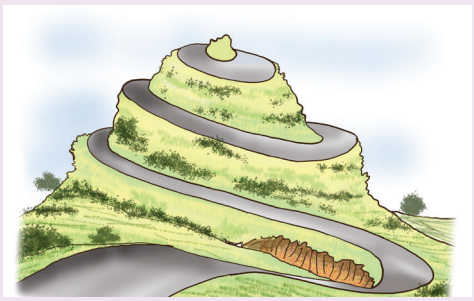


A. Fist class Lever

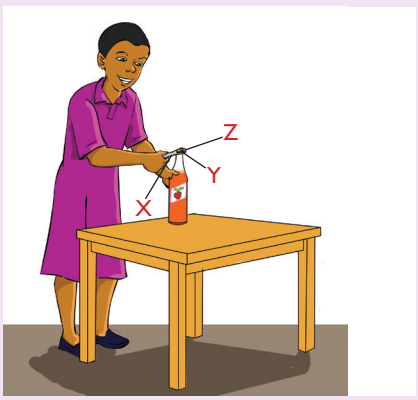
B. Third class Lever

C. Second class Lever

14. What is a simple machine and how does it help to make work easier?
15. Visit a construction site and list the simple machines used there.
16. Why do roads on a steep slope meander as shown below?



17. What is a lever? _____
18. Look at the diagram below. Can you label the parts named X,Y and Z?



19. A ladder is an example of _____ (lever, inclined plane)

Unit 3 Objects production

1. Look at the picture below.



Fig 3.1

2. What is happening in the picture?

3. What can you advise the pupils to do?

3.1 Making toys using clay

Find out

1. How you can make a doll using clay.
2. How you can make a toy motorcycle using wires.

Activity 3.1 Modelling a doll using clay

What you need

- Clay • Water in a container • Model of the doll

What to do

1. Collect clay and water.

A



2. Mix the clay with water and knead it to obtain dough for modelling.

B



3. Model the trunk of the doll.

C



4. Model the head with ears, eyes, nose and mouth.

D



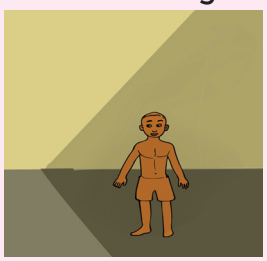
5. Model the limbs and join the trunks.

E



6. Make the final touches and compare your doll to show/drawn on the chalkboard. Allow you a model to dry under shade.

F



Remember!

We should not dry our toys under direct sunlight as this will make them crack!

Activity 3.2 Modelling animals using clay

What you need

• Clay • Water in a container • Model of the doll

What to do

1. Collect materials needed.

A



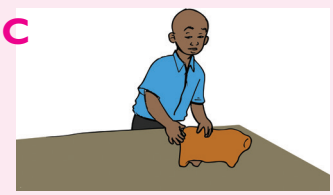
2. Mix the clay with water and knead it to obtain dough for of modelling.

B



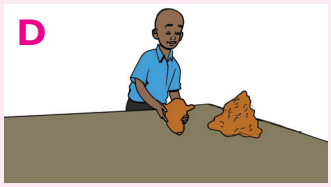
3. Model the trunk of the cow.

C



4. Model the head with ears, eyes, nose,mouth.

D



5. Model the limbs and join the trunks.

E



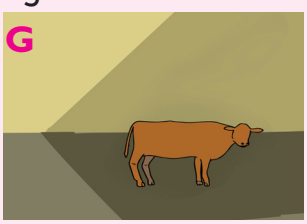
6. Model the tail and join it the trunk.
7. Fix the head onto the trunk. Make the final touches and compare your model drawn on the chalkboard.

F



8. Allow you a model to dry under shade.

G



Remember!

Our environment is our life. When collecting clay, avoid destroying a vegetation and polluting the water.

Work to do

Use the steps above to make a model of a sheep or a dog. Smoothen your model and make it as attractive as possible.

3.2 Making toys using wires

Activity 3.3 Making a motorcycle using wires

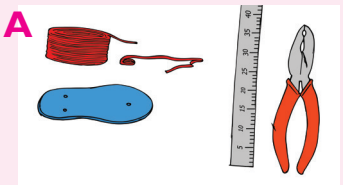
What you need

- Wires
- Pliers
- Ruler
- Rubber bands
- Old slippers(for making a wheel)
- Pencils
- Drawing paper

What to do

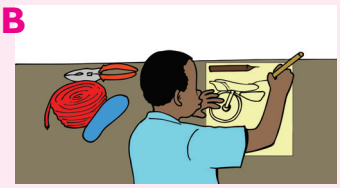
1. Collect materials you need.

A



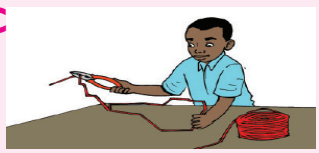
2. Make a sketch of toy motorcycle.

B



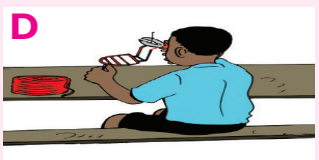
3. Prepare appropriate pieces of wires with the right measurements.

C



4. Bend the wires according to the motorcycle shape to be made. The frame of main parts are: body of motorcycle, handlebars, footrest or footpeg.

D



E



5. Connect the different frames with rubber bands.
6. Fix two wheels on the frame made of body and handlebars.

7. Display the complete the motor cycle.

F



Remember!

When making toys from wires, care should be taken. Wires are sharp objects that can pierce and harm the skin.

3.3 Making utility objects in threads

Find out

How you can make utility objects (socks, scarfs, hats) using threads.

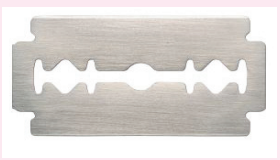
Activity 3.4 Making socks

What you need

- Threads
- Pair of scissors
- Sewing needle
- Razorblade or lancelet

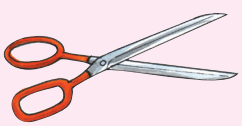
What to do

1. Collect the materials needed.

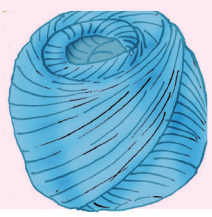






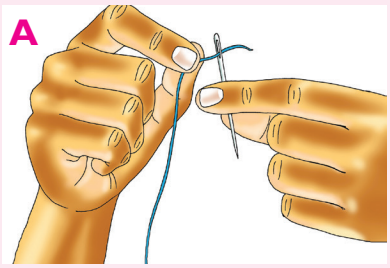


2. Choose your favourite yarn



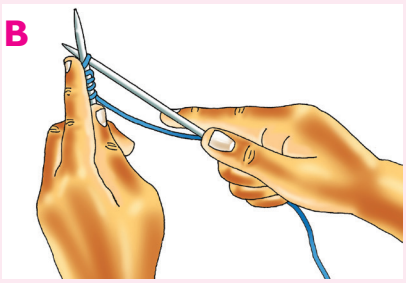
3. Cast-on-loop using the left hand needle.

A



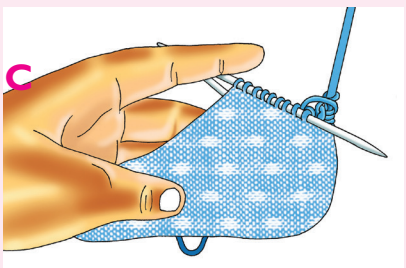
4. Use two needles to begin knitting the socks as shown below.

B



5. Knit the socks until you reach full sock as shown below.

C



6. Wrap the end of socks using a piece of cloth to make them strong. This is called **hemming**.

D



7. Repeat steps 1-4 to make another sock.

E



Activity 3.5 Making scarf

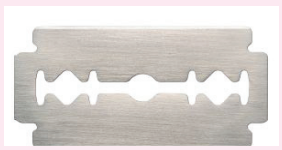
What you need

- Threads or yarn
- Hand cream
- Razorblades
- Sewing needles
- Pair of scissors

What to do

1. Collect materials required.

A



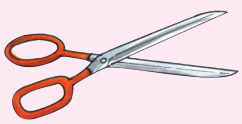
B



C

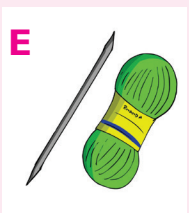


D



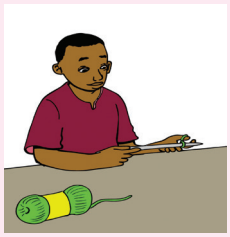
2. Choose your favorite yarn.

E



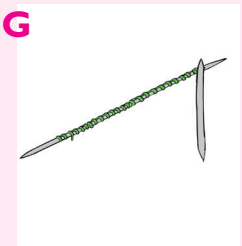
3. Cast on as shown below.

F



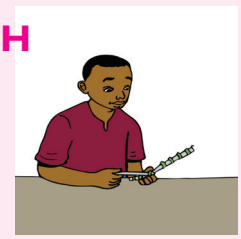
4. How to knit cast on 24 stitches.

G



- Hold the needle with the 24 cast on stitches in your left hand.
- Insert the point of the right needle into the first stitch from front to back under your left needle.
- With your index finger bring the loose yarn under and over the point of the right needle.
- Draw the yarn through the stitch with your right needle point.
- Skip the first loop on he left needle off , so you now have the new stitch on the right needle.

H

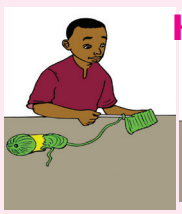


5. Knit until the scarf is complete.

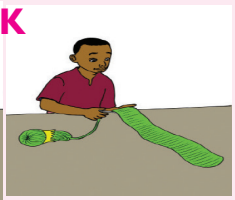
I



J

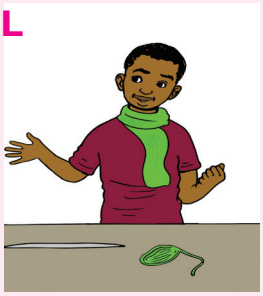


K



6 .Wrap the scarf on your neck .

L



Watch video using internet link http://www.youtube.com/watc?v=IwRwJUgt_Tg on how to knit a scarf.

3.4 Making learning materials using a paper

Find out

How to make learning aids from paper.

Can you name some learning aids you made in Primary 4 and 5? How did you make them? In this class, you will make:

- Regular polygons, for example a **pentagon** and **hexagon**.
- Various solids, for example **cuboid** and **cylinder.**

3.5 Making regular polygons

Find out

How to make regular polygons from manila paper. Which tools and materials are used when making polygons from a paper.

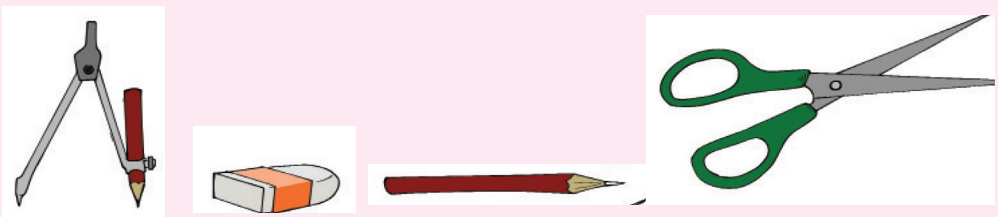
Activity 3.6 Making regular polygons from manila paper

What you need

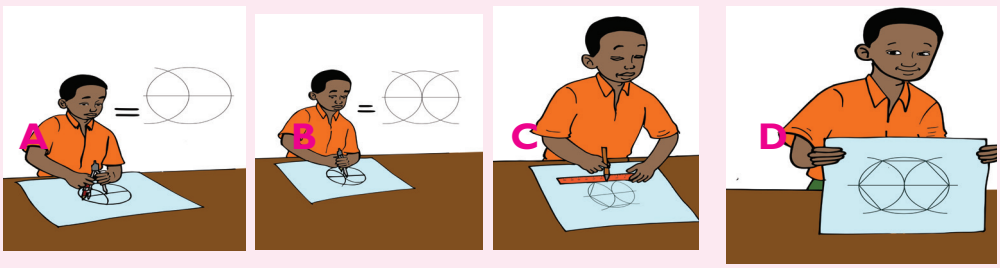
- Manila paper
- Pair of scissors
- Pencil

What to do

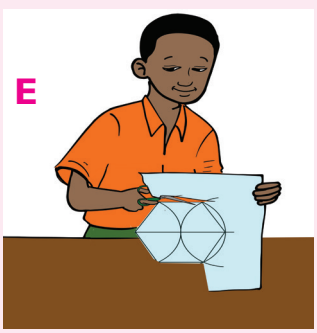
1. Collect the materials required.



2. Draw a hexagon using a pencil,compass on the manila paper.



3. Cut the paper along the lines as shown below.



Remember!

To make a regular polygon, you first draw the polygon on a manilar paper. Cut the manila paper into the polygon using a pair of scissors.

3.6 Making solids

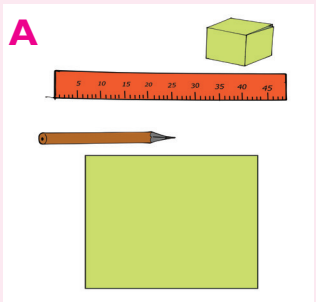
Activity 3.7 Making solids from papers

What you need

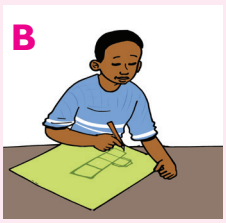
- Pencil
- Ruler
- A pair of compass
- Manila paper
- Lancelet, razorblade or pair of scissors

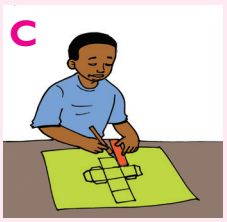
What to do

1. Collect materials needed.

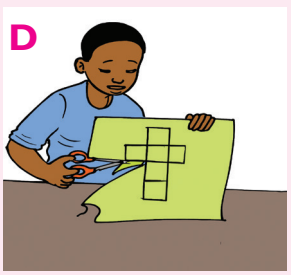


2. Draw a hexagon using a pencil on the manila paper.





3. Cut the paper along the lines as shown below.

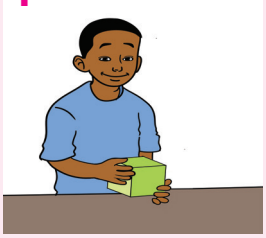


4. Fold the shape into the cube or solid as shown below

E



F



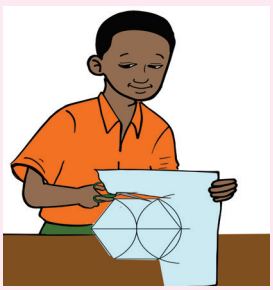
3.7 Maintenance of utility and learning objects

Find out

How to maintain utility and learning objects.

Activity 3.8 Maintaining utility and learning objects

1. Look the picture below.



2. Discuss how to maintain utility and learning objects.

Ways of maintaining utility and learning objects include:

- Storing utility objects in a clean and dry place.They should be **covered** to avoid dust.
- The learning materials should be placed on the wall of the classroom.

Remember!

Our utility objects require maintenance otherwise they will be spoilt.

UNIT TEST 3

1. Name two materials that can be used to make toys.
2. How can you make a toy made of clay strong?
3. Apart from toys, name other utility objects found at home that are made of clay.
4. Describe how you can make a motocycle from wires. How can you make it look beautiful?
5. Look at the picture below.



   a) What is the girl doing?
   b) What materials is she using?
   c) How can she make the mat more durable?
6. a) Give the importance of knitting in our society.
   b) Apart from knitting, which other methods can be used to make utility objects?
7. Describe how we can maintain our utility and learning materials.
8. Below is a boy playing with a toy.



   a) What is the toy made of?
   b) How should the boy maintain the toy?
9. Make a cylinder using a Manila paper. Which tools did you use? What method did you use?
10. Hitayezu does not like modelling using clay. He says it makes him dirty and that when he goes home, his parents quarrel him. What advice can you give Hitayezu and his parents?

Unit 4 Writing Skills

1. Study the picture below.



Fig 4.1

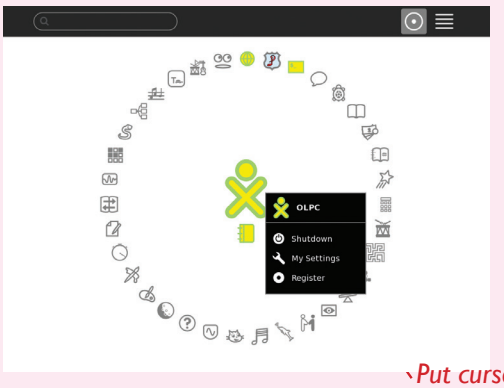
2. Summarise what is going on in the picture in one paragraph in your notebook.
3. Type your summary using your XO laptop. Are you happy with your typed work? How can you make it look better?

4.1 Gnome Environment

In Primary 4, you learnt about the two interfaces used in the XO laptop. Can you name them? How do you switch from Sugar to Gnome interface?

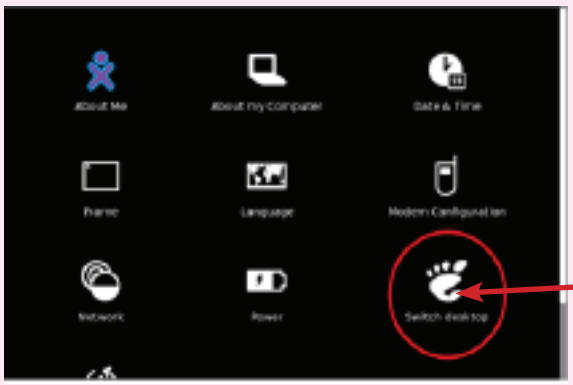
Activity 4.1 Switching from Sugar to Gnome interface

1. Go to my Settings by placing the cursor at 'X'



Sugar Interface screen

2. Click on **switch desktop.**



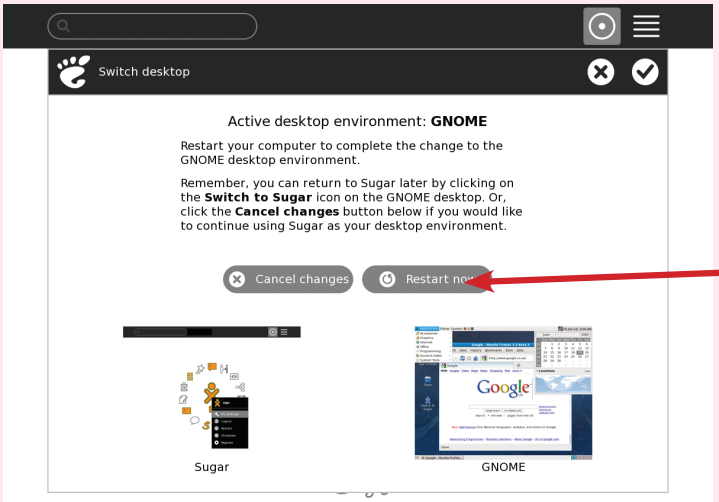
Desktop showing Gnome Ico

3. Click on **switch to GNOME.**



How to switch to Gnome Interface

4. Lastly, click on **restart now** button.



Screen showing restart-button

Your screen should look like this.

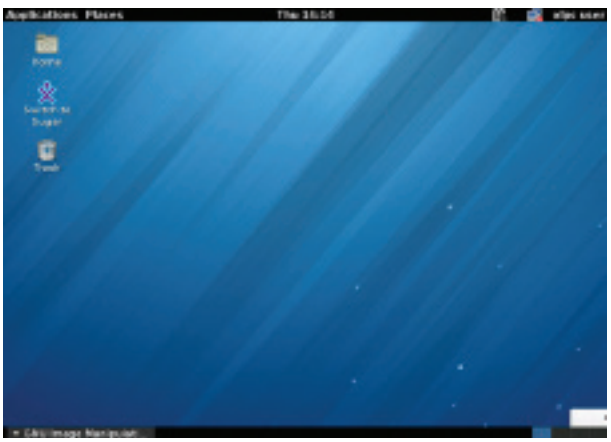
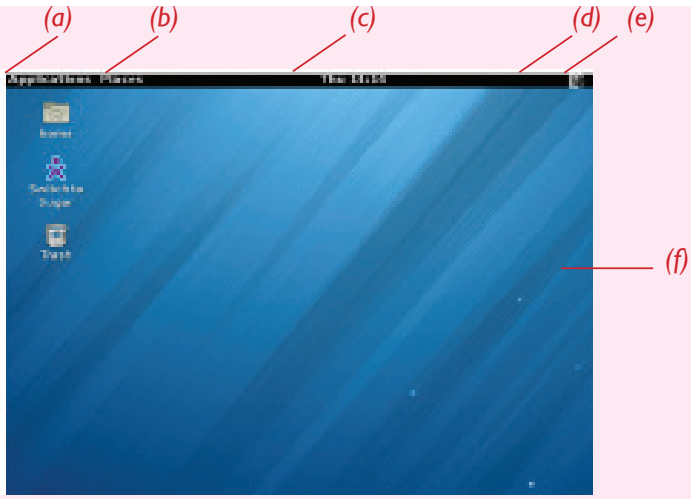


Fig 4.2: Gnome Interface screen

Identification of elements of Gnome environment

Activity 4.2 Gnome environment

1. Look at the screen below. Does it look familiar?



2. Identify the parts shown on the screen.

There are top and bottom panels in a Gnome window. On the top left there are: **applications** and **places**. On the top right, we find network, date and olpc user.

(i) The Top Menu Panel

This panel stretches across the top of the screen. The left side contains:

- Applications
- Places

The right side of the panel is home to:

- A clock and Calendar
- Network connection
- Battery status
- The User Switch area

Note: If you hold the mouse pointer over the menu text or an icon, a brief description of its function appears. If you click one of these icons, that application starts.

Activity 4.3 Launching an application menu

To launch an application, perform the following:

1. Open the Applications menu by clicking on it.
2. Move the mouse down the menu to the Sound and Video. (Each sub menu opens as your mouse passes over the category).
3. Click the menu item for the application.
4. Locate where you can record sound.



Fig. 4.3: Drop down menu for applications

This Menu displays a list of installed applications. When you click on Applications, a drop-down list appears as shown above. Each of these sub-menus corresponds to a category. For example, in the Sound & Video sub-menu, you will find applications for playing CDs and recording sound.

ii) Places menu

Activity 4.4 Explaining places menu

1. Click on places icon as shown below.



2. Select recent documents.
3. Write down names of the documents/ folders which are there.

The 'Places' menu is a quick way to go to various locations on your computer and your local network.

It allows you to open the following items:

- **Home folder**- where your personal files are kept by default.
- **The Desktop folder** - which is the main work area on your computer.
- **Documents** - list several of the last folders opened.
- **The computer** window allows you to browse the computer's files and all data storage attached to the computer.
- Network allows you to **manipulate** your networks.

iii) Network menu

Activity 4.5 Network Menu

1. Click on network icon to see which network connections are available for use in accessing the internet.
2. To connect a network you click on it. For example: click on one laptop per child to connect on it or to disconnect it



Fig. 4.4: Networks

It displays available networks including WI-FI networks that are available.

Setting date and time

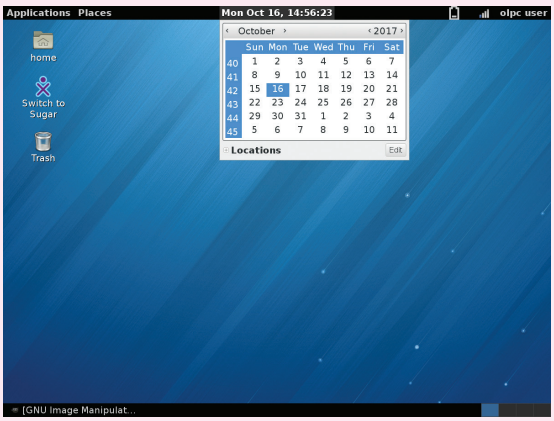
Activity 4.6 Setting date and time

To set date:

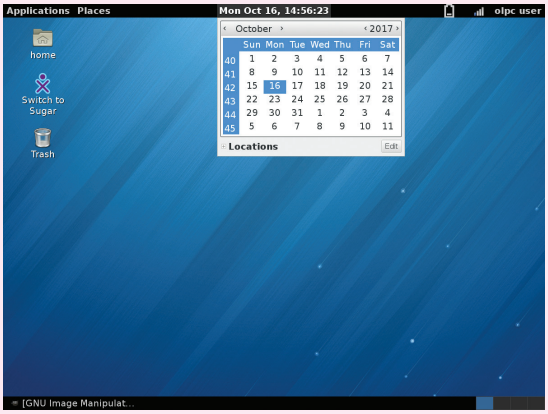
1. Place the cursor on the date icon at the top right panel. A drop down window with the calendar appears.



2. Click on the back and front arrows to select month and year.

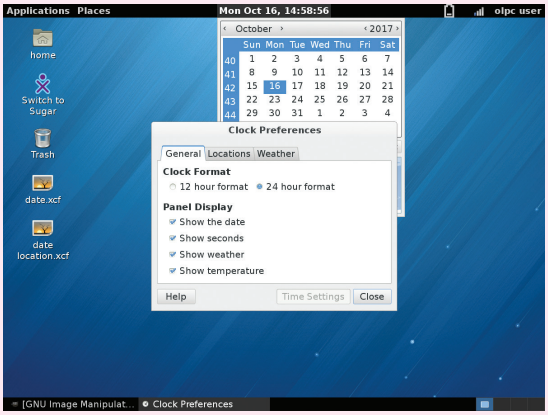


3. Place the cursor on the date then click on it to set the date.



To set time:

4. Place the cursor on the time icon at the top right panel. Click on edit. This will allow you to input the correct time.

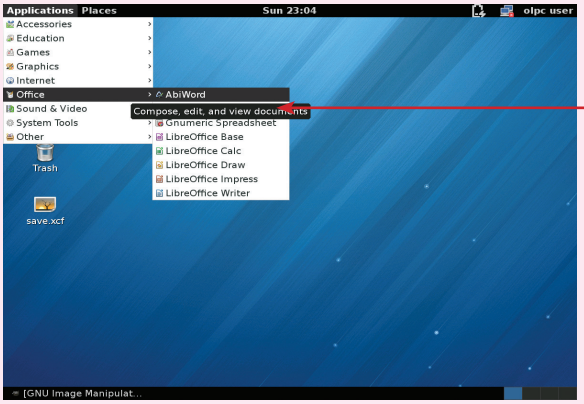


Sometimes, the date and time on the XO-laptop may not be right. When this happens, you may need to **re-set** the date and time.

Activity 4.7 Opening Abiword program

You will open an Abiword program in this activity.

1. Go to applications. A drop down menu like the one shown below appears.



2. Place the cursor on office, then click on it.
3. Select Abiword then click on it. A window like the one below appears.

Did your screen look like this?

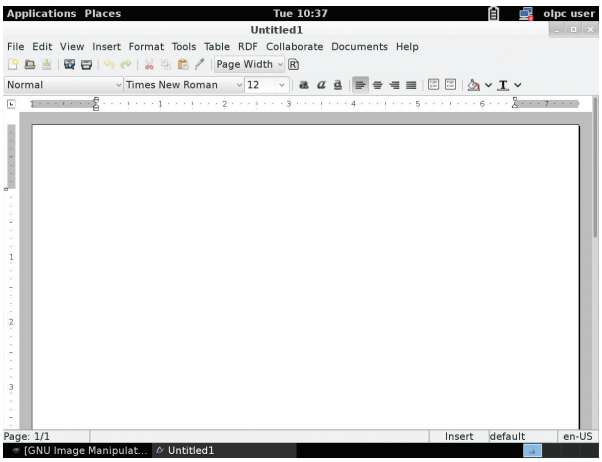


Fig. 4.5: Abiword window

This is the **Abi** word that can be used to type a word document

Activity 4.8 Text typing in Abiword

Follow the steps above to open a new abiword document using your XO - laptop. Type in the words 'Hello children'.

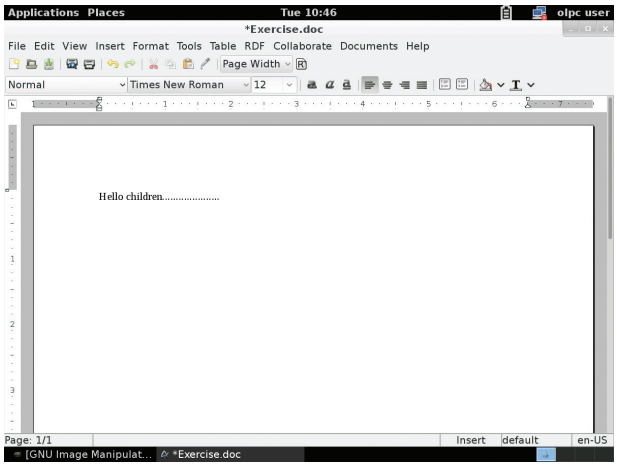
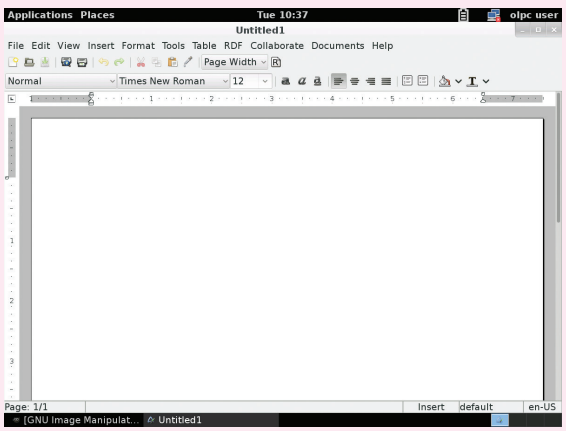


Fig. 4.6: Screen after typing text

Working with a document

Activity 4.9 Creating a new document

1. Follow the steps as highlighted in Activity 4.8 to open a new Abiword window.
2. Click the File tab and click New, or just click on the new document icon.



New Abiword window

3. Start **typing** your text. Once you are done with typing in your new AbiWord document, it is time to save your document to avoid losing the work.
4. Click the File tab and select **'Save As'** option.
5. Select where you would like to save your file (can be documents, desktop or any other earlier created folder on the desktop). Enter **file name** which you want to give (for example, **my test**) and Select **'Save file as'** type file. By default, it is AbiWord. **Abw**.
6. Finally, click on save button and your document will be **saved** with the entered name in the selected folder.

A new blank document always opens when you start Abiword. But you can start another new document by clicking on File + New or just click on the new document icon 

Remember!

In order for your document to be read using other computers, select microsoft word.**doc** as file type.

Activity 4.10 Saving new changes

1. Open the Abiword document you created in Activity 7.7 then make some corrections in the document. You may delete or add information.
2. Now go to file Tab and click on save option or just click on save icon  on the Menu Bar.
3. Re-open the document from its folder and confirm that the corrections were saved.

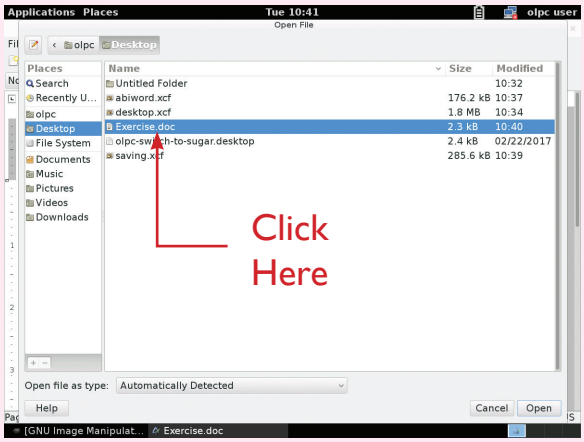
To save the new changes to the document you can do one of the following:

- Press CTRL +S to save the new changes.
- Click on save icon  below the file tab.
- Click on file then click on save.

Activity 4.11 Opening a document

1. Click the **'File tab'** and select **'Open'** option.

   (The window below will displayed (an open dialog box), which lets you move through different file folders and also lets you select a file, which you want to open).



2. Finally locate and select the file which you want to open and click on open. In the above screen the file to be opened is named **'exercise.doc'**.

When you want to open an existing document go to File Tab, select Open option , locate your file and click on Open button.

Activity 4.12 Closing a document

1. Click the File tab and click **'Close'** option.

   (When you select close option and if the document is not saved before closing, it will display a Warning box asking whether the document should be saved or not).

2. It is up to you; If you want to save the changes, then click **'Save',** otherwise click **'Close without saving'** button.

   (To go back to the document click 'Cancel' button. This will close the Dialog Box

3. Or click on **'(x)'** at the top right side of the screen.

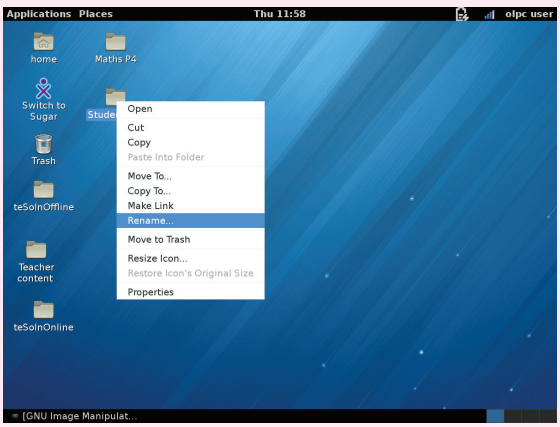
Once you have opened an existing document, you work on it. This may include making some changes, saving then closing it.

To close an open document, you can do one of the following:

- Click the File Tab and click close option.
- Or click on 'X' at the top right of the screen.

Activity 4.13 Renaming an existing document

1. Locate the folder where the document is (this may be in my documents, desktop or any other folder you created earlier).
2. Right-click on the document, a drop down menu like the one below appears.
3. Click on rename, and write the name you want. Then after, press the **'Enter key'**



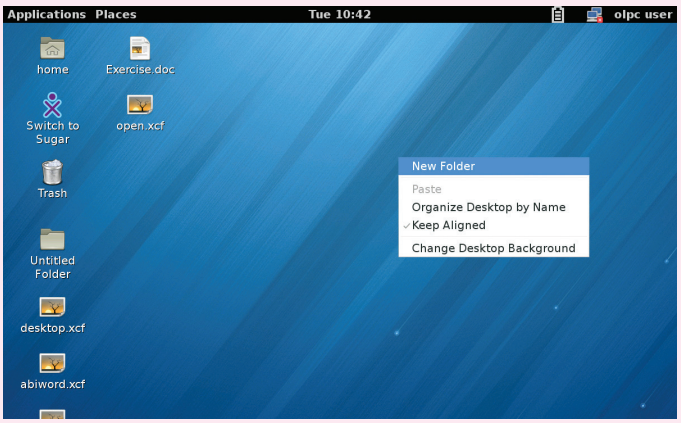
When you want to rename an existing file in your XO laptop,

- Right click on the file you want to rename option.
- Press the erase botton to delete the existing name.
- Then type the name of your choice and press enter key.

Folder management

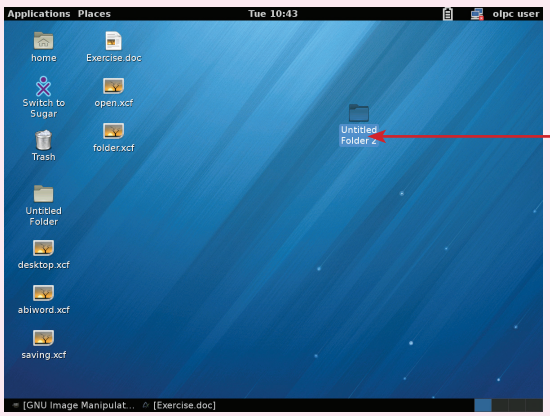
Activity 4.14 Creating a folder

1. **'Right click'** where you want to create a folder.



How to create a folder

2. Click on **'new folder'.**



Screen showing untitled folder

3. **'Right click'** on the untitled folder, then click on **'rename'** option or simply, erase 'untitled folder' by pressing on delete button on the keyboard then type the new name.

Folders are used to store documents in a computer. They are named depending on what content is stored there.

To create a new folder, you can do one of the following.

- Right click where you want to create the folder. It can be either on the desktop or elsewhere.

- Then click a 'new folder' and save the folder with a name. You can name the documents you want in there.

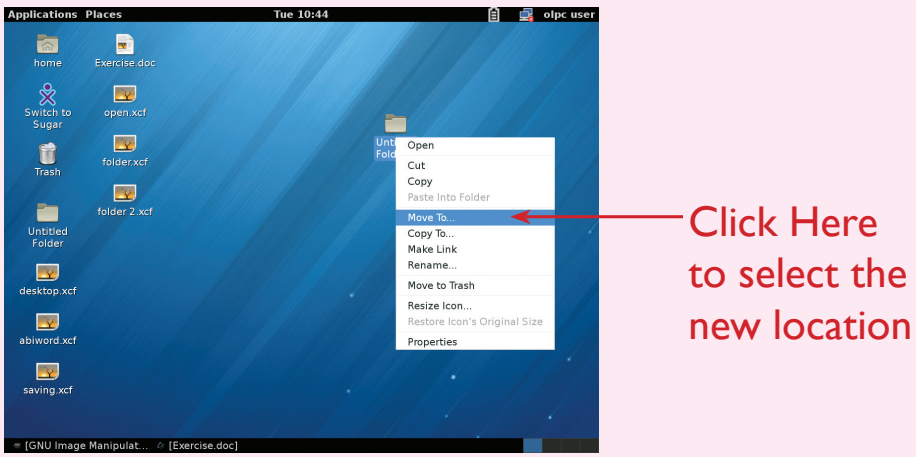
Activity 4.15 Create a folder

1. Follow the steps above to create a folder named ' MY SCHOOL'.
2. Save the folder on the desktop then shut down the XO-laptop.
3. Switch the XO-laptop on. Switch to Gnome interface then try to locate the folder on the desktop. Did you find it?
4. Rename the folder 'MY CLASS' and save. What happens?

Moving and deleting a folder

Activity 4.16 To move and delete a folder

1. Right click on the folder you want to move.



How to move a folder

2. Click on 'Move" option.
3. Select where you want to put your folder.
4. Locate the folder in the new location where you moved it to and right click on it to delete. Where is the file finally?

It is possible to move a folder from one location to another. This can be done by choosing **'move to'** command then clicking on the new location.

How to delete a folder

To delete a folder, follow these steps:

1. Right-click' on the folder.
2. Click on 'move to Trash'. This deletes the folder from its current location and move it to the trash or bin.

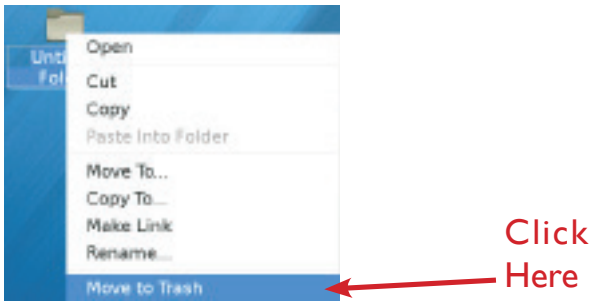


Fig 4.7: How to delete a folder

Talking Point

1. Create two folders on the desktop.
2. Name them as EXERCISE 1 and EXERCISE 2.
3. Move the folder "EXERCISE 1" to folder "Documents".
4. Copy the folder "EXERCISE 2" and paste it in Documents folder.
5. Delete the folder "EXERCISE 2" from the desktop.

Saving a file into a folder

Activity 4.17 Saving a file into a folder

1. Create an, AbiWord document as shown in Activity 4.7.
2. Type the following text then save the document on the Desktop. Name it "My Residence".

My residence address
Southern Province
Nyanza District
Mukingo Sector
Nkomero Cell
P. O. BOX 240 Nyanza

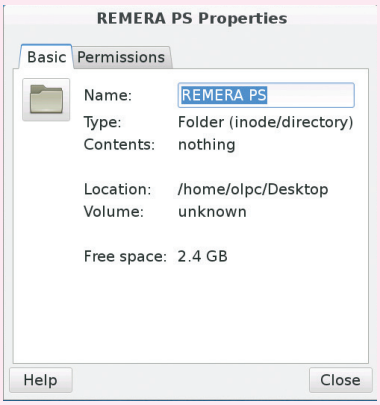
3. Save this file in the folder you renamed 'MY CLASS' in Activity 4.15.
4. Access the file in the folder, then copy and paste it in the folder named "EXERCISE 1" that you created in Activity 4.17 above.

As mentioned earlier, folders are used to **store files**. After you have created a file, for example in AbiWord, you can then save it in the appropriate folder by doing the following:

- Right click on the file, right click on cut then click on the folder, then click paste into folder.
- Place the cursor on the file and drag it to the folder.

Activity 4.18 Accessing properties of a folder

1. Right click on any folder on the desktop.



2. Select the 'Properties' in the display menu and click on it. What can you see?

To access the properties of a file or folder, right-click on it and select 'Properties'

Elements of AbiWord window

You have already interacted with AbiWord window several times. How does the screen of AbiWord look like?

Talking Point

1. Study the window below with a friend.

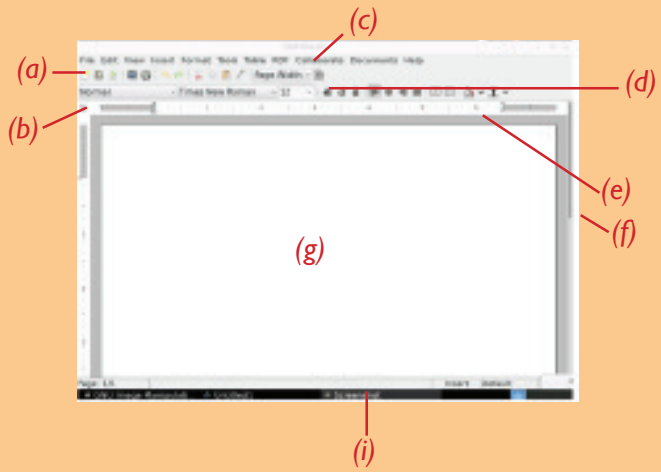


Fig 4.1

2. The main features of the window are shown using letters. Write them down in your notebook.
3. Compare your labelled window with other pupil's. Did you get it right?

AbiWord is a free word processing program. It has a number of different components as described below.

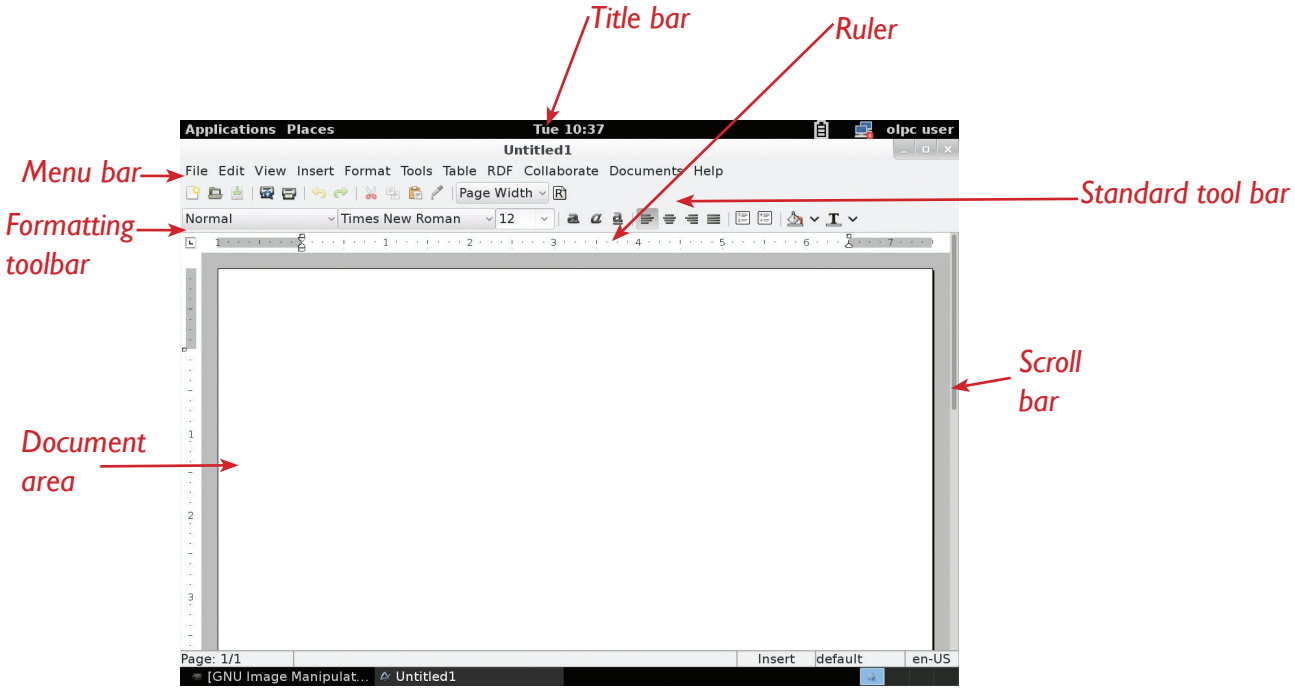


Fig 4.8: Features of AbiWord window

(a) Title bar

Activity 4.19 To name a document

1. Go to application office and click on AbiWord.
2. What is the title of the opened Abiword document?
3. Click on File save as and type the name of your choice and click on save.
4. Now what is the new name of the document?
5. Click on X to close the document.

The title bar normally displays the name of the program, and the document that is currently open. Title bar shows the document titles.

Table 4.1 Uses of the buttons in the title bar

Button	Use
 Maximize	This button will cause the AbiWord to take up the entire screen area or be minimised.
 Close	This button will close the AbiWord window. If there is only one AbiWord window, it will also close the program.
 Minimize	This button will remove the window from the screen, leaving it only on the task bar.

(b) The Menu Bar

Activity 4.20 Inserting a table

1. Open a new AbiWord document.
2. Type "Class test."
3. Go to menu bar and click on Insert option.
4. Click on table and select number of columns of your choice, then click on insert.
5. Type in the marks you got in the class test.

The menu bar is shown below.



Fig 4.9: Menu bar features

The menu bar allows you to choose commands that AbiWord is capable of performing. The menu bar has a series of words on it as shown in Fig 4.9. The most common one is the file tab.

(c) Toolbar

Toolbar buttons are typically used to quickly access commonly used menu commands. The two types of tool bars are

i) Standard toolbar

This toolbar provides access to the most commonly used operations, including **creating** a new file, **saving** the current document and printing the current document, along with **cut, copy** and **paste** functions.

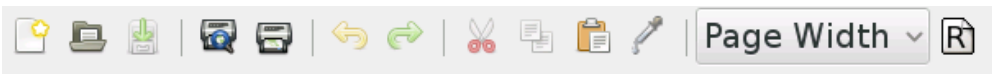


Fig 4.10 Standard toolbar features

ii) Formatting toolbar

Activity 4.21 Formatting Text

1. Open AbiWord on your XO - Desktop.
2. Write the following sentence:

Hallo friend. My name is Andy and this is my first experience with AbiWord.

3. Make **bold** the name "Andy".
4. Make **italics** the phrase "Hallo friend".
5. **Underline** the word "AbiWord".
6. Now, use the **Erase** button of your keyboard and try to delete the phrase "with AbiWord".
7. Use the **text cursor** and move to "Andy". Again use the **Erase** button and delete it in order to type your name.

This toolbar provides access to various formatting options such as **Italicising** text, making text **bold**, **underlining** text and changing **font type** and **font size** and so on.

(d) The Scroll bars

The scroll bars allow you to view other parts of your document and to see what part of the document you are currently viewing relative to the entire document.

i) The Vertical scrollbar

Activity 4.22 **Scroll bar**

1. Open a new AbiWord document.
2. Type number 1 then press Enter key.
3. Continue typing numbers up to 25.
4. Practice to scroll so that you can see the first number, and also scroll down to see the last number.

The vertical scrollbar shows where, between the top and bottom of the document, the part of the document currently visible is located. It scrolls upwards or downwards.

ii) The horizontal scroll bar

This allows you to see what part of the width of the document is currently visible. It scrolls the document horizontally. That is either towards the left of right.

(e) The status bar

Activity 4.23 **Using status bar**

1. Open a document done in Activity 4.2.
2. Click on minimise button.
3. Go to status bar.
4. How many pages are there?
5. What is the name/title of the document on the status bar?

This displays document information as well as the **insertion point** location. From left to right, this bar contains the total number of pages and words in the document, language among others.

(f) Document area!

This is the area where you type the text. The flashing vertical bar that appears when you click inside this area is called the insertion point and it represents the location where text will appear when you type.

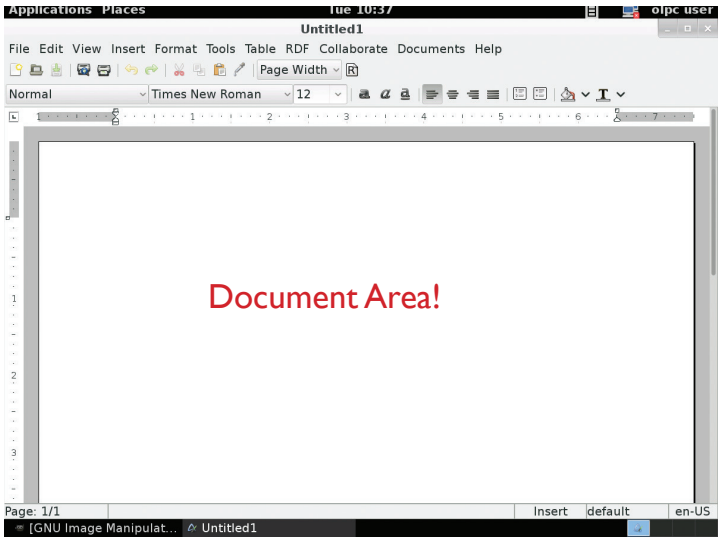


Fig 4.11 AbiWord screen showing document area

Selecting a Text

Activity 4.24 Formatting a text

1. Type the following text:

   "The computer has greatly changed how we do things today. For example, with the development in technology, we are able to send mails and receive messages without using the postal services. Further, we are also able to communicate using other means such as mobile phones. We can also send money electronically. Because of all these, it is said we are living in the computer age!"

2. Drag the mouse over the words "Computer age" and click on B to make it bold.
3. Double click on the word technology and change its colour.
4. Use the shortcut *Ctrl+A* to select the whole text and make its font Italic.
5. Which part of text did you highlight?

In order to highlight the text, click and drag the mouse over the desired text while pressing onto its left button.

You can also use the following shortcuts to select text.

- To select a whole word, **double click** within the word.
- To select the whole paragraph, **triple click** within the paragraph.
- To select several words or lines, **drag** the mouse over the words.
- To select the entire document, press **'ctrl+A'**.

Remember!

In order to de-select text, click anywhere outside the selection on the page.

Text formatting

a) Font Color

Activity 4.25 Using font color

1. Open AbiWord document.
2. Type the following: Kigali is the capital city of Rwanda.
3. Select the sentence you wrote.
4. Go to formating tools and click on font colour icon.
5. Or click on format tab, then click on font, choose text color and choose the color you want and click on ok.

b) Font Style

Activity 4.26 Using font style

1. Open AbiWord document.
2. Write the following sentence "Computer My friend".
3. Select the sentence you wrote.
4. Go to formatting tool and click on font style and choose the style of your choice.
5. Or click on format tab then click on font, then select the font you want and click on ok.

c) Font Size

Activity 4.27 Using font size

1. Type the following sentence "Computer My friend".
2. Select the sentence you wrote.
3. Go to formatting tool and change the size to 12.

d) Underline

Activity 4.28 Using underline

1. Select the sentence "Computer My friend"
2. Go to formatting tools and click on an underline "a" to underline your sentence.

When formatting text, you can change **font size, font type** and **font colour**. You can also **underline, italicize** or **bold text**. Additionally, you can align text to the left or to the right.



Fig. 4.12: Text formatting toolbar

Self –Test 4.1

1. Type text, "Hello Children" in your AbiWord new document. Create a folder on the desktop. Rename it as "exercise" Once you are done, save your document in that folder to avoid the document getting lost.
2. Open AbiWord and individually create a front page of your school newsletter. Use possible AbiWord tools and functions to make a good presentation.
3. Individually do an interview at your local community about fighting malaria in your village, type the findings in AbiWord and use formatting tools to make your presentation attractive.
4. Practice copying, cutting, pasting and moving parts of text in the document you created in 3 above.

4.2 Gnumeric Spreadsheet

Activity 4.29 Introduction to gnumeric spreadsheet

1. Study the following table carefully. Create a table in AbiWord and input the data in the table.
2. Calculate the total amounts and fill in the last column.

Home weekly shopping

No.	Item	Quantity	Amount per item	Total amount
1	Milk	10 litres	3500	
2	Juice	1 litre	4500	
3	Tomatoes	10kg	3000	
4	Potatoes	20kg	4000	
5	Fruits	5kg	5000	
6	Cabbage	3	600	
7	Onions	2kg	800	

3. Do you think there is a program that can display this table more clearly and calculate the total cost for shopping easily? Discuss with your friends.

Definition and role of spreadsheet application

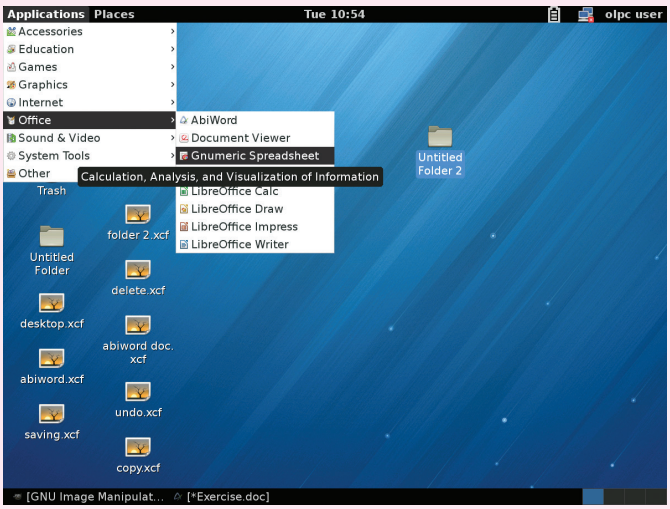
Gnumeric is a spreadsheet computer program used to **manipulate** and **analyze numeric data**. It can help you keep track of information in lists, organize numeric values in columns and rows, perform and update complex calculations.

Spreadsheet environment

Spreadsheet is another example of a program used in XO- laptop just like AbiWord. How do you open a **spreadsheet** application in your computer?

Activity 4.30 Opening spreadsheet environment

1. Switch from Sugar to Gnome interface in your XO-laptop.
2. Click the **'Applications'** icon on the top right corner. Did your screen look like this?



3. Click on "Gnumeric spreadsheet."

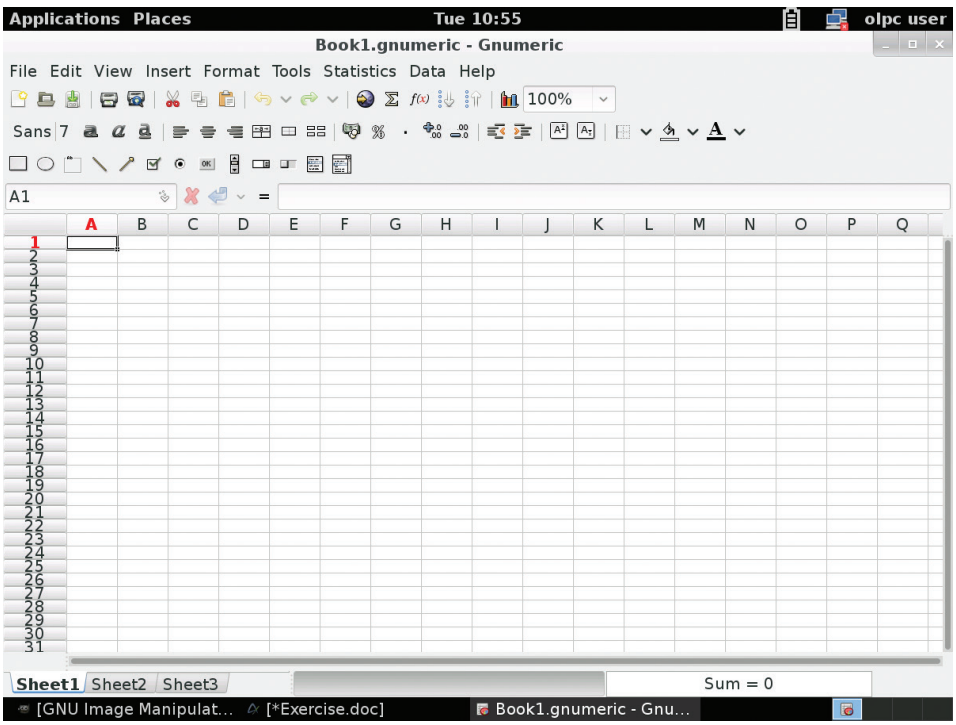


Fig. 4.13: Gnumeric spreadsheet window

Features of the spreadsheet window

Talking Point

1. Go through the screen in Activity 4.30 with a friend. Try to identify the various features on the screen.
2. What are the features used for?
3. Label the key features in the screen.

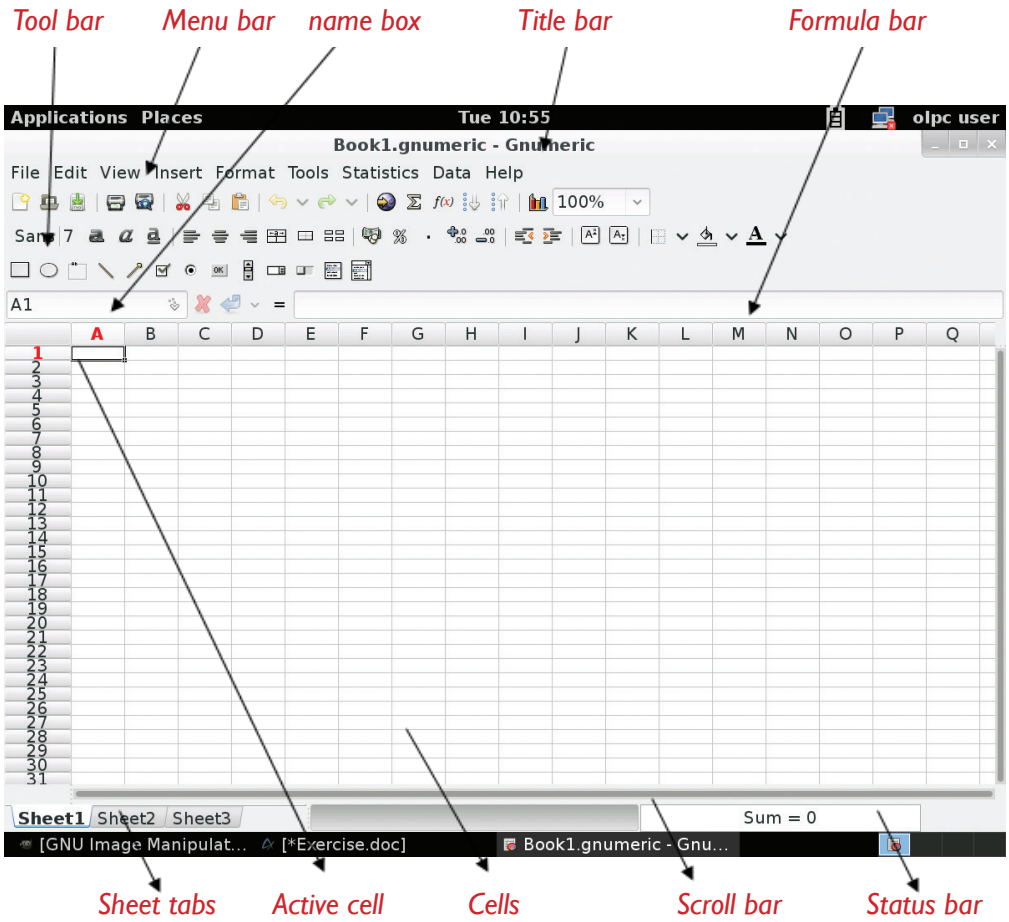


Fig 4.14: Features of a Gnumeric spreadsheet window

When you open a spreadsheet, you begin using a workbook that contains screens called **worksheets**. They are identified as **sheet 1, sheet 2, sheet 3** and so on. The spreadsheet uses **rows** and **columns**. The key features of a Gnumeric spreadsheet window are shown below.

Remember!

Each of the features in the spreadsheet window have special use as you shall learn next.

a) Title Bars

Activity 4.31 Using title bar

1. Open a new spreadsheet, window. Check the name on the title bar.
2. Go to File, Save as, and name this workbook as P6A Class list.
3. Go to title bar and see whether the name has changed.

The Title Bar is located at the very top of the screen. On the Title bar, spreadsheet displays the name of the workbook you are currently using. At the top of your screen, you should see "Book1.gnumeric-Gnumeric" as shown below or a similar name

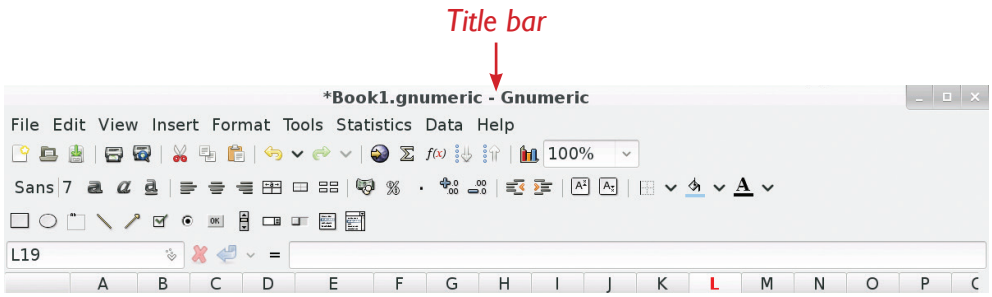


Fig 4.15: Title bar

b) Tool bar

Activity 4.32 Formatting text

1. Open the workbook named P6A Class lists.
2. Type "P6A Class lists" in capital letters.
3. Underline this sentence by clicking on the underlined "a"
4. Make the sentence bold by clicking on this icon.
5. Change the size to 14.
6. Go to standard toolbar and click on save to sa your work.

The Toolbars provide shortcuts to menu commands. Toolbars are generally located just below the Menu bar.



Fig 4.16: Tool bar

The basic toolbars that is, Standard and Formatting toolbars are available as the gnumeric spreadsheet is opened.

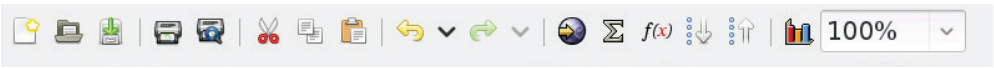


Fig 4.17: Standard toolbar

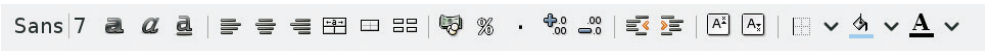


Fig 4.18: Formatting toolbar

c) Formula bar

Excel's Formula bar is located directly above the worksheet document window (see Fig. 4.28 below).

It displays the current content of cells and allows you to add in formulas, labels or values into a cell.

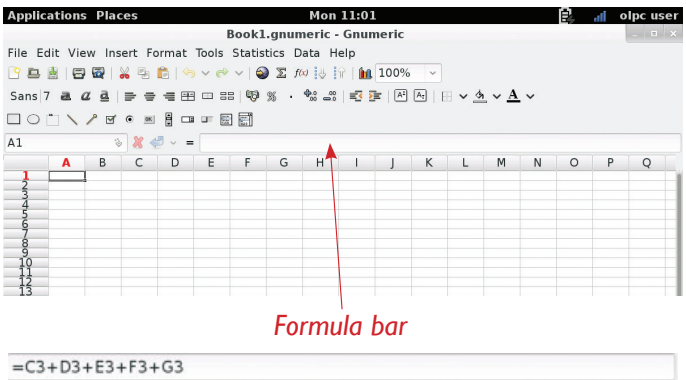


Fig. 4.19: Formula toolbar

d) Status bar

The status bar is located across the bottom of the spreadsheet workspace. The Status Bar provides information about the current work environment.

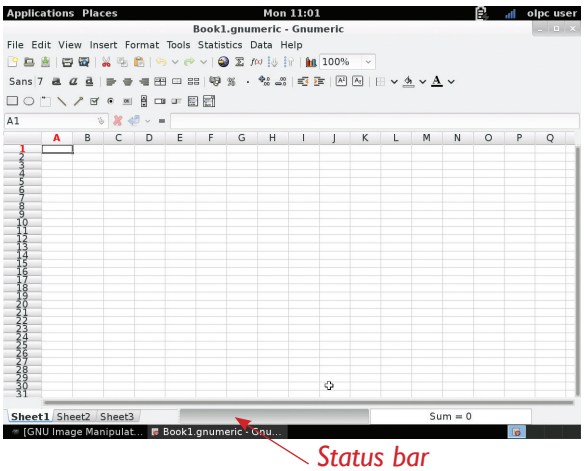


Fig. 4.20: Status bar

e) Cell

Activity 4.33 Using cell

1. Click on Cell A1 and type the word "**No**".
2. Click on cell A2 and type the word "**Names**".
3. Continue typing "**Age**" and "**Sex**" in cells A3 and A4.

A cell is an individual data box, which is intersection of rows and columns. For instance, the first cell is A1 (meaning Column A, Row 1).

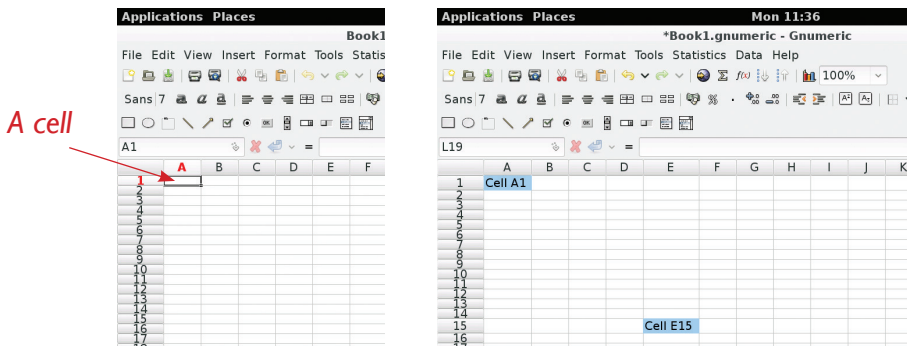


Fig. 4.21: A cell

f) Name box

Activity 4.34 Using name box

1. Click on cell C8 then go to the name box and check whether we have the same reference name.

The Name Box is located next to the formula bar above the worksheet area to the left of the formula bar. The name box displays a reference to a cell that is currently active.

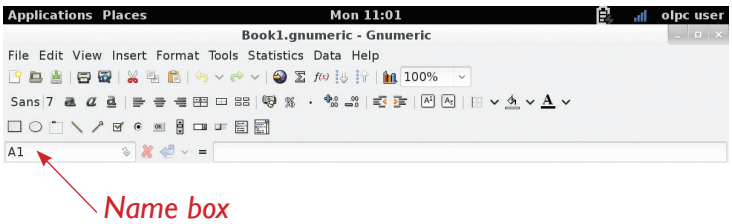


Fig. 4.22: A cell

g) Column heading

In Spreadsheets, the column heading or column header is the grey-coloured row containing the letters (A, B, C among others) used to identify each column in the worksheet. The column header is located above row 1 in the worksheet.

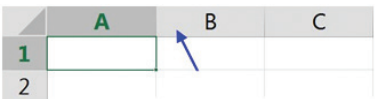


Fig. 4.23: Column heading

h) Row heading

The row heading or row header is the grey-coloured column located to the left of column 1 in the worksheet containing the numbers (1, 2, 3, among others) used to identify each row in the worksheet.

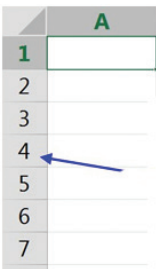


Fig. 4.24: Row heading

i) Menu bar

This is a horizontal menu that appears on top of a window. Usually, each option in a menu bar is associated with a pull-down menu.

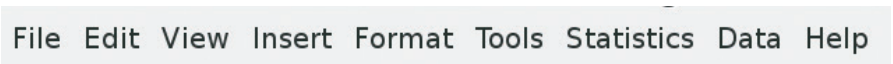


Fig. 4.25: Menu bar

j) Scroll bar

This is the bar that appears on the side or bottom of a window to control which part of a list or document is currently in the window's frame. The scrollbar makes it easy to move to any part of a file or document.

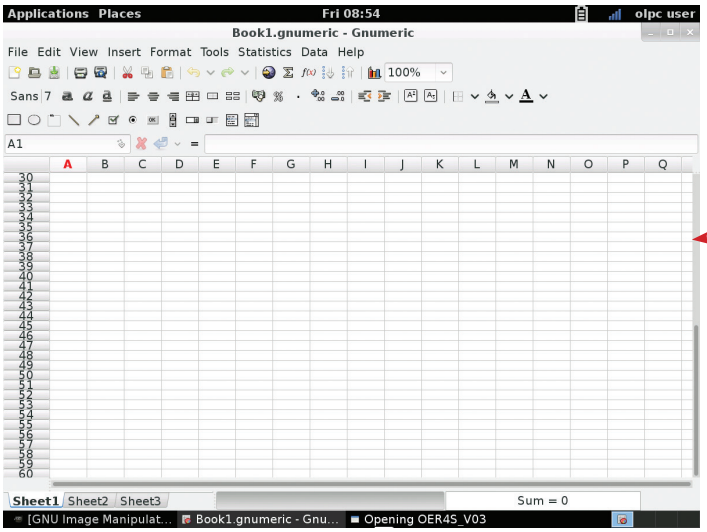


Fig. 4.26: Part of spreadsheet window showing scrollbar

k) Creating a workbook

A workbook is a spreadsheet file that contains one or more worksheets.

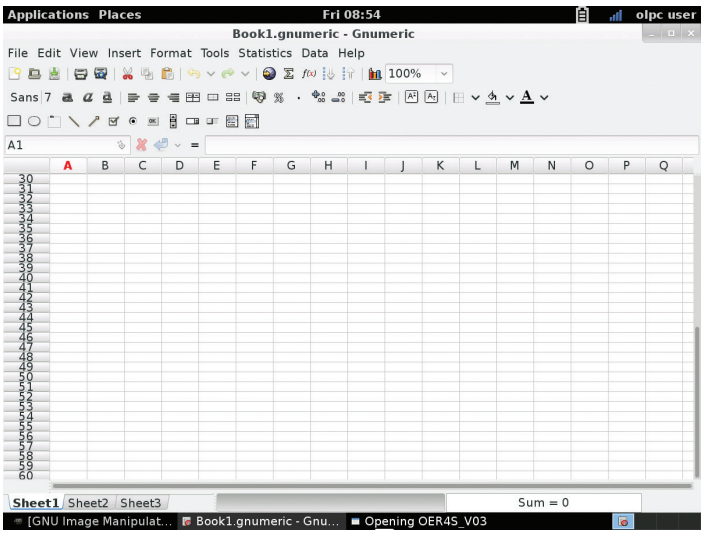
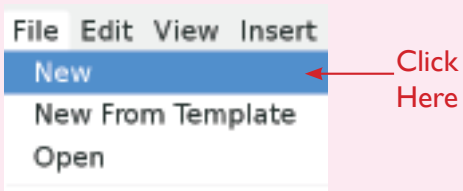


Fig 4.27: Workbook window

Activity 4.35 Opening new workbook

1. From the Gnumeric spreadsheet window opened in Activity 4.30, Choose File
2. Click on new from the menu bar. What happens?



The New Workbook task pane opens as shown below.

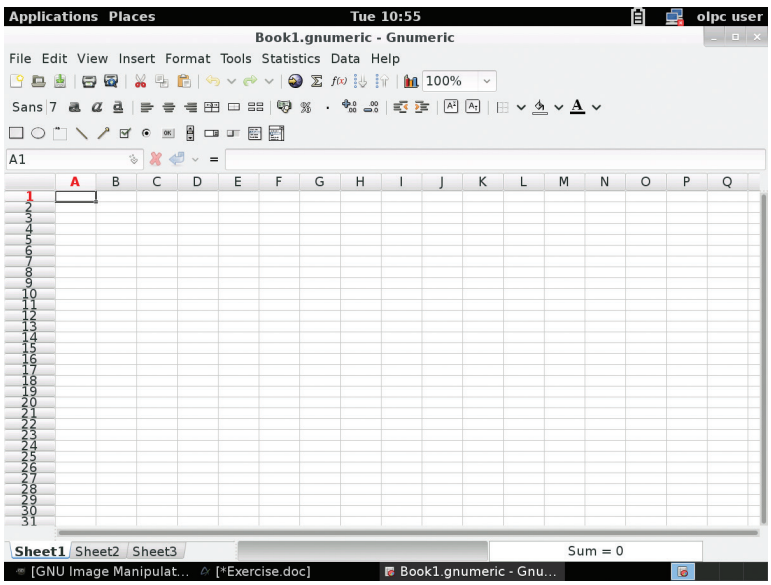
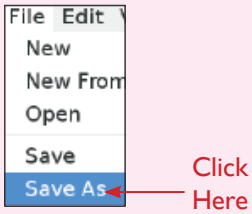


Fig 4.28: New workbook task pane

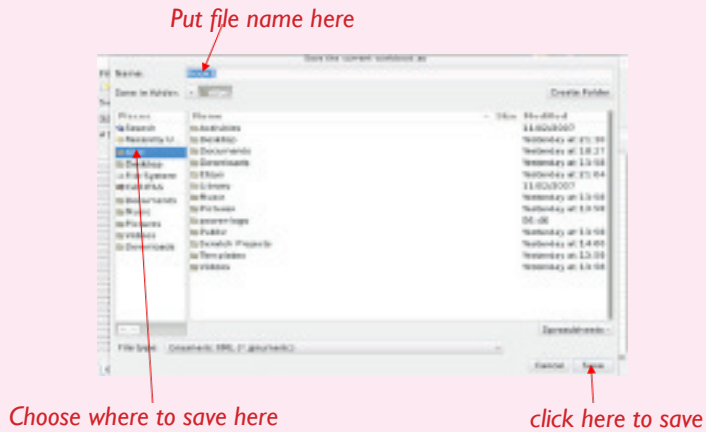
A blank workbook is displayed when Gnumeric spreadsheet is first opened. You can also create a new spreadsheet workbook by clicking on **File** then select **New**.

Activity 4.36 Saving a workbook

1. From the Gnumeric spreadsheet window opened in Activity 4.20, Choose 'File'.
2. Go to '**save as**' option on the drop down menu.



The 'Save As' dialog box appears as shown below.



3. Select where to save your file, write the file name and click on save.

Every workbook created in Excel must be saved and assigned a name to distinguish it from other workbooks.

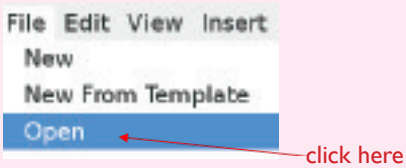
The first time you save a workbook, spreadsheet will prompt you to assign a name through the **'Save As'** option.

Once the name is assigned any additional changes made to the text, numbers, or formulas must be saved using the **'Save'** option.

Opening a workbook

Activity 4.37 Opening a workbook

1. Open a new Gnumeric spreadsheet window.
2. Choose File.
3. Go to Open option on the drop down menu.



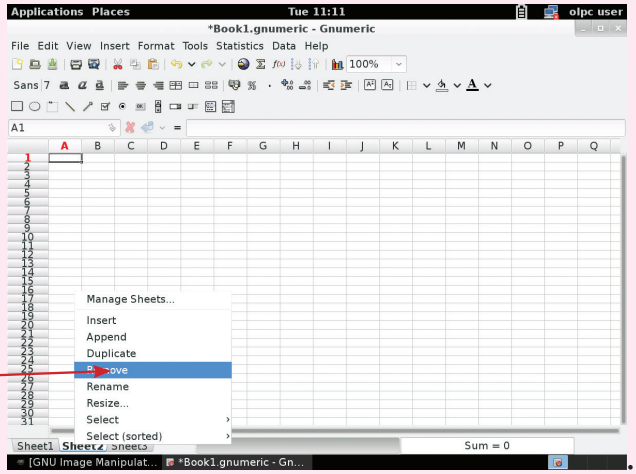
4. In the Look in list, click the drive, or folder that contains the file you want to open.
5. In the folder list, open the folder that contains the file. Once the file is displayed, click the file you want to open.
6. Click the Open button.

You can open any workbook that has previously been saved and given a name.

Worksheets

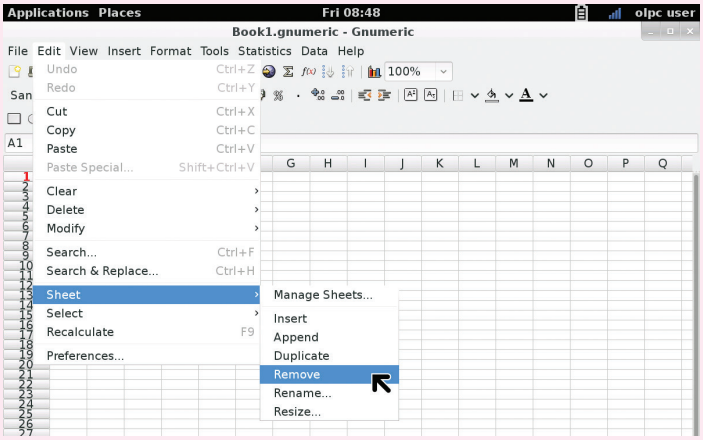
Activity 4.38 Using worksheets

1. Open a new spreadsheet window.
2. **Double Click** on sheet 1 then type first term, sheet 2 as second term and sheet 3 as third term.
3. Click on insert option and add another sheet.
4. **Double** click on it and name it as annual report.
5. Right click on sheet 4 and select remove to delete that sheet (In this example you are going to be deleting Annual report).



Click here

6. Or click on **Edit** select sheet and then click on remove.



A worksheet is a collection of cells where data are typed, stored or manipulated. By default, each spreadsheet workbook contains **three worksheets**.

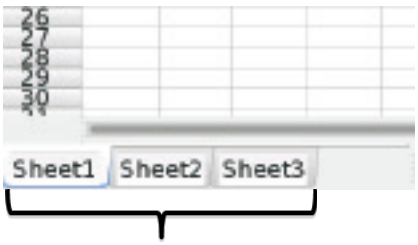


Fig 4.29: Spreadsheet window showing the three default worksheets

Selecting a worksheet

When you open a spreadsheet, it automatically selects **sheet1** for you. The name of the worksheet appears on its sheet tab at the bottom of the document window as shown below.

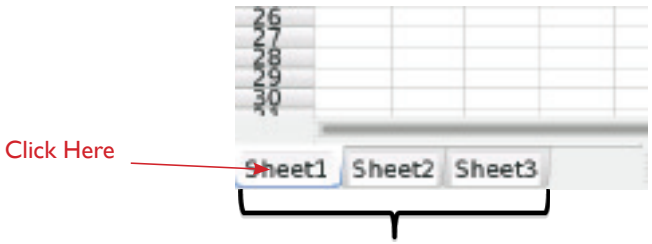


Fig 4.30: How to select a worksheet

To select one of the other two worksheets, simply click on the sheet tab of **Sheet2** or **Sheet3**.

Inserting a worksheet

You can insert as many worksheets as you want. To quickly insert a new worksheet, click the **'Insert'** option at the top of the document window.

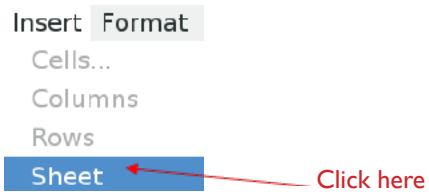


Fig 4.31: Where to click to insert a new worksheet

Deleting (or removing) a worksheet

To delete a worksheet, right-click on the sheet tab and select **'Remove'**

Renaming a worksheet

Activity 4.39 Renaming a worksheet

To give a worksheet a more specific name, do the following:

1. Right-click on the sheet tab of Sheet1.
2. Choose 'Rename'.
3. Rename it as you want.

By default, the worksheets are named Sheet1, Sheet2 and Sheet3.

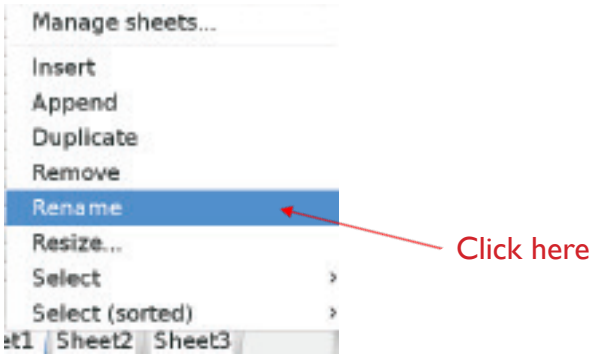


Fig 4.32: How to rename a worksheet

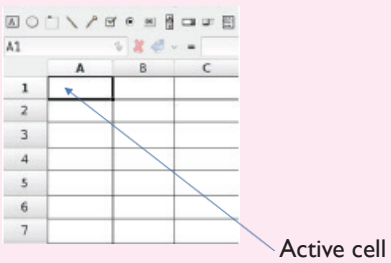
Columns, rows and cells

Entering text or data in a cell

Activity 4.40 **Entering text or data in a cell**

1. Open a new spreadsheet document.
2. On the worksheet, click a cell.
3. Type the numbers or text that you want to enter, then press ENTER or TAB keys.
4. Look at the Figure below. The position of the active cell is A1. Can you identify cells whose positions are:

   a) A5 b) C3 c) B7



5. Practise entering data in a created worksheet.

A **cell** is the intersection between a **row** and a **column** on a spreadsheet. They are numbered A, B, C, D and so on horizontally and 1,2,3,4 and so on vertically. Therefore, each cell can be given a unique identification number such as A1, A2, B1, B2 and so on, depending on its position. To select a cell, click on the desired cell, the cell will have a **black border,** which indicates that it is the **active cell**.

Remember!

If a cell is active, any typing will replace what is already in that cell. Double-click on the cell to make the cursor appear in the cell for smaller edits.

Modifying columns and rows

It is possible to change column width and row height.

Activity 4.41 Modifying columns and rows

To change row height or column width:

1. Open spreadsheet window.
2. Select a row or column to resize.
3. **'Right-click'** the row number or column letter, then select **'Resize row'** or **'Resize column'**.

You can also click and drag the edge of a row or column to resize it.

Inserting rows and columns

Activity 4.42 Adding columns or rows

1. On your spreadsheet, select a row or column. You can also highlight multiple rows or columns.
2. Click on **'Insert'** on the menu bar, or right-click on the row or column you want to add.
3. From the menu that appears, select row or column.

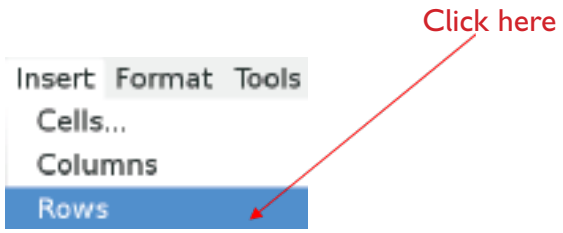


Fig 4.33: How to add a row in a worksheet

Deleting columns and rows

Activity 4.43 Deleting columns or rows

1. On your spreadsheet, 'right-click' a row or column.
2. From the menu that appears, select **'Delete row'** or **'Delete column'**.

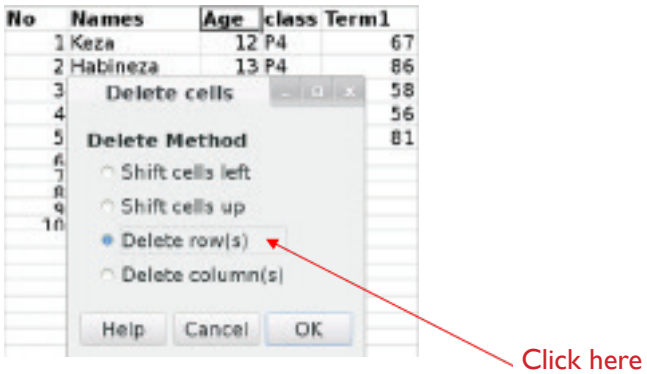


Fig 4.34: How to delete rows from a worksheet

Talking Point

1. Open a new spreadsheet document. Practice doing the following:
2. Increasing the height of a row and the width of a column.
3. Deleting a column.
4. Inserting a row.

Formatting cells

Activity 4.44 Formating Cells

1. Open a new spreadsheet window.
2. Type the following titles from cells A1 to E1(Maths, Science, English, SST, Kinyarwanda)
3. Resize all the columns to make all subject titles visible.
4. Change the font size to 10 and apply 'sans' as font style.
5. Select the cells from A1 to E1 and go down from A20 to E20.
6. Put borders to the selected area by clicking on the toolbars and select 'all borders'.

7. Put the Maths and Science titles in blue and the rest in green color.
8. Select all titles and make them center by clicking on the correct icon.
9. From the menu that appears, select row or column.

We can manipulate cell content in a variety of ways to make our document look attractive or more appealing. Some of them include:

- Changing font type or font size.
- Inserting or removing cell borders.
- Applying colour.
- Aligning text.

a) Changing font type or font size in a worksheet

To change font type or font size, follow these steps:

1. Select the cell, range of cells, text or characters that you want to format.

   On the toolbar (Fig 4.30) in the Font group, do the following:

   - To change the font type, **click the font type** that you want in the Font box.
   - To change the font size, **click the font size** that you want in the Font box.



Fig 4.35: Where to click when changing font size/type

b) Inserting or removing cell borders on a worksheet

Here is how you can add borders by selecting different line styles and colours:

1. Select the cell or range of cells.
2. On the Tool Bar, click the arrow next to Borders, and then choose the border options that you want.

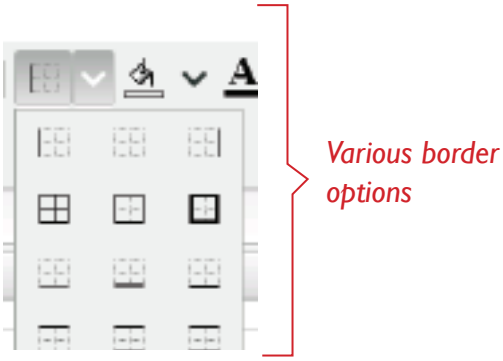


Fig 4.36: Border options

To remove a border, select the cells with the border and click the arrow next to Borders.

c) Applying a fill colour

To choose a new fill colour for a cell selection, follow these steps:

1. On the Tool Bar, in the Font group, click the 'Fill Colour' button in the drop down menu.
2. The **'Fill Colour'** palette appears as shown below.

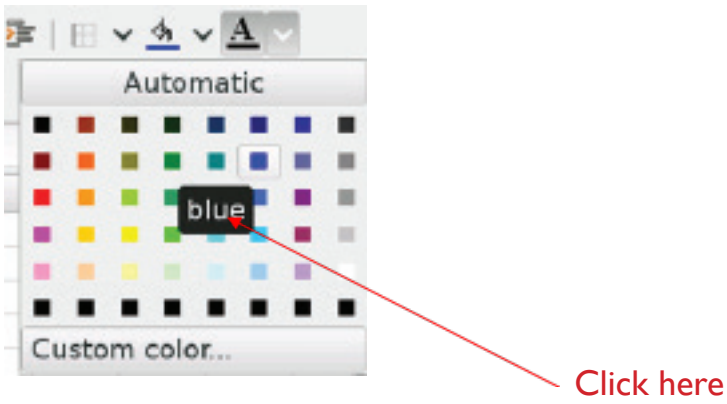


Fig 4.37: Fill color pallete

3. Select the colour you want to use in the drop-down palette.

Text alignment and orientation

Texts and numbers may be aligned using the left-align, center and right-align buttons on the Formatting toolbar.

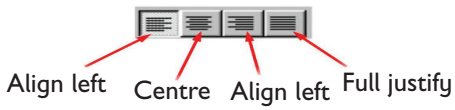


Fig 4.38: Toolbar for text alignment

To align text or numbers in a cell:

1. Select a cell or range of cells.
2. Click either the Left-Align, Center, or Right-Align buttons on the Standard toolbar.
3. The text or numbers in the cell(s) take on the selected alignment treatment.

Remember!

You can get more orientation styles in Format Cells dialog box by clicking the **'Format Cells'** alignment item in the list. See the figure below.

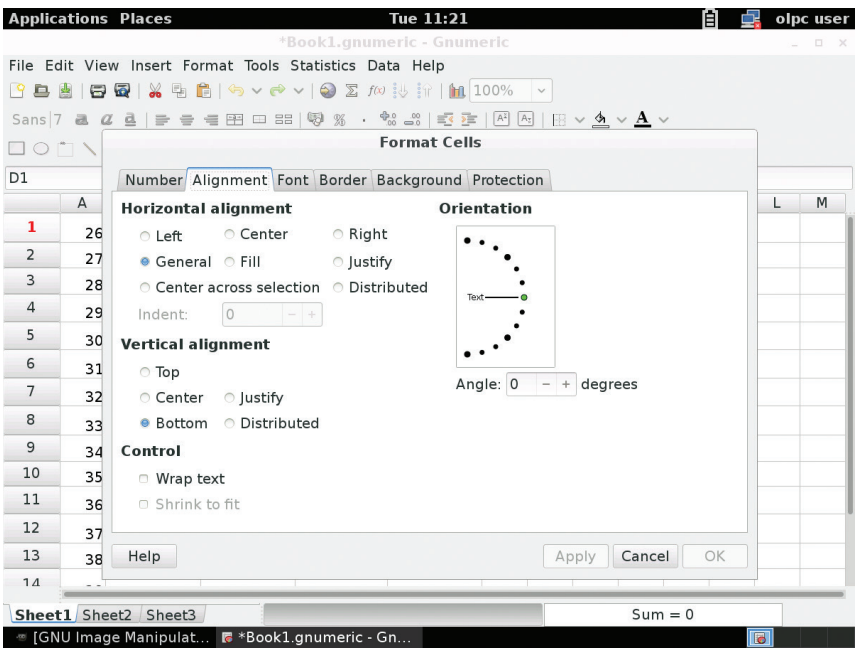


Fig 4.39: How to change orientation style using format cell option

You could also **'right-click'** and choose Format Cells from the shortcut menu.

- The Format Cells dialog box opens.
- Click the Alignment tab.

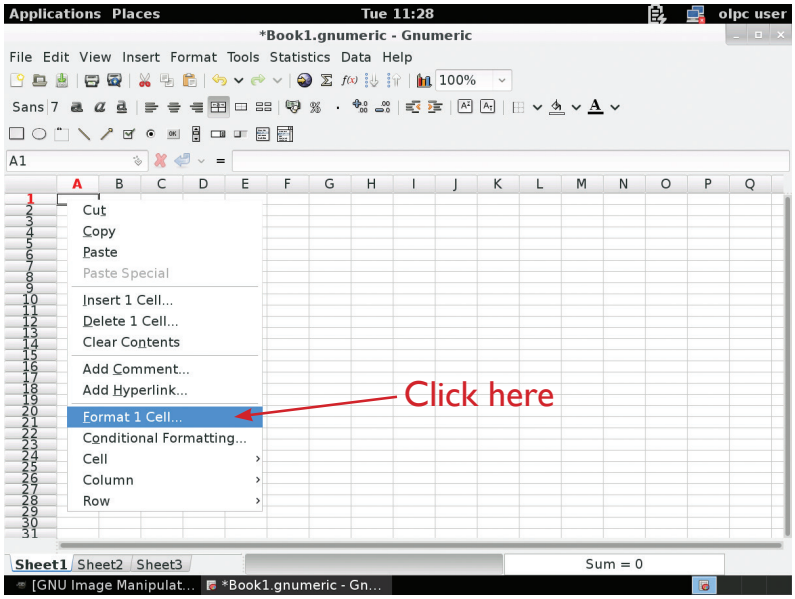


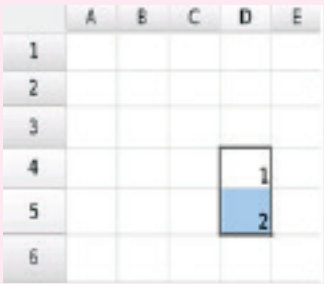
Fig 4.40: Using shortcut menu to change text alignment in a cell

Basic mathematical operators in spreadsheet

Activity 4.45 Basic Mathematical operations

1. Beginning in cell D4 (See the screen below), and going down, enter the numbers 1, 2, 3, upto 10.

   (**Hint**: Enter the first 2 numbers, drag over both cells to select, then drag the "fill" handle down until the numbers up to 10 are entered).
2. In a cell under the last number put an equal sign (=).
3. Click on the fist number then type a plus sign (+).
4. Click on last number you want to add and press enter or a blue icon near the formular bar.



It is possible to manipulate data using Gnumeric spreadsheet. It uses standard operators for formulas, such as a **plus** (+) sign for addition, **minus** (-) sign for subtraction , **asterisk** (*) for multiplication, forward (/) slash for division.

Operation	Sign
Addition	+
Substraction	-
Multiplication	*
Division	/

Fig 4.41 Common mathematical operators

Remember!

All formulas in numeric spreadsheets must **begin** with an **equal sign** (=). This is because the cell contains, or is equal to the formula and the value it calculates.

- After the equal symbol, you enter either a **calculation** or **function**. For example, look at the following spreadsheet screen:

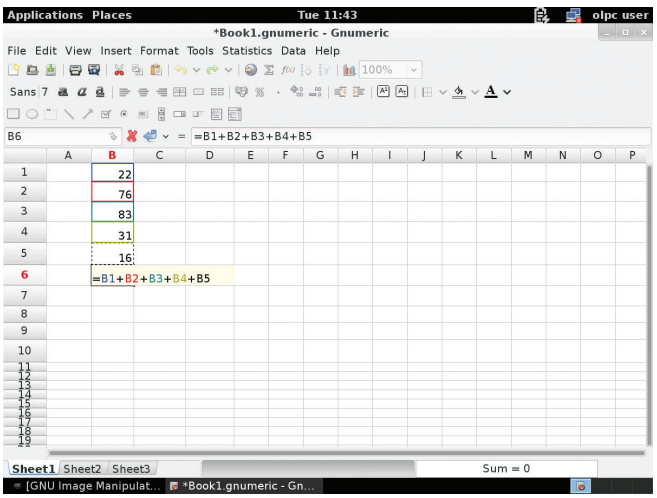


Fig 4.42 Entering data in a spreadsheet

Type the entire equation: =A1+A2+A3+A4+A5

Add up values in cells B1 through B5, you can use the SUM function: = SUM(B1:B5)

Using the colon (:) in Excel formulas allows you to supply a range of cells for the formula. In the above formula example, range B1:B5 includes five cells, that is, B1 through B5. Try these out in your XO-laptop and see the sum.

Understanding cell references

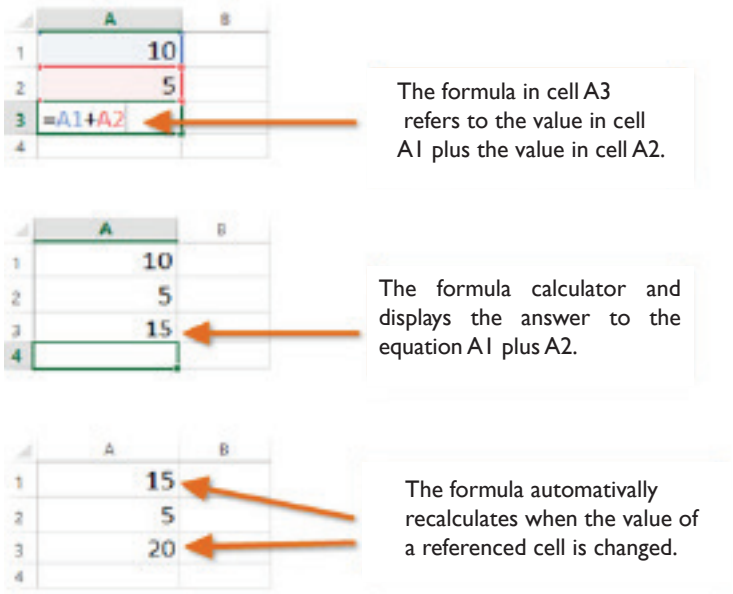


Fig 4.43: Use of cell reference in calculations

While you can create simple formulas in Excel manually (for example, =2+2 or =5*5), most of the time you will use cell addresses to create a formula. This is known as making a **'cell reference'**. Therefore, by combining a mathematical operator with cell references, you can create a variety of simple formulas in spreadsheet.

Formulae can also include a combination of cell references and numbers, as in the examples below:

Formula	What it does
= A1+A2	Adds cells A1 and A2
=C4-3	Substract 3 from cell C4
=E7/J4	Divides cell E7 by J4
=N10*1.05	Multplies cell N10 by 1.05

Fig 4.44: Examples of formula with cell reference and numbers

Activity 4.46 Total calculation

1. Enter the following information into a blank worksheet in columns A, B and C, and in rows 1 through 6.

Costs	First Term	Second Term	Total cost
Fees	64200	58000	
Books	14000	6700	
Tuition	8000	4000	
Transport	12000	9800	
Total cost			

2. Calculate the total cost using a formula in spreadsheet.

The sum function

You can use the auto sum icon (Σ) on the standard tool bar, which automatically adds numbers in a cell. Follow these steps:

Activity 4.47 Total calculation

1. Select the cell that the sum will appear in, that is, outside the cluster of cells whose value will be added.
2. Click the **auto sum** button.
3. Highlight the group of cells that will be summed.
4. Press the **'Enter key'** on the keyboard, or click the green check mark on the formula bar.

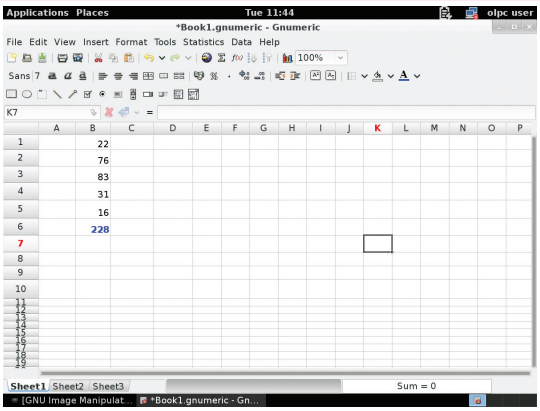


Fig 4.45: Using autosum function to calculate sum of numbers

Further Activity Calculations

1. In the costs for the first term and second term in activity 4.46, calculate the total cost for the second term using auto sum.
2. Create your home weekly shopping list in spreadsheet, indicate what have been purchased and how much it costs. Work out the total costs.

Self –Test 4.2

1. Open a new Gnumeric Spreadsheet document. Enter the following information:
   a) Type "January" in Cell A1, press TAB.
   b) Type "February" in Cell B1, press TAB.
   c) Type "March" in Cell C1, press TAB.
   d) Practice using holding your left mouse button to select a range (block) of cells. Select A1 through C1.
2. Open a new Gnumeric spreadsheet document. Do the following:
   a) Format the labels in Cell A1 through C1: **Bold**
   b) In Cell D1 type: **TOTAL**
   c) Format the text in Cell D1: **Bold, Centered and Blue**
3. Save your practice spreadsheet and name it: "Beginning Excel Practice 1".

UNIT TEST 4

1. Do an interview about fighting malaria at your village. Write down your findings in your notebook.

   (a) Type the findings in AbiWord.
   (b) Use required formatting tools to make your text look good.
   (c) Create a folder on the desktop and re-name it "Malaria".
   (d) Save your file as "interview" and save in the folder you created.

2. Write in AbiWord your class timetable and make all necessary formatting.

3. Talk to your friend about your favourite subjects, type them in AbiWord.

4. Save your file as "my favoUrite subject" in 'My Documents'.

5. Enter the information below in a spreadsheet. Be sure that the information is entered in the same cells as given, or the formulas below will not work.

	A	B	C	D	E	F
1	Address book					
2	Last name	First name	Class	Cell	Sector	Phone
3	Uwimana	Tedy	P6	Kinunga	Remera	0788564321
4	Kalisa	Joe	P6	Gasozi	Remera	0783245432
5	Ineza	Sandra	P6	Gasozi	Remera	0723409865
6	Kamanzi	Steven	P6	Kinunga	Kabeza	0783126754
7	Uwase	Chantal	P6	Gashaki	Kabeza	0765318907
8	Habimana	Joseph	P6	Gashaki	Remera	0765432098

   (a) Click on the Column Header D to highlight the entire column.
   (b) Click on the drop down arrow by Insert.
   (c) Click on Insert Sheet Column.
   (d) Click on Cell D2 and type Email Address.

6. Type the following text in AbiWord document:"Be good friends. Do not quarrel any more".
   (a) Make your text italics.
   (b) Change the font size to 14.
   (c) Use Calibri body as a font style.
   (d) Save in my document.

7. Open a new workbook and save it with the file name "Months".
   (a) Activate cell location A2 on the worksheet.
   (b) Type the word "Names"
   (c) Press the right arrow key, this will enter the word into cell A2 and activate the cell to the right.
   (d) Type Math and press the right arrow key.
   (e) Repeat the step 4 for the words Science and Total.

Unit 5 Computer Research

1. Study the picture below. What is happening in the picture?

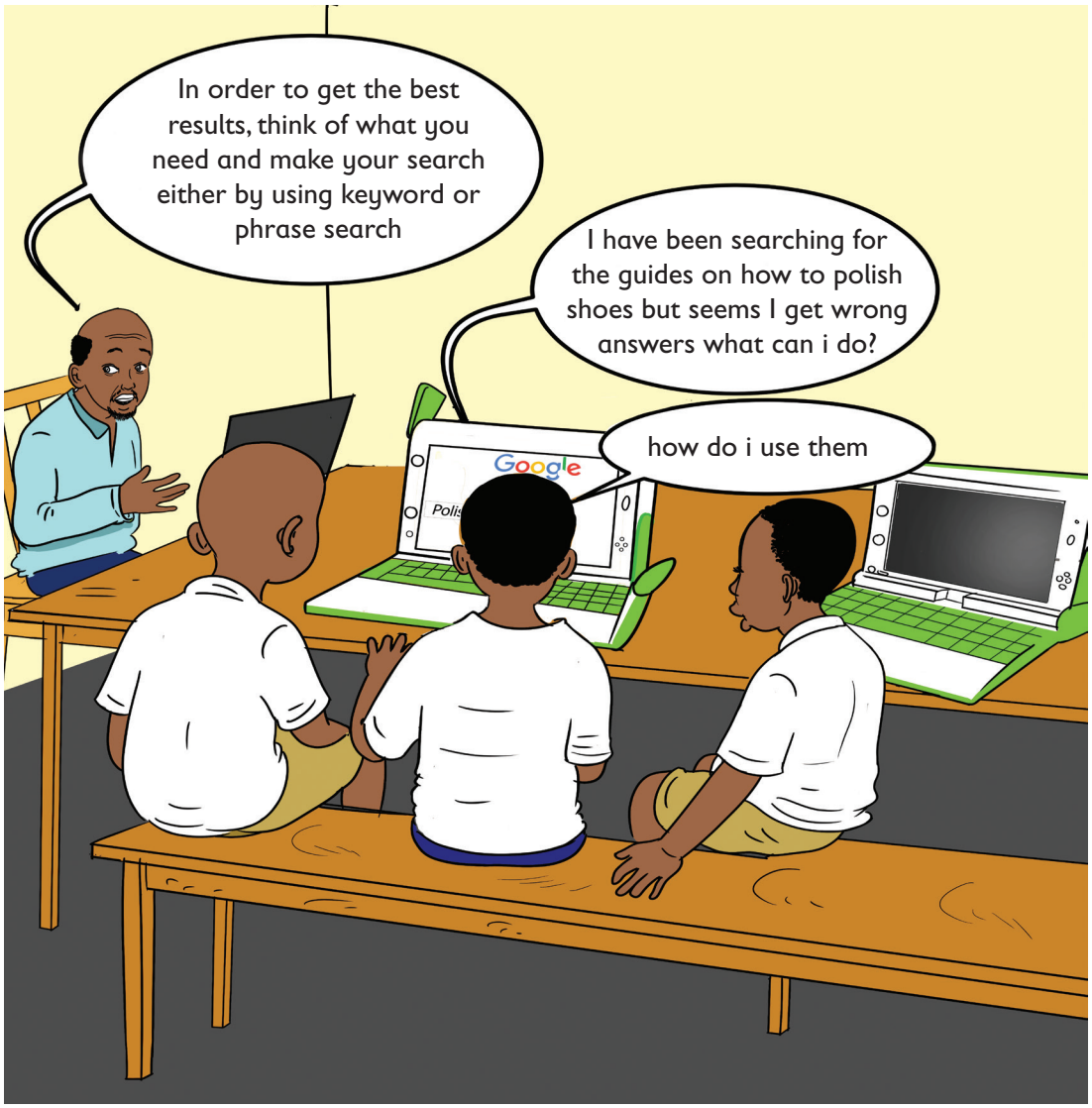


Fig 5.1

2. How can you help the learners in the picture?

5.1 Introduction to Search engine

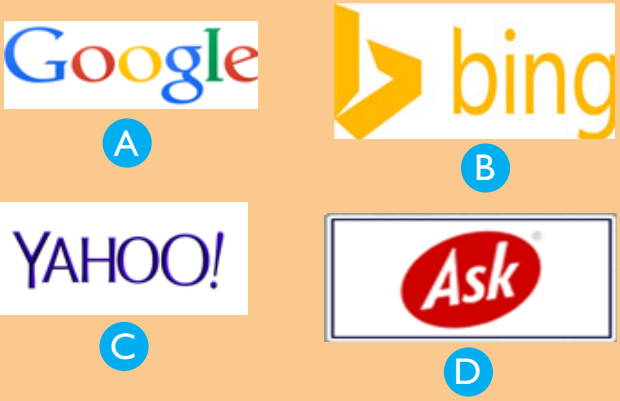
Activity 5.1 Introduction to Search engine

1. Open google search engine using your XO-laptop.
   REMEMBER – The XO-laptop should be connected to the internet first.
2. Type these words ' Rwanda Education Board'.
3. Click on search. What can you see?

We can use the Internet to search for information. To do this, we use a web search engine. A web search engine is a software system that is designed to search for information on the **World Wide Web** (www).

Talking Point

1. Look at the images below. Do you know the images?



2. What are the images used for?
3. Research about them. Give their uses

Examples of search engines are:

- Google
- Bing
- MSN
- Ask
- Yahoo
- Wikipedia
- Netscape

Role of search engines

Search engines allows internet users to find specific information from the web, based on keyword criteria that is entered by the user.

5.2 Search engine techniques

The two main techniques of conducting internet search are:

- **Keyword** searching
- **Phrase** seaching

a) Keyword Searching

Case Study

1. Search your own mind and come up with the most unique keyword you can think of.
2. Log on to Google web browser.
3. Type the keyword and search its meaning. Write the meaning down.
4. Use the other web browsers to search the same keyword. Write the meaning in your notebook.
5. Compare the definitions from the different browsers. Are they the same?

A **keyword** search is a basic search technique that involves searching for one or more words within a collection of documents. The documents returned by the search engine are called the **search results**.

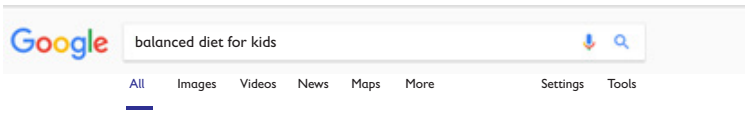


Fig 5.2 Google search window

You can also make your search for **images, videos, maps, books** or **news** by just clicking on the options you want to search for as shown in the image above.

Remember!

Keyword searches are usually **punctuation-sensitive**. Therefore, omit apostrophes, parentheses, hyphens, among others when typing the keywords. For example, type **'dont'** instead of **don't**, CD ROM instead of **'CD-ROM'** and so on.

b) Phrase Searching

Phrase search is a type of search that allows users to search for documents containing an exact **sentence** or **phrase**, rather than single keywords.

Note: Anytime you have more than one key word, you have a phrase. Although each search engine is different, know when you should use this method.

Examples of Phrase searches include:

- "Rwandan President"
- "Ozone layer depletion"
- "Spirit of St. Louis"
- "Gulf of Mexico"

Work to do

Repeat the case study under Keyword search to search for the phrases above. Compare your search from the different browsers.

Activity 5.2 Assessing the search results

1. After you complete a search, glance over the first page of search results.
2. Did it return what you are looking for, or is it just a lot of unnecessary information?
3. If your search results do not seem to be very good, you may need to try different search keyword or phrase.

Remember!

The search engine cannot read your mind, it just looks for matching words. For example, if you just search for the word 'polish', the search engine does not know whether you are looking for 'shoe polish' or 'history of the Polish language'!

You could improve your search results by searching for 'shoe polish'. However, this still may return a variety of websites, including:

- Stores that sell shoe polish
- Guides on how to polish shoes
- The history of shoe polish

To get the best results, ask yourself, "What exactly am I looking for?" Specific terms usually return better results.

Activity 5.3 Conducting a basic search

1. Go to www.google.com
2. On the Basic Search screen, type in the following keywords exactly as they are written below and take note of the results.

Chocolate health food or health risk

NOTE: *You do not need to link keywords with AND. Google does this automatically.*

3. Click on Search. How many results are retrieved?
4. Go back to the Basic Search box and type the following: (chocolate OR cocoa OR "dark chocolate") AND (diet OR nutrition).
5. Click on **'Search'**. How many results are retrieved?

Successful Search Skills

Case Study

1. Search for the phrase "river boats" using google search.
2. Now, search for 'river' AND 'boats' then 'river + boats' separately.
3. Compare your results in the cases above. Which results are more relevant?

Searching for 'river boats' will give you more relevant results than searching for, 'river and boats' or 'river + boats'.

Activity 5.4 Use of keyword and phrase search

Think about the appropriate keywords or phrase to use, to search for the various cultural practices in Rwanda. Using google or any other search engine, type the keywords or phrase then search. List down the cultural practises in your notebook. Compare your work with those of your other class members.

Before you even open your Internet browser, prepare a **list of keywords**. This will help to eliminate being overwhelmed with millions of irrelevant results. Follow these guidelines to create your list of keywords:

- Identify the **main concepts** of your topic.
- **List keywords** for each concept.
- Include **synonyms** and alternate spellings.
- Determine the **logical relationships** between your keywords.

Self –Test 5.1

1. What does www stand for?
2. In pairs discuss the benefits and risks of using Internet.
3. Explain the role of search engines in our lives.
4. Name and compare different search engines using keyword and phrase search techniques.

5.3 Types of search engines

Most search engines give general information. They are examples of **general search engines**. The general search engines can be put into three categories namely:

- Primary
- Secondary
- Targeted

Other examples of search engines include:

- Meta search engines
- Science-specific search engines
- Social sciences-specific search engines
- Art and humanities-specific search engines
- Format-specific search engines

a) Primary Search Engines

Activity 5.5 Using primary search engine

1. Go to www.google.com
2. Search for the phrase ' One laptop per child Rwanda'.
3. Repeat the search above using **"Yahoo"** and **"Bing"**.
4. Compare your search results.

The most popular search engines used nowadays are known as primary search engines. Examples include Google, Yahoo! and Bing.



Fig 5.3 Primary Search Engines

- **Google** – This is the most widely used search engine.
- **Yahoo** - This search engine has been around for many years and is one of the most widely used as well.
- **Bing** – This is relatively new. It is Microsoft's latest attempt at developing a search engine.

b) Secondary Search Engines

Activity 5.6 Secondary search engine

1. Go to www.ask.com
2. Search for the question: 'Who is the president of Rwanda?'
3. Write down the results of your search.

Secondary Search Engines are targeted at smaller, more specific audiences although the content itself is still general. Examples of secondary search engines include Lycos, LookSmart, Miva, Ask.com and Espotting.

Of the search engines in this category, **Ask.com** is the most common: ASK.com is based on a question and answer format where most questions are answered by other users or are in the form of polls.

c) Targeted Search Engines

Activity 5.7 Using targeted Search Engine

1. Go to city search and search for 'the fisrt astronaut to visit the moon'.
2. Go to Yahoo Travel and search for 'the most amazing park in Rwanda'.
3. Go to Music Search and search for ' Rwanda Musicians'.
4. Write down the search results in your notebook.

Targeted Search Engines are sometimes called **topical** search engines. These search engines are narrowly focused usually to a general topic like medicine or branches of science, travel, sports or some other topic.

Examples of targeted search engines include CitySearch, YahooTravel and MusicSearch.

d) Meta search engines

Case Study

1. Go to www.metacrawler.com and search for the process of digestion.
2. Go to www.dogpile.com and search for ' the process of digestion.
3. Compare your results in the two cases. Which site gives more accurate information?

Meta search engines take the results from all the other search engines and combines them into one large listing. Examples of Meta search engines include:

- Metacrawler (www.metacrawler.com)
- Dogpile (www.dogpile.com)

e) Science-Specific search engines

Case Study

1. Go to http://scholar.google.com and search for "cause of climate change" and "how we can slow it down".
2. Repeat the search above using:
   a) http://www.sciencedirect.com
   b) http://www.getcited.org/.
3. Compare your search results above. Which is more accurate?

These are academic search engines used for finding and accessing articles in academic journals, repositories, archives or other collections of scientific information and other articles. Examples include:

- Google Scholar - http://scholar.google.com
- Science Direct - http://www.sciencedirect.com
- GetCITED - http://www.getcited.org/

f) Social science specific search engines

Case Study

1. Go to behavioral brain science archive and search for 'populations of sub-saharan African countries'.
2. Repeat the search above using:
   a) Social Science Research Network:
   b) SocioSite
   c) SocioWeb
3. Compare your search results above. Which is more accurate?

Several Internet search engines are available to assist in locating abstracts and other information about the social sciences. Examples include:

- Behavioral Brain Science Archive.
- Social Science Research Network.
- SocioSite.
- The SocioWeb.

g) Art and humanities specific search engines

Activity 5.8 **Using art and humanities specific search engines**

1. Use the search engines:
   a) http://www.vads.ac.uk/search.php
   b) http://wwar.com/
   To find out about the origin of Kinyarwanda language. Write short notes on your research findings in both cases. Compare the two search two results.
2. Back at home, ask your parent or guardian about the origin of Kinyarwanda language.
3. Compare your findings in (2) above with your search results.

Humanities are academic disciplines that study human culture. These include ancient and modern languages, literature, philosophy, religion, and musicology. Examples of search engines used to extract information in these areas are:

- VADS visual art images
  http://www.vads.ac.uk/search.php
- Arts Search (World Wide Arts Resources)
  http://wwar.com/

h) Format-specific search engines

Activity 5.9 Format-specific search engines

1. Use the internet to search for information on:
   a) the game parks in Rwanda
   b) Rwanda athletes
2. Use different search engines i.e Google, Bing, Yahoo, Ask.com, MSN, Wikipedia and Netscape and compare the results of the search.

A format-specific web search engine focuses on searching for web pages in a certain area. This area could be format, subject area, geographic region or domain. There may be overlaps between one or more of these areas.

5.4 How to search for information using different search engines

In this section, you will learn how to search for information using different search engines.

a) Google

Google search engine is the most popular search engine and the most popular product from Google.

To do a search in Google, type the key word or the phrase in the space in a window similar to Fig. 5.4 below.

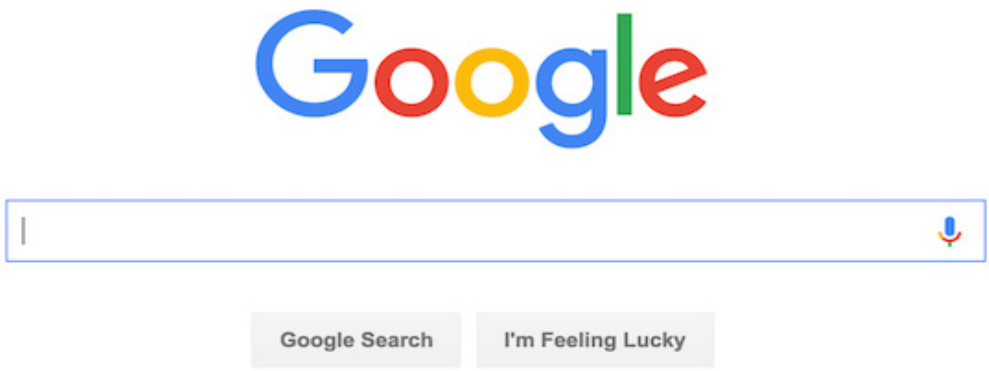


Fig. 5.4 Google Search Window

b) Bing

Bing is an equivalent to Google but from Microsoft company. It is the default search engine in Microsoft's web browser. It provides different services including image, web and video search along with maps.

To search using bing, type the keywood or phrase in the space shown in a window similar to Fig. 5.5 below.

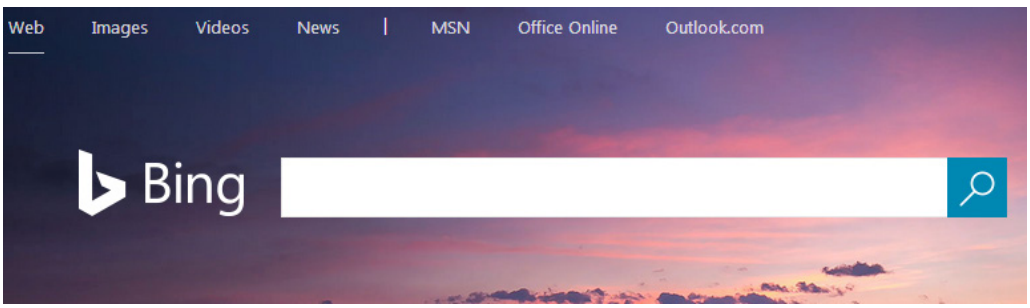


Fig. 5.5 Bing Search Window

c) Yahoo

Yahoo apart from being the most popular free email provider, it is also a search engine. However, it is not much popular in search engine area.

To search using yahoo, type the keyword or phrase in the space shown in Fig. 5.6.

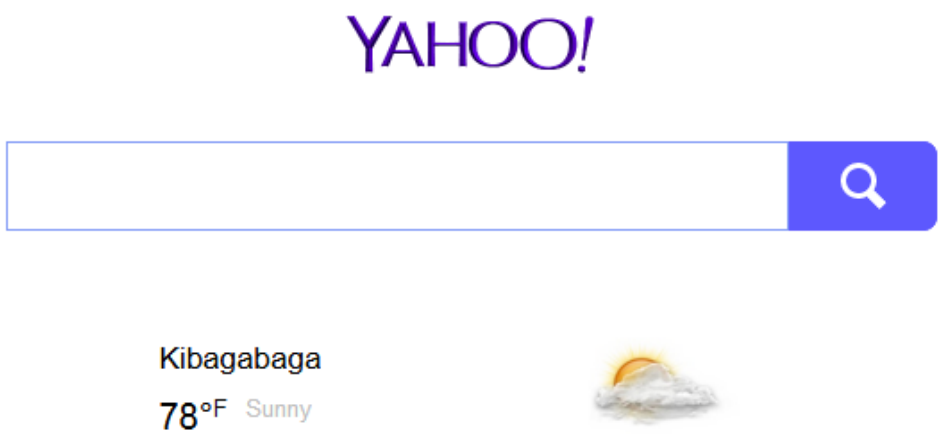


Fig. 5.6 Yahoo Search Window

d) Ask

Ask.com is a question and answer search engine. Using ask.com, you can get the answers to your questions. It integrates a large amount of archive data to answer your questions.

To search using ask.com, type the question in the space shown in Fig. 5.7 below.



Fig. 5.7 Yahoo Search Window

e) MSN

MSN is a web portal and related collection of Internet services and apps for Windows and mobile devices provided by Microsoft.

It is the best in news, sports, entertainment, money, weather, travel, health, and lifestyle searches.

To search using MSN, type the keyword or phrase in the space shown in a window similar to Fig. 5.8 below.

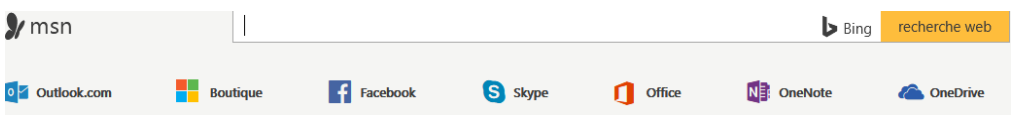


Fig. 5.8 MSN Search Window

f) Wikipedia

Wikipedia is an online encyclopaedia that allows anyone to search and edit articles. It is the largest and most popular general reference work search engine on the Internet and is ranked among the ten most popular websites.

To search using Wikipedia, type the keyword or phrase in the space shown in a window similar to Fig. 5.9 below.



Fig. 5.9 Wikipedia Search Window

g) Netscape

Netscape is an Internet browser first introduced as Mosaic Netscape 0.9 in 1994. Netscape is no longer supported or used, but old versions can still be downloaded.



Fig. 5.10 Netscape logo

Self –Test 5.2

1. Name and classify the diferent types of search engines.
2. Click on the 'MAPS' link:
   a) Type in the search box: 'Rwanda Population'.
   b) Write down the search results.
   c) Compare the results from different search engines.
3. Using different search engines, find out the population of East African countries. Compare the results from different search engines.
4. Make a research on how we should keep our environment clean. Compare your results using different search engines.
5. Find out the cause of climate change. How can we slow down the process? Compare the results from different search engines.

UNIT TEST 5

1. Find a website that sells books. What is the website address?
2. Find a website with news in your first language. What is the website address?
3. On google.com, find a Weather Website.
   a) Find out what the weather is going to be like on Friday, Saturday and Sunday in Rwanda.
   b) Write it down in your notebook. How will you dress on these days?
4. On google, find information on the cause of climate change.
   a) What is the name of the website you found the information from?
   b) Find out how we can slow down this process.
   c) Write down the information you get.
5. In the address bar of google.com, type the following:
   www.reb.rw
   a) Find the school calendar.
   b) What information did you get?
   c) Write down the calendar for the second and third term.
6. Open google, search for the 'Population of Sub Saharan Africa". Write your findings in AbiWord.

Unit 6 Programming for children

The picture below shows a family watching a cartoon programme in a Television at their home.

1. Study the chat among the family members carefully.

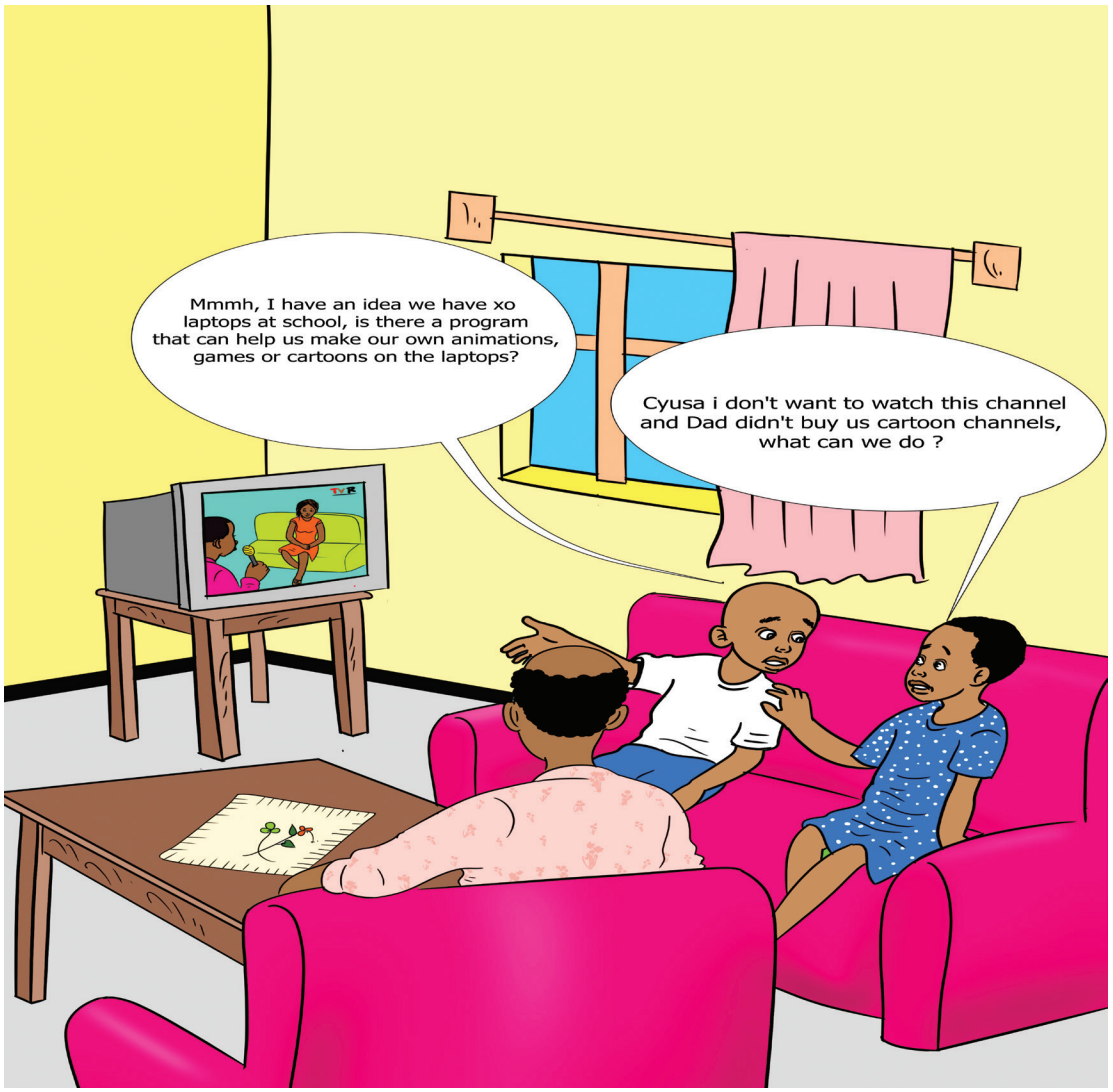


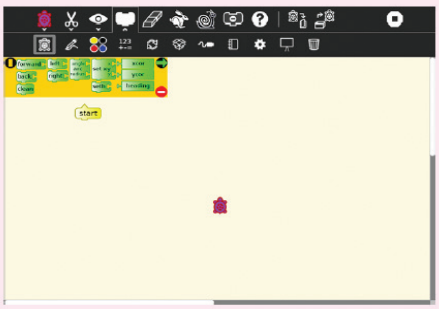
Fig 6.1

2. How would you help Nganji reach his dream as advised by her brother?

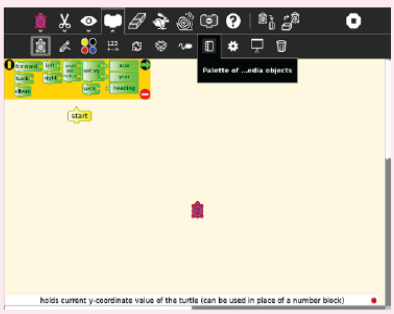
6.1 Turtle Art for displaying things

Activity 6.1 Displaying text

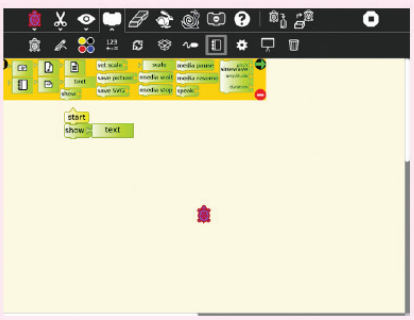
1. Open turtle art.



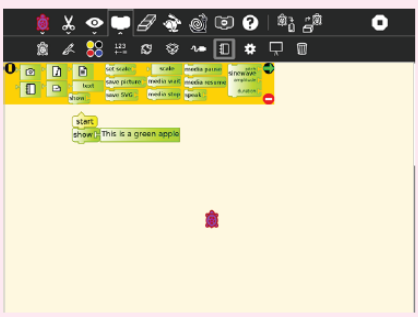
2. Click on pallete of media objects.



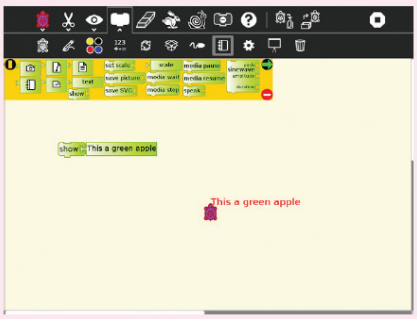
3. Click on show command.



4. Replace the word text by typing "This is a green apple".



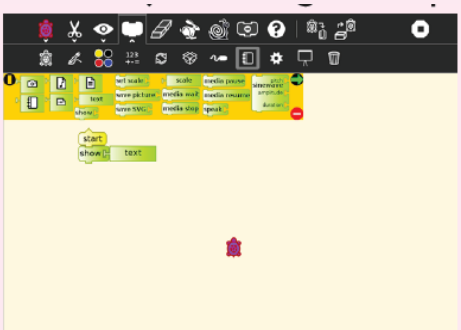
5. Click on show to display this word.



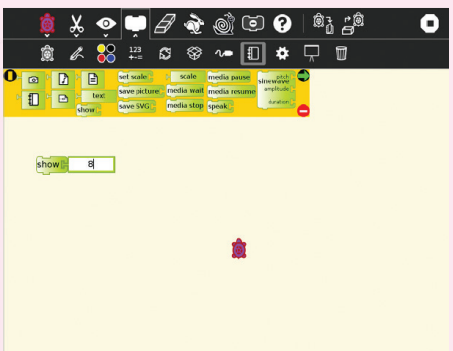
To display text and numbers use the command block **show** then type the intended text. When you run the command, turtle prints values in the **status** block and displays it in the window.

Activity 6.2 Displaying numbers

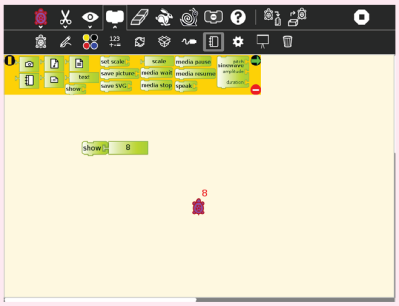
1. Open turtle art.
2. Go to palette of media objects drag & drop **show** command.



3. Replace the word "text" with a number, example here type "8".

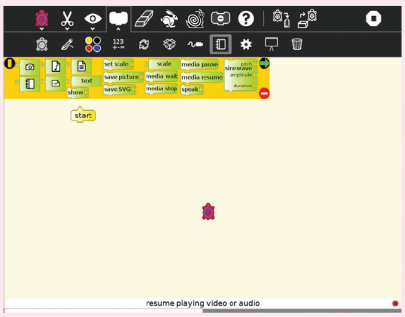


4. Click on show to display the number.

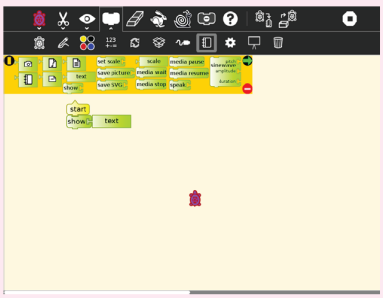


Activity 6.3 Displaying images

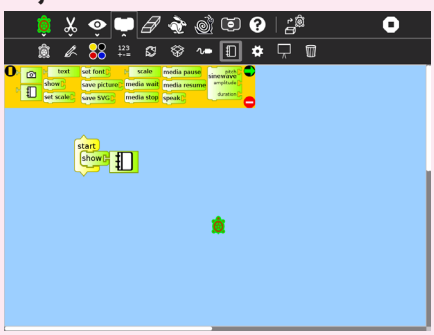
1. Click on palette of media objects.



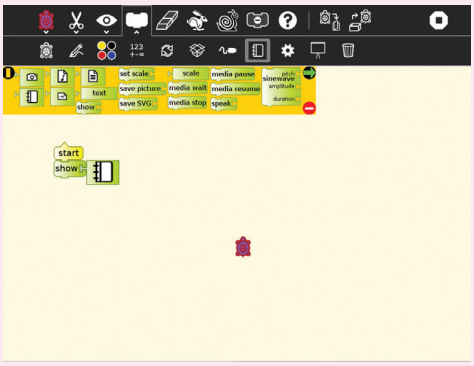
2. Drag and drop the show command.



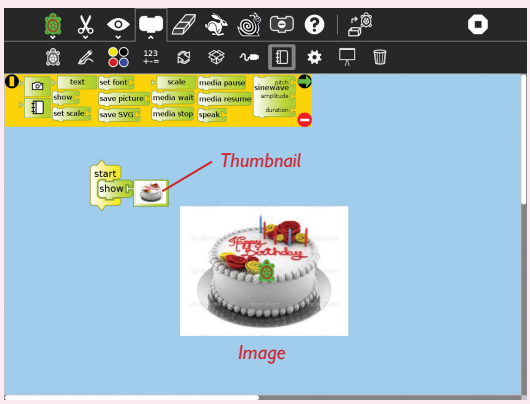
3. Drag and drop the journal icon over the word "text".

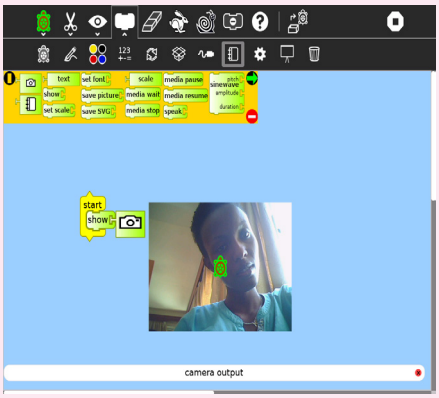


4. Click on the image icon to choose the image in the journal.



5. Select the image by clicking on it.
6. Click on show block to display the image.





Activity 6.4 Displaying audio

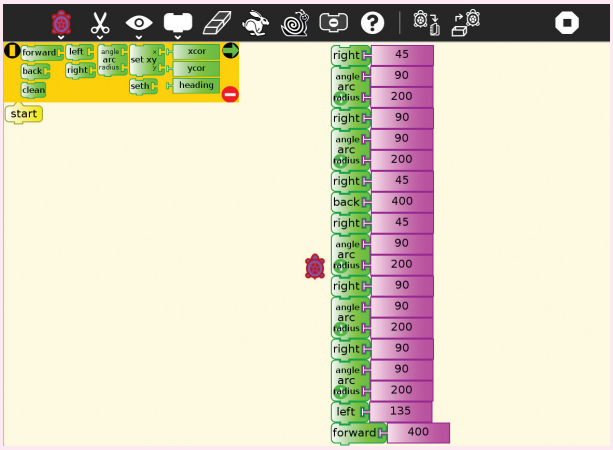
1. Go to palette of media objects, click on media icon (sugar journal audio object).
2. Drag and drop the command "show"
3. Drag and drop the audio icon over the word text.
4. Click on audio icon to choose the audio from journal, select and click on the audio you want.
5. Click on show to listen to the audio.

We can also use show block to play sound from our music or sound files.

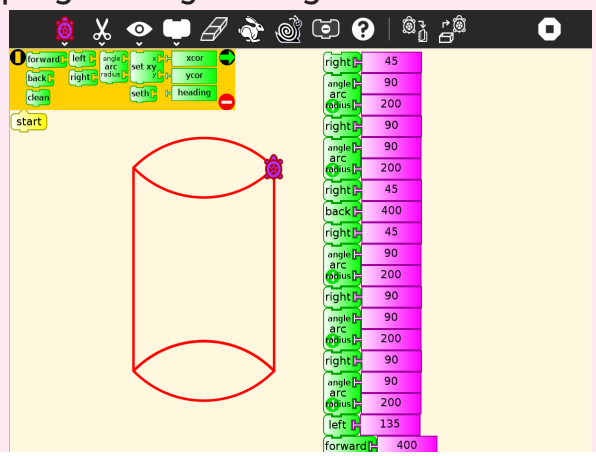
Drawing regular polygons

Activity 6.5 Drawing a cylinder

1. Open turtle art
2. Put the following blocks together (screenshot)

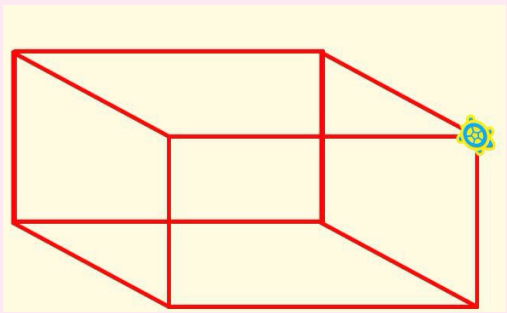


3. Test your programs by clicking on the commands



Activity 6.6 Drawing cuboid

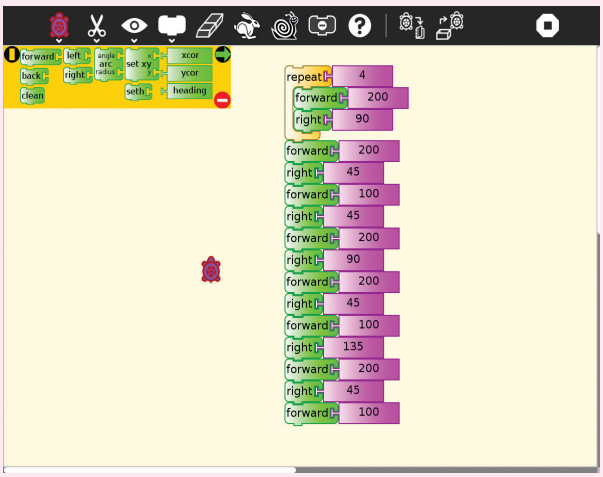
1. What is the name of this shape? What are its characteristics?



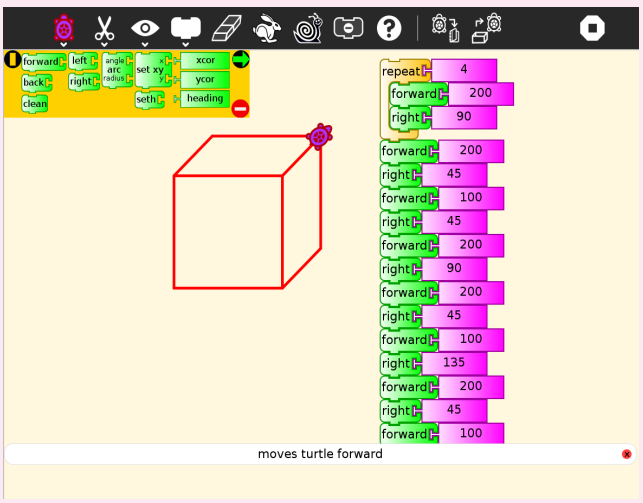
2. Discuss in pairs and draw it using turtle art. Which set of instructions did you follow? Write them down in your notebook.
3. What shape will this set of commands make? Try and see.

Activity 6.7 Drawing a cube

1. Open turtle art.
2. Put the following blocks together.

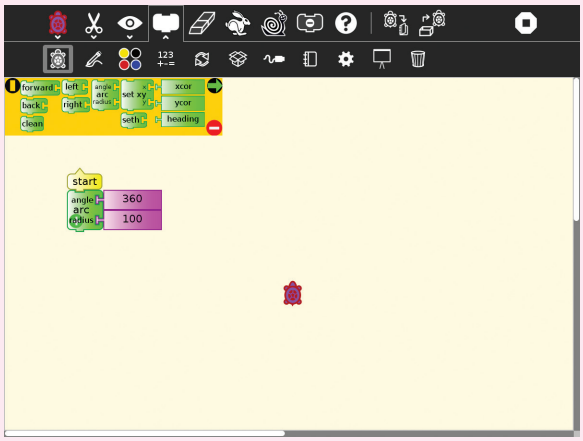


3. Test your program by clicking on the commands.



Activity 6.8: Drawing a circle

1. Open turtle art.
2. Put the following blocks together (screenshot).



3. Test your programs by clicking on the commands.

Self – Test 6.1

1. We can use show blocks to display four things. Name them.
2. Distinguish between a regular and an irregular polygon.
3. Which of these shapes are regular polygons?

   Cube, cuboid, circle, oval, triangle, rectangle, square, parallelogram, rhombus

4. Draw vertical, horizontal and oblique lines using turtle art commands.
5. Display some sound from your XO – laptop.
6. Construct and produce different geometric shapes (rectangle, triangle, cube, circle) using turtle instructions.

6.2 Programming animations and computing in scratch

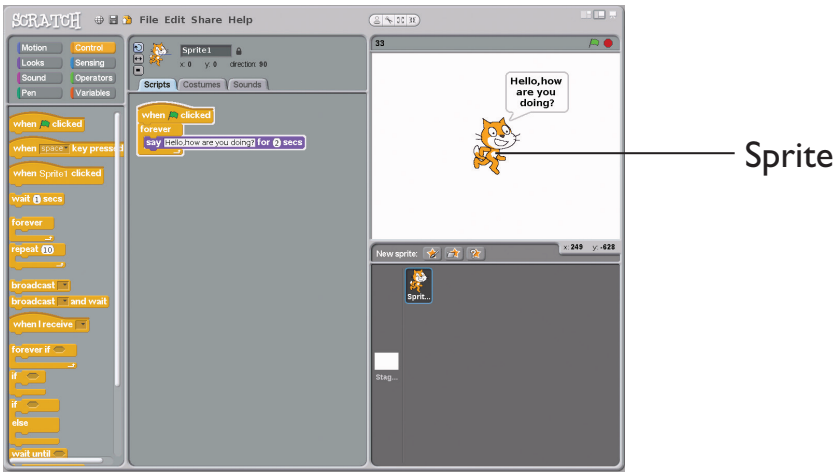


Fig 6.2 Scratch screen showing a sprite

Activity 6.9 Animation

Take time and familiarise yourself with the main features of the **scratch screen** or the **scratch Home Page**. Recall what you learnt in Primary 4 and 5 under Scratch. Do the following individually in your XO-laptop:

1. Open scratch activity, click on the cat in the Sprite List.
2. Drag out **"move 10 steps"** block.
3. Double click on the block to see the cat move.
4. Add a control block, for example **"When space key pressed"**

In Scratch, Sprites can move around, can be activated or they can be objects that stay still.

Scratch project

In this project, you will create a dancing Sprite. What steps will you follow? To have an idea, try out the activity 6.10.

Activity 6.10 A dancing sprite

1. Open scratch program in your XO-laptop.
2. Select 'New' from the Menu to start a new project.
3. Delete the cat sprite.
4. Select the suitable background by clicking on the "stage icon" located under the display window in the third column of the scratch screen.
5. Click on background in the second column and click on import.
6. Choose an appropriate background for the dancing sequence you are about to make by clicking on indoors and select spotlight stage.

Remember!

A **Sprite** cannot do anything by itself. You have to give instructions for it to follow.

Activity 6.11 Choosing a sprite

1. Click on "**choose new sprite** from file".
2. Click on **people folder** then click ok.
3. Click on the **1st sprite** of **cassy-dancing** then click ok.
4. Click on **costume tab** in the second column then **click on import**.
5. **Click on** the **second sprite** of **cassy dancing**, then **click ok**.
6. **Go back** to **costume tab click on import** and choose the **third sprite** called **cassy dancing**.
7. **Repeat step** 6 until you finish all sprites of cassy dancing as shown.



Activity 6.12 Animating

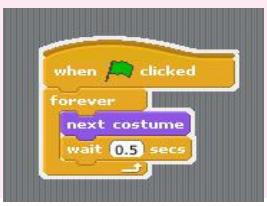
1. Go to script box and select 'when clicked' drag and drop it to the script area.



2. Again from the **control folder** drag the command **'forever'.** This command will let the dance program run continuously until the user selects the **red circle** (Stop icon) located at the top right side of the Stage screen.



3. Next, select the **'Wait command'**, which the user should reduce in duration from 1 second to 0.5 seconds - otherwise the Sprite will be dancing slowly.
4. Go to **Looks folder,** select **'Next Costume'** and place it within the Forever command block as shown below.

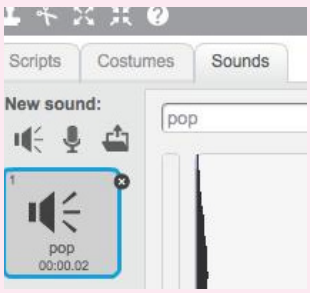


5. In order to add sound, go to **Sound tab** and click on **"Sounds box"** and click on import.

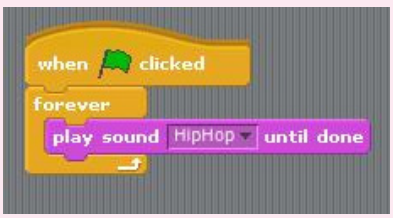
6. Click on music loops then click ok.

7. Select hip hop music then click ok.

8. Go to script box, click on sound and drag the command play sound hip hop until done to the script area and drop.



Adding sound



Looping sound command

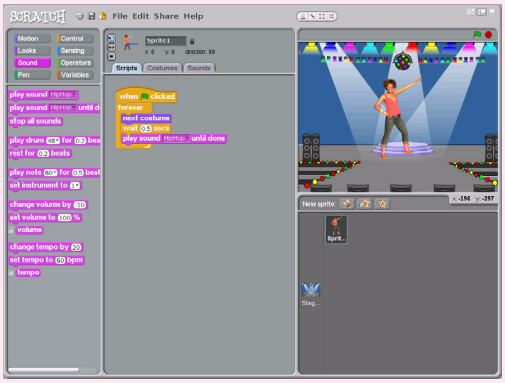
9. Run the program by clicking on the commands.

10. Finally, add the following command to introduce a disco light effect to the stage.



Adding discolight command

Your screen after inputting all the instructions should look like this.



Screen shot showing Cassy dancing

Activity 6.13 Scratch projects

In this activity, you will follow the steps in activity. 6.12 to come up with your own animation.

1. Start a new program with a different background, different music and three dancing sprites.
2. Draw a few Rwandan traditional dancers in different poses using paint editor, stagger their appearances on stage.
3. Locate some appropriate music and make your very own River dance scene using the above

Activity 6.14 Understanding X and Y co-ordinates

Familiarise yourself with xy co-ordinates as follows:

1. Switch on your XO laptop. Open scratch Activity.
2. Go to the stage, followed by background then select 'Import' icon.
3. Choose the xy-grid - the last of the screen options in the background library.
4. Move the sprite around in order to come to an appreciation of coordinates.
5. Put the cursor on the sprite, then check the horizontal bar at the bottom right corner. Write down the 'x' and 'y' coordinates.
6. Repeat step 5 several times. Which 'x' and 'y' coordinates did you come up with?

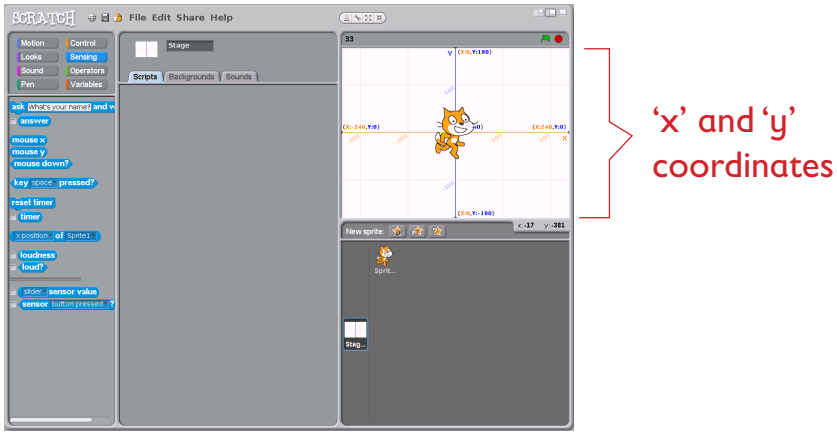


Fig 6.3: Screen shot showing x and y coordinates

X and y coordinates

'X' and 'Y' coordinates are respectively the horizontal (x) and vertical (y) addresses of any pixel or addressable point on a computer display screen.

With motion commands, inserting co-ordinate values can control the magnitude and direction of the sprite's movement. For example,

- A negative 'x' value will move the sprite horizontally left.
- A positive'x' value will move the sprite horizontally right.
- A negative 'y' value will move the sprite vertically down.
- A positive'y' value will move the sprite vertically up.

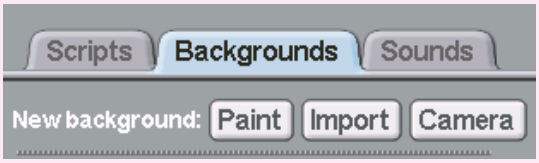
Working with a stage

Activity 6.15 Selecting a background

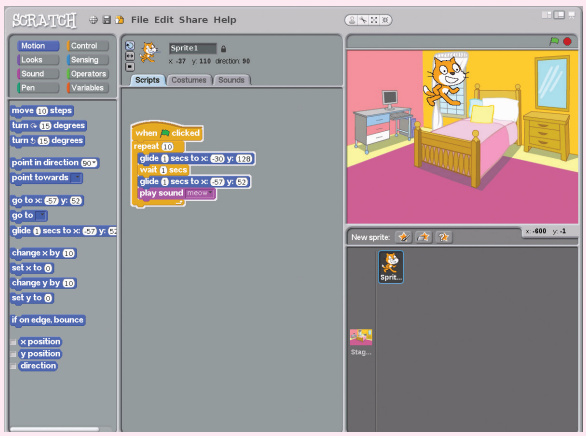
1. Open scratch activity.
2. Click on Stage.



3. Go to the "**background**" option and select "**import**" option.



4. Go to the folder labelled 'Indoors' and select **'bedroom1'**. Does your screen look like this?

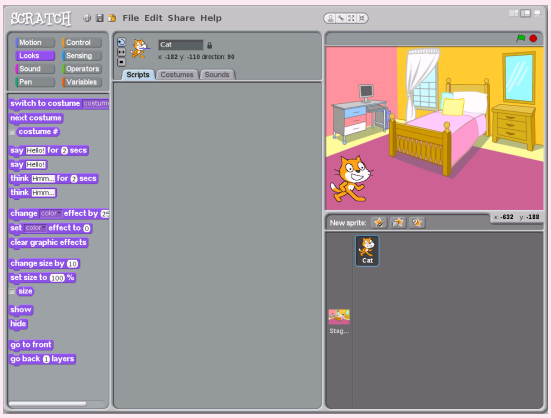


You will notice that we have a problem - the cat looks as if it is walking on air! Next is to come up with a solution of how to code the Script in order to make the cat move across the floor of the room.

We therefore have to put in some extra command code that will ensure that the cat walks along the floor.

5. First step is to make the Sprite (cat) become the active element instead of the Background, so **'double Click'** on the sprite (cat) to move back to the Script of the Sprite.

6. Move the Sprite to the bottom left-hand corner of the stage screen as shown below.



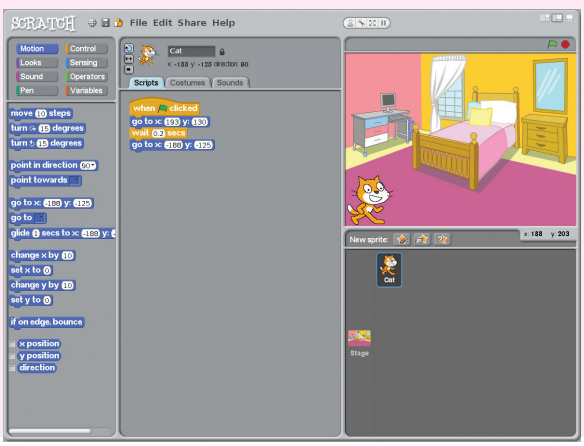
7. Return to the "bedroom 1" background by clicking on the stage icon.

8. Move the cat to the top right hand corner of the stage.

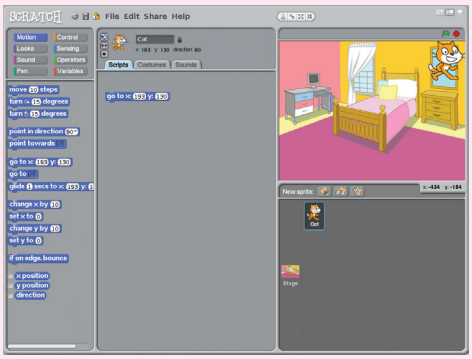
The 'x' and 'y' coordinates for the cat will appear under the faded sprite icon located at the top right hand side of the script area.



9. Go to the 'Motion' folder of the 'Command' panel.
Find the '**Go to X: Y: block'**

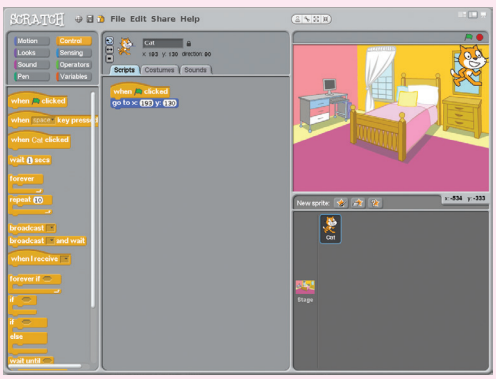


10. Move this block into the Script area block. Fill in the 'x' and 'y' coordinates shown when you point the arrow head on the cat.

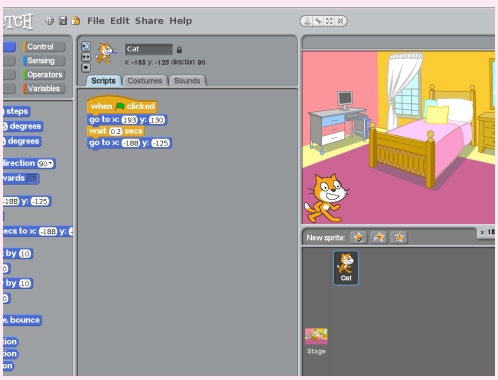


11. Go to command panel, click on control, pick the **'when flag is clicked** 

block . Drag it into the script area and place it on top of the block in step 10.



12. Return the sprite to the bottom left of the stage panel and double click on it.

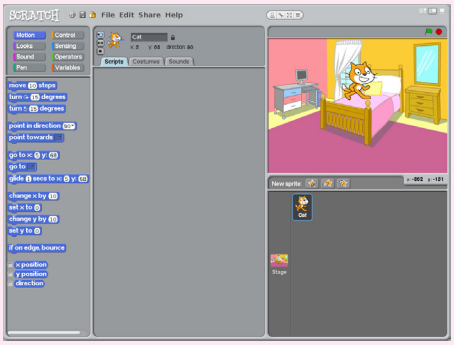


13. Click the Green Flag  icon to start the program.What happens?

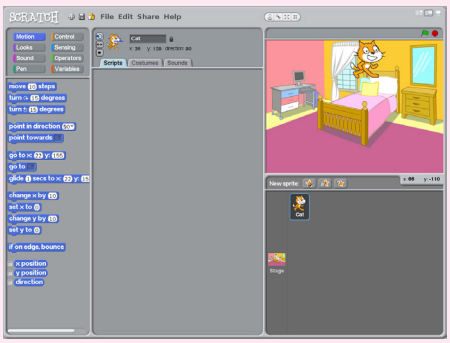
How to make the cat jump up and down

Activity 6.16 Moving a sprite

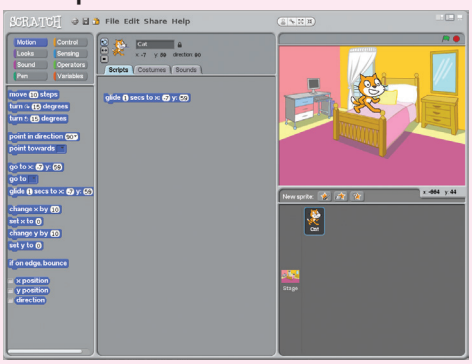
1. Move the cat onto the bed. Place the cursor on the cat then note the 'x' and 'y' co-ordinates of this position.



2. Now, move the cat to the highest position of jumping. Place the cursor onto the cat and record the 'x' and 'y' co-ordinates of this position.



3. Go to the Motion folder of the Command panel and find the **'Glide 1 secs to X:Y block'.**
4. Move this block into the Script area and input the 'x' and 'y' co-ordinates of the position of the cat at the bed level.

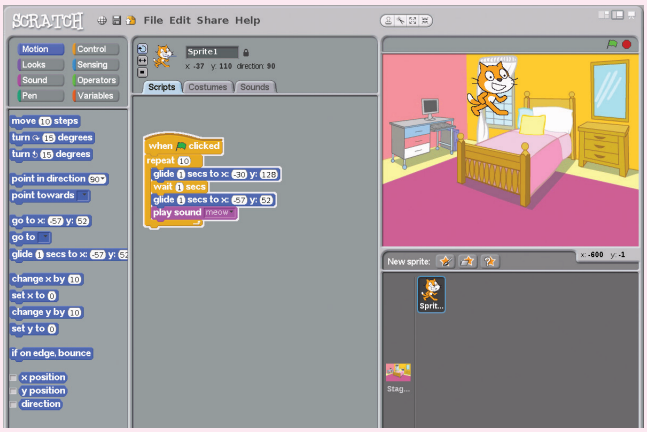


5. Repeat steps 4 for the top position of the cat when it jumps.

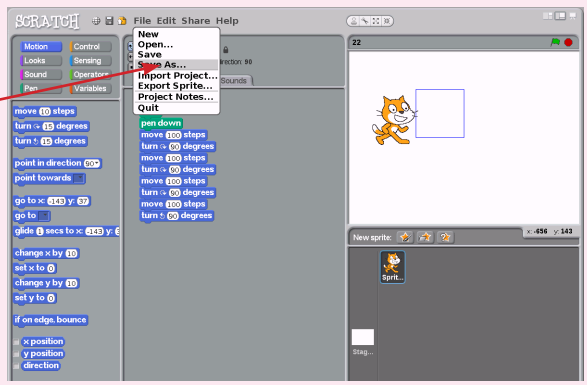
6. Now, go to control panel and drag 'when clicked', 'wait for 1 sec' and 'repeat 10 times' blocks to the script area.

7. Go to sound panel choose 'meow' sound from import option and bring the block to the script area.

8. Click the Green Flag  icon to start the program. Does your screen look like this?



9. Save your program file with the name **'Cat Jumps'** by selecting '**Save As'** in the File pull-down menu located at the top of the Scratch screen, that is:



Your file will be saved in the scratch default folder located in your XO-laptop.

Further Activity

1. Place some further blocks of code in the program that will allow the cat to jump off the bed and walk a few steps.
2. Make the cat change colour for each step of the remainder of his walk in question 1 above.
3. Replace the background with a new image from the Background Library.

Activity 6.17 Creating an animation from a story

Step 1: Create a story line

The first step to create an animation is to have an idea. It could be from a joke you've heard or a story you recently read. Or better yet, it could be entirely your own. An example of a simple story line has been created for you as shown below:

"Mr. Meow was hungry and needed to find the Donut Man, who is known to carry numerous donuts. Fortunately, Mr. Meow found the Donut Man immediately and got what he wanted. He ate and ate and ate! When Mr. Meow was full, he let out a happy sigh and returned home."

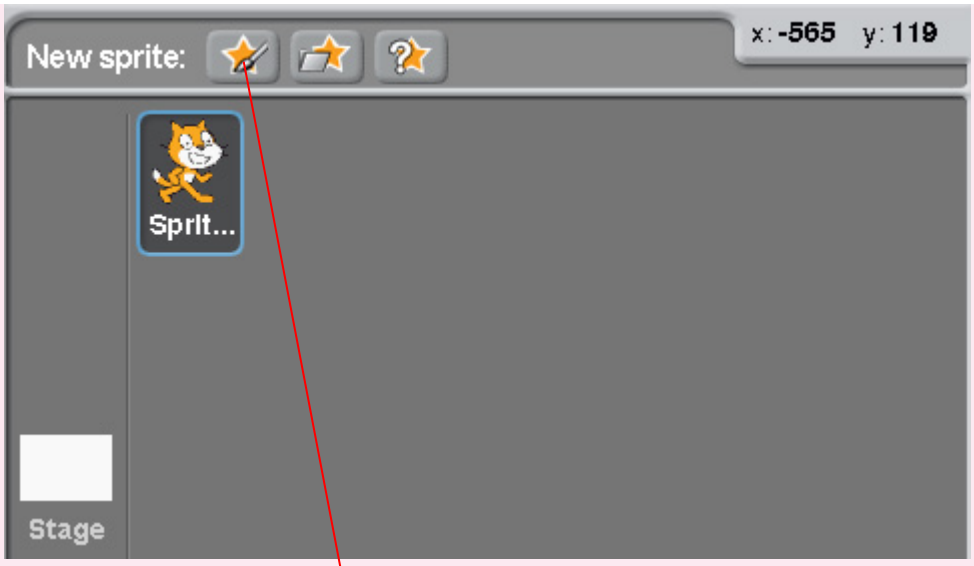
Step 2: Create Sprites

In the story above, we can see that there are **"three sprites"** we need to have. Can you name them? They are:

- Mr. Meow
- The Donut Man
- The Donut

The SPRITES are things or characters shown in the animation. It is very easy and fun to create your own sprite. Let's start by making them. First, let's create the Donut Man.

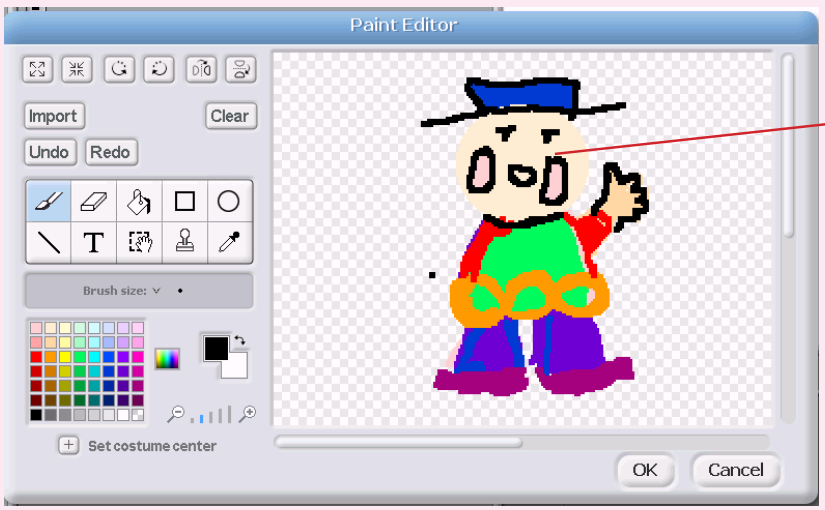
Click the  ("Create new sprite") button to open the Paint Editor. The paint editor allows you to create the default costume of the new Sprite.



Click here to draw a new sprite

Where to click when creating sprite

Create the Donut Man who proudly wears three donuts round his waist as a belt. Do this using lines, circles, rectangles, colours and other tools found in the paint editor.



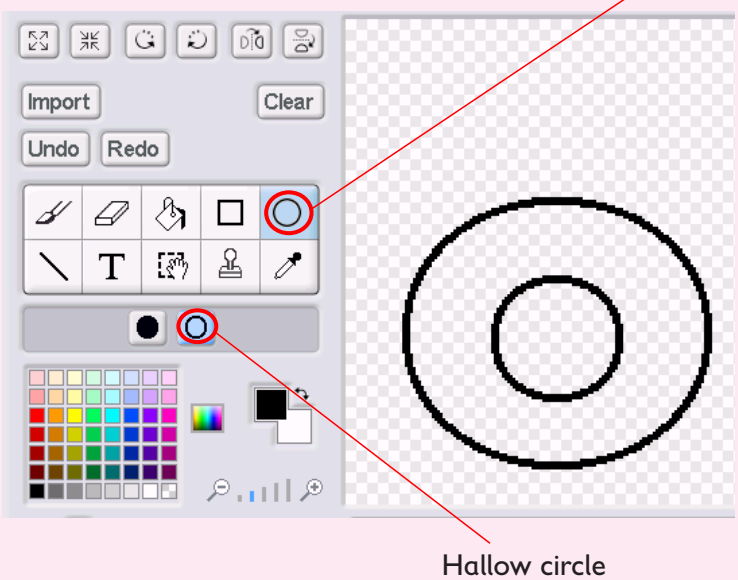
Donut man

Draw Donut man using Paint Editor



Scratch screen after draw donut man

In the same way, create a **Donut Sprite**. Click  to open the Paint Editor again. Use the circle drawing tool  and make sure that you select the **hallow circle** instead of solid circle to create the donut shape. Then use paint  bucket to fill the inside of the donut.

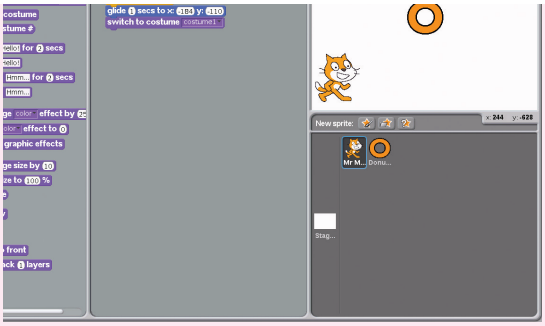


Paint Editor showing hallow circle

When you have created both new Sprites, that is, Donut Man and Donut, your Scratch Screen should look something like this:

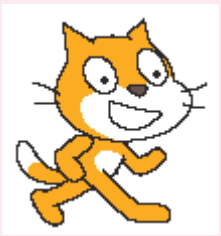
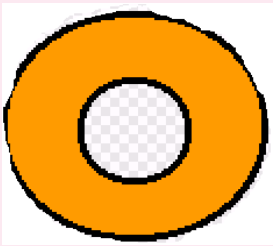
When you have created both new Sprites, that is, Donut Man and a Donut, your Scratch Screen should look something like this:

You will then do the following with the sprites:



Scratch screen after creating Donut and Donut man

Table 6.1 The various sprites and their roles

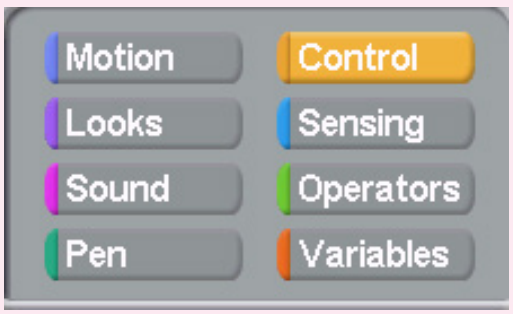
Sprite	What the sprite will do
	1. Mr. Meow shows up first at his house. 2. He heads toward the donut that the Donut Man sends. 3. Once he eats the Donut, he lets out a happy sign and goes right back home.
	1. The Donut Man shows up at his house. 2. He "sends" Mr. Meow a donut. 3. He says "I hope you like it" when Mr. Meow gobbles up the Donut.
	1. The Donut appears in the center when the Donut Man delivers it. 2. It disappears when Mr. Meow finishes it.

Step 3: Creating Scripts from the Story Line Sprites

Now that we have all sprites we need, the next step is to get them to work. To make them do anything meaningful, we need to give them their scripts. To design scripts for each sprite, we need to review our simple story line:

"Mr. Meow was hungry and needed to find the Donut Man, who is known to carry many donuts. Fortunately, Mr. Meow found the Donut Man immediately and got what he wanted. Mr. Meow ate, ate and ate. When Mr. Meow was full, he let out a happy sign and returned home."

NOTE: Do not worry if the Scripts in Scratch Language do not make sense to you; we will explain them very shortly while we build Mr. Meow's scripts. Let's do it!

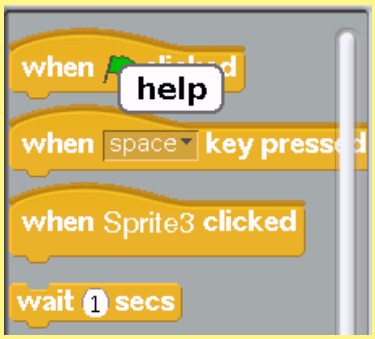


Scratch toolbox

Now we need to use the Scratch "Tool Box". There are eight categories of tools but we will only look at five categories that is, **Motion, Looks, Sound, Control,** and **Sensing**.

Remember!

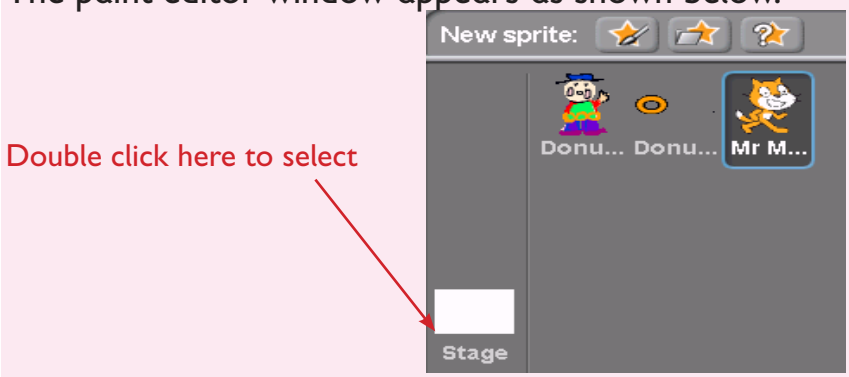
Most of the tools are very self-explanatory and you can RIGHT-CLICK a tool and click on help to see a brief description about that tool as shown below.





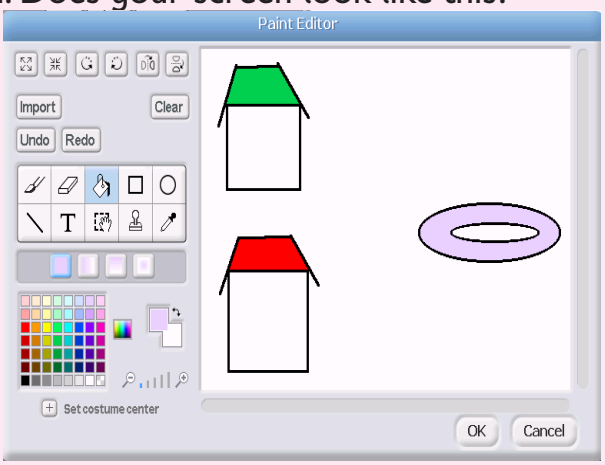
Step 4: Create a Simple Scene

To create a scene, we change the costume of "Stage". We will add **two houses** and **a plate** to the "Stage". To do so, double-click the Stage icon to select. This will take you to "background 1", hit "Edit" button. The paint editor window appears as shown below.



Changing costumes of stage

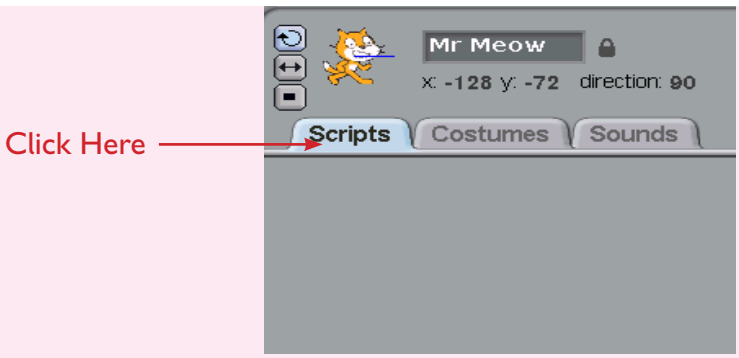
Change the costume by adding the two houses and a plate. When done, hit "OK" button. Does your screen look like this?



Screen after adding a plate and two houses

Step 5: Adding Simple Movement Scripts to Sprites

We are going to show you how these tools work by first building Mr. Meow's scripts. **"Double Click"** Mr. Meow from the Sprites area, then click "Scripts" tab. Do you see a screen like this?



Where to click to add movement to sprite

From the Tool Box, click the "Control" button. From the Control Script Snippets, click and drag 'when clicked' to the "Scripts tab area". Your screen should look like this.

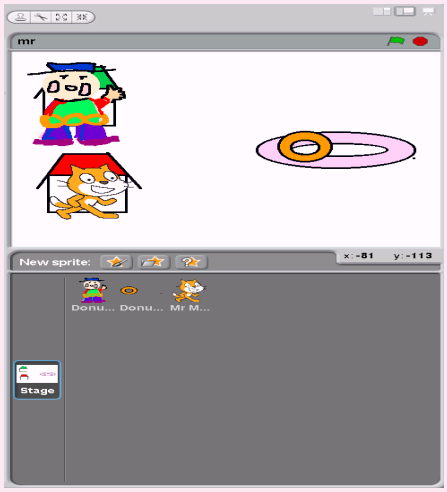


Screen after adding "when clicked"

Then, build a really simple script so that Mr. Meow follow go to his house when the green flag is clicked. Here are the steps to build this;

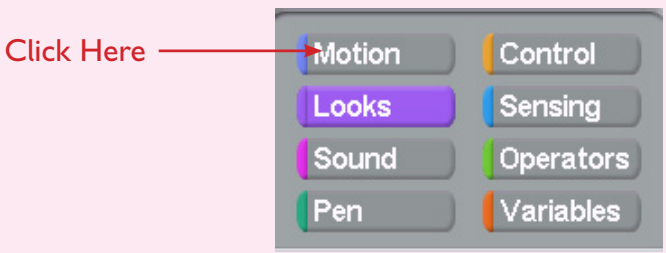
Activity 6.18 Moving the sprite around the stage

1. Move the three sprites as shown below. The x-axis and y-axis values will be updated accordingly. Note them down for each sprite.





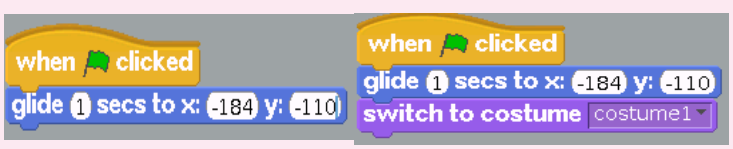
2. Click "Motion" button in Tool Box Selection.



3. From Motion Script Snippets, you would notice that the 'x'-axis and 'y'-axis values are already filled in. See the figure below.



4. Click "Looks" button in Tool Box Selection, then 'switch to costume' as shown below.



5. You are now ready to test this simple scripts. Drag Mr. Meow to anywhere in the Stage and then click the Green Start Flag. You would see Mr. Meow gliding back to his house.
6. In the same way, create the following scripts for the Donut Man and the Donut itself.



(a) Donut man *(b) Donut* *(c) Mr. Meow*

7. Click the green  flag and see what happens.

Step 6: Saving the Project

To save your completed work: Click on **'File'**, and then **'Save as'**. Give the project a title. In the **"About this Project"** section, fill in details about the project such as what it does, what buttons activate the controls and any other information you wish to include.

Step 7: Testing the project

Now you can test this very simple animation by first moving the sprites around in the Stage and clicking the Green Start  Flag button. Describe what happens.

Further Activity

1. Make a Playground scene complete with see-saw and swing.
2. Draw in two children (boy and girl) and position them at the end of the see-saw.
3. Give the impression of the see-saw moving.

Scratch with Mathematics (Simple Computing using scratch)

As mentioned earlier, it is possible to use scratch to do some mathematical computations. In this section, you will learn how to use scratch in:

- Determining **angles** and shapes
- Determining **areas**.
- Working **out averages**.

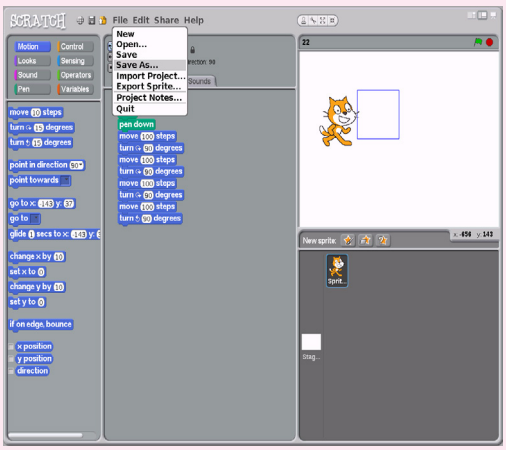
a) Shapes and angles

What shapes do you know? Draw some of these shapes in your notebook. What angles do the corners make? For each shape you drew, write down the value of the angles at its corners.

Activity 6.19 Drawing shapes using sprites

1. Try these out with a friend:
   (a) Walk forward 2 steps, let your friend draw a line of your path using a stick.
   (b) Turn 90 degrees to the right. Walk forward 2 steps. Again, let your friend draw a line of your path.
   (c) Turn 90 degrees to the right. Walk forward 2 steps. Let your friend draw a line of your path .
   (d) Turn 90 degrees to the right, walk forward 2 steps. Let your friend draw a line of your path.
   - What shape did your friend come out with?

   It is possible to draw shapes like this using sprites. It is as if your sprite is holding a pencil. Whenever the sprite moves, it leaves a line behind it. To draw a shape we must "walk" that shape.
2. Now, open a scratch activity and input the commands. In the following picture



3. Run the program by clicking on the green  flag. What shape did you come up with?

Did you notice that the code in step 3 above is repetitive? (Because the movements and turns are all equal?)

In Scratch, we can use a **repeat loop** to create a shorter piece of code. For example, the code above can be summarised as follows:

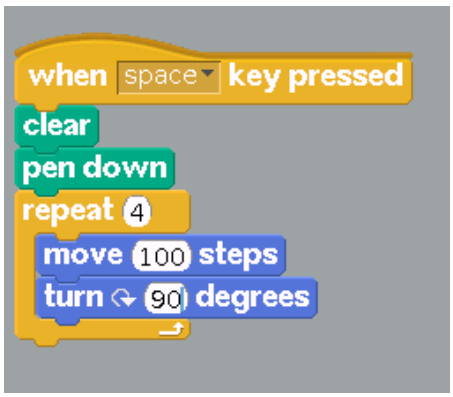


Fig 6.4 Summarised code in a script format

Try this out in your computer and run it. What shape did you end up with? Compare it with the Fig. 6.4. Use the same basic commands to draw a rectangle, triangle, pentagon and other shapes of your choice.

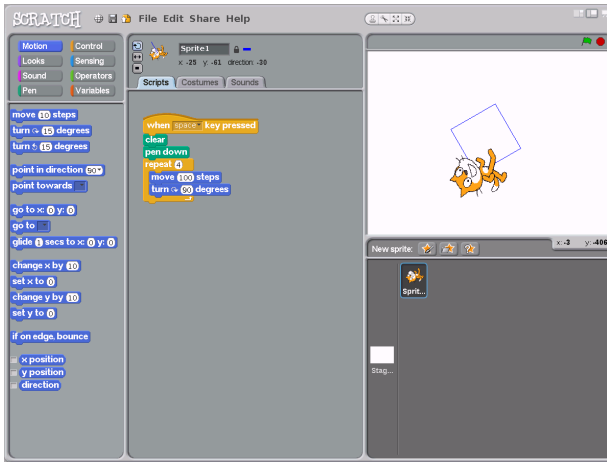


Fig 6.5: Screen showing above script

b) Using scratch in calculations

We can add, subtract, multiply or divide numbers in Scratch. Look at the figure below and do different calculations by entering the numbers and check for the answers.

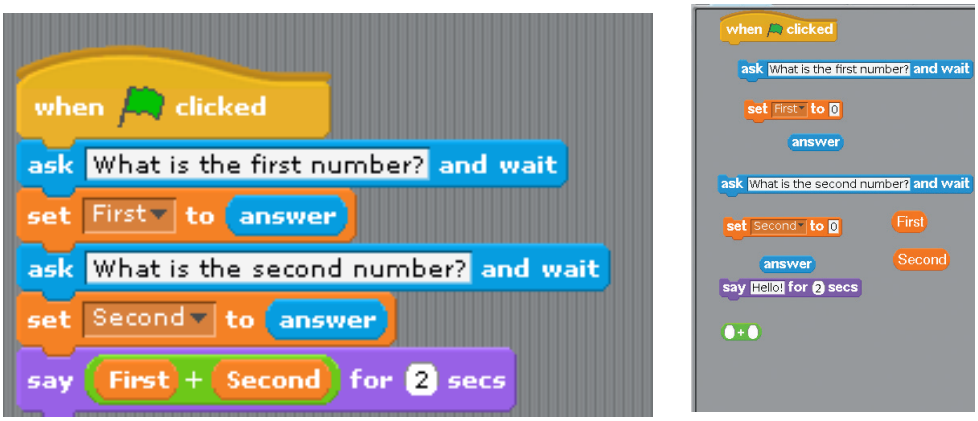


Fig 6.6: Script for carrying out addition in scratch

You can also use scratch to calculate areas and perimeters. Further, you can use scratch to determine perimeters of figures and to compute averages.

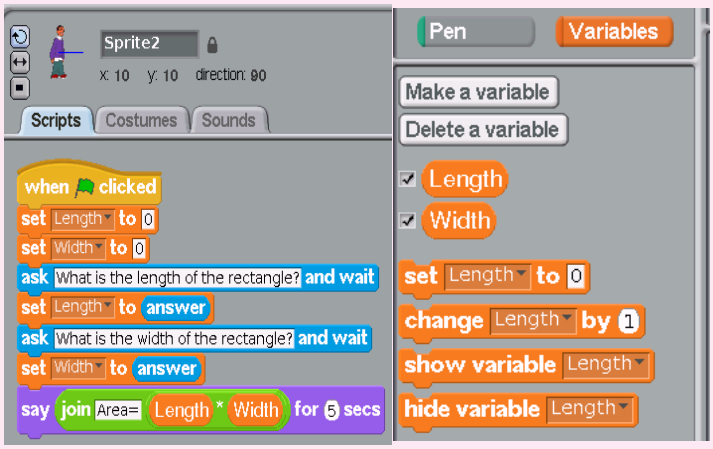
Example: Using Scratch to calculate the area of a rectangle

To do this, create two (2) variables, one called **Length (L)**, and the other called **Width (W)**. By clicking on " Variable"then" Make Variable" You can enter the length and width values and the program will calculate the area using the formula:

Area = Length × width or A = (L × W)

Activity 6.20 Calculating the area of a rectangle

1. Follow the steps shown in the screens below to calculate the area of a rectangle in scratch.



2. Set 'Length' and 'Width' in variables as shown below.



3. Calculate the area of a rectangle with length and width of your choice in Scratch by running the program. What value did you get?
4. Use the dimensions above to draw the rectangle in your notebook. Calculate its area using the formula: **Area = Length x Width**. Compare your value in step 4 above to what you obtained using scratch. Are they the same?
5. Try to calculate the perimeter of the rectangle:
   - Ask the user for length (L)
   - Ask the user for width (W)
   - Compute (P) = (L + W) × 2
   - Report P to the user.

Program to compute average in scratch

You may begin by an exercise first:

- Average 5 numbers for example { 12, 14, 15, 10, 10 }
  Variable 'sum' will be used to add them. After you add all the numbers, divide by 5.
- In the example sum = 12 + 14 + 15 + 10 + 10 = 61
- The average = $\frac{61}{5}$ = 12.2

Doing it using a Scratch program

In order to make a script in Scratch program, you need:

- To set variables, that is N-SUM and NEXT.
- A repeat loop (N-times).
- To ask the user for a number 'NEXT' inside the repeat loop
- To add NEXT to SUM each time in the loop.
- To say the answer eventually.

a) Creating the variables

The variables include:

N - which refers to how many numbers to average.

NEXT - the next number.

SUM - the sum of the numbers.

AVERAGE - the average of the numbers.

Remember!

A variable is a changeable value recorded in Scratch's memory. Variables can only hold one value at a time.

To create the variables, click on variables tab on the commands panel followed by 'make a variable'. A window like this appears.

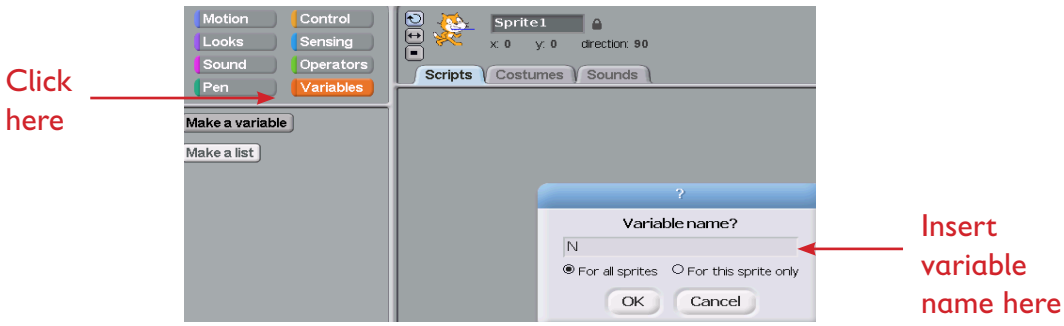


Fig 6.7: Where to type variable name

Type in the variable name and create the next variable until you finish the four. Your screen should eventually look like the one shown on figure below.

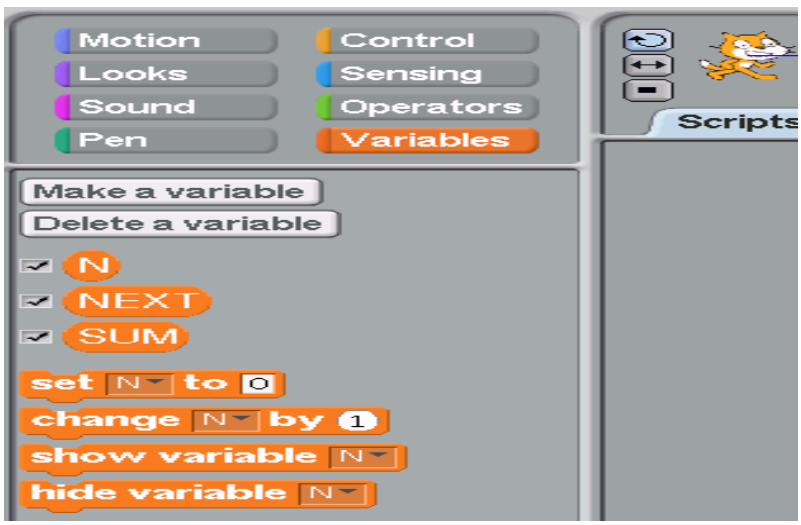


Fig 6.8 Screen after inserting variable

b) Creating the program

The program has three parts:

- **Part 1**: Allows you to insert the value of 'N'.
- **Part 2**: Prompts you to insert the 'N' numbers to be averaged and adds them up.
- **Part 3**: Computes and says the average.

Can you identify these parts in the screen below?

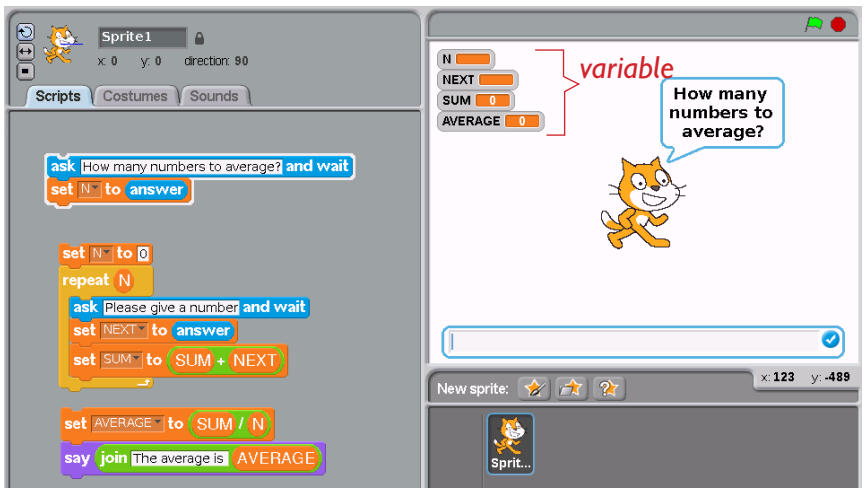


Fig 6.9: Screen showing the four variables

Open a scratch activity, input the above instructions to determine the average of this set of data 14,15 and 16. Click on each part of the program and see it run! Did your screen finally look like this?



Fig 6.10:The results of running above program

Save your average program in your scratch projects folder. You can always use it again in the future.

Further Activity

Follow the steps above to determine the average of this range of data: 23, 5, 8, 13, 17 and 11.

Self –Test 6.2

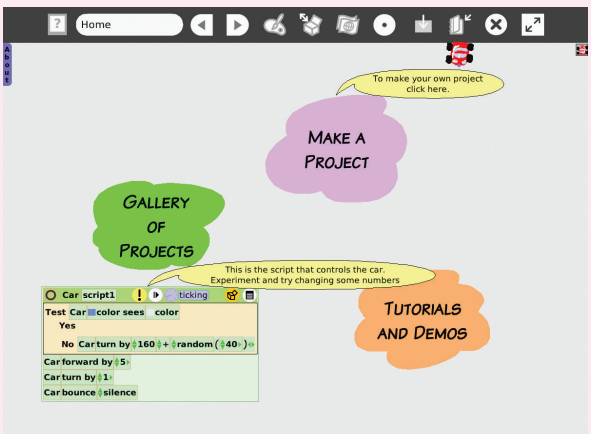
1. What is a sprite?
2. A sprite cannot do anything on its own. Why is this the case?
3. Practice changing the following:
   a) Background.
   b) Costumes of a sprite in your XO-laptop.
4. a) What is the importance of 'x' and 'y' co-ordinates in a scratch project?
   b) What does;
      i. negative x-coordinate values mean in sprite movement?
      ii. positive y – coordinate values mean in sprite movement?
5. When creating animation stories, which steps will you follow?
6. We can use scratch in calculating _____, _____ and _____.

6.3 Etoys

Identification of elements of Etoys environment

Activity 6.21 Identifying elements in Etoys environment

1. Look at the screen below. Is the screen familiar?
   Try to identify the things in the screen.



2. Draw and label the window in your notebook.

Etoys is a software environment that allows you to learn real programming.
We use Etoys to make our own games, multimedia presentations, computer art, animated storybooks, computer simulations and many other things.

The screen in Activity 6.21 is an **Etoys screen**. It is called **'the World'**. Everything you do from etoys will happen in this World!

To start Etoys, simply double-click on the Etoys icon which is located on the desktop of sugar. The Etoys opening screen displays:

- **Navigator** bar
- Three **coloured clouds**
- An **automobile** that travels around the window, bouncing off the clouds and the edges of the screen.
- **The script** - that controls the car's movement.

Can you identify these in the screen above?

In the next section you will learn about some important features in Etoy environment which you will use more oftenly. They include:

- Navigator bar
- Supplies
- Etoys book

a) Navigator Bar

The Navigator Bar has many buttons:



Fig 6.11 Navigator bar

All these buttons will allow you to navigate across different Etoys projects. For now, note the **'Publish It'**,  the **'Find'**  and the **'Quit'**  buttons.

To save a project you will use the 'Publish it' button. To find a project that you have saved, you will use the 'Find' button. To leave Etoys, you will use 'Quit' button.

b) Supplies

When you click on the 'Supplies box'  , a drop down screen like this appears:



Fig 6.12 Supplies drop-down screen

It contains various tools used to manipulate etoys program. The book in the drop-down menu is very important.

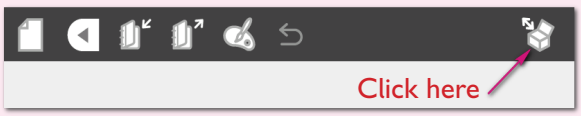
c) Etoys book

The BOOK is one of the most useful objects in Etoys. You can use it to do **Slideshows**, **class diaries** and **albums; register observations** and even create your own **animated book**.

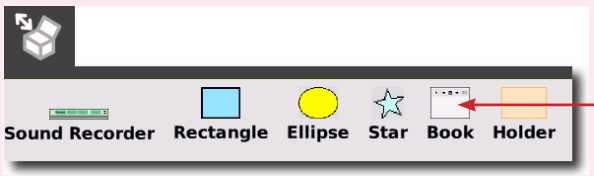
The most interesting part is that you can **insert any kind of element (OBJECT)** inside a BOOK. For example, you can add **text**, **drawings** and even **animations** in order to bring your book to live. So, let's see some tips before you create your first BOOK.

Activity 6.22 Creating a new book

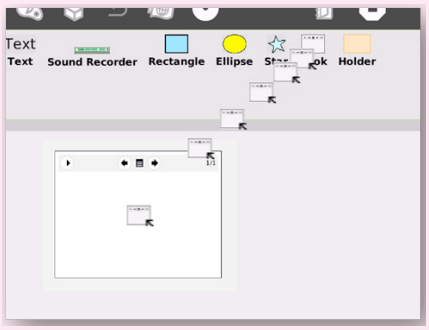
1. Once Etoys is open, you can find the BOOK in the SUPPLIES box.



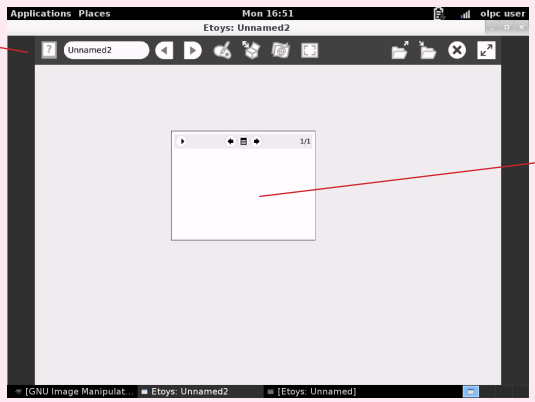
2. When the SUPPLIES box opens, you will see the BOOK icon.



3. Now, just drag the BOOK icon over the WORLD to create a new book. Did your screen look like this?



Some of the features of the new book are shown below.



Etoys book screen

With this, a new book is now ready to be created!

Adding Text to the Book

To add text to the book, you need to open the SUPPLIES box again and look for the TEXT object.

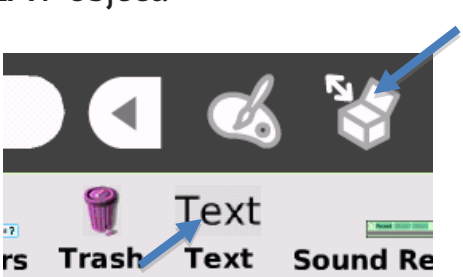


Fig 6.13 Screen showing text object

Just drag the TEXT over the book again and drop it. To start writing, just select the text and start typing.

Now, you might have noticed that the size of the text is not right, or you want to change the font or the size of your text. So, what you need to do is to call the halo, by clicking the TEXT with the circles buttons.



Fig 6.14 Text with circle buttons

Activity 6.23 Adding text to an Etoy book

1. Follow the steps above to open an etoys book. Add text to the book stating your name, your class and your school.

Adding drawings to the Book

There are two ways of adding a drawing to the BOOK. If you already have a drawing outside the book, just **drag** it and drop over the book. The drawing will be automatically added to the current page. The second way is to create a new drawing, by clicking the **PAINT**  icon located at the top menu. Clicking the paint palette in the toolbar brings up the painting tool. It has two components: a translucent rectangle called a **SketchEditor** where the user can paint an image and a **PaintBox toolbar**.

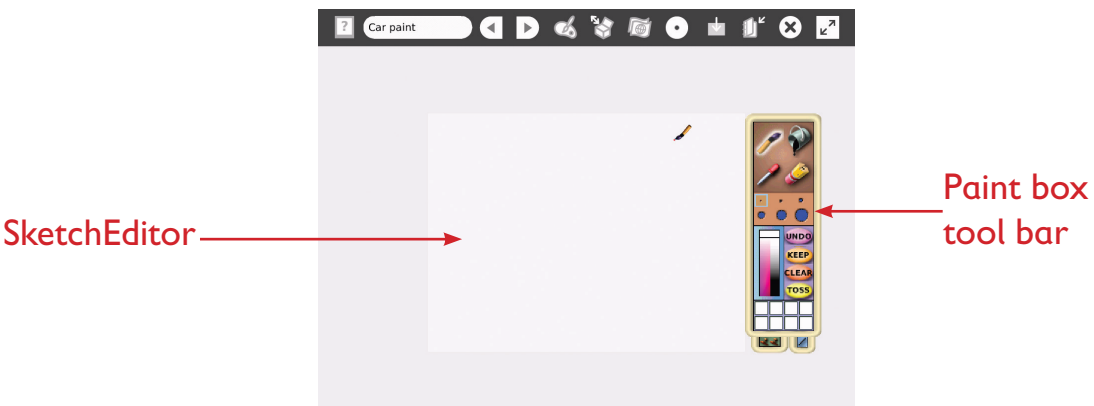


Fig 6.15 Screen showing SketchEditor and paint box tool bar

The SketchEditor is smaller than the screen. Therefore, everything drawn on one page will be one object. To draw several objects, exit the painting tool by clicking **"keep"** when one object is done and open it again to get a new sheet to draw on. To draw the background of the world, click the world's grey pencil 'halo' icon.

You can then use the toolbar to make a drawing of your choice.

Activity 6.24 Drawing in an Etoy book

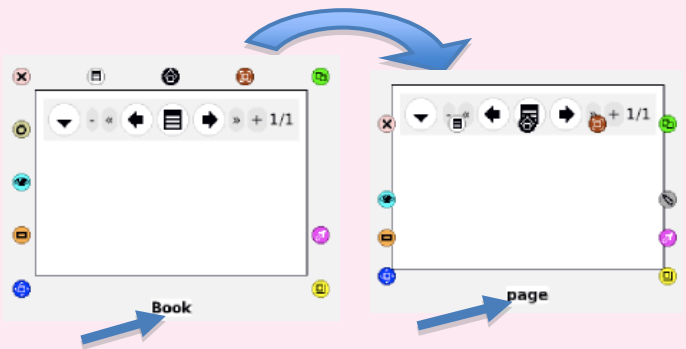
1. Open a new Etoys book and draw a house in a valley. Do not paint the diagram at this stage.

Painting a background

The BOOK is often used to create stories with animated characters. But, in order to do animations in Etoys, it is necessary to draw the scenario **(BACKGROUND)** separated from the characters **(OBJECTS)**. What should you do?

Activity 6.25 Painting a background

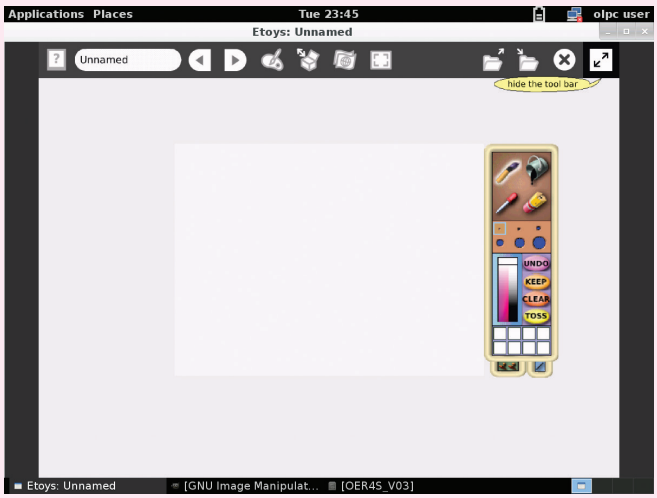
1. Right-click the circle button one time over the book. You will see the halo, with the word **"book"** under it.



(a) (b)

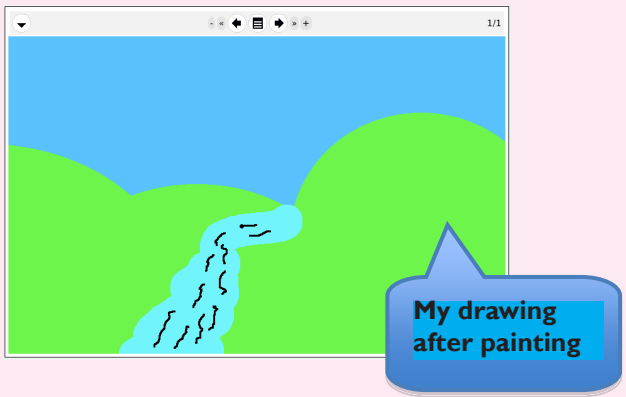
2. Now, click again over the book, You will see that the word 'book' changes to 'page'. See Fig 6.40 above.

(If you look closer at the image, you might also notice some other details. The PEN ICON , should have showed up. Well, it is exactly in this icon that you should click in order to paint your scenario. Clicking on it gives you the paintbox toolbar below).



Paint toolbox

3. Use the various tools in the paintbox toolbar to paint your drawing in Activity 6.22 above. After painting, you will have a drawing such as this.



4. Finally, you can add the title of your storyline to come up with the cover of your book as shown below. The first page of your storybook should then look like this.



The cover of our book

Etoys projects and Animations

In this section, you will learn how to create Etoys projects, how to save new projects and how to open, rename and delete existing projects. You will begin by making an Etoys animated car. To do this, go through the following steps:

Step 1: Drawing and painting the car

Activity 6.26 Drawing and painting the car

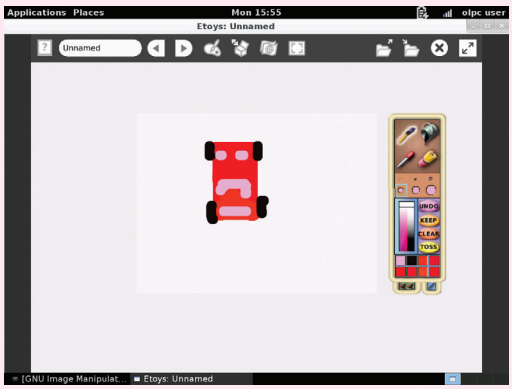
1. Switch on your XO-laptop then click on the 'Etoys' icon in sugar interface to open a new Etoys activity.
2. Click on 'Make a Project', or the 'page icon' to open up a new project.
3. Choose the paintbrush to open up Etoys' paint palette.
4. Draw a blob – which looks like the shape of a car as seen from above. See the diagram below.



NOTE: *If you do not like what you drew, click on 'Undo' on the paint palette.*

5. Choose different colours for the wheels, windows and so on.

6. When you are happy with what you have drawn, click on keep to save your drawing. Did your screen look like this?



Congratulations! You have just finished the first step in your Etoys project.

Right now, your car object is just a drawing. But every object in Etoys has **characteristics** (properties) and behaviour, just like real world things. You can manipulate the properties and behaviour of the objects to make them do different things.

If you **'right-click'** your mouse over the car object, you will see little ovals surrounding the car. These are called **'Handles'**. Through these handles, you can access the properties of your object and also modify its behaviour.

Activity 6.27 Accessing the properties of a viewer handle

1. Click on the viewer handle to reveal the viewer. Did you see images like these?



The viewer contains property tiles (Fig.B) that shows what your car is and what it can do.

2. You can "collapse" the viewer against the right edge by clicking on the small tab with the picture of your car on it. To make the viewer re-appear, simply click on the tab again.

Step 2: Changing the name property of the car

First, you will change the name of the object from **'Sketch'** to **'Car'**. Find the word **'Sketch'** at the top of the viewer. Click on it to highlight it and type in the word **'Car'**. Press enter to save the new name. Confirm that your object is now known as 'car' and not 'sketch'.

Step 3: Getting into more action!

Look at the tiles in the basic category pane. You will see two types of tiles: some are preceded by a **yellow exclamation** ! point and others are not. The **tiles** following the **exclamation point** ! are **action tiles**. Clicking on them will **fire** the action once. **Holding down** on them will run the action **repeatedly**. Try driving the car around the world using the exclamation points.

Step 4: Changing the behaviour of the car manually

Numeric values of the tiles can be changed by either clicking on the up or down arrow on the left of the value or by selecting the value and typing in a new number and hitting enter once.



Fig 6.13 Tile showing where to type numbers

After changing the value, click on the ! again. What happens?

Activity 6.28 Changing the value of the car

1. Practice changing the value as explained above.
2. Try different numbers, what do you think will happen if you type in negative numbers? Try this out as well!

Step 5: Changing the properties of the car

Tiles which are not followed by an exclamation point are **value** tiles. (See Fig 6.17 below). Each of these is followed by a green and white arrow that assigns or sets that value as the current value for a particular attribute or property of the car.



Fig 6.17: Screen showing value titles

In the real world, objects have properties such as size, colour, location, direction and so on. Every object that you draw or pull out of the supplies bin in Etoys automatically has many **standard properties** that tell us about the object, where it is and what it looks like and so on. Type different numbers in the tiles then press enter, what happens?

Step 6: Changing the behaviour of the car – automatically

Manually pressing down on the yellow exclamation point as you did in above activity to make the car move seems very inefficient and not interesting! However, to make the car **move on its own**, until some condition is reached (i.e. for one minute, until the car reaches an obstacle and so on) we can use scripts just like in scratch.

a) Creating a script

Scripts are created for objects by assembling tiles in a scriptor. There are two ways to get a scriptor:

i) Drag out the tile **"car forward by 5"** from the viewer and drop it on the world. A scriptor will sprout around it. You can do this with any action tile.

ii) If you would like to start with an empty scriptor, go to the scripts pane of the viewer and drag out **"car emptyscript"**. (You can scroll between panes by clicking on **"basic"** and **"additional panes"** choices will appear).

Remember!

For now, use the first option only.

b) Naming the script

You now probably have something like this:



Fig 6.18 Sample Etoy script

Click on "script1" to highlight it, and then change it by typing "drive".

NOTE: *When we program, we want our scripts and objects to be named things that tell us what their purpose is.*

c) Running the scripts

Clicking on the yellow exclamation mark fires the action once. This means that from the program above, the car will go forward 5 pixels. However, to make the car keep moving, click on the clock symbol paused (or **ticker**) on the scriptor. Notice that in the title of the script, the word has changed to say **"ticking"**. If you click it again, the script will stop and it will show **"paused"**.

Activity 6.29 Running the scripts

1. Open a new Etoys project. Experiment with different values and different scripts.
2. How can you make your car go faster? Go Slower? Go backwards? Go round in a circle? What tiles do you need to add for these?

d) Changing the "ticking" rate

Another way to change a script is to modify its "ticking rate". Every script is born with the default rate of 8 ticks per second. You can speed things up, or slow them down by holding down the mouse button over the clock icon until the following menu appears, after which, you can make your selection.

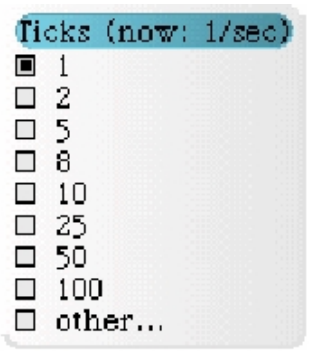
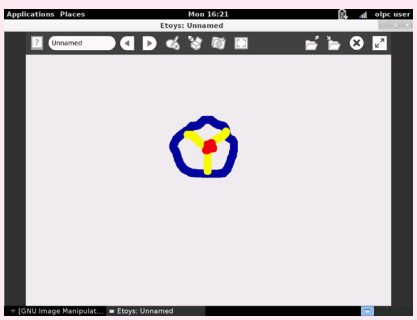


Fig 6.19 Menu for use to choose ticking rate

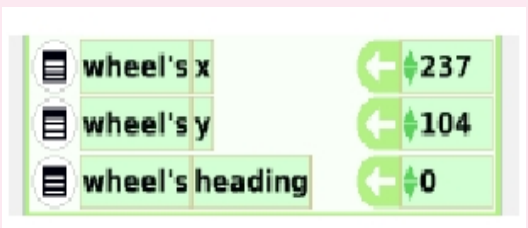
Step 7: Creating the steering wheel object Activity 6.32

Activity 6.30 Creating a steering wheel object

1. Open a paint activity, paint a steering wheel.
2. Bring up the handles of the steering wheel by pressing '**alt-**'.
3. Open the viewer for the steering wheel by clicking on the 'eyeball' handle. Did your screen look like this?



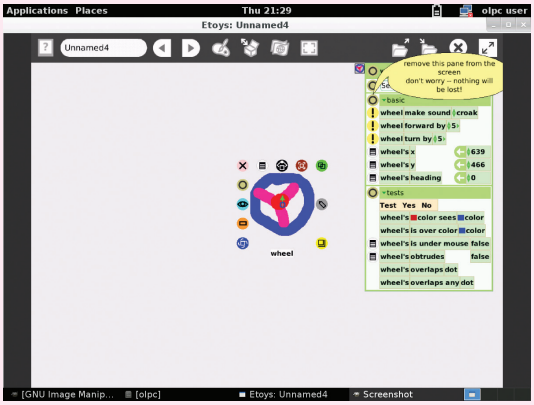
4. Change the name of the object to 'Wheel'.
5. Bring up the handles of 'Wheel' again. Click on the blue 'Rotate' handle. What happens?





By clicking and dragging the blue rotation handle, you can rotate the steering wheel.

6. If you look at the wheel's heading in the viewer, you will see how the values change as you rotate the wheel. Try this out. Which values did you see?



Step 8: Controlling the car through the steering wheel

In the car's scriptor, make sure you have the following tiles: To control the car through the steering wheel, the car and the steering wheel have to be connected. Specifically, the turn of the car has to be connected to the heading of the steering wheel. Heading indicates at what angle the object is rotating. As the car moves forward, if the heading of the steering wheel is negative, it will turn **left**. If the heading is positive, it will turn **right** and if the heading is 0, then the car will **move straight** ahead.

Activity 6.31 Connecting the head of a steering wheel to the car

To connect the heading of the steering wheel to the turn of the car," drag the heading tile of the steering wheel from the viewer and position it over the "5" in the **"turn by tile"** of the car on its scriptor. You should end up with this:



Step 9: Driving the car using the steering wheel

You are now ready to drive the car using the steering wheel. In wheel's basic pane, set the value of heading to 0. Then start the car's script by clicking on the ticker in the car scriptor. Quickly bring up the handles of the wheel. Scroll the mouse down on the blue rotation angle and start driving the car! Is it fun?

Step 10: Using maths to scale the effect of the wheel on the car

You may have realised that the car in step 9 above is too sensitive to the wheel. With every **"tick"**, the car turns by the wheel's heading. So, if the wheel is heading slightly to the right, say 5 degrees, then, assuming 8 ticks per second, the car is spinning 40 degrees every second. Dizzying!

Activity 6.32 Using maths to scale the effects of the wheel on the car

1. Click on the small green arrow just next to the word "heading", and it will change to say "car turn by heading + 1". You can change the "+" to a variety of other math operations and you can change the "1" to any number. Try these out and see what happens.
2. Try the following and determine what they do, and which effect you want in order to get the car to be less sensitive to the wheel"
   a) "car turn by wheel's heading –5"
   b) "car turn by wheel's heading * 5"
   c) "car turn by wheel's heading * -5"

Step 11: Publish the car (save the car project)

We do not "save" Etoys projects, we **"publish"** them. In the Navigator tab, click on the "Publish"  icon A form like the one shown below will appear.

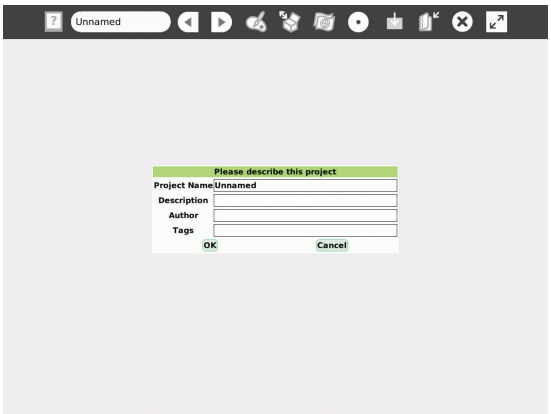


Fig 6.20 Screen shot for publishing book

Using the form, **name the project**. Follow the guidelines given by your teacher. Include descriptive information in the name. Do not use any special symbols in the name other than dashes. You need not to fill out the other information. You can come back to that later.

After you click "ok" on the form, a new window like the one shown below will appear.

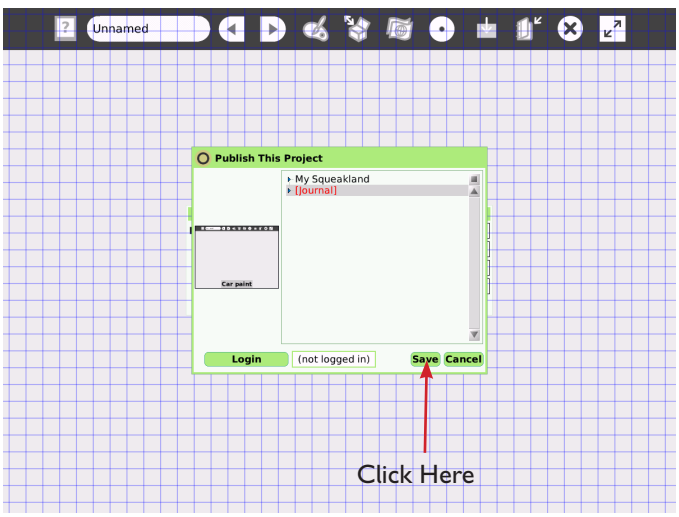


Fig 6.21 How to save an Etoys project

Click once on "Etoys" (or wherever else your teacher tells you to publish to) which is a special folder on your computer, and then click "Save" at the bottom of the window. Wait for Etoys to finish publishing.

Congratulations!

You have just completed your very **first Etoys project**. Now go ahead and play with the different options that we explored!! When you are

done, go back to the Navigator tab and click on "Quit". At the end of this tutorial, you should have this:

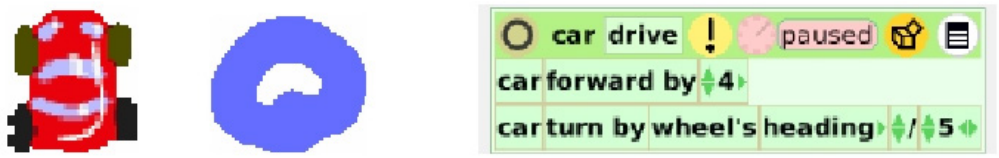


Fig 6.22 Complete Etoy project

Recovering your work (Open)

Open Etoys, and find your project by clicking on the **"Find"** button on the Navigator Bar. Click on **"Etoys"** in the left pane, select your project in the right pane and click **"OK"**. Follow this procedure to recover your saved work.

Remember!

When you are drawing multiple sketches, it is very important to draw them in layers. To do this, you must open the sketching tool every time you want to draw a new sketch. For example, what we have done in the project above is one sketch. If I want to draw a hat that moves, I have to open the paint tool again and draw a separate hat sketch.

Self – Test 6.3

1. How do we call the window that appears when we open an Etoys activity?_____
2. Name the main features in an Etoys window.
3. What is a "halo" of an object?
4. How do you open a "viewer" for objects in Etoys?
5. Give five properties of any object in Etoys.
6. What is a "scriptor"?
7. What is the "heading" of an object? What does it mean if a ticking program changes the heading so that it increases by 90? If you were riding on the object, what would you say happened?

UNIT TEST 6

1. Using record activity, record a song of your choice and save it in Journal. Open turtle art and use correctly the blocks of commands to display your song.
2. Take different photos of yourself. Use turtle art to display them by arranging appropriate blocks.
3. How can you make an object move backwards in Etoys?
4. a) Habineza wants to program a "hot air balloon" to go up and down as she drags a picture of a sandbag up and down. Can you describe how she can do this in Etoys? Be real and specific, because she hasn't seen Etoys before.
   b) How would you make the balloon go up and down much further than the sandbag?
5. a) Create scratch programs to do the following: (save each project in your computer).
      i) Calculate the area of a rectangle.
      ii) Calculate the perimeter of a rectangle.
      iii) Calculate the sum of three numbers.
      iv) Calculate the average of three numbers.
   b) Practice the following: Create three sprites. First sprite 1 starts at the upper left corner of the screen and glides to the middle. Then sprite 2 starts in the upper right and glides to the middle of the screen. They are followed by sprite from bottom left and finally sprite 4 from bottom right to the middle.
6. Practice and create a shark attack game in scratch. Change to a suitable background and animate a shark to make it interactive.
7. Calculate the answer to the following problems; write the answers in your exercise book. Enter the calculations into scratch and confirm your answers.

   a) $5 + 4$ b) 5×4 c) $5 + 4 - 3$

   d) $34 + 3 \times 6$ e) $(34 + 3) \times 6$ f) $\frac{40}{5} + 4$

   g) $4 + \frac{40}{5}$

Unit 7 Air pollution

1. Look at the following pictures.

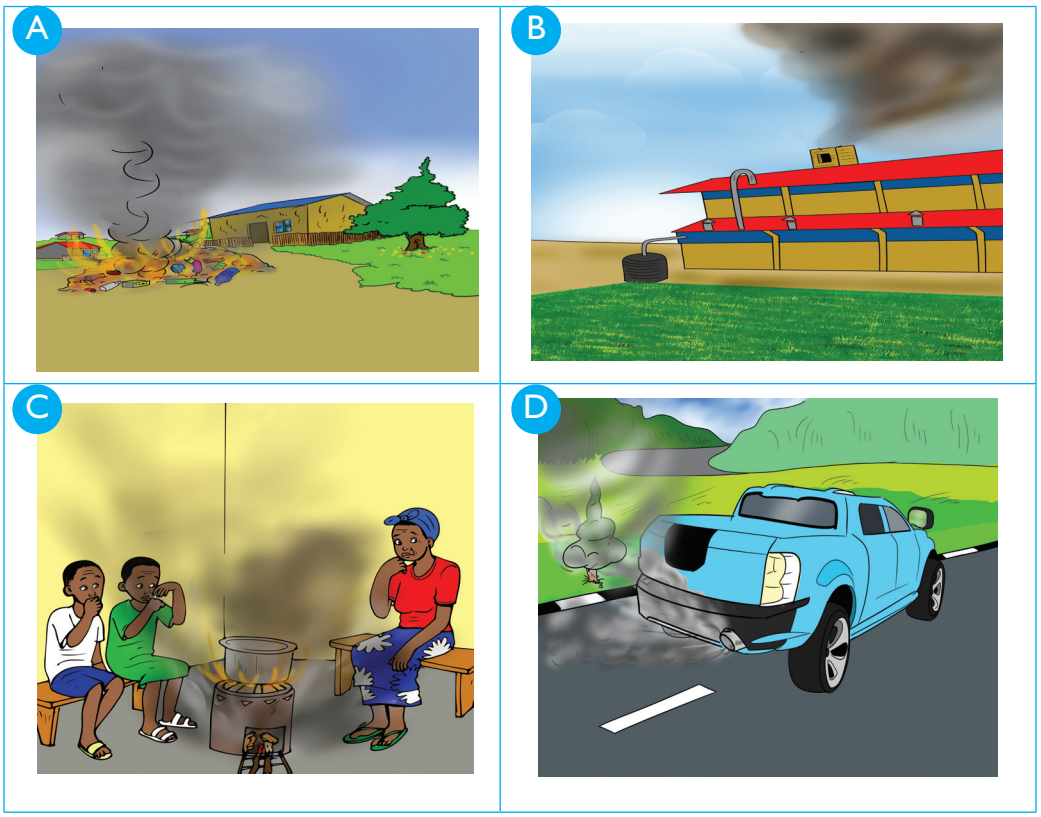


Fig 7.1

2. Think about the responsibilities of human beings in the situations above and predict what you are going to learn in this unit.

7.1 Definition of pollution

Find out

1. What pollution is.
2. How polluted air affects us.
3. Causes of air pollution.
4. How to advocate against air pollution.

Activity 7.1 Field visit

1. Describe the harmful effects of motor vehicles to the environment.
2. Visit an industry near your school.
3. Ask questions on several activities going on in the industry including how the environment is managed.
4. Write short notes in your notebook.

Pollution is the presence or introduction into the environment of a substance which has harmful poisonous effects.

7.2 Sources of common air pollutants

Activity 7.2 Identifying the sources of air pollution

1. Look at these pictures.



A



B



C



D

2. What is going on in the pictures? Is it good or bad to the environment?
3. Visit a polluted environment and observe it carefully. Write down short notes that include:
   a) Causes of air pollution
   b) Effects of air pollution

Air pollutants are substances that cause air pollution. e.g smoke, dust particles, fumes, gases such as carbon monoxide, sulphur dioxide and nitrogen dioxide.They come from burning of garbage and tyres, vehicle exhaust systems, industries, smoking, deforestation, woodfires. Dust created by wind and other activities like quarrying also pollute the air.

Air pollutants contaminate the air making it unsafe for use.

7.3 Consequences of air pollution

Activity 7.3 Identifying effects of air pollution

Carry out the following experiments:

1. Burn some fresh leaves in a closed room. How do you feel after some time? Why is this the case?
2. Burn some plastics such as tyres then place a shiny lid or pan on top of the burning fire. Observe the lid or pan after sometime. What do you see?

NOTE: Be careful not to get burnt!

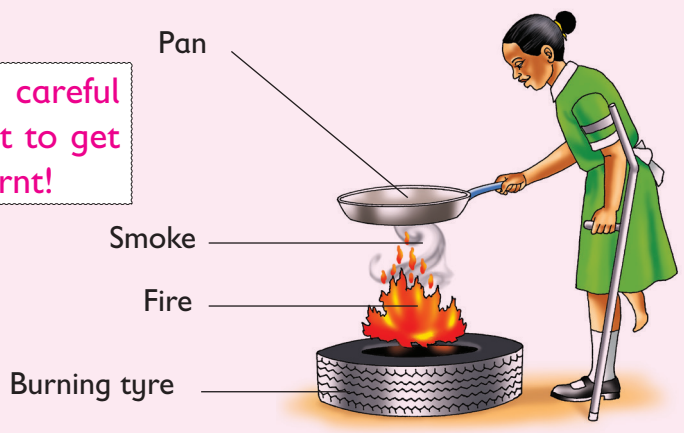


Fig 7.2 Burning rubber materials like tyres causes air pollution

3. What do these experiments tell you about how air pollution affects us?

Activity 7.4 Research Activity

1. Go to the library and read articles, textbooks, magazines and pamphlets on consequences of air pollution.
2. Visit a local environment management authority office. While there, ask the officers about the causes and effects of air pollution and how to control it.
3. Write short notes on your findings on consequences of air pollution.

Consequences of air pollution can be grouped into two:

- Health effects
- Environmental effects

a) Health effects

These include:

- Irritation of the eyes, nose and throat.
- Respiratory diseases such as asthma, pneumonia and cancer of the lungs.
- Damage to other living organisms.

b) Environmental effects

These include:

- Air pollutant gases such as **carbon monoxide** which can cause death when inhaled. This happens especially when in limited supply of air. This explains why we should not stay in a closed room with burning charcoal.
- Acid rain which contaminates water, putting the lives of human beings and other animals at risk.
- Destruction of the ozone layer leading the **green house effect** which causes **global warming**.

7.4 Advocating against air pollution

Find out

Ways of avoiding air pollution.

Activity 7.5 Ways of preventing air pollution

1. Look at the following picture.



2. How are the activities above important regarding environment protection?

Ways of controlling air pollution include:

- Planting plenty of trees to create forest covers in order to absorb carbon dioxide. Forests act as both water catchment areas and recycling points of gases.
- Fitting vehicle exhausts with catalytic converters to help convert poisonous gases into less poisonous ones before being released to the atmospere.
- Setting up industries far away from residential areas and fitting factories with chimneys that filter air.
- Avoiding/reducing cooking using firewood and charcoal.

UNIT TEST 7

1. What is pollution?
2. Apart from carbon dioxide, give other pollutants that are gaseous in nature.
3. Give any three reasons why air pollution is a threat to animal lives and the environment.
4. Why is it not advisable to stay in a room with burning charcoal?
5. Explain the term "go green" as a solution to air pollution in our environment.
6. Explain why the government of Rwanda stopped people from smoking cigarettes in public places.
7. Look at the pictures below. Say whether what is going on is right or wrong. Give reasons for your answer.



a) _____



b) _____



c) _____

8. a) What is global warming?

   b) What environmental activities can we practise to avoid global warming?

9. How does air pollution affect drivers?

10. What advice would you give to people who use fuel as a source of energy?

11. Air pollution is severe in _____. (cities, rural areas) Why?

12. Which of these gases is responsible for global warming?

    A. Hydrogen peroxide

    B. Carbon dioxide

    C. Sulphur dioxide

    D. Nitrogen dioxide

Unit 8 Animals

1. Study the picture below.

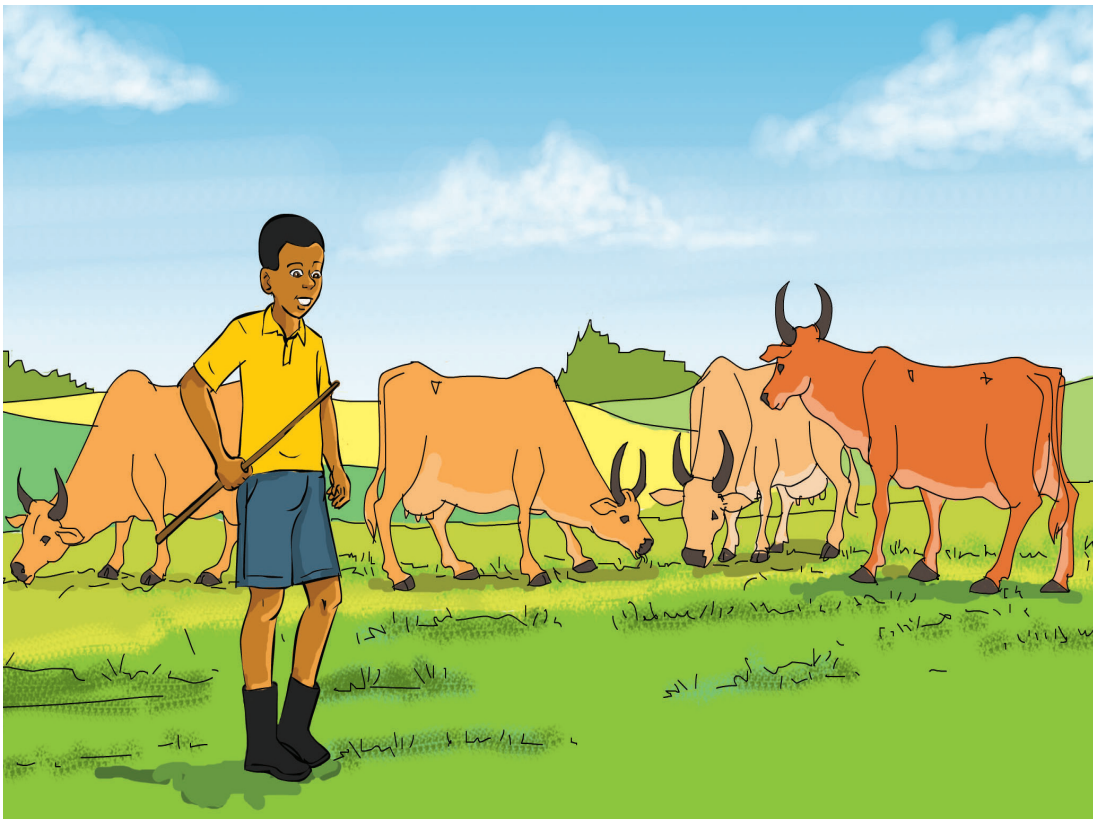


Fig 8.1

2. What is happening in the picture?
3. Is it good to graze many cows in a small piece of land?

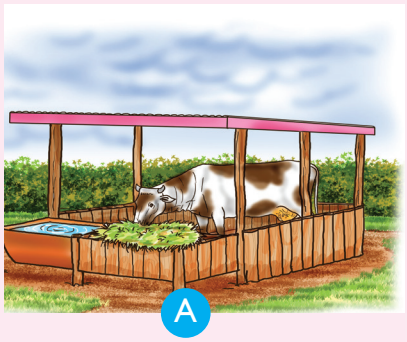
8.1 Characteristics of a good cowshed or goat shelter

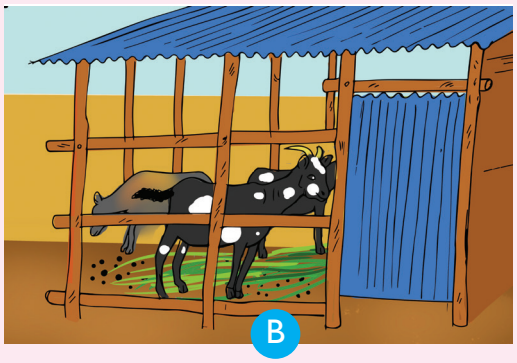
Find out

1. How a cowshed or goat shelter should look like.

Activity 8.1 Investigating the characteristics of a good cowshed

1. Observe and write the characteristics of good cowshed/ goat shelter to a famer during school trip.


A


B

a) Where is the location of the shelter or cowshed?

b) What is it made of?

c) Do young ones share the same shelter as the older ones? Why?

d) How does the floor of the shelter look like? Why?

A good **cowshed** should have the following characteristics:

- It should be **fenced** to avoid predators.
- The floor should be made in an inclined manner for easy flowing of water during runoff in order to drain easily.
- It should be roofed.
- It should have proper **ventilation**.
- It should have **concrete rough floors** that are easy to clean and to prevent the cows from slipping.
- It should have both clean **feeding** and **watering troughs** at designated points.
- There should be another **part reserved** for **calves**.
- It should have an **isolation box** to accommodate animals that are on treatment.
- There should also be a **crush** to be used for spraying the cows and a **milking shed**.

8.2 Types of cattle and goat breeds

Find out

The different types of cattle and goat breeds.

Activity 8.2 Identifying breeds of cattle/goats to rear

1. Make a trip to a cattle farm to observe the various types of cattle kept. Write down their characteristics.

Types of cattle/goat breeds

The term **'breed'** means a group of animals with **similar characteristics**. There are two main types of cattle breeds namely.

- Local (indigenous) breeds
- Foreign (exotic) breeds

a) Local (indigenous) cattle breeds

These are cattle breeds that are found locally in Rwanda. They are native cattle that can withstand hostile climatic conditions and are also **resistant** to tropical diseases. They have long legs and they can walk over long distances looking for food and pasture. Their productivity is generally low and they are small in size. Examples of indigenous cattle breeds include:

i. **Zebu cattle –** They are small in size and have short humps. Dairy cattle of this breed have the ability to resist tick-borne diseases.

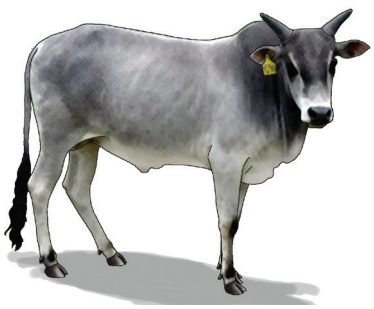


Fig 8.2 Zebu cow

ii. The **long – horned** cattle (Inyambo) -These are fairly large in size and have well developed horns



Fig 8.3 Inyambo cattle

iii. The **boran cattle –** They are large in size than the zebu, have short horns and big humps. They produce good quality beef.

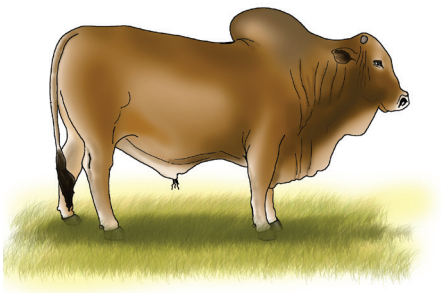


Fig 8.4 Boran bull

b) Foreign (exotic) cattle breeds

They were introduced in Rwanda from foreign countries and can be **beef** or **dairy** cattle.

Dairy cattle breeds

These are mainly kept for production of milk. They include: **Friesian, Jersey, Guernsey** and **Ayrshire**.



Fig 8.5 Friesian cow

i) Friesian

- Originated from Holland.
- Produces the largest amount of milk.

ii) Ayrshire

- Originated from Scotland.
- Produces 20 litres of milk per day.



Fig 8.6 Ayrshire cow

iii) Guernsey

- Its origin is Guernsey island (coast of France).
- Produces about 17 litres of milk per day.



Fig 8.7 Guernsey cow

iv) Jersey

- Originated from England.
- Produces about 14 litres of milk per day.

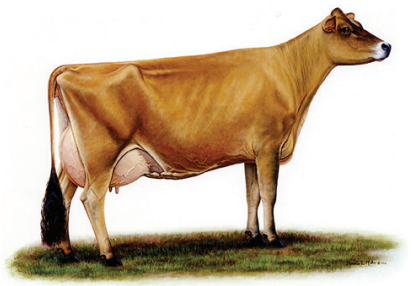


Fig 8.8 Jersey cow

Beef cattle breeds

These are purposely kept for meat production. They include:

Aberdeen angus, Hereford, Charolais, Shorthorns and **Galloway**.

i) Aberdeen Angus

- Originated from the counties of Aberdeenshire and Angus in North-Eastern Scotland.
- Best in quality beef.



Fig 8.9 Aberdeen Angus bull

ii) Hereford

- Originated from England.
- Bulls weigh 1000 kg and are excellent grazers.



Fig 8.10 Hereford bull

iii) Charolais

- Its origin is France.
- Bulls weigh 1200 kg with high quality meat.



Fig 8.11 Charolais bull

iv) Short horns

- Originated from England.
- Bulls weigh 800 kg.



Fig 8.12 Short horn bull

v) Galloway

- Originated from Scotland.
- Are black with brownish tinge.
- Bulls weigh 1000 kg.
- They have long earlaps which droop.
- They weigh between 60-75 kg.
- They lack horns (are hornless).



Fig 8.13 Galloway bull

R Remember!

Some cattle are kept for both milk and meat. They are called **dual-purpose cattle**. Examples are **Sahiwal**, **Red poll** and **Simmental**.

Breeds of goats

Goats can be kept either for milk or meat. Main types of goat breeds.

a) Local (indigenous) breeds of goats

- They are the native goats of Rwanda. They are kept mainly for meat and are more resistant to diseases. e.g: East African small goats and Nubian goat.



Fig 8.14 Local goat breed in Rwanda

b) Foreign (exotic) breeds of goats

They can be dual propose e.g Boer goat and Galla goat.

Goat breeds for mutton/ meat production

i) Boer

- Originated from South Africa.
- They are fast maturing.
- Are ideal for cross-breeding with local breeds.



Fig 8.15 Boer goat

ii) Galla

- Its origin is Northern Kenya.



Fig 8.16 Galla goat

iii) Nubian goat

- Its origin is Sudan.
- It is white in colour with brown patches or vice verse.



Fig 8.17 Nubian goat

Dairy goat breeds

Examples **toggenburg, saanen** and **alpine goat**.

i) Toggenburg

- Originated from Switzerland.
- Produce 3-4 litres of milk per day.

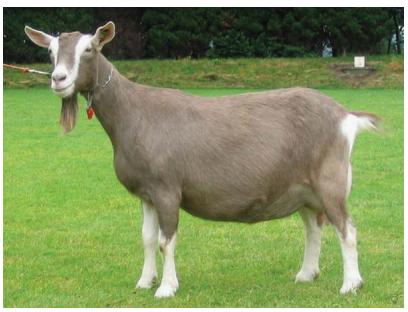


Fig 8.18 Toggenburg goat

ii) Saanen goat

- Originated from Switzerland.
- It Produces 2-3 litres of milk per day.



Fig 8.19 Saanen goat

iii) Alpine goat

- Its origin is France.
- It produces between 3-4 litres of milk per day.



Fig 8.20 Alpine goat

R Remember!

Goats can also be kept for fibre /mohair production. e.g Angora goat.

Characteristics of cattle and goat breeds to rear

Goats and cattle to rear should have the following characteristics.

- **Growth rate –** they should grow fast.
- **Resistance –** they should resist against common diseases found in the area such as anthrax and foot and mouth disease.



Fig 8.21 Cow feediing

- They should be good producers of milk and meat.
- They should be able to survive a range of climatic conditions available.

8.3 Feeding of cows and goats

Find out

How farm animals especially cows and goats are fed.

Activity 8.3 Visit to a goat and cattle farm

1. Make a trip to a goat and/or cattle farm and describe:
   - Observe and describe what goats and cattle are feeding on.
   - Identify nutrients of good animal diet and their sources.

Cattle / Goat should be fed on a balanced diet. A balanced diet contain animal feeds with aproppriate nutrients in their right amounts.

A balanced diet contains:

- carbohydrates e.g pastures, fodder crops, vegetables e.t.c
- proteins
- fat and oils
- minerals and vitamins
- roughages

Below is a summary of elements of good cattle/goat diet and their sources.

- **Carbohydrates** e.g potato vines, maize grains, sorghum stalks, cereals and molasses.
- **Poteins** e.g legumes, commercial seeds (concentrated).
- **Minerals and vitamins** e.g saltlicks and bone meal.
- **Fats and oils** e.g plant leaves and cotton seeds.
- **Roughages** e.g greenfodder, green pasture and vegetables.



Fig 8.22 Napier grass



Fig 8.23(a) Potato tubers



Fig 8.23(b) Banana twigs chopped to pieces

Remember!

In addition to feedstuffs, farm animals should be provided with plenty of clean drinking water.

8.4 Cattle or goats health sanitation conditions

Find out

Which sanitation conditions are necessary in cattle or goat farms.

Activity 8.4 Field visit

- Visit a nearest farm of cattle / goat.
- Observe and discuss sanitation conditions on the farm.
- Compare sanitation of farm animals and have one at home.

Things that should be done to maintain proper sanitation in a goat or cattle farm include:

- Keeping animals houses **clean**.
- Keeping **feeding** and **drinking** troughs **clean**.
- **Clearing the bushes** around the animals' sheds.
- Keeping **water sources clean**.
- **Cutting over growths** from the feet of animals such as the goats.
- **Disposing off dead animals** by burying them deep into the soil.

8.5 Common diseases of cattle and goats

Find out

What to do when animals become affected

Activity 8.5 **Identifying common diseases of cattle and goats and their prevention measures**

1. Visit a cattle or goat farm/ gooogle engine/ library.
2. Describe diseases, signs and symptoms that are observable through the sick animals.
3. Make a summary of your findings (Diseases, animals affected with signs and symptoms.

a) Indentification of common disease of cattle and goat

Diseases that affect cattle and goats are grouped into two:

- **Parasitic diseases** - these are diseases that are caused by parasites. Examples are East Coast Fever (ECF), anaplasmosis and trypanosomiasis, pneumonia, Nagana.
- **Infections** - these are diseases that are caused by micro-organisms such as viruses and bacteria. Examples are pneumonia, mastitis and anthrax.

b) Prevention and control measures of cattle and goat diseases

General ways of controlling or preventing livestock diseases include:

- Vaccination
- Quarantine
- Isolation
- Use of drugs such as antibiotics to treat the disease
- Dipping or spraying to control external parasites that may cause diseases among others

Table 8.1: Common diseases of cows and goats, their causes, signs, symptoms,prevention and control measures

Disease	Animal affected	Cause	How it is spread	Signs and symptoms	Control and prevention
Foot and mouth disease	Cattle and goats	Virus	Contaminated food and water	Rough coat Swollen feet Swelling blisters on the tongue and gums	Quarantine Vaccination Isolation
East Coast Fever	Cattle Goats	Virus	Ticks	Diarrhoea with some blood Fever Difficulty in breathing Discharge from the nose General weakness	Dipping and spraying cattle / goat, to kill ticks. Injection with drugs
Nagana	Cattle Goats	Protozoa	Tsetse flies	General weakness Too much saliva is produced Fever that comes and goes	Control of tsetse flies

Disease	Animal affected	Cause	How it is spread	Signs and symptoms	Control and prevention
Rinderpest	Cattle Goats	Virus	Contact	Rough skin Watery eyes Discharge from the nose Diarrhoea Swelling and sores in the mouth and nostrils Animal grinds teeth	Vaccination Isolation
Anthrax	Cattle Goats	Bacteria	Contaminated food and water Contact with sores	Fever shivering Blood oozes from the mouth, nose and anus Dung has some blood stains Animal loses appetite Animal dies suddenly	Vaccination Isolation Dead animals should be buried It also kills humans, do not eat dead animals
Pneumonia	Cattle Goats	Bacteria or virus	Dirty, dumb and dusty condition	Difficulty in breathing and coughing High temperature Nasal discharge General body weakness Loss of appetite	Early treatment with antibiotics

Disease	Animal affected	Cause	How it is spread	Signs and symptoms	Control and prevention
Brucellosis	Cattle Goats	Bacteria	Contact	Kills animals in their foetal stages Abortion followed by brownish vaginal discharge	Vaccination Kill and burn infected animals Milk should be boiled before drinking because it also affects humans
Mastitis	Cattle	Bacteria	Contact	Milk contains pus , blood or turns watery Udder and teats become swollen Animals reject suckling their calves or being milked Infected udder stops producing milk	Treatment with antibiotics Cleanliness and use of disinfectants
Trypanosomiasis	Cattle Goat	Protozoa Ticks		Intermittent fever Anaemia Weight loss Swollen lymph nodes and spleen	Early treatment with certain drugs Control tsetse fly using sterile insect techniques

Disease	Animal affected	Cause	How it is spread	Signs and symptoms	Control and prevention
Red water and Anaplasmosis	Cattle Goats	Protozoa	Ticks	High fever Constipation Anaemia and yellowish mucous membrane Animal licks soil Swollen lymphatic nodes Red urine is seen	Early treatment with tetracycline antibiotics Control ticks by dipping and spraying the animals
Tuberculosis	Cattle Goats	Bacteria	Contact	Hard and dry coughs Loss of appetite and dullness High temperatures Small swellings develop on the udders of infected animals	Isolate infected animals Apply quarantine Restrictions Treatment with drugs Milk should be boiled before taking it
Heart water	Cattle Goats	Protozoa	Ticks	High fever and shivering Dullness and loss of appetite Tongue protrudes Animal moves in circles and becomes restless When animal falls down the legs keep paddling in the air	Treatment with tetracycline antibiotics Control of ticks

8.7 Importance of cattle or goat farming

Find out

1. How animals are helping families in Rwanda.
2. The animal product we sell to get income.

Activity 8.6 Identifying various cow/ goat products and their importance

Discuss the following questions:

1. Which are some of the products we get from goats or cows and their importance? Fill the table below.

Products from goats	Importance	Products from cows	Importance

2. Think about other ways in which we benefit from cattle and goats. List them down in your notebook.

The following are some reasons why we keep cattle and goats:

a) Nutritional benefits

- Meat and milk that enriches our diet with proteins and fats.

b) Economic benefits

- **Milk** from cows and goats enriches man's diet with vitamins, proteins, carbohydrates and fats.
- Hides or skins provide leather which is used to make bags, wallets, belts, shoes, jackets and sofa sets.
- Provides employment to various groups of people example include: farmers, veterinary doctors, slaughterhouse workers, butchermen and women, workers in dairies among others.

- Source of **income** (selling milk and meat).

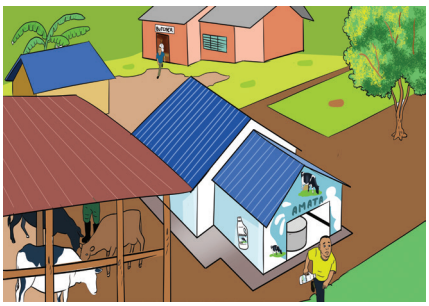


Fig 8.24 Dairy farm

c) Social benefits

- Cattle and goats are used in **social functions** such as dowry.



Fig 8.25 Dowry ceremony

d) Agricultural benefits

- **Manure** to be used in farms to grow crops.

R Remember!

Animals are our heritage. We should avoid mistreating them. Instead, ensure that they are well taken care of.

UNIT TEST 8

1. Assume you want to start a project of keeping goats or cows at home. Describe how you would construct the cowshed or the goat shelter.
2. a) What is a breed?
   b) Distinguish between indigenous breeds and the exotic breeds of animals.
3. Give two reasons why an animal house should be fenced.
4. Akaliza is a primary 6 pupil. Everytime they go for field visit to observe animals, she complains of bad smell. One day, she said that she cannot become a farmer. In fact, she added that farming is meant for boys alone. What advice can you give to Akaliza?
5. Which characteristics will you look for when selecting a cow for
   a) Beef production? b) Milk production?
6. Fill the gaps in the table below.

Disease	Animal affected	Cause	Sign & symptoms	Prevention & control
	Cattle & goat		Blood oozes from body openings	
Heart water		Protozoa		Control of ticks
		Bacteria	Swollen udder and teats	
Brucellosis	Cattle and goats			Vaccination

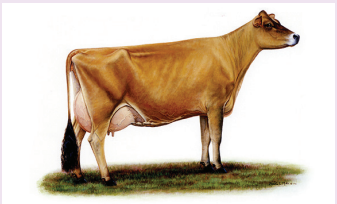
7. What is the importance of keeping proper sanitation in animal farms?
8. Which breed of cattle are those in the next page? Which are dairy cattle and which are beef cattle?



(a)



(b)



(c)

9. Why do you think it is an advantage to grow crops when you are a cattle or goat farmer?
10. Why is the government of Rwanda emphasising that there should be at least a cow per family in Rwanda?
11. Why do you think people are advised NOT to drink milk that is not boiled?
12. Write **TRUE** or **FALSE** for each statement.
    a) Ayshire, Holstein and brown swiss are all dairy cattle breeds. _____
    b) The most important products of cattle are draft power and milk and not meat. _____
    c) Taking goat milk by human beings is NOT healthy. _____
    d) When animals die of diseases, they are supposed to be slaughtered immediately and eaten. _____
13. Give a reason why the government of Rwanda is encouraging Rwandans to practice 'Gira inka munyarwanda'!

Unit 9 Plant reproduction

1. Look at the pictures below. What is going on in the pictures?



Fig 9.1

2. How can you help the family in picture B?

9.1 Definition and types of plant reproduction

Find out

1. What is plant reproduction ?
2. Two types of plant reproduction.

Activity 9.1 **Investigating definition and types of plant reproduction**

1. Research in a library textbook or search engine what plant reproduction is.
2. Obtain some healthy sugarcane cuttings.
3. Bury the sugarcane cuttings into the soil then observe for two weeks.

Reproduction is the production of new plants from the parent plants e.g cassava cuttings.

Reproduction occurs in two ways:

Asexual reproduction e.g sugar cane

Sexual production e.g beans

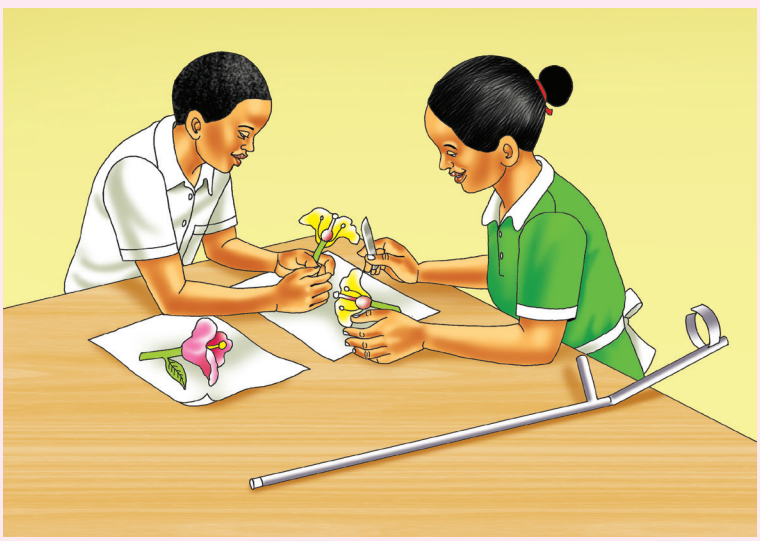
9.2 Identification of parts of a complete flower

Find out

1. The various parts of flowers and their funtions.
2. Which parts of a flower makes the male and female reproduction.

Activity 9.2 Observing and dissecting parts of flower

1. Go out of the classroom and collect as many flowers as you can.
2. Observe the external parts carefully. What parts do you see?
3. Dissect the flowers and identify the internal parts.



4. Did all types of plants have the same type of flowers?

A Complete flower is made up of three main parts:

- The **external flower parts**
- The **male reproductive** parts
- The **female reproductive** parts

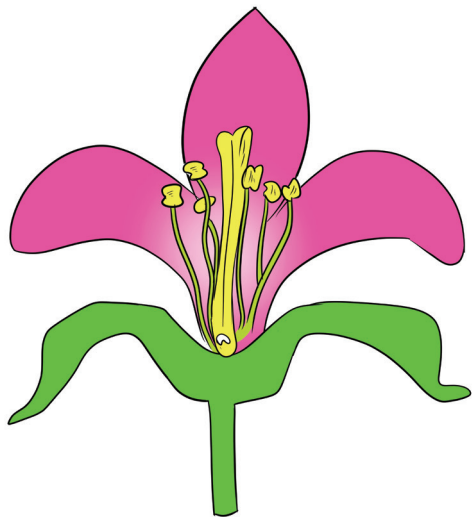


fig 9.2 A complete flower

a) External parts of the flower

These include the stalk, calyx and corolla.

The flower stalk

The stalk joins the flower to the plant.

The calyx

This consists of small parts that look like leaves. They are called **sepals**. Sepals protect the develping flower.

The corolla

Corolla consists of brightly coloured parts called **petals**. They attract insects and birds thereby assisting during the pollination process.

b) Male reproductive parts

The male reproductive parts put together are know as **stamen**.

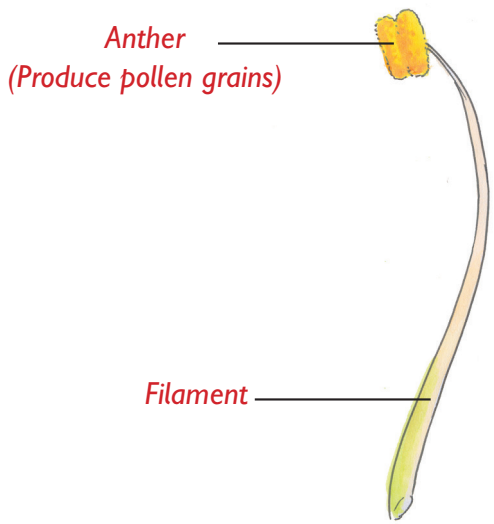


Fig 9.3 Male reproductive parts/ stamen

The stamen is made up of:

- **Anthers** - which contain **pollen grains.** Pollen grains are the male reproductive cells.
- **Filament** - a long stalk that holds the anther.

c) Female reproductive parts

The female reproductive parts put together form the **pistil**

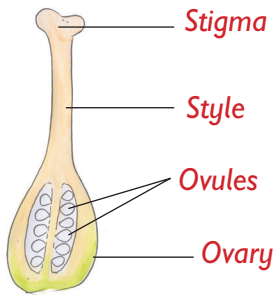


Fig 9.4 Female reproductive parts/ pistil.

The pistil is made up of:

- **Stigma** - which receives pollen grains from the anthers during pollination.
- **Style** - is a long and narrow tube that joins the stigma to the ovary.

- **Ovary** - is the swollen part at the bottom of the style. It contains ovules. **Ovules** are the female reproductive cells.

9.3 Process of sexual reproduction in flowering plants

Find out

1. Various agents of pollination.
2. How the agents cause pollination to occur.

Activity 9.3 Investigating ways in which plant reproduce

1. Research in search engine or library textbook on ways of plant reproduction
2. Write down notes on various ways on which plants reproduces

Sexual Reproduction in flowering plants involves the following processes : pollination, fertilisation, seed dispersal and seed germination.

a) Pollination

Pollination is the transfer of pollen grains from the anthers to stigma of a flower.

There are two types of pollination:

- **Self pollination** - involves transfer of pollen grains from the anthers to the stigma within the **same flower** or to the stigma of another flower on the **same plant**.

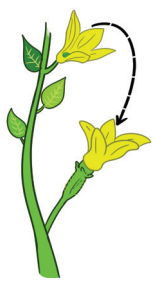
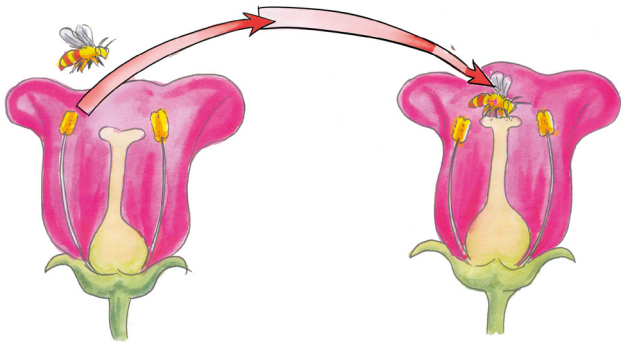


Fig 9.5 Self pollination

- **Cross pollination** - This is the transfer of pollen grains from the anther of one flower to the stigma of **another flower** on a **different plant** but of the same type.



Flower in plant A *Flower in plant B*

Fig 9.6 Cross pollination

Agents of pollination

These refer to things that help to transfer pollen grains from the anther to the stigma of another flower. They include:
Insects: example bees and butterflies
Birds: example: sunbird; wind, water.

- **Birds** and **insects** are attracted by **bright colours** and the **sweet scent** of flowers. They help in the transfer of pollen grains. The wind blows the pollen grains from flowers of one plant to the stigma of flowers on another plant or within the same plant.
- **Water** flows downstream carrying pollen grains with it.

b)Fertilisation

- After pollination, fertilisation follows.

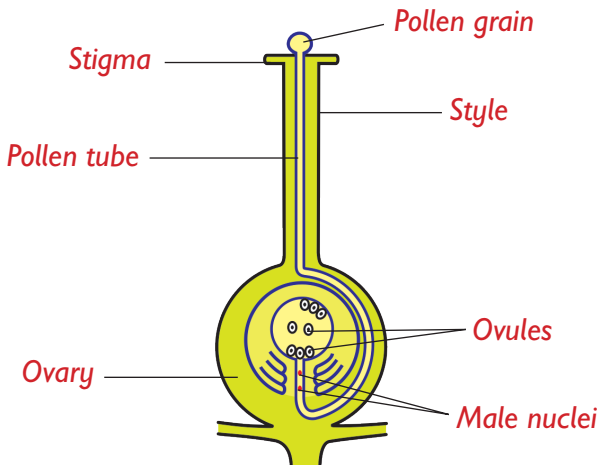


Fig 9.7 Fertilisation process in a flower

- When pollen grains reach the stigma, it **germinates** and grows down through the style to the ovary and meets the ovules. This process of joining together of the nuclei of pollen grains with that of ovules is called **fertilisation**.

After fertilisation, the ovules become **seeds** and the ovary develops into a **fruit**.

c) Seed dispersal

Seed dispersal is the scattering away of seeds in order to germinate and grow into new plants.

Agents of seed dispersal

a) Self-dispersal

This is whereby fruits split open with a lot of force (explode) and throw out the seeds.

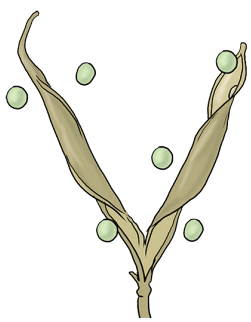


Fig 9.8 Pea pod exploding to release seeds

b) Wind –Wind flows and spread the plant seeds at long distance

c) Animals

- Animals eat juicy and fleshy parts of fruits and scatter away the seeds. Examples of such fruits are mangoes and oranges.
- Some fruits and seeds have **hooks** or **spikes** which stick to the hair, fur or clothing of passing animals and human beings. They later drop at distant places from where they grow into new plants. An example is the **black jack** seed.



Fig 9.9 Black jack seeds

d) Water

Fruits and seeds are dispersed by water.



Fig 9.10 Coconut seed being dispersed by water

d)Germination

Activity 9.4 Investigating germination of seeds

1. Plant some bean or maize seeds in a tin or box.
2. Water the planted seeds for one week as you observe what happens.



3. Discuss your findings.

Germination is the process by which a seed develops into a young plant known as **seedling**. During germination, the following take place:

- The seed **absorbs** water through a tiny hole on the seed.
- The seed coat (testa) **bursts** and splits open.
- The **radical** comes out to form a tiny root.
- The **plumule** forms a **shoot** with tiny leaves and grows upwards.
- The **seedling** grows to become a **mature** plant.

Self –Test 9.1

1. What is the function of a flower in a plant?
2. Draw and label the different parts of a flower.
3. _____ and _____ make up the stamen of a flower.
4. Name two seeds dispersed through wind and through water.
5. Many petals together form_____while sepals form_____
6. What is pollination?
7. Name two types of pollination.

9.4 Asexual reproduction methods

Find out

Different types of asexual reproduction.

Activity 9.5 Investigating of types of plant asexual reproduction

1. Put the potato tuber into the soil and leave them for one week.
2. Observe the potato tubers such as the one alongside. What can you see?



In **asexual reproduction**, there is no need of male or female sex cells to come together. Here, a certain plant part may separate from the parent plant and grow into a **new plant**. Asexual reproduction methods include the following:

- Use of cuttings
- Grafting
- Layering
- Use of suckers

a) Use of cuttings

Activity 9.6 Vegetative reproduction using stem cuttings

1. Cut stems of sugarcane or cassava plant.
2. Plant the stems in the kitchen garden at home.
3. Water them for five days then make your observations.



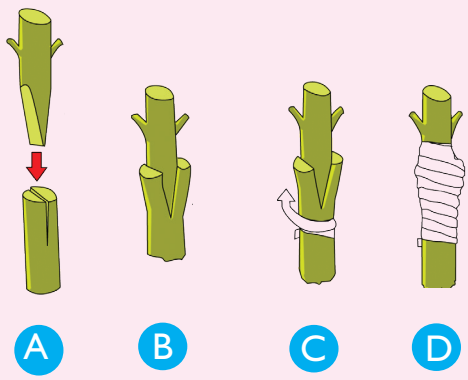
We can use leaves, stem or root cuttings to come up with new plants.

e.g sweet potatoes, cassava, yams and sugarcane.

b) Grafting

Activity 9.7 Grafting

1. Look at the picture below.



2. What is going on in the picture above?

The picture above shows the process of **grafting**.

In grafting, **scion** is added to the stem of another plant of same type called the **root**. The two unite and come to grow together as one plant.

Examples of plants that can be grafted: **oranges, lemons, mangoes, avocados.**

Note: Grafting helps to improve the quality of a produce of certain plant.

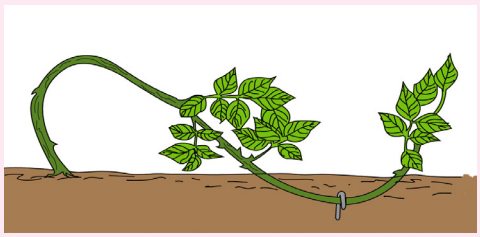
Project work

1. Practise grafting using an orange plant (scion) with a lemon plant (root stock) at home.
2. Take care of the plant until it produces fruits.
3. Taste the fruits produced. Are they different from the original orange fruits?

c) Layering or marcotting

Activity 9.8 **Layering**

1. Bend one of the branches of a passion tree down as shown below. Peg the branch into the soil and pile a heap of soil on the branch.
2. Leave it for one week and check if the roots have developed.



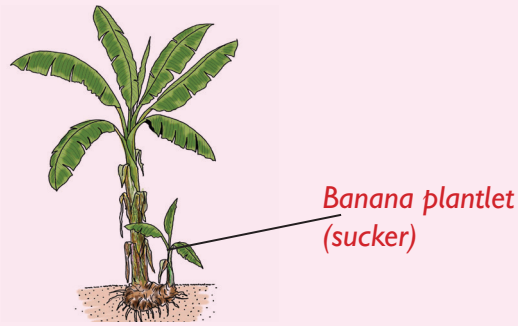
3. Cut off the branch from the main plant then plant it in a different garden. Monitor the growth of the plant until fruiting.
4. Monitor the growth of the plant until fruiting.

Layering also known as **marcotting**. It is a form of asexual reproduction whereby rooting is induced in part of a tree branch as shown above.

d) Suckers

Activity 9.9 **Vegetative reproduction using suckers**

1. Visit a banana or a sisal plantation.
2. Separate the plantlets from the main plant carefully. Plant it in a different place.



3. Water the plantlet for a few days. Do they grow into mature plants?

The small plants (plantlets) growing besides the mature banana or sisal plants are called **suckers**. The suckers can be separated from their parents and be planted at another location. The new plant continues to grow to become a healthy mature plant. eg: Pineapple, Ginger, Aloe vera.

9.5. Reasons for plant reproduction

Find out

The reasons for plant reproduction.

Activity 9.10 **Investigating the importance of plant reproduction**

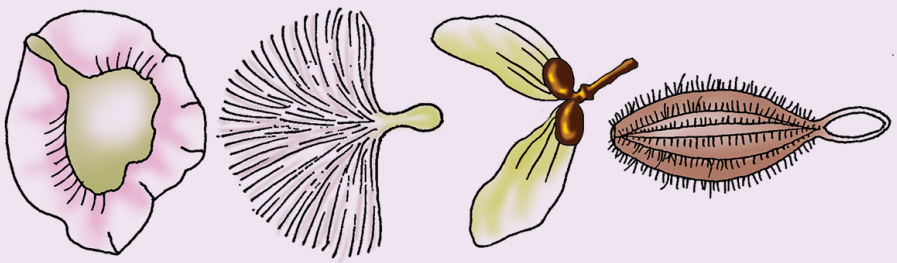
1. Search in library textbook or search engine on plant reproduction.
2. Write down the reason for plant reproduction.

Reproduction in plants is important because it:

- Improves the quality of produce of crop plants.
- Prevent the plant species from becoming extinct.
- Helps to control plant diseases through mixing of genes.
- Increases food production through research.

UNIT TEST 9

1. What is the difference between pollination and fertilisation?
2. The three agents of pollination are _____, _____ and _____.
3. The ovules in a flower are produced in the _____ while the pollen grains are produced in the _____.
4. Distinguish between male and female parts of a flower using diagrams.
5. Potato tuber is an underground _____. (stem, root)
6. After fertilisation _____ becomes seeds while _____ develops into a fruit.
7. Which method of reproduction would you recommend for the following plants?
   a) Banana _____
   b) Sugarcane _____
8. Hagimana came across the following seeds during a field trip. The seeds are likely to be dispersed by _____.



A B C D

9. Distinguish between grafting and layering. Use diagrams.
10. Which conditions must be present for germination to occur?
11. Explain why bee-keeping is important near a sunflower farm.
12. Draw and label the parts of a flower.
13. Match each part of the flower in the table that follows with its function using a line.

Part		Function	
a)	Petal	i)	Contains ovules
b)	Sepal	ii)	Receives pollen grains during pollination
c)	Stigma	iii)	Holds stigma in position
d)	Style	iv)	Produces pollen grains
e)	Ovary	v)	Protects young flower
f)	Anther	vi)	Attracts insects and birds

14. Give a reason why some plants have brightly coloured petals.
15. Why do most flowers have scent?

Unit 10 Sustainable waste management

1. Look at the picture below.



Fig 10.1

2. Is there a better way in which we can manage the wastes in the picture?

10.1 Classification of wastes

Find out

1. How wastes are classified.
2. What should happen to the wastes.

Activity 10.1 Classifying wastes

1. Take a walk around the school compound.
2. Look out for any types of wastes.
3. Group the wastes as shown in the table below.

Hazardous wastes	Organic wastes	Recyclable wastes

4. Discuss the advantages and disadvantages of each category of wastes.
5. How should we dispose of each type of waste?

The two main categories of wastes are **biodegradable** and **non-biodegradable** wastes.

a) **Biodegradable wastes** – these are wastes that can be **decomposed** by microorganisms to form organic manure.

They include kitchen garbage, animal dung, vegetable remains among others.

b) **Non-biodegradable wastes** – wastes that cannot be decomposed by microorgarnism. They are recycleable. They remain in the environment forever.

Examples: plastics, polythene bags and glass.

Waste can also be grouped as follows:

a) **Hazardous wastes** – wastes that can harm or cause diseases, fire etc. Examples are biomedical wastes.



Fig 10.2 Wastes in a waste bin



Fig 10.3 Biomedical wastes

b) **Toxic wastes** – wastes that can cause death. Examples: chemicals and gases such as carbon monoxide.

c) **Flammable wastes** – wastes that can easily catch fire and react explosively with air. Examples : waste fuels and gas cylinders.



Fig 10.4 Gas cylinder

Remember!

We should form a habit of separating wastes into their various categories. For example, hazardous, biodegradable and non-biogradable recyclable wastes.

10.2 Sources of wastes

Find out

Different sources of wastes.

Activity 10.2 Discussion

1. Think about the activities that take place in the following places:
   - Farms
   - During general cleaning at home
   - Industries
   - Medical centres

(i) Which ones create wastes?

2. For each category, discuss some wastes that come about as a result of the activities.

Sources of wastes in our environment include:

- **Urban** or **municipal wastes** - these are wastes collected from residential areas, markets, streets and other places mostly in town. Examples: plastics, old clothes, pieces of glass, organic matter and food remains from households and wastes from business premises establishments.
- **Industrial wastes** - these originates from cement factories, power stations, textile factories, food processing industries and many others.

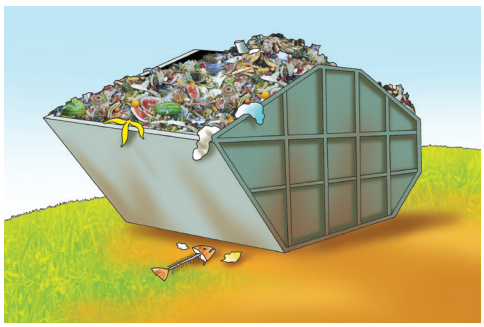


Fig 10.5 Container where wastes are dumped in town

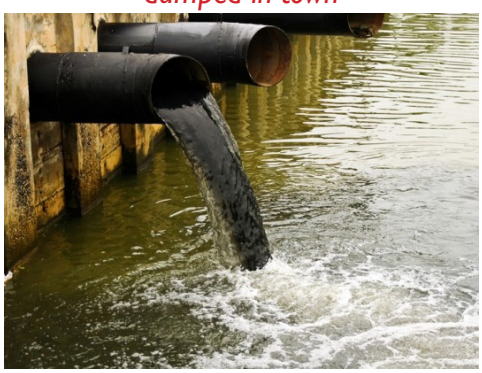


Fig 10.6 Industrial waste being dumped in a water source (This should be discouraged)

Remember!

Some of these wastes especially those from chemical industries can be hazardous, so we need to be careful when handling them.

- **Agricultural wastes -** Bio-degradable wastes, are associated with agricultural activities.

  Examples: crops remains, animal remains,e.t.c



Fig 10.7 Agricultural wastes

- **Construction wastes -** these are wastes from construction sites. **Examples:** unwanted materials produced at the construction sites, empty cement bags, broken bricks, soil and packaging boxes .



Fig 10.8 Construction wastes

- **Biomedical wastes -** generated from hospitals, clinics and other medical institutions. **Examples:** expired drugs, surgical dressings, plastic syringes and used gloves.



Fig 10.9 Biomedical wastes

- **Electronic sources of wastes - e-waste** or **e-scrap** are old electronic and electrical devices. **Examples** : old DVD, television sets, telephones, computers, vacuum cleaners and their parts.



Fig 10.10 Electronic wastes

- **Wastes from automobiles -** are wastes that come from cars or old vehicles. Also, oil and grease.



Fig 10.11 Automobile wastes

10.3 Waste management techniques

Find out

1. How garbage is collected.
2. How garbage is safely transported to a landfill.
3. How recycying, upcycling and re-using of waste is done.

Activity 10.3 Applying waste management techiques

1. Collect the garbage around the school surroundings.
2. Apply waste sorting techiques
3. Search in library, text book or search engine on waste management.
4. Write a report on compositing of waste,upcycling and recycling of waste and waste processing .

Wastes should be handled depending on their types:

- **Hazardous wastes -** These can cause harm. They should either be buried or burnt in an incinerator. For example, hospital waste.



Fig 10.12 Burning wastes in incinerator

Note :The golden rule of environmental stewardship

Always remember the **3Rs** - Recycle, Reuse and Reduce!

Waste management refers to the process of handling wastes after its production. Some ways of handling wastes include:

- Collection of the wastes.
- Safe transportation of wastes.
- Waste processing to identify what wastes are to be re-used, recycled or decomposed.

a) Professional garbage collection

Garbage or wastes can be collected in two ways:

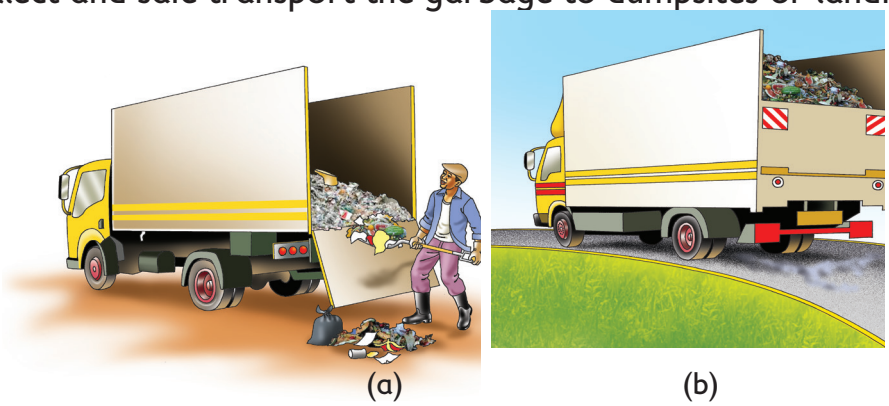
- The garbage is thrown into dust bin.
- By depositing the wastes in a compost pit.



Fig 10.13 Throwing waste in dustbin

b) Safe waste transportation

Collect and safe transport the garbage to dumpsites or landfills.



(a) (b)

Fig 10.14 (a) Garbage collection vehicle (b) Transportation of garbage

c) Proper waste processing

Biological , chemical and mechanical methods used are:

1. Changing chemical composition of waste.
2. Removing environmental pollutant from industries and municipal wastes.
3. Treating sewages before discharging.

(d) Recycling and re-using

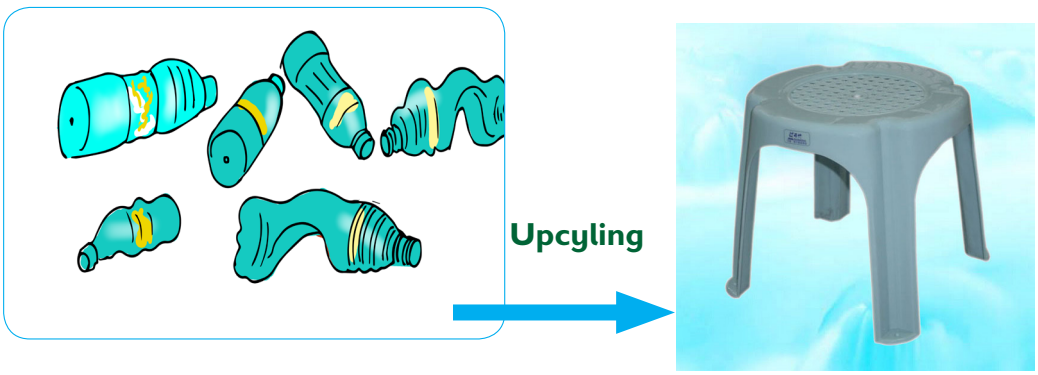
Recycling is the process of converting waste materials into same new materials. Old plastic bottles can used to make new ones.

Re-using is making use of the waste product for another purpose from the **original one.**

For example: old plastic tins can be used as flower pots.

e) Upcycling

Upcycling is changing the wastes into different utility items. For example, plastic bottles can be used to make chairs, toys among others things.



10.15 (a) Waste bottles

(b) Recycling of plastic bottles to give plastic stool.

f) Compositing

This is making use of natural processes to **decompose.** These wastes materials (biodegradable)are dumped in a compost pit and left to rot or decay. The manure formed is used in agriculture to improve crop production.

UNIT TEST 10

1. What is waste management?
2. With examples, give the difference between **biodegradable** and **non-biodegradable** wastes.
3. a) What are hazardous wastes?
   b) Write down different types of hazardous wastes and their potential danger.
4. Distinguish between recycling and re-using wastes?
5. Recently, Kigali was ranked as the cleanest city in Africa. How do you think the government of Rwanda has managed to do this?
6. The golden rule of waste management is 3Rs. What does it stand for?
7. Give the missing information in the table below.

	Type of waste	Examples	How to manage
(a)	Industrial waste		
(b)	Medical waste		
(c)	Electronic waste		
(d)	Agricultural waste		

8. What do you understand by the term 'professional garbage collection'?
9. Mungwana's computer got spoilt. He took it and dumped it in a compost pit nearby his home. Comment on this.
10. What can you advise Gamka who doesn't like collecting garbage in her home compound?
11. Explain what landfill is and its importance in the society.
12. What should be done to hazardous wastes?
13. Wastes are a must! Discuss this statement.

Unit 11 Circulatory System

1. Study the pictures below carefully.



Fig. 11.1

2. What is happening in picture A? How about picture B?
3. Discuss the consequences of poor health care shown on picture A and B

11.1 Main function of human circulatory system

Find out

1. The main function of circulatory system.

Activity 11.1 **Investigating the function of human circulatory system**

1. Research in library text book or search engine on human circulatory system
2. Write down your findings

The main functions of the human circulatory system include

- Transport oxygen to blood cells.
- Transport digested food nutrients to the cells of the body.
- Transport carbondioxide from cells to excretory organs.
- Transport hormones to the glands.

11.2 Organs of the human circulatory system

Find out

1. The main organs of the human circulatory system.

Activity 11.2 Identifying organs of the human circulatory system

1. Use a chart of blood circulation and name main organs of circulatory system.
2. Watch the video on human blood circulation using the link:
   https://www.youtube.com/watch?v=_qmNCJxpsr0

The circulatory system in human beings is made up of three main organs:

- **The heart** - This is a muscular organ that **pumps** blood to all parts of the body.
- **Blood vessels** -These are **tubes** that carry blood around the body. They are of different types depending on what they do.
- **Blood** - This is the **transport fluid** in the body.

Structure of the human heart

Activity 11.3 Drawing the structure of the human heart

1. Research from library text book about the heart structure.
2. Draw the diagram of the human heart in your notebook.
3. Label the various parts of the human heart.

The human heart is a muscular organ that **pumps blood** to all parts of the body. It is divided into **four chambers**:

- Two chambers are on the upper side of the human heart. They are called **Auricles** or **atria** (singular-**atrium**).
- Two other chambers are located on the lower side of the human heart. They are called **ventricles**.
- The heart also has blood vessels. Example, **vena cava**, **pulmonary artery**, **aorta** and **pulmonary vein**.

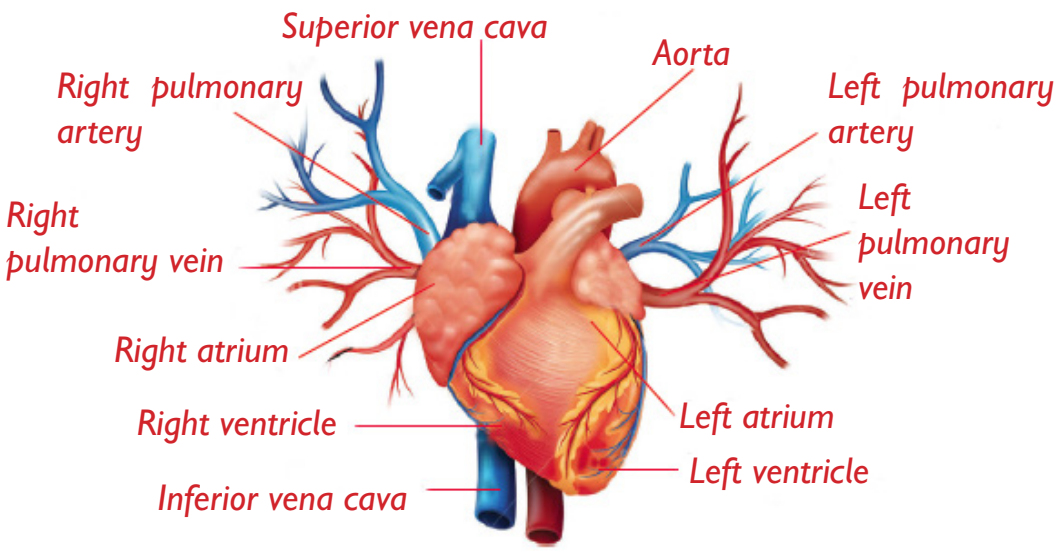


Fig 11.2 Parts of the human heart

Note : Further, the human heart chambers are separated by valves on both the left and right sides. Valves prevent the blood from flowing backwards.

Separating the left side of the heart from the right side is a muscular wall called **septum.**

Remember!

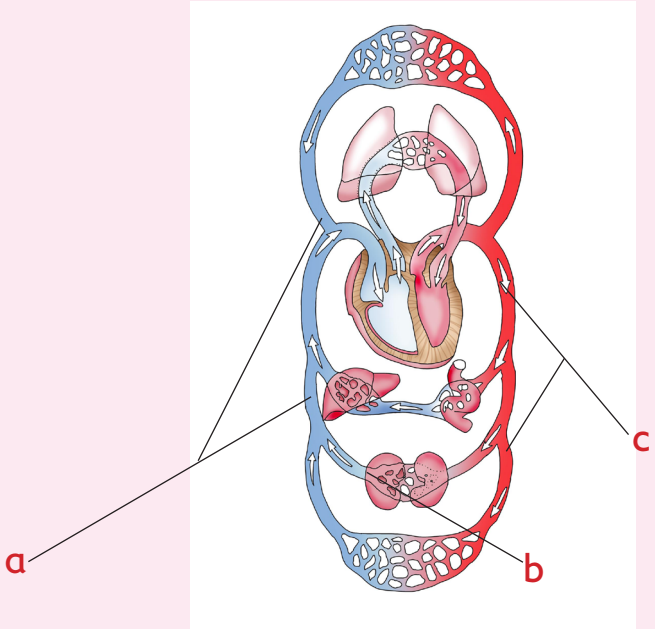
The division of the heart into four chambers is important as it ensures that oxygenated and deoxygenated blood do not mix.

11.3 The process of human blood circulation

a) Blood vessels

Activity 11.4 **Identifying different types of blood vessels in human beings**

1. Observe the picture below of human blood circulation. Name the parts labelled a, b and c.



2. Trace the path of blood from the heart to the lungs and to all parts of the body and back using the picture above.
3. Watch the video on human blood circulation using the link:
   https://www.youtube.com/watch?v=_qmNCJxpsr0
4. Try to trace the path of blood from the heart or other body parts.
   - How does blood flow from the heart to other body parts? Which vessels are involved in the process?
   - How does blood flow from the other body parts back to the heart? Which vessels are involved in the process?
5. Draw a diagram to represent the path of blood from the heart to the lungs and to all parts of the body and back. Compare your diagram to the one in the picture in (1) above. Are they similar?

The blood vessels are interconnected to allow transportation of blood to all parts of the body. There are three major blood vessels:

- **Arteries -** carry blood from the heart to all parts of the body. The main artery is the **aorta**. They lack valves , have thick elastic wall and narrow lumen and carry blood at high pressure.

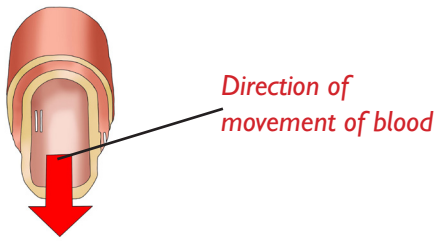


Fig 11.3 Structure of artery (note the absence of valves)

- **Veins -** carry blood from all parts of the body to the heart. The main vein is the **vena cava**. They have thinner walls than the arteries but with wider lumen. They have valves which prevent blood from flowing backwards. Blood in the vein flow at much low pressure than in arteries.

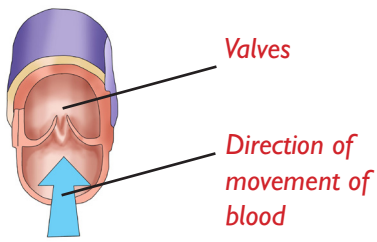


Fig 11.4 Structure of vein (note the presence of valve)

- **Capillaries -** act as a link between arteries and veins. They form a network within tissues. They are very thin -They have tiny holes called **pores** which allow movement of materials in and out. Further, they connect arteries and veins.

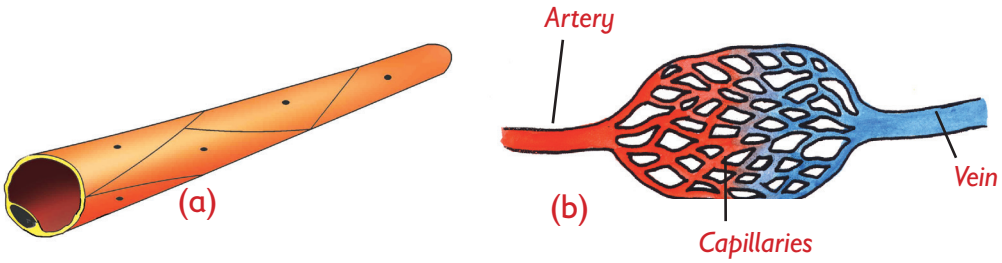


Fig 11.5 (a) A capillary (b) Network of capillaries acting as a link between arteries and veins

b) Blood circulation

The heart pumps blood to all parts of the body.

- The blood leaves the heart and flows to the body parts through **arteries**. The blood returns to the heart from the body parts through **veins**.
- The steps involved in blood circulation are as follows:

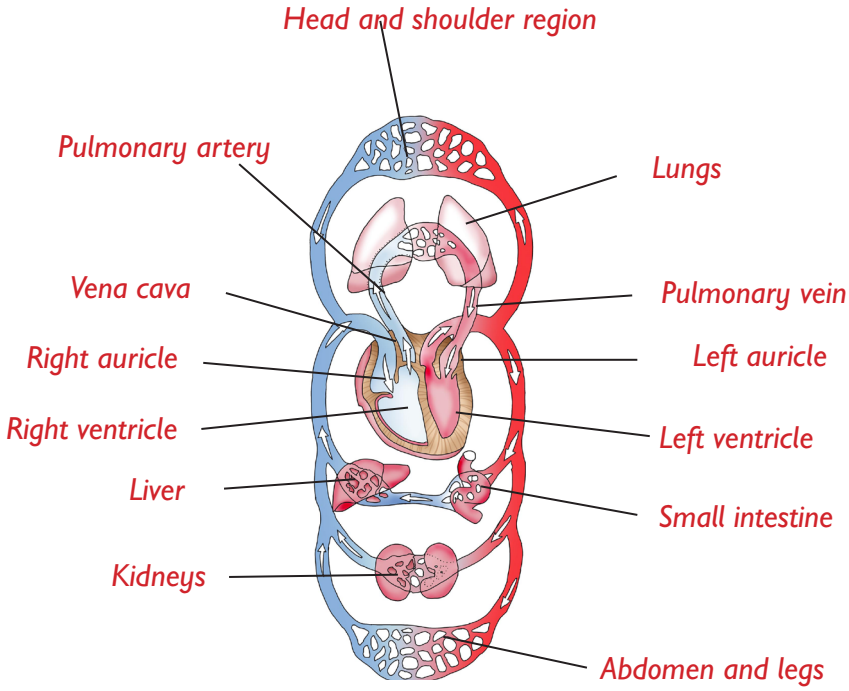


Fig 11.6 Circulation of blood in human body

- Deoxygenated blood from all parts of the body flows through the vena cava into the right auricle (RA) and finally into the right ventricle.
- The walls of the right ventricle then pumps the blood into the lungs through the **pulmonary artery** for oxygenation.

- In the lungs, oxygen is added to the blood and carbon dioxide is removed. The blood is now said to be **oxygenated**.
- The oxygenated blood then flows to the left auricle through **pulmonary vein** and finally into the left ventricle.
- The walls of the left ventricle (which are thicker and more muscular) then pump the blood to all parts of the body through the **aorta**.
- Once the blood circulates to all parts of the body, it flows back to the heart through **vena cava** and the cycle repeats itself.

11.4 Components of human blood

Find out

1. The various components of human blood.
2. The importance of the various components of human blood.

Activity 11.5 **Investigating the components of human blood.**

1. Research in library text book or search engine on components of human blood.
2. Write your findings in exercise note book.

Blood is the red fluid found in our bodies. It has four main components:

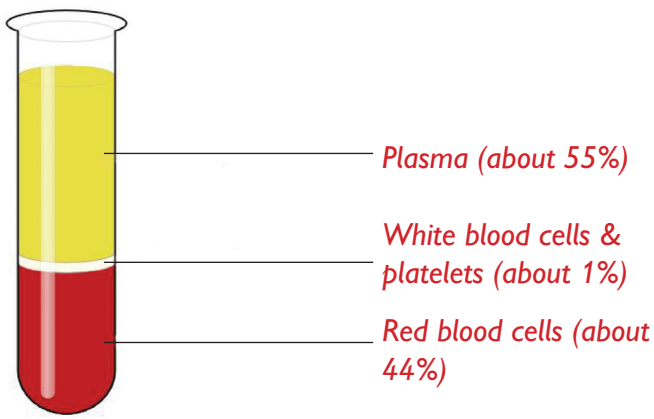


Fig 11.7 Components of blood showing plasma

a) **Plasma -** This is the main component of blood. This part is mainly liquid.

b) Red blood cells - Red blood cells help to carry oxygen from the lungs to all body organs. They contain a red colouring matter called **haemoglobin**.

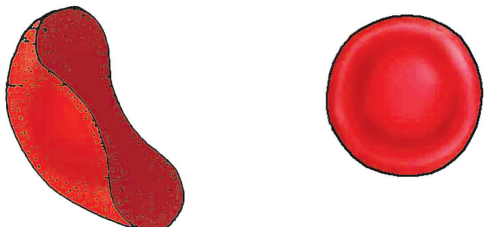


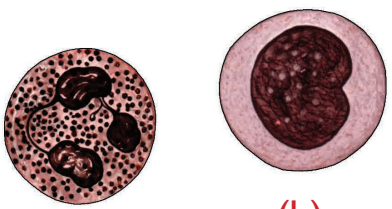
Fig 11. 8 Red blood cell

Remember!

Blood that contains oxygen is called **oxygenated blood**. It is scarlet or bright red in colour. Blood that has lost oxygen and has more carbon dioxide is called **deoxygenated** blood. It is dark-red in colour.

c) White blood cells

White blood cells help to fight and kill disease - causing germs. They are therefore responsible for **body immunity**.



(a) (b)

Fig 11.9 (a) and (b) Types of white blood cell

d) Platelets

Blood platelets are responsible for **clotting** of blood, they therefore help to stop bleeding in case of injury. They also help during healing of wounds.

Self –Test 11.1

1. What makes up the circulatory system?
2. Describe the process of blood circulation using a flow diagram.
3. What is the significance of the organisation of the heart into four chambers and further left and right sides?
4. Complete the table below.

	Blood vessel	Function
(a)	Vena cava	Carries blood from _____ to_____
(b)	Pulmonary artery	Carries blood from _____ to_____
(c)	Pulmonary vein	Carries blood from _____ to_____
(d)	Aorta	Carries blood from _____ to_____

5. Differentiate between arteries and veins.
6. What is blood made of? What are their functions?

11.5 Caring for and health of circulation system

Find out

1. What to do in order to keep our blood circulatory system healthy.
2. How to take care of the human heart.

Activity 11.6 Researching how to keep the blood circulation system healthy

1. Visit the library. Find out from textbooks about practices that help to keep the human heart healthy. You can also use the Internet.
2. Write your findings in a exercise book.
3. Do the same with the rest of the parts that make up the human circulatory system (blood vessels and blood).

Table 11.1 below shows some ways of observing hygiene of the human heart, blood and blood vessels:

Table 11.1: Hygiene of the human heart, blood and blood vessels

How to take care of the human heart	How to take care of blood	How to take care of blood vessels
Eat healthy food. (balance diet) Exercise regularly. Avoid taking too much alcohol. Avoid smoking. Know how to manage your life stresses.	Healthy diet. Regular exercises. Drinking plenty of water. Avoid behaviours that may expose you to HIV and AIDS. Keep your weight checked. Avoid excessive loss of blood.	Eating healthy. Regular exercises. Avoiding smoking and taking alcohol. Managing stress before it gets worse.

Remember!

We should avoid all activities that may lead us into getting infected with HIV and AIDS.

11.6 Diseases or conditions of the circulatory system

Find out

1. The diseases that affect the circulatory system.
2. The causes, signs and symptoms of diseases that affect the circulatory system.
3. How to avoid diseases of circulatory system.

Activity 11.7 Investigating common diseases of circulatory system

1. Research in library textbook or search engine on disease that affect circulatory system.
2. Write your findings in a exercise book.

The diseases that affect the circulatory system include: **high blood pressure, heart attack, stroke, atherosclerosis and deep-vein thrombosis (DVT)**

Table 11.2 Diseases of the circulatory system, their signs and symptoms and prevention and control measures

Disease (condition)	Signs and symptoms	Control and prevention
• **High blood pressure (hypertension)** - this is a condition whereby blood circulates quickly at high pressure through narrow arteries.	• If not treated can lead to heart attack or stroke. • Headache that is persistent. • Nausea or feeling like vomiting. • Blurred vision. • Nose bleeding. • Dizziness or feeling unsteady.	• Avoid salty foods. • Avoid alcohol and smoking cigarettes. • Exercise regularly. • Medication to control disease.
• **Heart attack** - when heart can't get oxygen.The flow of oxygen -rich blood to parts of heart muscles suddenly becomes blocked.	• Pain in the chest. • Sweating. • Heart burn. • Extreme body weakness. • Shortness of breath. • Coughing or wheezing.	• Take the patient to the hospital within 1-2 hours of attack

Disease (condition)	Signs and symptoms	Control and prevention
• **Stroke** -stroke occurs when the blood supply to the brain is interrupted or reduced.	• Weakness or numbness of one side of the body. • Loss of vision. • Loss of speech. • Sudden or severe headache. • Loss of balance.	• Seek medical help immediately.
• **Atherosclerosis** - This is a condition whereby the arteries get blocked through formation of a clot.	• Blocked arteries. • Heart attack. • Stroke. • Pain in arteries and chest in general.	• Avoid risk factors such as smoking, stress and diabetes. • Exercising regularly.
• **Deep-Vein Thrombosis (DVT)** - this is a result of blocked veins due to blood clot formed in one or more of the deep vein.	• Swelling of the affected area. • Pain. • Redness of arm or leg. • Tenderness of the affected part.	• Operation to remove the clot. • Avoid risk factors such as smoking and stress. • Exercising regularly.

11.7 Blood pressure measurement



Find out

Normal measurement of blood pressure

Activity 11.8 A visit to health centre

1. Go to a nearby health centre .
2. Observe how the nurse measures your blood pressure.



3. Ask the nurse what normal blood pressure is.
4. Discuss and interpret your blood pressure.

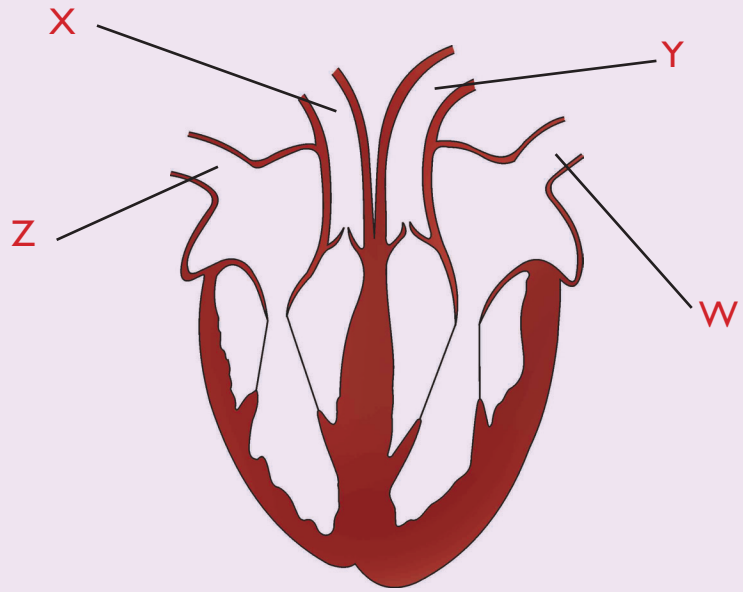
- Blood pressure is the amount of force exerted against the walls of arteries as blood flows through them.
- It is measured using an instrument called **sphygmomanometer/ blood pressure meter.**
- The normal blood pressure is **120/80mmHg.**

Note: Any value lower than **120/80mmHg** is considered **low blood pressure.** Any value higher than **120/80mmHg** is **high blood pressure**.

UNIT TEST 11

1. Name the organs that make up the human circulatory system.
2. Blood leaves the heart to the rest of the body through _____ and returns to the heart through the _____.
3. The _____ prevents blood from flowing backwards in veins.
4. The main artery is the _____ while the main vein is the _____.
5. Draw and label the parts of the circulatory system. Using arrows, show how blood circulates in the body.
6. Name the three types of blood vessels in human circulatory system.
7. Arteries do not have valves. Why?
8. Compare and contrast heart rate during rest and during exercise.
9. How would you ensure that your blood is functioning properly?
10. Why is it important to check our blood pressure regularly?
11. Blood carried by the arteries are under_____ pressure while that carried by veins is under _____ pressure. (high, low)
12. The main function of white blood cells is_____ while platelets help during _____ process.
13. Oxygen is carried in blood in form of_____

Use the diagram below to answer questions 14-17



14. Which of the following statements is correct? The blood vessel mark **W** carries:
    A. Blood from the lungs
    B. Blood to the lungs
    C. Blood to the body organs
    D. De-oxygenated blood
15. The blood vessel marked **X** is the _____
16. Which one of the following statements is not correct about the blood vessel marked **Y**?
    A. Carries deoxygenated blood
    B. Is the major artery in the circulatory system
    C. Carries blood from the heart to the body organs
    D. Is the aorta
17. The blood vessel marked **Z** is _____. It is the largest vein in the body.

Unit 12 Respiratory System

1. Look at the picture below.

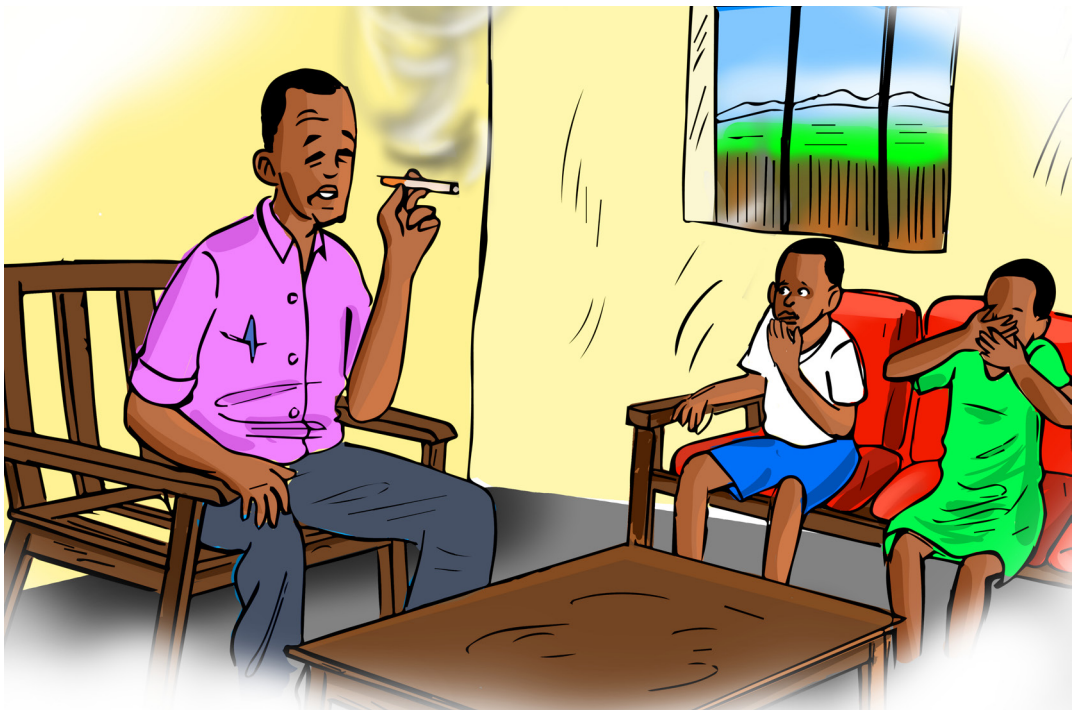


Fig 12.1

2. Is it right or wrong to smoke inside the house where people are?
3. How does smoke affect the health of people?
4. What would you advise people who smoke in public places?
5. Predict what you are going to learn in this unit.

12.1 The human respiratory system and its function

Find out

1. The main function of human respiratory system .
2. The various organs of the human respiratory system.

Activity 12.1 Investigating the main function of the respiratory system

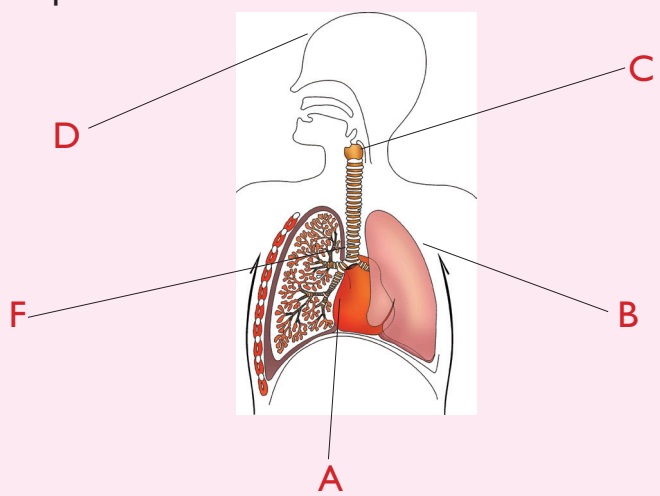
1. Take a deep breathe and note the time on the clock or wrist watch.
2. Close your mouth and nose tightly and hold onto your breathe. How long can you stay without breathing? What does this tell you about breathing?

The main function of respiratory system is to **transport fresh air**(oxygen) into the lungs and **remove waste air** (carbondioxide) out of the lungs.

Identification of organs of the respiratory system

Activity 12.2 Identifying organs of the respiratory system

1. Look at the picture below.



2. Draw and label the human respiratory system in your notebook.

The main parts of the human respiratory system are the **nose, trachea lungs** (windpipe), **bronchi** and the **diaphragm**.

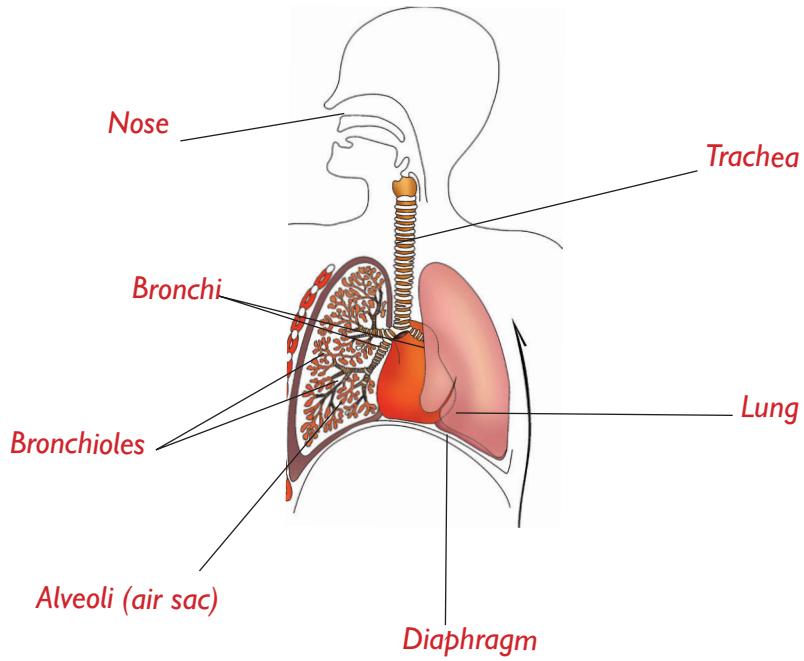


Fig 12.2 Parts of human respiratory system

Table 12.1: Parts of respiratory system and their functions

Part	Description	Function
Nose	The outer part of the respiratory system with two **nostrils**.	Pre nostils allow air to enter into the nose while mucus and hairs clean the air by removing dust particles.
Trachea (windpipe)	Divide into two bronchi, it is kept open by hard rings of cartiliages.	Passage of air from nose to lungs.
Bronchioles	Divide into smaller tubes called **bronchioles** which end up in air sacs or alveoli inside the lungs.	Connect bronchi to airsacs (alveoli).

Bronchus (Bronchi)	The trachea divides into two branches known as **bronchi**, each bronchus enters separately into the lungs.	Connect bronchi to bronchioles.
Lungs	Two lungs are enclosed in the chest cavity. Trachea conducts inhaled air into the lungs through bronchi. Bronchi divide bronchioles. Bronchioles open into alveoli.	Site for gaseous exchange.
Diaphragm	A dome shaped muscular that separates the chest cavity from the abdomen.	Increases the volume of the thoracic cavity and air drawn into the lungs.

12.2 Mechanism of respiration (Breathing in and out)

Find out

1. How the human respiratory system operates.
2. The process of breathing in and breathing out in human beings.

Activity 12.3 Investigating the mechanism of the respiratory system

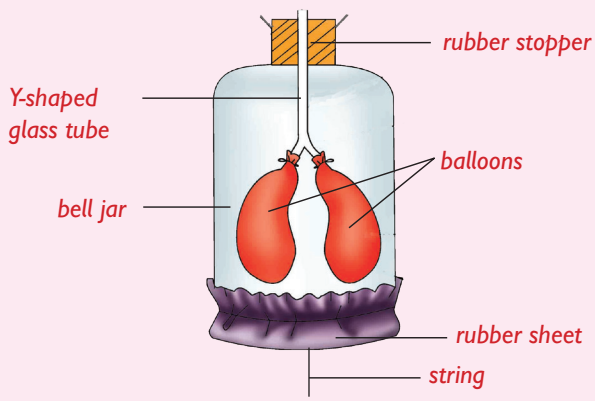
1. Place your hands on both sides of your chest. Take a deep breath. What happens to your chest?
2. Repeat this several times and note what happens.
3. Interpret your findings about breathing process.

Activity 12.4 Experiment to demonstrate how respiratory system works

What you will need

Bell jar, two balloons, rubber stopper, Y-shaped glass tube, rubber sheet, string.

1. Set up the things above as shown in the picture below.



2. What do you think the following parts represent in the respiratory system?
   a) Bell jar
   b) Balloons
   c) Rubber sheet
   d) Y-shaped tube
3. Pull down the string tied on the rubber sheet. What happens to the balloons?
4. Release the string. What happens to the balloons?
5. Repeat steps 3 and 4 several times as you note what happens.
6. How do you think the findings in this experiment relate to the working of the breathing system?

Mechanisms of breathing

Respiration refers to the act of breathing in / inhalation / inspiration and breathing out/ exhalation / expression.

- The bell jar represents chest cavity, Y-shaped tube represents the trachea and bronchi, the balloons represents the lungs and the rubber sheet represents the diaphragm.

Breathing in (inhalation/ inspiration)

- When the rubber sheet is pulled downwards, the **volume** inside the bell jar increases.
- The balloons become **inflated**(air rushes into the ballons). This is similar to what happens during **breathing in**.

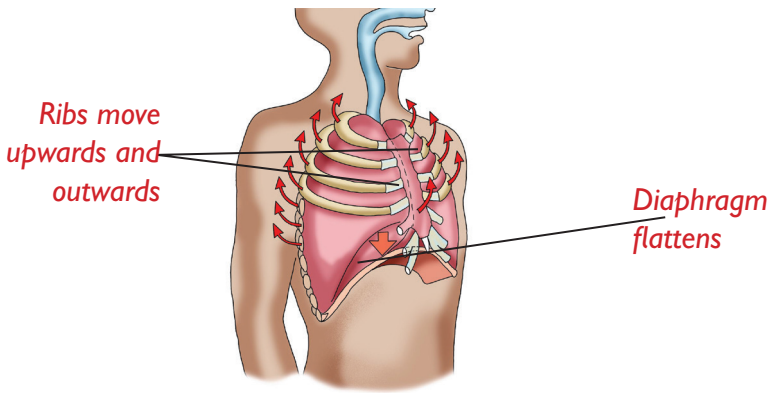


Fig 12.3 What happens during breathing in?

- When the sheet is released, the volume inside the bell jar reduces. Air is pushed out of the balloons and they become **deflated**. This is similar to what happens during breathing out.

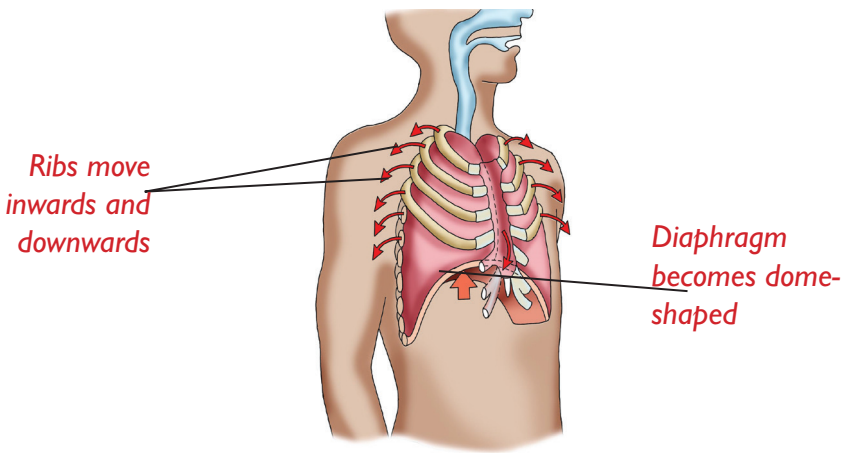


Fig 12.4 What happens during breathing out

Table 12.2: What happens during (inhalation) and breathing out (exhalation)

Part/activity	Inhalation	Exhalation
Diaphragm	Tightens and becomes flat.	Relaxes and becomes dome-shaped.
Ribs	Move upwards and outwards.	Move downwards and inwards.
Chest cavity	Increases in volume.	Reduces in volume.
Lungs	Expand reducing pressure inside them. Reduced pressure leads to air rushing into the lungs.	Reduces in size and increases pressure inside. Increased pressure pushes air out of the lungs.

12.3 Good health practices and behaviours for a healthy respiratory system



Find out

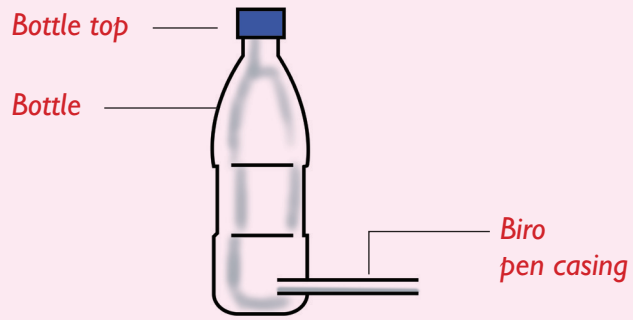
1. Care of the respiratory system.

Activity 12.5 Experiment to demonstrate the danger of smoking cigarette

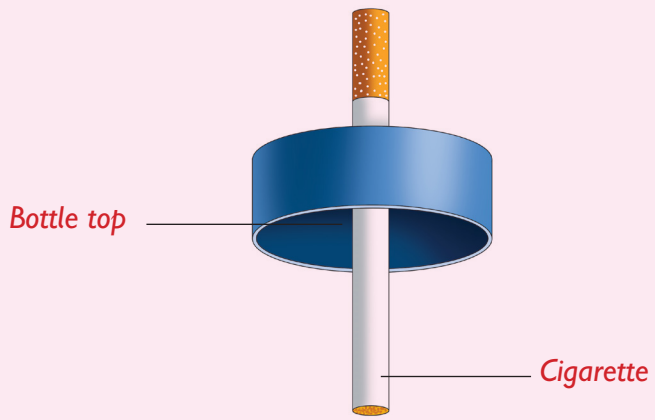
What you will need

- Transparent plastic bottle with cap
- Tissue paper
- Cigarette
- Nail
- Water
- Rubber band
- Match box
- Biro-pen casing with cap

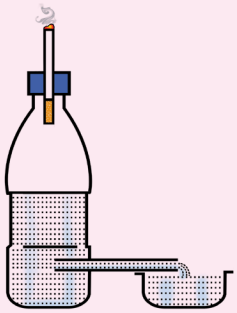
1. Make a hole at the bottom of the plastic bottle. Insert the biro pen casing as shown below. Ensure that the bottle top is on.



2. Fill the bottle almost three-quarter way with water.
3. Take the cap off the bottle, make a hole then insert the piece of cigarette.



4. Screw the bottle cap into the bottle with the cigarette filter inside the bottle.
5. Light the cigarette using the match stick and match box.
6. Remove the cap of the biro pen casing to let the water out as shown below and observe what happens.



7. Once all the water is drained out of the bottle, remove the bottle cap and wrap the tissue paper round the mouth of the bottle. Tie it using the rubber band.
8. Blow air through the biro pen using the bottom of the bottle as shown below.



Why do you think this is important?

9. Unwrap the tissue paper and observe it carefully. What can you see?
10. Discuss the results of this experiment with your friends. Relate your findings here to what happens to the lungs when you smoke.
11. Based on the results of this experiment, do you think smoking is good or bad for our health?

Ways of taking care of the respiratory system include:

- Avoiding **smoking** or **excessive driving of alcohol** to ensure healthy lungs.
- Eating a **vitamin- rich diet**
- Seeking immediate medical care in case of a respiratory problem.
- Exercising regularly to strengthen respiratory muscles.
- Drinking plenty of water.
- Avoid refined sugar, pasta or dairy products.
- Avoiding inhaling unknown or dangerous substances or chemicals.
- When spraying chemicals in the house or any other place, always wear protective clothing, for example, a gas mask.
- Developing good eating habits

12.4 Diseases of the respiratory system



Find out

1. The various diseases that affect the respiratory system.
2. What are their signs and symptoms?

Activity 12.6 **Investigating the diseases of the respiratory system**

1. Using search engine, find out about diseases of the respiratory system.
2. Write down your findings in your exercise book.

Common diseases of the respiratory system include:

- Tuberculosis (TB)
- Whooping cough
- Asthma
- Bronchitis
- Pneumonia

Table 12.3 Signs and symptoms of the respiratory diseases and their control measures

Disease	Signs and symptoms	Control and prevention
Pleurisy	- Sharp pain in the chest during breathing. - Shortness of breath.	- Treatment using antibiotics.
Pneumonia	- Fever and chills. - Chest pains. - Rapid shallow breathing and sometimes wheezing. - Sore-throat. - Cough with greenish-yellow sputum.	- Avoid over-crowded places. - Stay in well-ventilated rooms. - Treatment using antibiotics.
Asthma	- Difficulty in breathing. - Wheezing sound while breathing. - Shortness of breath. - Tight chest.	- Avoid dusty places. - Use of inhalers.
Bronchitis	- Difficulty in breathing. - Increased fatigue. - Blood in sputum. - Shortness of breath. - Wheezing and coughing.	- Avoid smoking. - Use of bronchodilators for treatment.

Disease	Signs and symptoms	Control and prevention
Tuberculosis	- Persistent cough with blood in the sputum. - Fever. - Loss of appetite. - Weight loss and fatigue. - Shortness of breadth. - Chest pains. - General body weakness.	- Avoid spitting or coughing anyhow. - Always cover your mouth if you have to cough. - Eating balanced diet to improve body immunity. - Avoid overcrowded and places with poor ventilation. - Children with persistent coughs should be taken for medical check-up.
Whooping cough	- Coughs that get worse at night. - The child sneezes and has a running and blocked nose. - Frequent vomiting that often leads to the bursting of blood vessels present in the nose. - Sometimes, severe attack of cough can damage the lungs and make the child prone to chest diseases.	- Children should get D.P.T vaccine. - The sick child should be separated from others to avoid the spread of the germ. - Avoid overcrowded places. - Use of antibiotics for treatment. - Children should be kept away from cigarette smoke.

12.5 Suffocation

Find out

1. What suffocation is.
2. The cause of suffocation.
3. First aid for suffocation.

Activity 12.7 Investigating the causes and first aid suffocation

1. Look at the picture below.



2. Discuss what happened to the people in the picture above.

If a person does not get enough air into the lungs, he/she suffocates.

Note: Suffocation may lead to death.

a) Causes of suffocation

- **Choking** - this is the blocking of the windpipe by food or other materials. It prevents smooth flow of air into the lungs.
- **Drowning** – when we drown, the water prevents air from reaching our lungs. We therefore suffocate.
- Carbondioxide inhalation.
- When a place is so hot that you cannot breathe easily you may suffocate.



Fig 12.6 Choking boy

b) First aid for suffocation

In case of suffocation, you should do the following:

- For all the victims, **loosen** the clothing surrounding the neck, move the victim to an open place with plenty of fresh air.
- Gently **slap** between the shoulder blades in case of chocking.
- Perform **abdominal thrusts.**



Fig 12.7 Performing abdominal thrust

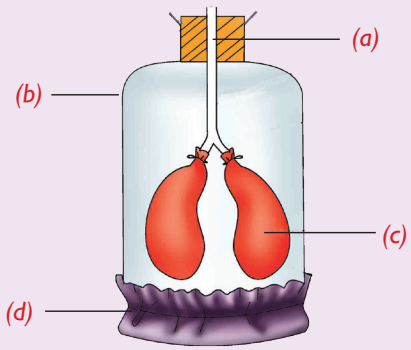
- If the person is unconscious, lie them on a flat floor, clear the airways and perform **chest compressions**.
- In case of drowning, tilt the victim towards one side with the head down.
- If breathing has stopped, mouth to mouth **resuscitation** should be given.

Self –Test 12.1

1. Which four practices would help to prevent respiratory problems in human beings?
2. Name four respiratory diseases.
3. What causes suffocation?
4. Describe the procedure you will use to help a suffocated person.

UNIT TEST 12

1. A human being without a respiratory system is as good as a car without fuel. Explain this statement.
2. Explain the following observations:
   a) Your heart rate increases when you do exercise such as running.
   b) You cannot hold your breathe for more than five minutes.
3. Describe what happens to the chest and lungs during:
   a) breathing in.
   b) breathing out.
4. Dust particles and germs are trapped by the _____ and _____ in the nostrils. Why is this important?
5. The _____ is a sheet of muscles that separates the chest cavity from the abdomen.
6. What do the parts shown in the breathing model below represent in human respiratory system?



7. During breathing out, the waste gas called _____ moves from the blood into the air sacs, after which it is breathed out. On the other hand _____ gas moves from the air inside the air sacs into the blood.
8. Inspiration is to _____ as expiration is to _____
9. Which one of the following organs is not involved in breathing?
   A. Diaphragm B. Bronchioles
   C. Oesophagus D. Wind pipe
10. Describe an experiment you would use to show dangers of smoking to members of your class.
11. How would you ensure that your respiratory system remains healthy?

Unit 13 Reproduction system

1. Study the chat among family members in the picture below.



Fig 13.1

2. Do you think all is well in this family?
3. Predict what you are going to learn in this unit.

13.1. Main function of the reproductive system in human being

Find out

The function of the reproductive system?

Activity 13.1 **Investigating main function of the reproductive system**

1. Using search engines, find out about main function of the human reproductive system.
2. Write down your findings in your exercise note book.

The main function of reproductive system in human being is to produce male and female **sex cells** and to insure the growth and development of **offsprings.** Reproduction is the process of giving rise to new ones of own kind.

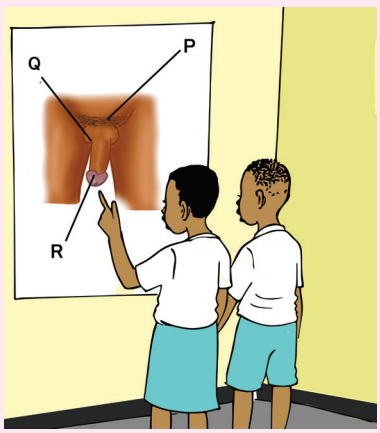
13.2 Male reproductive organs

Find out

What makes the male reproductive systems

Activity 13.2 **Identifying external parts of male genitalia**

1. Observe the picture chart
2. Draw and label diagrams of male external reproductive organs.
3. What are the functions of each part?



Major external male genitalia

From the outside, the male reproductive system is made up of:

- **The scrotum** -This is a bag-like skin that contains the testis and proctects them.
- **Penis** - This is a tube- like muscular organ that deposits **sperms** to female vagina during sexual intercourse.
- **The testicles (or testis plural testes)** - Two oval organs that contain sex glands which produce sperms.

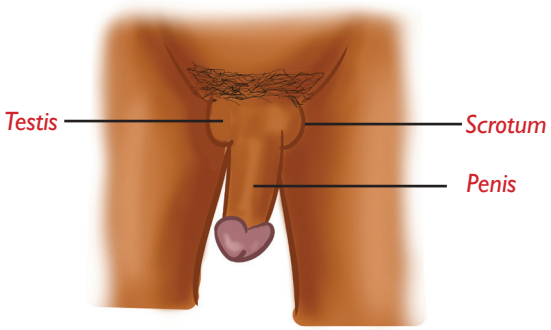


Fig 13.2 External parts of male genitalia

Major internal male genitala

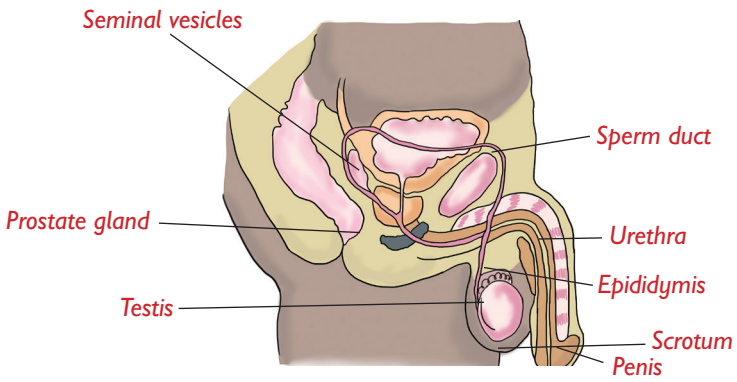


Fig 13.3 Male reproductive system

The male reproductive system is made up of:

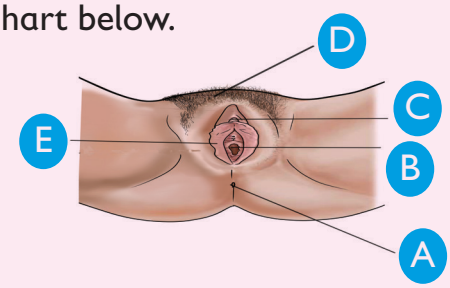
- The **sperm duct** also known as **vas deferens** is a tube that allows passage of sperms from the testis to the urethra.
- **Prostate gland** and **seminal vesicle**s: Gland that produce fluid in which sperms swim. A mixture of sperms and these fluids is called **semen**.
- **Urethra** - This is the tube inside the penis that lets out sperms and urine.

13.3 Female reproductive organs

The female reproductive system is made up of external and internal parts.

Activity 13.3 **Identifying external parts of a female genitalia**

1. Observe the chart below.



2. Can you identify parts of the female reproductive system above?
3. Draw the diagrams in your notebook and label the various parts shown in the chart above.

Major external female genitalia

The major external organs of the female genitalia are shown below.

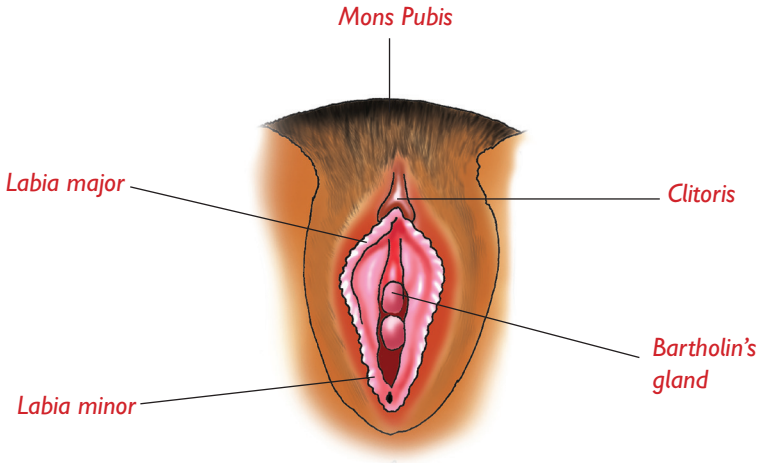


Fig 13.4 The external female genitalia/vulva

The vulva consists of the following external female organs:
The **labia major** and **labia minor -** protect female sexual organ.
The **Bartholin's gland** - secretes mucus which lubricates the vagina.

- **Clitoris** –A small electile female organ.
- Mon pubis
- Urinary meatus
- Vaginary opening

Major internal female reproductive organs

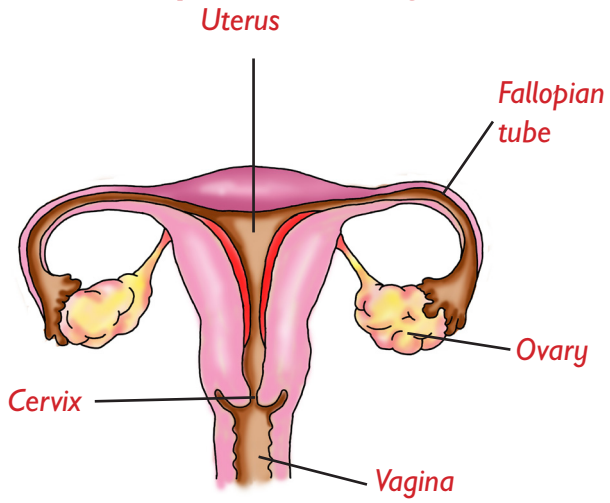


Fig 13.5 Internal female genitalia

Table 13.1 The functions of female internal gentialia

Part	Function	Description
Vagina (Birth canal)	• It receives sperms from penis during sexual intercourse. • It is the passage for the baby during child birth hence the name birth canal.	This is elastic muscular canal that extends from the cervix to the vagina opening.
Cervix	• It allows flow of menstrual blood from uterus into the vagina and directs the sperms into uterus during intercourse.	Made up of strong muscles it connects the uterus to the vagina.
Uterus	• This is the space where foetus develops into full grown baby. • It also has muscular walls that contract to force the baby out through the cervix during birth.	It connects to the fallopian tube in the vagina via cervix .
Ovaries	• They produce ova (eggs) (singular ovum) through ovulation. • The ovaries work in turns to release an ovum after every 28 days.	These are two oval-shaped organs on each side of the uterus.
Fallopian tube (also know as Oviduct)	• They allow passage of sperms from the uterus. • Fertilisation takes place in the fallopian tube.	These are two tubes connecting each ovary to the uterus.

Remember!

Both boys and girls should clean their genitals regularly to avoid infections. Girls should particularly do this thoroughly during **menstruations** this helps to remove the blood stains and germs which may cause genital diseases.

Self –Test 13.1

1. Draw and label the male reproductive organs. Name both internal and external parts.
2. State the functions of every part that you labelled in question (1) above.
3. Name the parts of external genital organs in females.
4. Draw and label the female internal genital organs.
5. Come up with a table on the functions of internal parts of female genitalia.

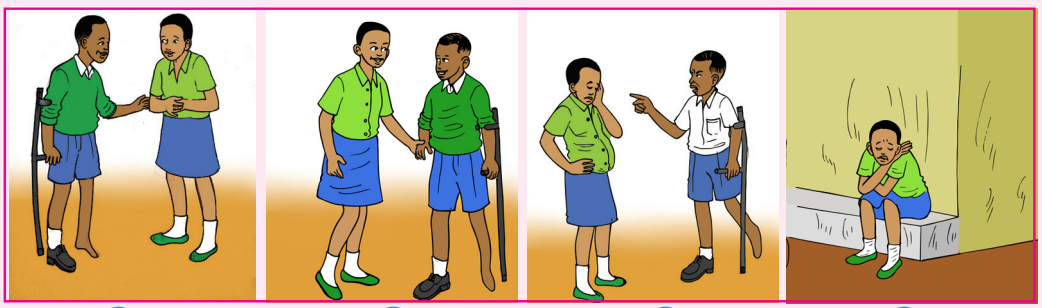
13.4 Prevention of unplanned pregnancy

Find out

1. Consequences of early or teenage pregnancy.
2. How teenage pregnancy can be avoided.

Activity 13.4 Preventing unplanned pregnancy

1. Study the pictures below carefully.



2. Discuss what is going on in the pictures.
3. Discuss how the pregnancy will affect the future life of the girl and the boy.
4. Identify ways through which one can avoid unplanned pregnancy.

Pregnancy occurs when a male and a female engage in sexual intercourse.

A teenage pregnancy/ early pregnancy is pregnancy in the females under age.

a) How to prevent unwanted pregnancy

Unwanted pregnancy/unplanned pregnancy it is involuntary or un expected pregnancy. When a woman gets pregnant against her wish, the pregnancy is not planned.

Unwanted pregnancy/unplanned pregnancy can be prevented by

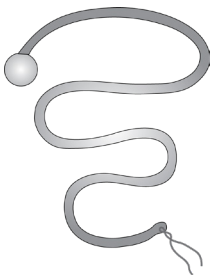
- Abstinence (Not engaging in sexual intercourse).
- Avoid sexual exploitation.
- Using contraceptives diaphragms, pills, condoms, coils / IUD, Norplant, Depo - provera, spermicides)



A Coil



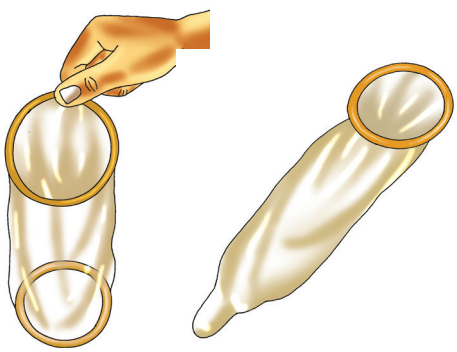
B Pills



C Condoms



D Spermicides



E Condom



E Depo-provera

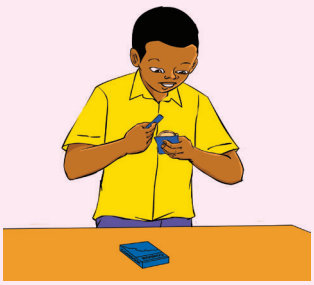
Activity 13.5 Demonstrating of safe use of male condom

What you need

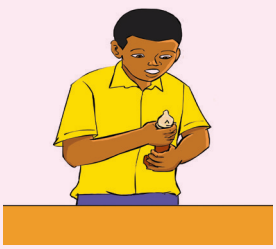
- A packet of condom
- A penis model or a ripe banana

What to do

1. Wash the penis model or the banana (without peeling) to ensure that it is clean.
2. Check on the expiry date on the condom. If expired, do NOT use.
3. Remove the condom from its packet carefully.



4. Determine which way the condom is rolled.
5. Ensure that the reservoir at the tip of the condom is facing away from you.
6. Roll the condom down the length of the penis model or the banana.



7. As for penis, make sure that it is erect and roll the condom down the shaft as shown below then use. Continue rolling until it reaches the end of the banana or model.



A condom is a thin rubber tube, closed at one end used to prevent the sperms from reaching the uterus. It is used during sexual intercourse.

Condoms are about 98% effective. This means that in every 100 users only two get pregnant.

b) Consequences of early pregnancy

The consequences of early or teenage pregnancy include:

- Dropping out of school or college.
- Emotional stress especially for the girls.
- Girls may die during pregnancy or at birth because their bodies are not yet prepared to handle giving birth.
- Teenage pregnancy is associated with a stigmatisation and rejection by familes.
- Illegal abortion.

d) Dangers of abortion

When a pregnant woman attempts to do away with the pregnancy. This is known as **abortion**. Abortion is very dangerous and is illegal in many countries including Rwanda.

Dangers of abortion include:

- Abortion leads to loss of life of the foetus.
- Abortion may cause injury or damage to reproductive organs and other internal organs.e.g cervix, uterus, bladder, rectum.
- Abortion may cause infection due to incomplete abortion or use of contaminated equipments.
- Abortion may cause complete infertility.
- Abortion may cause spontaneous abortion in the future.
- It can lead to death of the mother.

Remember!

AVOID abortion always! It can lead to death!

13.5 Sexually transmitted infections (STIs)

Find out

1. Sexually transmited infections.
2. Signs and symptoms of sexually transmitted infections.

Activity 13.6 Research about STIS

1. Use search engine or library to research on examples of sexually transmitted diseases. What causes them? How can they be prevented?
2. Watch the video using the link: http://www.youtube.com/

Sexually transmitted infections are diseases that can be transmitted from one person to another through **sexual contact**. Examples: **syphilis**, **herpes, gonorrhea**, **chancroid**, **genital candidiasis** and **HIV** and **AIDS**.

Table 13.2: The cause, transmission for the various Sexually Transmitted Diseases.

	Disease	Transmission
1.	**Syphilis** – caused by bacteria	• Sexual intercourse. • Infected mother to the child at birth. • Deep mouth kissing. • Sharing of personal items.
2.	**Gonorrhoea**- caused by bacteria	• Sexual intercourse. • Infected mother to child at birth. • Contacts with an infected person's body fluids or genitals.

3.	**Chancroid** (soft sore disease)- caused by bacteria.	• Sexual intercourse. • Contact with open sores.
4.	**Herpes** simplex caused by a virus.	• Sexual contract. • Skin to skin contact.
5.	**HIV and AIDS** caused by a virus Human Immunodeficiency Virus.	Transmitted through: • Sexual intercourse during breast feeding, infected mother to child. • Contact with body fluids e.g semen and vaginal fluids. • Blood transfusion.
6.	**Candidiasis** –caused by fungi. Can affect: • The skin • Mouth • Throat or • Genitals At this level you will learn about genital candidiasis.	Genital candidiasis is transmitted through sexual intercourse.

13.6 Prevention of Sexually Transmitted Infections (STIs)

Activity 13.7 Investigating ways of preventing sexually transmitted infection

1. Discuss how STIs can be prevented or controlled. Write short notes and share with the rest of the class.

Ways of preventing sexually transmitted infections include:

1. **Abstaining** from sexual intercourse.

2. Married people should be **faithful** to their spouses.
3. Seeking **medical help** immediately on suspicious of infection.
4. Use of condom during sexual intercourse.
5. An expectant mother who feels she has STI should seek medical assistance to ensure the baby is protected from contracting the infection.

13.7 HIV and AIDS



Find out

1. Mode of transmission of HIV and AIDS.
2. How to prevent HIV and AIDS.
3. How to live positively with HIV and AIDS.

Activity 13.8 Research about HIV/AIDS

1. Write down what each letter in the table below stands for.

Letter	What it stands for
H	
I	
V	
A	
I	
D	
S	

2. Discuss what causes , HIV and AIDS. How is it transmitted?
3. Write short notes on these.

HIV stands for human immuno defieciency virus is the virus that lead a acquired immune deficiency syndrome or AIDS for not treated.

Transmission of HIV and AIDS

AIDS is transmitted when we come into contact with various body fluids. Examples: blood, breast milk, semen, vagina fluids and others.

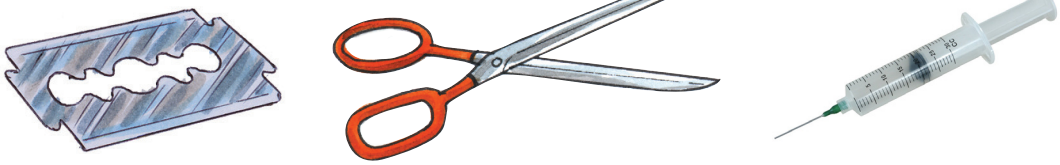
The fluids get into our body during sexual intercourse, blood transfusion,

sharing body, piercing and cutting objects, and mother to child during pregnancy or during breast feeding.

Prevention and treatment of HIV and AIDS

Ways of preventing the spread of HIV and AIDS include:

1. **Abstinence** from sexual intercourse.
2. **Not sharing** body piercing and cutting tools such as razor blades, nail cutters, scissors, syringes and ear piercing, circumcision and tattooing tools.



Razor blade *Scissor* *Syringe*

Fig 13.16 These tools can spread HIV when shared

3. **Seeking medical** help from trained doctors or officers. They use sterilised instruments and have equipment for screening donated blood for presence of HIV.
4. Using **protective clothing** such as gloves when handling bleeding patients.
5. **Avoiding abuse of drugs**. Drug addicts make poor decisions. They may engage in sexual activities This can lead to HIV infection.

NOTE : Like many viral diseases, HIV and AIDS has no cure. However, the severity of the disease may be reduced using drugs called **ARVs** (Anti-Retro-Viral).



Fig 13.17 Sample of ARVs

Remember!

Stop HIV and AIDS spread! Insist on abstinence until you get married

Living positively with HIV and AIDS

Activity13.9 Chatting,reading and searching about living positively with HIV

1. Talk to a person living positively with HIV and AIDS. Write down main points.
2. Read textbooks, brochures, handouts and pamphlets on HIV and AIDS.

   Look out for:

   a) The ways of living positively with HIV and AIDS patients.

   b) Challenges that HIV and AIDS patients come across and how to manage them.

   c) How to live positively with other family members and the community.

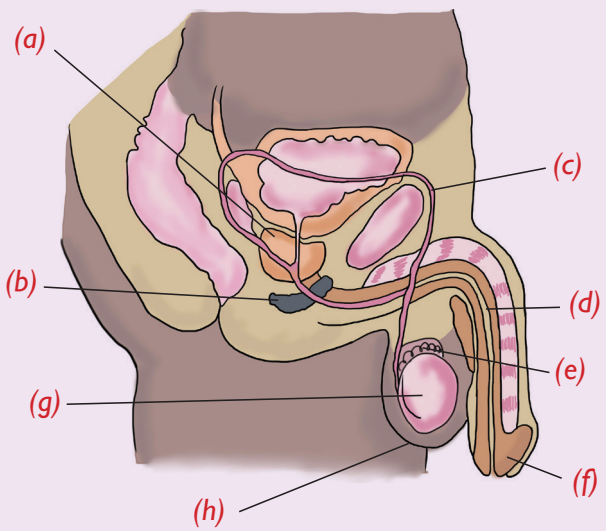
Ways of living positively with HIV and AIDS patients include:

- The patients should be given **love** and **affection**.
- They should not be isolated, but should be given **good care**.
- They should be given a **balanced diet** at all times.
- The infected persons should be **counselled** so that they may accept their conditions and not live in denial.

UNIT TEST 13

1. What is the role of reproductive system in human beings?
2. Draw and label
   a) Internal parts of male genitalia.
   b) Internal parts of female genitalia.
3. In males, sperms are produced in the _____ while in females ova are produced in _____.
4. _____ as well as _____ pass through the urethra in males.
5. Give other names for
   a) Uterus b) Oviduct c) Vagina
6. You have been invited to your local church to talk to your friends about:
   a) How HIV and AIDS is spread.
   b) How the spread of HIV and AIDS can be prevented.
   c) How HIV and AIDS can be controlled.

   List down the points you will talk about.
7. Label the external parts of male genitalia shown below.



8. The most effective way of preventing HIV and AIDS, especially for adolescents is by:
   A. Abstinence B. Using condoms
   C. Having one partner D. Being faithful.

9. Which one of the following statements about STIs is incorrect?
   A. STIs are spread through sexual contact.
   B. STIs can be passed from mother to the unborn baby.
   C. STIs cannot be transmitted through kissing.
   D. The most effective way to avoid contracting STIs is abstinence.
10. Assume that your close relative is suffering from HIV and AIDS. How would you take care of him or her?
11. Which signs will you look out for to know if your sister is pregnant? What should you do there after?
12. What are the consequences of early or teenage pregnancy?
13. Abortion is illegal in Rwanda. Why is this the case?
14. What causes and how can these diseases be prevented?
    a) Candidiasis
    b) Syphilis
    c) Chancroid
15. Match the contraceptive with its use using a line.

	Contraceptive		Use
i.	Depo-Provera	a)	Kills sperms
ii.	Condom	b)	A dome-shaped rubber sheath blocking the uterus
iii.	Diaphragm	c)	An injection that alters menstruation
iv.	Spermicide	d)	A physical barrier for sperms

16. Which one of the following cultural practices cannot lead to spread of HIV and AIDS?
    A. Wife inheritance
    B. Circumcision
    C. Teeth removal
    D. Sharing meat from a common pot.
17. Which one of the following is not a mass communication medium through which HIV and AIDS education can be carried out?
    A. Television
    B. News papers
    C. Radio
    D. Mobile phone
18. Role-play how to avoid early pregnancy with a friend.

Unit 14 Energy management

1. Study the picture below.



Fig 14.1

2. What is going on in the picture?
3. What would you advise the parents of the children to do to help them out of their problem?

14.1. Definition of energy and forms of energy

Find out

What is energy ?

Activity 14.1 Investigating the means of energy.

1. Look at the picture below.



2. What are the people doing in the picture above?
3. Discuss which ability is needed for work in the picture above

When you do work of any kind, you apply **effort** to do it.
Also, when you dig, you apply effort. The source of this effort is the energy stored in your body muscles. So, what is **energy?**
Energy is defined as **'the ability to do work'**.
The various forms of energy include:

- Mechanical energy
- Chemical energy
- Thermal (heat) energy
- Electrical energy
- Electromagnetic energy
- Elastic energy

a) Chemical energy

Activity 14.2 Investigating chemical energy

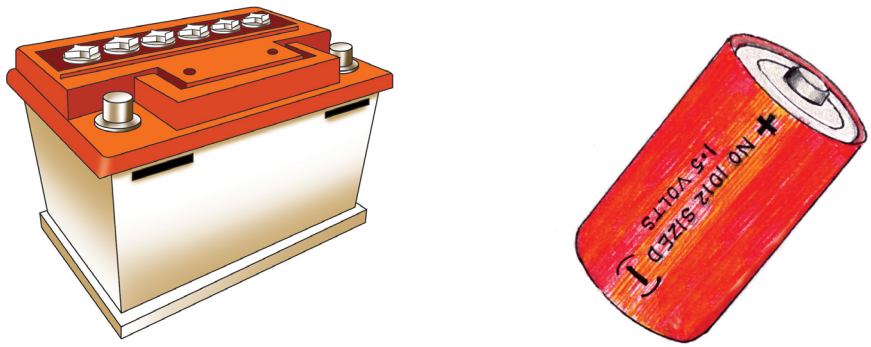
Materials needed

- Fuel (charcoal, firewood or kerosene)
- A gas lighter or matches and matchbox
- A kerosene stove or charcoal burner
- Irish potatoes

What to do

1. Peel the potatoes before cooking. Are they soft or hard?
2. Put the kerosene in the stove or charcoal in the charcoal burner.
3. Light the stove or charcoal burner using a lighter or matchbox.
4. Use the stove or charcoal burner to cook the Irish potatoes. Observe the potatoes after cooking.
5. Which is softer? Before or after cooking? Why?

- We cook potatoes (food) by using energy. The energy stored in charcoal, kerosene or fire wood is called **Chemical energy.**
- **Car batteries** and **dry cells** also have stored chemical energy which is used to run vehicles and produce electricity respectively.



(a) (b)

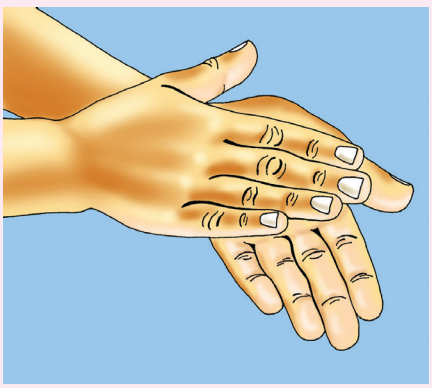
Fig 14.2 (a) Car battery (b) Dry cell

b) Heat (thermal) energy

Activity 14.3 Investigating heat energy

Carry out these activities:

1. Rub your hands against one another for some time. How do you feel?
2. Rub two rough surfaces against one another and then feel the surfaces.



What can you conclude from the results of the activities above?

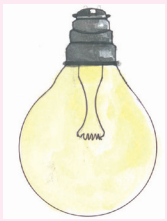
- When we rub our hands against each other, heat is produced. We feel **warm** as a result.
- When we rub rough surfaces together, heat is produced.

Note: Common sources of heat energy are the **sun**, **electricity** and **fuels** such as charcoal, gas, biogas and firewood.

c) Electrical energy

Activity 14.4 Investigating of electrical energy

1. Look at the pictures below.



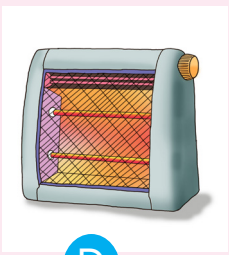
A



B



C



D



E

2. Can you identify the things in the pictures?
3. What do they require in order to work?

Electrical energy is also known as **electricity.** It is produced when electrical currents flow in a conductor.

Uses of electricity

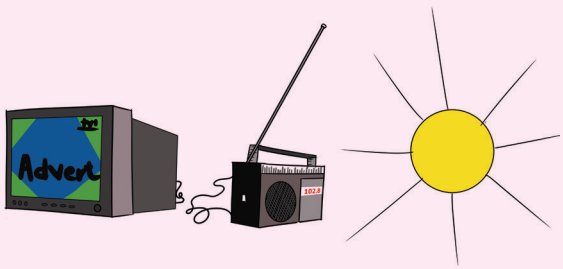
Electricity can be used to do the following things:

- Lighting bulbs.
- Driving machines in factories and industries.
- Operating electrical appliances such as radios, televisions and computers.
- Drying things for example, harvested crops.
- For cooking.

d) Electromagnetic energy

Activity 14.5 Investigating electromagnetic energy

1. Look at the picture below



2. Try to identify the pictures shown.

Electromagnetic energy is a form of energy that is in form of **magnetic and electrical waves** (also known as **magnetism**).

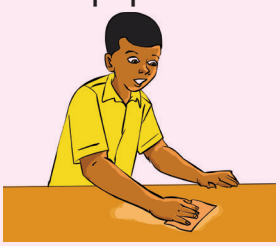
Example: Radio waves.

e) Mechanical energy

Activity 14.6 Investigating mechanical energy

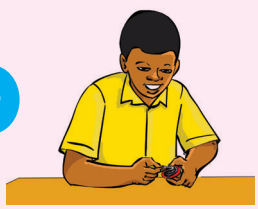
1. Rub top of a table with sand paper.

A



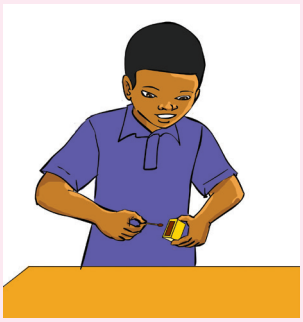
2. Use a file to rub an iron bar.

B



3. Rub a matchstick on the side of a match box.

C



4. Discuss the results of your experiments above.

Energy can be stored or can be in motion. Energy of objects due to their current position and ability to move is called **mechancial energy.**

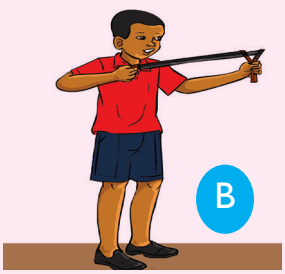
f) Elastic energy

Activity 14.7 Investigating elastic energy

1. Look at the diagram below.
2. What is the person using?



A



B

3. Make your own catapult using pieces of old tyre tubes and a Y-shaped stick. Ask your parent or your guardian to help you.
4. Play with the catapult by throwing stones.
5. How effective was the catapult at throwing stones? Compare it to when you use your bare hands to throw stones.

- **Elastic energy** is a type of energy that is found in elastic materials.

Self –Test 14.1

1. What is energy?
2. Give any five forms of energy that you know.
3. Give three examples of devices that use electric current.
4. Explain briefly how you can generate static electricity.

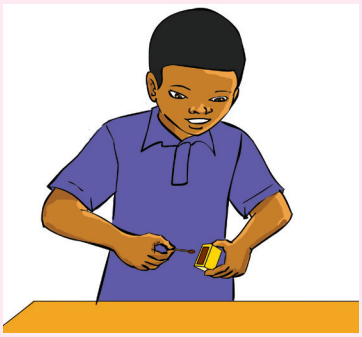
14.2 Energy transformation (Energy conversions)

Find out

How energy is transformed from one form to another ?

Activity 14.8 Investigating energy transformation

1. Put some dry cells in a torch.
2. Put on the switch. What happens?
3. Strike a matchbox using a matchstick. What happens?



4. Blow a whistle or flute. What happens?
5. What does the experiments above tell you about energy?

Energy can be changed from one form to another. We say that the energy has been **transformed**.

Remember!

Energy is transformed from one form into another but it is **never** destroyed.

a) Conversion from mechanical energy to heat (thermal) energy

Activity 14.9 Converting mechancial energy to heat energy

1. Rub top of a table with sand paper. What happens?
2. Use a file to rub an iron bar. What do you see or feel?
3. Rub a matchstick on the side of a match box. What happens?
4. Explain the results of your experiments above.

- When person is using sand paper to rub a wooden table, the heat is produced due to mechanical energy which in converted into heat energy.
- The **file** produces **heat** energy. Mechanical energy is converted to produce heat when using a file.
- The matchstick bursts into flames because of heat produced during rubbing. Mechanical energy stored in the matchstick is converted into heat energy,

  Mechanical energy ⟶ Heat (thermal) energy

b) Conversion from mechanical energy to electrical energy

Activity 14.10 Converting mechancial energy to electrical energy

Rub a comb against your hair. Try to attract pieces of paper using the comb. What happens?

When a comb is rubbed on hair, electrical energy is produced. This electrical energy is called **static electricity**.

Mechanical energy (Comb rubbed on hair) → Electrical energy (Static electricity produced)

Other common examples

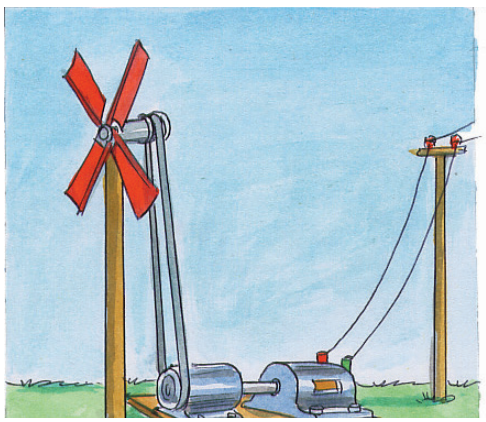


Fig 14.3 Windwill converts mechanical energy to electrical energy

- In **windmills** – electricity is generated by using wind energy.
- In **hydroelectric power stations** – water flowing under the influence of force of gravity is used to turn huge turbines to produce electricity.

c) Conversion from chemical energy to heat (thermal) energy

Activity 14.11 Converting chemical energy to heat (thermal) energy

1. Use the stove or charcoal burner to cook Irish potatoes.
2. Observe the potatoes after cooking.
3. Where did the heat that was used to cook the potatoes come from?
4. What does this tell you about energy conversions?

Charcoal store chemical energy. During burning, this chemical energy is transformed into heat (thermal) energy that is used to cook the food.

Chemical energy (In fuel/ charcoal) → Heat (thermal) energy (Cooks food)

d) Conversion from chemical energy to electrical energy

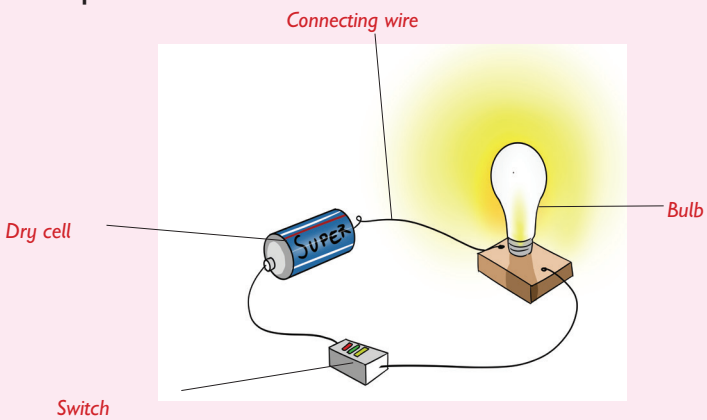
Activity 14.12 Converting chemical energy to electrical energy

What you need

• Dry cell • Switch • Connecting wire • Bulb

What to do

1. Set up an experiment as shown below.



2. Put on the switch. What happens to the bulb?
3. Now, put off the switch. What happens?
4. Write a report about your findings and present to the rest of the class.

When the switch is put on, the **bulb lights**. This is because chemical energy stored in the dry cell is converted into electrical energy

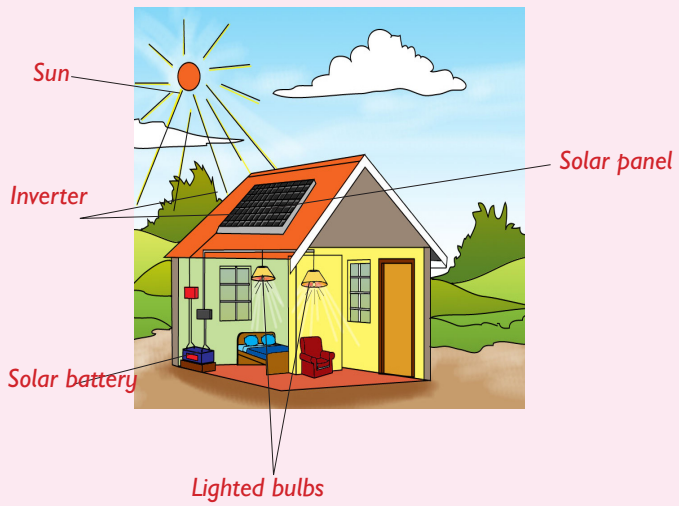
Chemical energy (In dry cell) → Electrical energy (In bulb)

Note: When switched off, the chemical energy is not converted hence the bulb does not light.

e) Conversion from solar energy to electrical energy

Activity 14.13 Converting Solar energy to electrical energy

1. Look at the picture alongside. Have you ever seen such an installation in the community where you stay?
2. What are the benefits of what is going on in the picture?



In the figure above, solar energy is used to produce electrical energy that is used to light the house.

Solar energy (In solar panel) → Chemical energy (In battery) → electrical (In bulb)

Remember!

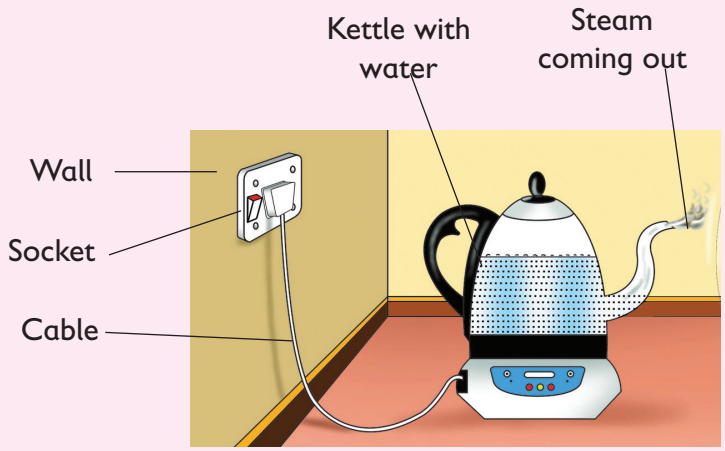
Solar energy can also be transformed into heat energy that can be used to heat water for domestic use, that is:

Solar energy **(In solar panel)** → Heat energy **(In water heater)**

f) Conversion from electrical energy to thermal (heat) energy

Activity 14.14 Converting electrical energy to thermal energy

1. Assemble the apparatus as shown below.



2. Switch on the electric kettle.
3. Summarize the energy transformations that are involved in this experiment.

When the switch is turned on, the **electrical energy** is converted to **heat energy** in the kettle. The heat energy is used to **boil the water** inside the kettle.

Electrical energy ⟶ Heat(thermal) energy

An electric iron also works in a similar way.
Electricity possessed in electric iron produces thermal (heat) energy which is used to straighten the piece of cloth.

Electrical ⟶ thermal energy

(Electric iron) (Heat in iron)

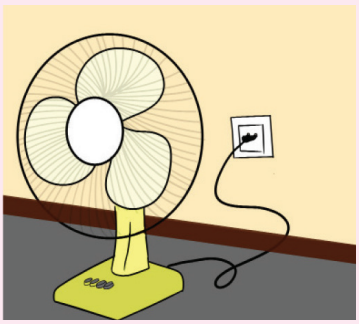


Fig 14.4 Ironing with electric iron

g) Conversion from electrical energy to mechanical energy

Activity 14.15 Converting electrical energy to mechanical energy

1. Assemble the apparatus as shown below.



2. Switch on the electric fan.
3. What energy transformation occurs when an electrical fan is turned on ?

Some electrical appliances transform electrical into mechanical energy e.g electrical blender, electric fan and motors among others.

Electrical energy ⟶ Mechanical energy

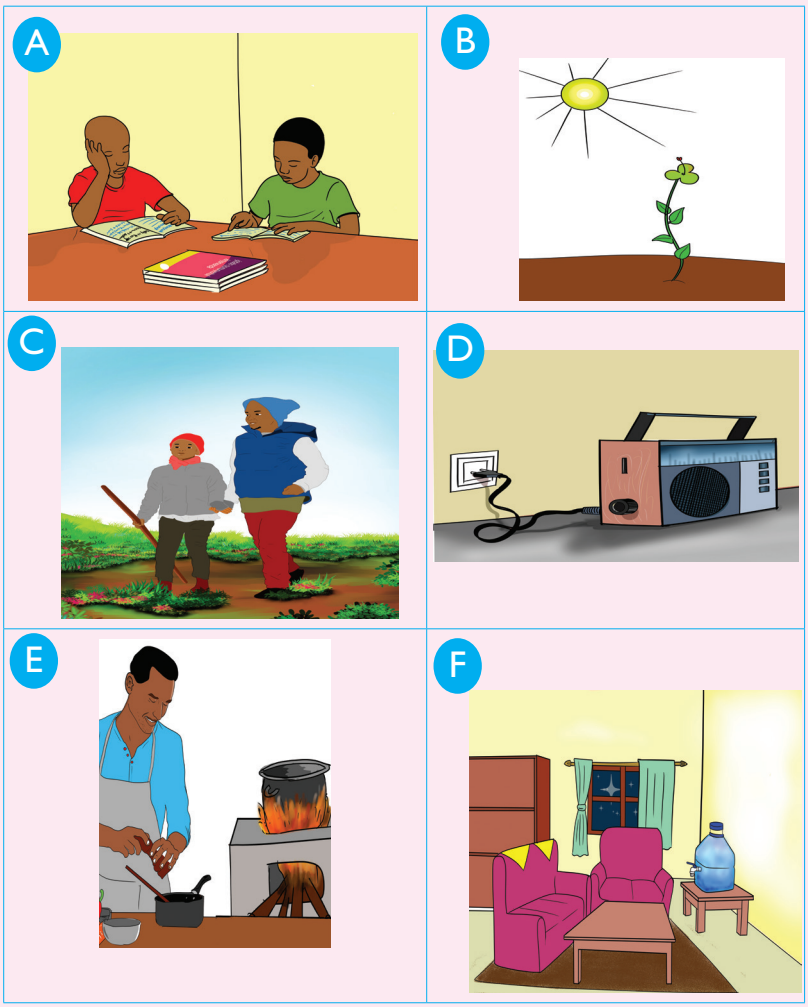
14.3 Importance of energy

Find out

1. Why do we eat food?
2. What would happen if a vehicle ran out of fuel?
3. Suppose the Sun did not exist, what will happen to plants?

Activity 14.16 Investigating the importance of energy

1. Look at the picture below.



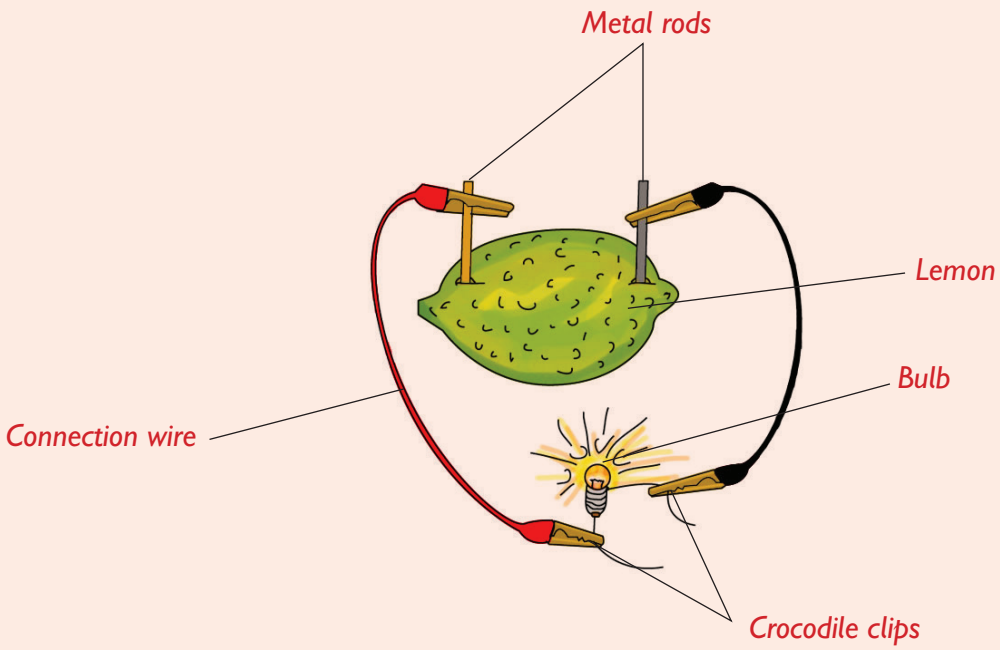
2. Observe the pictures above and discuss the importance of using energy

We can not live without energy, for example, energy helps in **movement,** in **growth,** as a **source of light**, **heat**, and **electricity** among other uses.

- We get **heat** from different sources example, the Sun, from burning fuels, electricity among others.
- Energy helps to grow .
- Many objects around us work using electrical energy and heat energy.
- Energy helps to impove the quality of lives.
- Energy support economic competitiveness.

Self –Test 14.2

1. Name any three forms of energy that you know.
2. Which form of energy is produced when we:
   a) burn charcoal?
   b) connect a bulb across a lemon using wires as shown below?



   c) rub a file on an iron metal?
3. Describe the energy transformations that occur in a
   a) Radio
   b) Hydro-electric power generation station
   c) When throwing a stone using catapult.
4. Distinguish between elastic and thermal energies.
5. Which energy transformations are involved in the diagram in question (2) above?

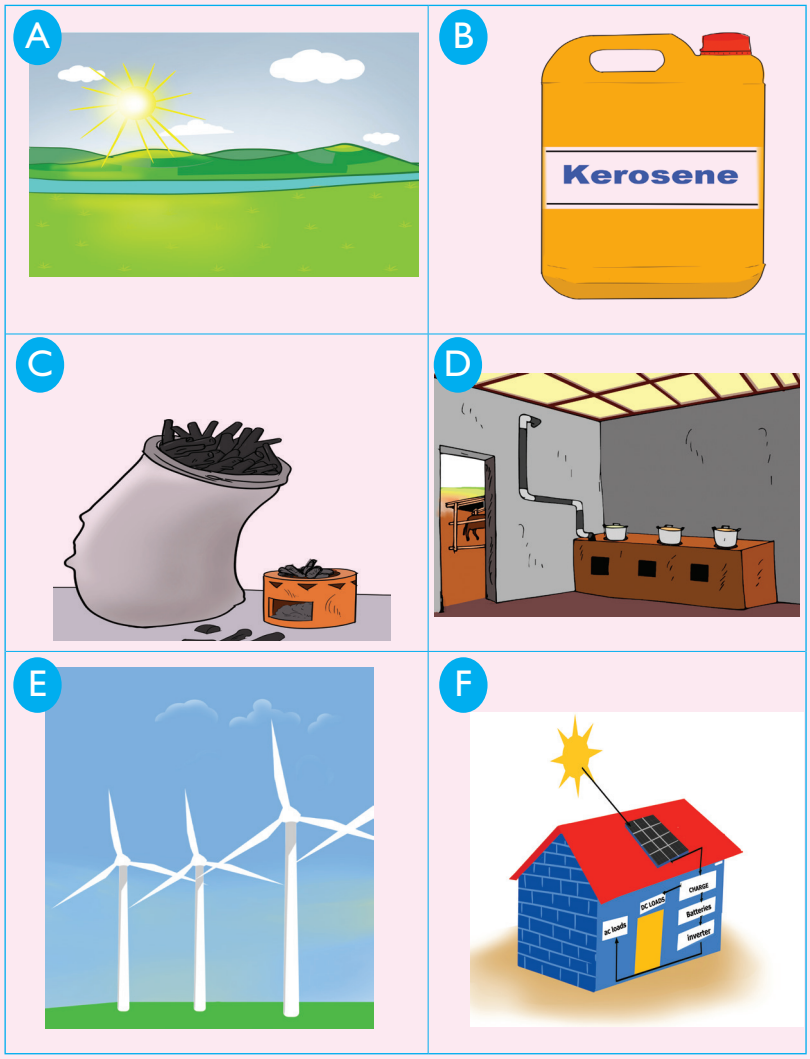
14.4. Sources of energy

Find out

How energy is transformed from one form to another ?

Activity 14.17 Investigating sources of energy.

1. Look the pictures below.



2. Analyse the pictures above and discuss the main sources of energy.

The common sources of energy are:

- The **Sun** - which is the main source of energy.
- **Fuels** – we burn fuel (solids, liquids and gases) to produce heat.

  Examples

  - Gas (or LPG)
  - Diesel
  - Kerosene
  - Petrol
  - Biogas
- **Hydro-electric power** – this is power produced from generators driven by water. An example is **Rusizi** hydroelectric power generation station.

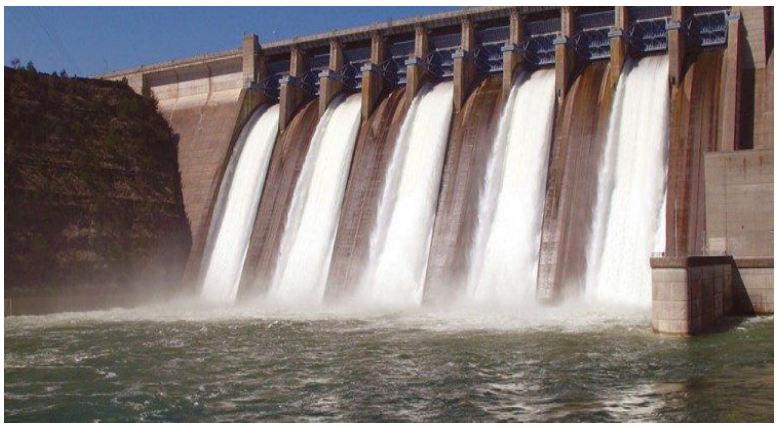


Fig 14.5 Rusizi hydropower station

Wind – wind power is produced from windmills. Windmills are wind-driven turbines which rotate the machines that produce electricity.

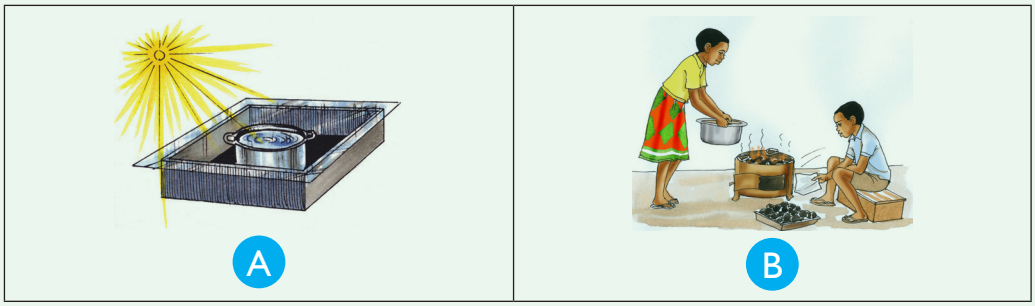
14.5. Renewable energy

Find out

1. Different sources of renewable energy.
2. The most common source of renewable energy.
3. The advantages and uses of renewable energy.

Case Study

1. Look at the sources of energy below.



2. Which source of energy can get finished? What happens when it gets finished?
3. Given a choice between the two, which one would you prefer for cooking? Why?
4. Write short notes about the advantages and disadvantages of the two sources of energy.

Energy sources can be renewable or non-renewable. **Renewable energy** sources are those that cannot get finished. They can actually be **recycled** or **reused**. **Examples** include:

- Sunlight
- Wind
- Water or hydroelectric power
- Energy from ocean waves
- Geothermal power
- Solar power
- Bio-fuels (trees which can be planted to replace cut ones)

a) Solar energy

Activity 14.18 **Visit to a solar power generation plant**

Make a visit to a nearby solar energy installation.

1. Find out how solar power works.
2. Find out about the components of a solar power installation.
3. Enquire about the importance of solar power.
4. Draw a sketch of what you observe in your notebook.

The **Sun** is the main source of energy.This is what is called **solar energy**. It is a renewable source of energy. Look at the diagram below.

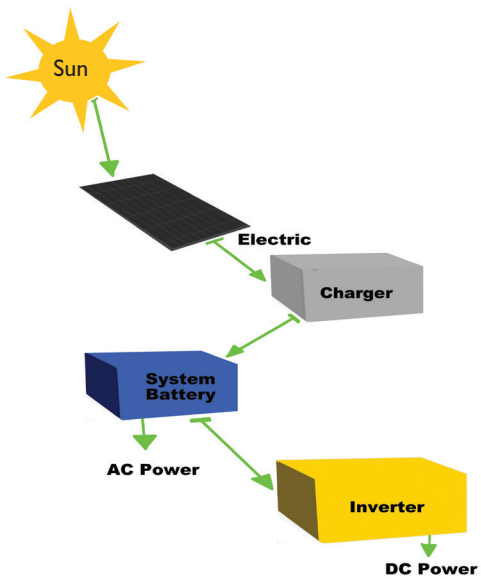


Fig 14.6 Solar power generation plant

The various components of a solar power installation are:

- **Solar panels** – These trap solar energy from the Sun.
- **Solar battery** – stores charge in form of chemical energy following conversion of light energy from the Sun.
- **Inverter** – converts direct current (D.C) - which is the form in which chemical energy is stored in the battery to alternating current

(A.C) - which is the form that can be utilised by the bulbs and other electrical equipments.

- **Bulb** – the load. It converts electrical energy into light energy which enables us to see.

Uses of solar energy

1. All crops and plants depend on energy from the Sun to make their food.
2. Solar energy is a source of warmth and light.
3. Heat energy from the sun is used to dry clothes and grains.
4 Solar panels are used to heat water in solar heaters.

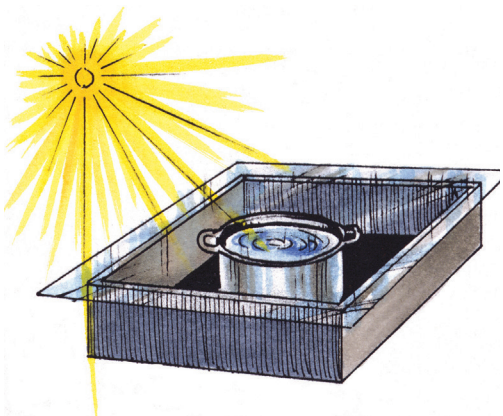


Fig 14.7 Using solar energy to cook

5. Heat energy from the Sun is used to dry harvested food crops using solar drier. They can also be dried by placing them directly under sunlight.
6. Heat energy from the Sun causes evaporation in the water cycle. This eventually provides us with rain.

Maintenance of solar installation

- Solar panel is held every time firmly in a safe position.
- Solar panel is exposed to maximum sunlight by removing all litter that may fall it.
- Solar repair and replace the faulty parts of solar plant.

b) Biogas

Activity 14.19 Visit to a biogas plant

Visit to a nearby biogas generation facility.

1. What are the components of a biogas digester.
2. Explain the process of producing biogas and the challenges faced in operating digester.

Biogas is produced in a special unit called **biogas digester**. Water and cow dung or other materials used to produced biogas are mixed in the digester. From the digester, a pipe is connected to the bulb or the cooker where the biogas is intended for use.

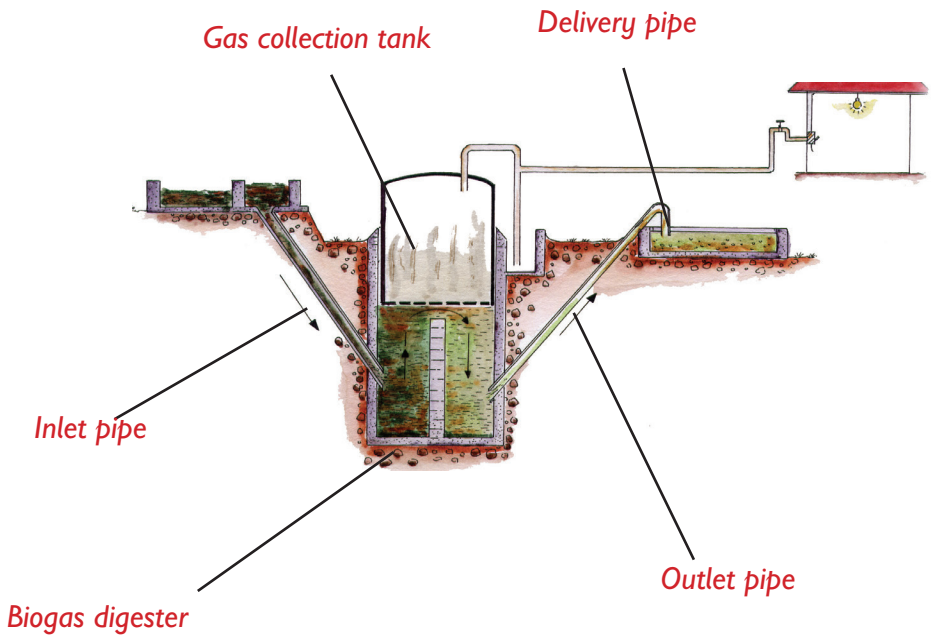


Fig 14.8 Diagram showing biogas production installation

Activity 14.20 Making a biogas plant

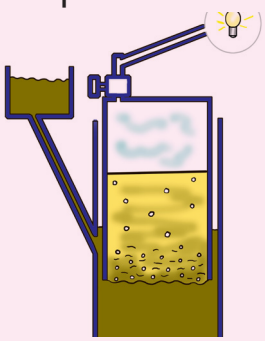
You will build your own biogas digester in this activity.

Materials

- 3 containers.
- Enough cow dung and water mixed in the ratio of 4:5:1.
- A long wire and a pipe .
- A delivery tube (rubber) of about 60 m long.
- Candle wax, plasticine or clay.

What to do

1. Set the biggest drum of the three with open end facing up.
2. Add the cow dung-water mixture.
3. Cut open end of the second drum to make three stands. These stands should be about 7 cm long.
4. Make a hole on the extreme right of the closed end (bottom).
5. Make another hole (pipe-size) on the extreme left.
6. Place the small drum upside down into the large drum. Tie it with wires to keep it in central position.



7. Insert the pipe with bigger diameter through the bigger hole.
8. Insert the delivery tube through the hole on the small drum.
9. Make a hole the size of delivery tube at the top right side of the third tin. Seal round it with wax to close all the spaces. Connect the delivery tube from the first tin to this tin.
10. Connect this tube to a tap (regulation of gas).
11. After one week, connect the tube to the gas cooker open the tap and light the matchbox.

The gas produced from animal dung mixed with water is called **methane** The bacteria present in the mixture breaks down the organic materials to produce the gas. The gas is burnt to produce flame. The gas burns with a blue flame.

Domestic uses of biogas

1. Biogas can be collected and stored in gas cylinders for domestic use. The remaining waste is used as manure.
2. At home the biogas is used in cooking and as a source of light. It can also be used to warm the room when it is cold.



Fig 14.9 Using biogas for cooking

Advantages of installing a biogas plant

1. Biogas unlike petroleum products such as kerosene, firewood and charcoal is a **cleaner** source of energy hence good for our environment.
2. It is less cheaper unlike other sources of energy such as fuels. It will only cost more money during installation but once you have installed, no costs are incurred,
3. It is **more convenient** to use than other energy sources.
4. Biogas can be produced by anybody with **minimum training**.

Advantages of using renewable energy

1. They are cheap hence can be afforded by many families.
2. They do not pollute the environment that is, they are environmental friendly.
3. They help us to conserve non-renewable sources of energy.
4. They are readily available and in abundance.
5. They, help to conserve trees, thereby conserving the environment.
6. Renewable energy sources are convenient to use.

Remember!

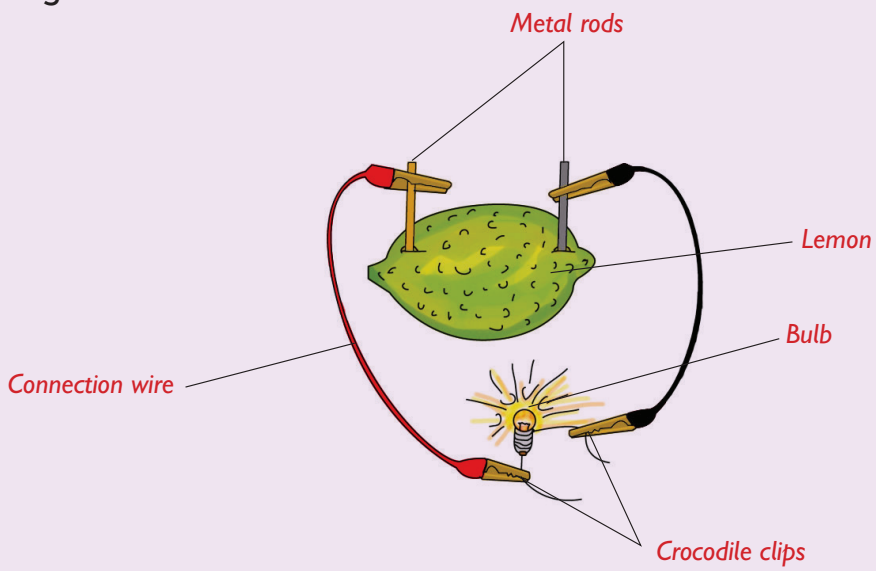
- Conserving energy by using renewable sources

Self –Test 14.3

1. Name five sources of energy.
2. Distinguish between renewable and non-renewable sources of energy.
3. Many solar types of equipment are painted black. Give a reason for this.
4. Name four components of a solar power installation and give their uses.
5. Suggest three ways in which cow dung can be used as a source of fuel.
6. What name is given to the gas that burns in biogas as a source of fuel?
7. Give some advantages of using renewable sources of energy as opposed to non-renewable sources.

UNIT TEST 14

1. What is energy?
2. When we eat, we get energy to work and to do other things. What form of energy is contained in food?
3. Why would a vehicle without fuel stop moving?
4. Describe the energy transformations involved in the following diagram.



5. You have been employed in an organisation dealing with environmental conservation in your home area.Assume you have been asked to explain to the people the importance of planting trees, what are some of the points you would give?
6. Solar panels change Sunlight into _____ form of energy.
   A. Heat B. Sound C. Chemical D. Electrical
7. Which of the following is not a use of animal dung?
   A. Production of biogas B. Making charcoal balls
   C. Fuelling improved jikos D. Making of solar panels
8. Energy stored in fuels is _____ energy.
9. Describe a simple experiment you would use to demonstrate the existence of thermal energy.
10. a) What is the difference between static and current electricity?
    b) Describe how you would produce static electricity using a comb.
11. When a bulb is lit using dry cells, the energy changes that take

place are:

A. Chemical → electric → light → heat

B. Chemical → electric → kinetic → heat

C. Chemical → heat → light → electric

D. Chemical → electric → heat → light

12. Find out and circle eight forms of energy in the puzzle below.

B	C	E	L	E	C	T	R	I	C	A	L
R	H	V	M	Q	V	U	Y	Z	P	J	E
H	E	A	T	L	S	O	U	N	D	K	L
W	M	E	C	H	A	N	I	C	A	L	A
X	I	Z	L	G	E	G	F	J	I	Q	S
Y	C	Q	D	X	O	R	V	W	L	Z	T
O	A	X	O	V	M	N	M	S	F	T	I
W	L	I	G	H	T	S	U	A	L	D	C
D	M	N	K	Y	R	X	Q	W	L	P	H

13. When food is digested, chemical energy is changed to _____.

A. Light and heat B. Heat and motion

C. Electric and motion D. Electric and heat

14. Which one of the following correctly describes the energy transformations in a simple electromagnet?

A. Electromagnetic → electric → chemical → attraction

B. Chemical → electric → electromagnetic → attraction

C. Chemical → electrical → electromagnet

D. Electrical → chemical → attraction → electromagnetic

15. Write **true** or **false**.

a) A magnet gives electromagnetic energy. _____

b) Ocean waves is an example of a renewable source of energy. _____

c) An inverter stores charge in solar panel installations. _____

d) A biogas digester does not require a slurry pit. _____

16. Plan and execute a project on biogas digester at home. Use the biogas to cook a variety of foods?

17. Mention ways you can use to conserve energy in your community.

Unit 15 Magnetism

1. Study the pictures below.



A *Fig 15.1* A

2. What is going on in the pictures?

3. What can you advise the mother of the child to do to help her separate the iron fillings with ease? Why is this possible?

15.1 Types of Magnets

Find out

1. The definition of a magnet.
2. The various types of magnet.

Activity 15.1 Investigating the meaning of the term " Magnet"

1. Research from library books or search engine on meaning of the term " magnet".
2. Discuss on different types of magnet
3. Write down a short note and do a presentation to other class members.

- A **magnet** is an object that attracts materials usually made of **iron** or **steel.**

There are two main type of magnets:

- Natural magnets
- Artificial magnets

a) Natural magnets

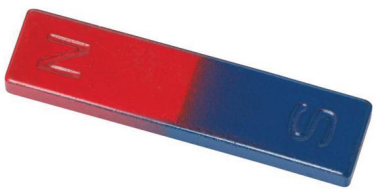
These are magnets that are found **naturally** in the earth's crust. Example **magnetite**/lodestone.



Fig 15.2 Magnetite

b) Artificial magnets

These are magnets made by human beings from magnetic materials.



(a) Bar magnet



(b) Horse - shoe magnet

Fig 15.3 The two main types of artificial magnets

Remember!

Magnets are used in various electrical appliances e.g Radio, Television freezer e.t.c

15.2 Composition of magnets

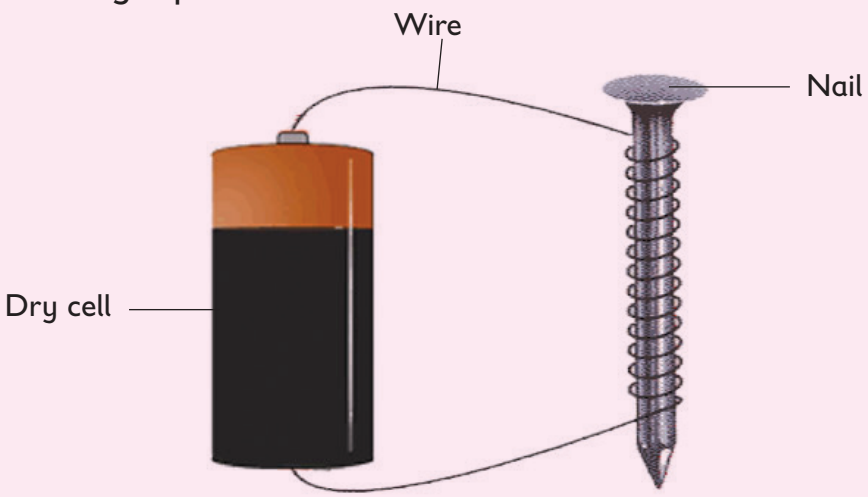
Activity 15.2 Making a temporary magnet

What you need

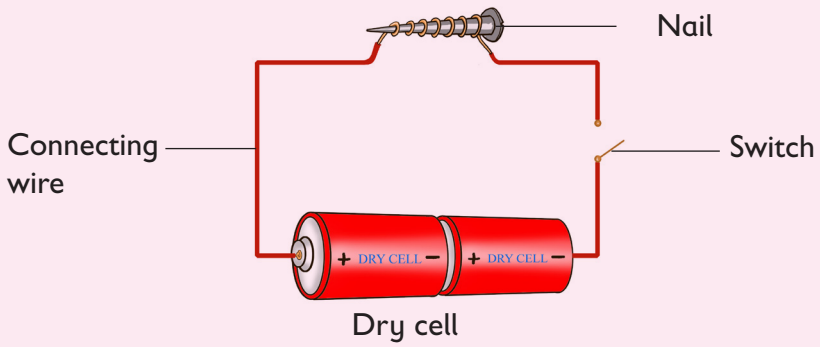
- Nail, piece of copper wire, a dry cell, pins or paper clips, masking tape and switch.

What to do

1. Wrap the copper wire to the nail several times as shown below.
2. Connect the wire ends to the two terminals of the dry cell using masking tape.



3. Bring the paper clips or pins close to the nail. What happens?
4. Now, remove the wire ends from the dry cell terminals and connect through the switch. Connect to the dry cell as explained in procedure 2 above.
5. Switch on the switch and bring the pins close to set up. What happens?



6. Now, switch off the switch and bring the set up close to the pins or paper clip close to the set up again. What happens?
7. What does the findings in this experiment tell you about the nature of the magnet that you have just made? How is it different from the normal bar or horse-shoe magnet?

Activity 15.3 Making a temporary magnet

What you need

- Permanent magnet, nail or paper clip, needle or pin.

What to do

1. Rub a paper clip or a nail along the length of a permanent magnet as shown below.

Note: Move the paper clip or nail in only one direction. Do not rub back and forth!

2. Continue rubbing the paper clip and the magnet about 50 times or more.
3. Use the nail or paper clip to touch the needle or pins. What do you observe? What do you think happened? The nail on paper clip picks up the needle or pins. This is because it became magnetised.

Rubbing a magnet a few times over an unmagnetized piece such as an iron nail as in the activity above, you can convert the nail into a temporary magnet. This is because the nail becomes magnetised.

The magnet made in Activity 15.3 above is temporary magnet called an **electromagnet**.

- **Temporary magnets** loose their magnetic properties after sometime. Iron which is magnetically soft is used to make temporary magnet.
- A **permanent magnet** on the other hand retain their magnetism over a long period of time. Steel/ferromagnetic material is used to make permanent magnet. Example: Horse-shoe magnet.

Natural magnet is composed of substances created by nature, which have the property of attraction. They have properties of iron fillings e.g iron ore, magnetite e.t.c

15.3 Characteristic of magnets

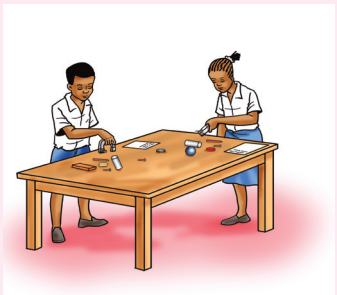
Activity 15.4 Investigating the characteristics of magnets

What you will need

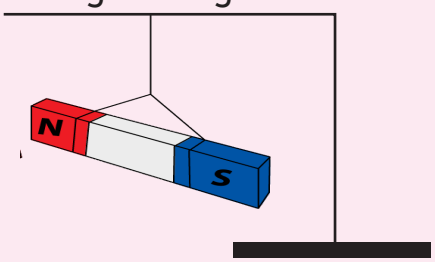
- Two bar magnets
- Items such as pins, paper clips, nails, rubber, pencil, pieces of wood, coin.
- String

What to do

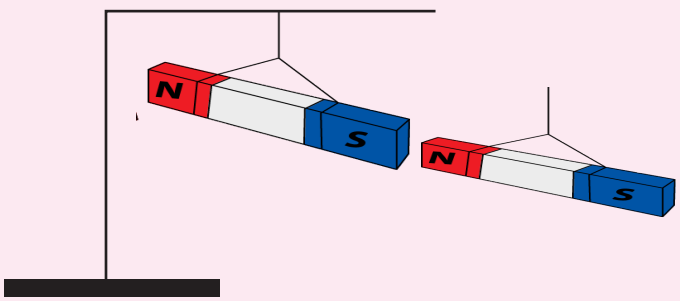
1. Put the items above on a table. Move a magnet over them as shown below. What happens?



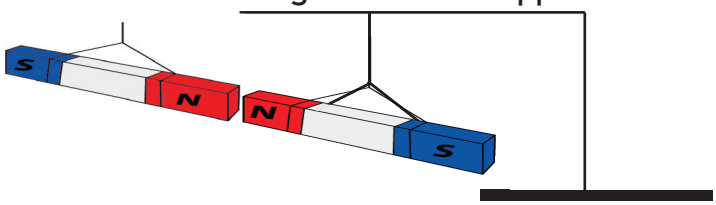
2. Suspend one bar magnet using a string as shown below



3. Bring the **north pole** of the second magnet near the **south pole** of the suspended magnet. What happens?



4. Bring the **north pole** of the second magnet close to the **north pole** of the first magnet. What happens?



Give reasons for your observations in this activity.

5. Write short notes about what you think magnets are, what they are made of and their characteristics.

Magnets have the following characteristics:

1. They have two poles - **North pole** and **South pole**.
2. Unlike poles of magnet **attract** while like poles **repel**.
3. When a bar magnet is suspended, it rests with its South pole pointing North of the earth's magnetic pole.
4. Magnets **attract** magnetic materials but do not attract non-magnetic materials.
5. Magnetic force can pass through non-magnetic materials.

Magnetic forces and magnetic materials

Find out

The difference between magnetic and non-magnetic materials.

Activity 15.5 Investigating magnetic force

What you need

- Magnets of various sizes,
- White sheet of paper,
- Sewing needle or safety pins,
- Pieces of glass, a coin-sized cross section of cork,
- Iron fillings,
- Paper clips or small nails of different metallic objects,
- Biro-pen casing
- Staples.

What to do

1. Explore what happens if you place the materials listed above close to a magnet. Come up with a table like this.

Material	Attracted	Not attracted
Iron fillings		
Sewing needle		
Safety pins		
Pieces of glass		
Cork		
Biro pen casing		
Paper clip		
Staples		
Nails		

- A magnet attracts certain things but not others:
- A magnet attracts iron fillings, iron nails, office pins, staples, sewing needles, safety pins. These are **magnetic materials.** A magnet attract objects made up of iron, steel,nickel e.t.c
- On the other hand, a magnet does not attract things like plastic, wood, paper, glass, copper and aluminum foil. They are **non-magnetic materials.**

Table 15.1: Magnetic and non-magnetic materials

Magnetic materials	Non-magnetic materials
Iron fillings	White sheet of paper
Steel	Pieces of glass
Cobalt	Cork
Chromium	Wood
Alnico	Plastic
Nickel	Leaves
Paper clips	Pieces of cloth
Staples	Flour
Nails	Sand

Self –Test 15.1

1. Name some magnetic materials found in your home.
2. Suppose you have dropped iron fillings in some salt or sugar, explain how you can separate the two.
3. Give any four uses of magnets.
4. Explain how you can create magnetism using biropen case or comb using your hair.

15.4 Magnetic field

Find out

The definition of a magnetic field.

Patterns or field lines at a magnet.

Activity 15.6 Investigating force of attraction of a magnet

What you need

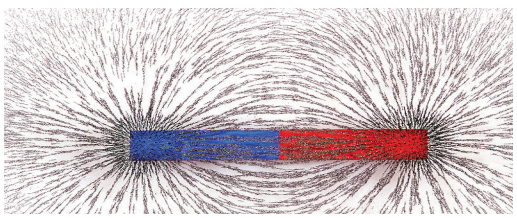
- Permanent magnets of different types (horse-shoe and bar magnets)
- White sheet of paper
- Iron fillings

What to do

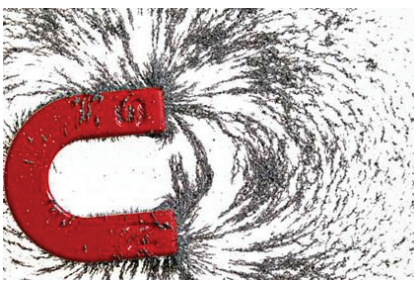
1. Place the bar magnet and the horse-shoe magnet one at a time below a white sheet of paper.
2. Sprinkle the iron fillings on the white paper. What do you observe? Draw the pattern formed by the iron- fillings.
3. Now, bring two bar magnets with their north poles close to one another below the piece of paper. Sprinkle the iron fillings. What happens to the iron fillings?
4. Repeat step 4 above but this time with the north and south poles of the two magnets facing one another.

Draw the pattern made by the iron fillings in each case above. Is there any difference between the patterns? Why is this the case?

Magnetic field is the area around a magnet or materials that are magnetic where magnetic force is **experienced.**

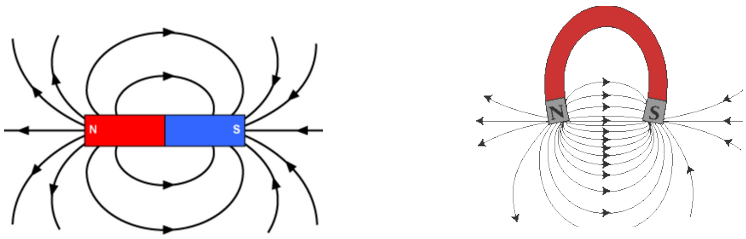


(a)



(b)

Fig 15.4 Magnetic field of (a) bar magnet (b) Horse shoe magnet



(a) *(b)*

Fig 15.5 Magnetic field line of (a) bar magnet (b) horse-shoe magnet

When two North poles of two bar magnets are brought together; their magnetic fields interact with one another to form a pattern like the one shown below.

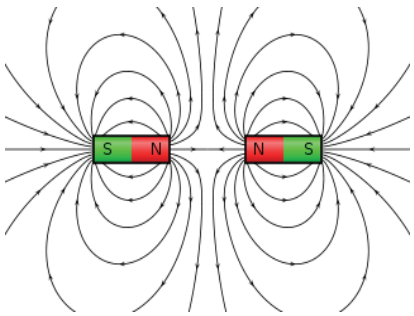


Fig 15.6 Magnetic field lines of like poles (repulsion)

However, when the North Pole and the South pole of two bar magnets are brought together, the field lines formed are shown below.

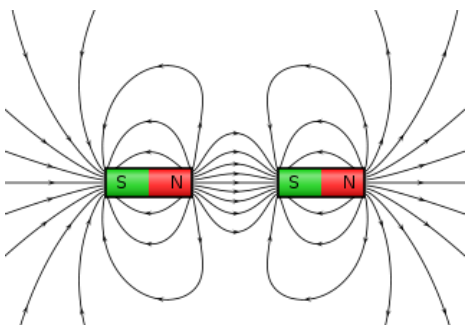


Fig 15.7 Magnetic field lines of unlike poles (attraction)

15.5 Magnetic compass

Find out

The function of a magnetic compass and its uses.

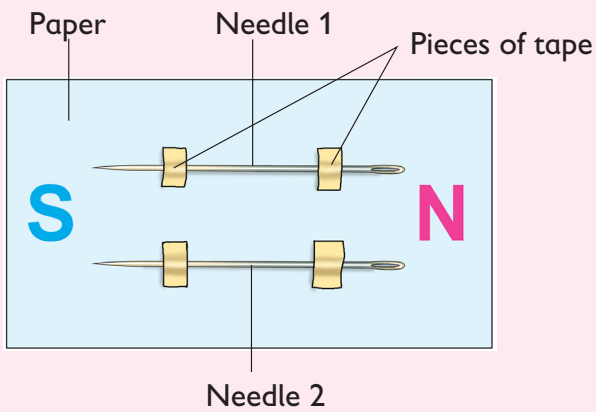
Activity 15.7 Making a simple magnetic compass

What you need

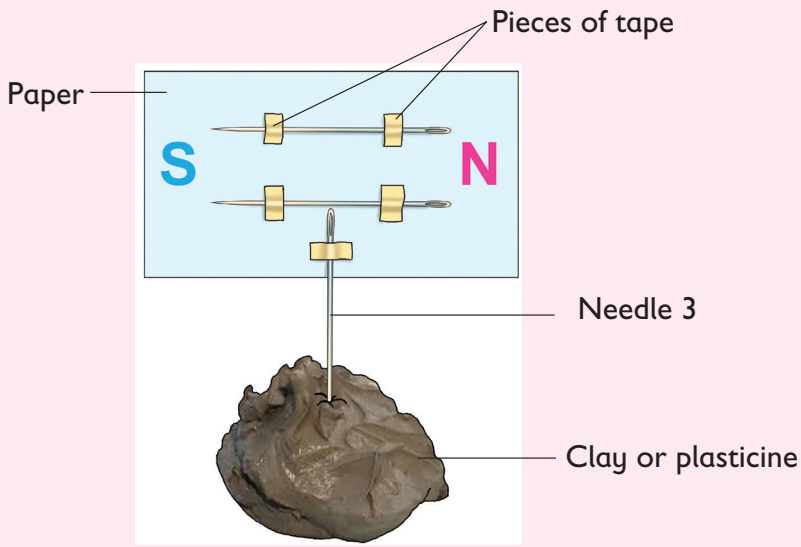
A magnet, clear jar with some water, three needles, thread, pencil, piece of Manila paper, tape clay or plasticine.

What to do

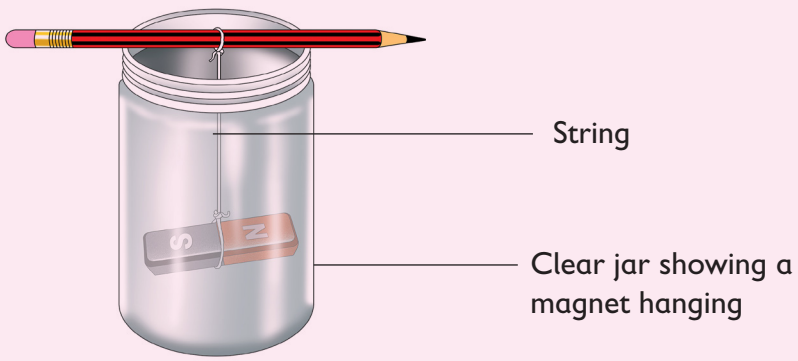
1. Magnetise the needles by rubbing them against the magnet as explained in Activity 15.5.
2. Tape the needles onto a piece of paper. Mark the paper with the end with needle eye 'N' and the pointed part 'S'.



3. Insert the third needle into clay or plasticine. Balance the paper with needles on top of the third needle as shown below.



4. Tap one end of the paper. Does the paper turn to its original position? Why is this the case?
5. Remove the needle and fasten the magnet using a string onto the pencil.
6. Put the pencil across the mouth of the clear jar with water as shown below.



Watch as the magnet spin inside the clear bottle. Where does it settle?

7. Disturb the jar by turning it. Note what happens to the magnet.
8. Look at the picture below. What is shown in the picture? How is it useful in our lives?



9. Discuss the results of this experiment. Write short notes and do a presentation to the rest of the class.

- The picture in Activity 15.6 above shows a **magnetic compass**.
- **Magnetic compass** is an instrument that uses magnetised steel bar to indicate direction relative to the Earth's magnetic poles.
- You earlier learnt that the Earth's core is made up of magnetic materials. This makes the Earth a **huge magnet**.
- Therefore, being a magnet, it has poles.
- When the magnetic compass is placed at any point on the surface of the earth, the steel bar rests with its head pointing in the magnetic north direction of the earth. Thus the compass can be used to find or locate direction of a place while on the surface of the Earth.



Fig 15.8 Electronic card uses magnetic strip

15.6 Uses of magnets

Find out

The devices that we use in our daily life that use magnets.

Activity 15.8 Use of magnet

1. Look at the pictures below. What can you see in the pictures?



2. Discuss how magnets are used above objects.

Magnets are used almost everywhere in our lives. The things in the pictures above show where magnets are used. Other uses include:

- **Electric trains** and **roller coasters** use electromagnets.
- Electromagnets are also useful in **carrying heavy loads** at the port.
- Used in **refrigerators** to keep doors closed.
- They are used in TV screens, computers, telephones, tape recorders and as **magnetic strips** in electronic cards.
- Used in **speakers** of radios to help in sound production.
- Used in constructing **electric motors** and generators.
- Used in making of **electric bells**.
- Used in **separating mixtures** involving magnetic and non-magnetic substances, for example iron fillings and flour.
- Used in making **telegraph** machines.
- **Magnetic compass** is used in showing or finding directions.

Self –Test 15.2

1. What is magnetic field?
2. State one important use of a magnetic compass.
3. Draw a diagram to show how iron fillings will be distributed when placed on a paper covering a horse-shoe magnet.
4. Name four areas where magnets are used at home.

UNIT TEST 15

1. What is magnetism and how is it important in our lives?
2. Many materials found where we live are either magnetic or non-magnetic. Based on that information, fill the table below.

Magnetic materials	Non-magnetic materials

3. Draw a diagram to show magnetic field when unlike poles of two bar magnets are brought close together.
4. Magnets can be temporary or permanent. What is the difference between the temporary and permanent magnet?
5. What are magnets made of?_____
6. In which of the following mixtures can the solids be separated by use of a magnet?
   A. Rice and husk.
   B. Iron fillings and flour.
   C. Flour and copper turnings.
   D. Zinc and copper turnings.
7. Which of the following pairs of materials consists only of non-magnetic materials?
   A. Steel spoon, iron nail.
   B. Aluminum foil, a glass rod.
   C. Nickel, cobalt.
   D. Chromium, cobalt.
8. Make a simple temporary magnet at home and use it to separate a mixture of iron fillings and flour.
9. What are some of the characteristics of magnets?
10. Give an example of a natural material that is magnetic.
11. Suggest ways in which you can make use of magnets in your local environment.

Unit 16 States of matter

1. Study the chat between the parent and the boy in the picture below:

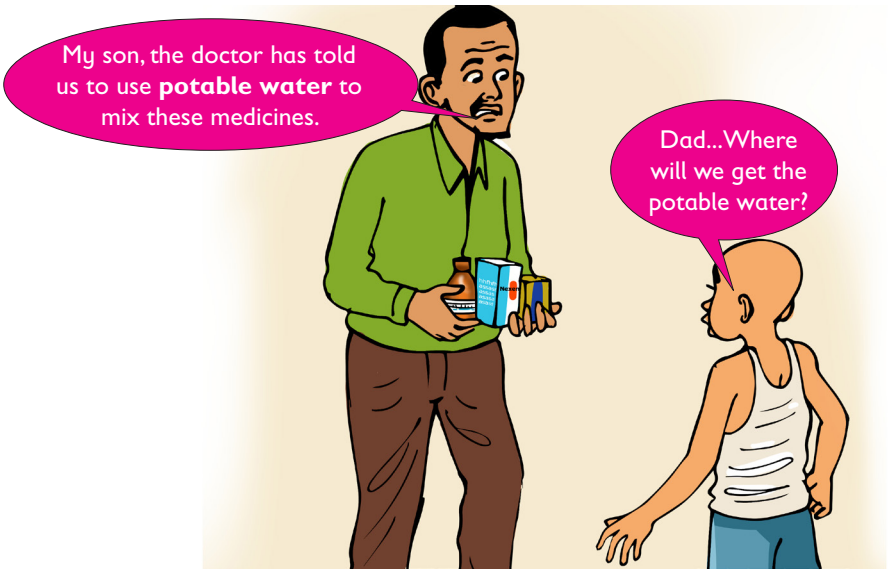


Fig 16.1

2. Why do you take medicines with portable water?
3. Which state of water is needed while taking medicines.
4. How would you help the parent of the boy to get potable water?

16.1 Definition of matter

Find out

1. Definition of matter.
2. If matter occupies space and has mass or weight.

Activity 16.1 Discussing the definition of matter

What you will need

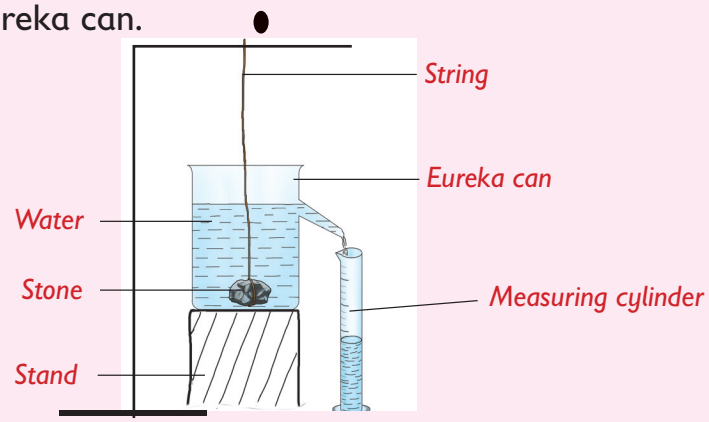
Bottle of water, two balloons, stone, electronic balance, exercise book, a measuring cylinder, a wooden plank, strings, a stick, eureka can, nail and a pin.

What to do

1. Weigh the mass of the bottle of water and stone using an electronic balance. Record their masses in a table like this.

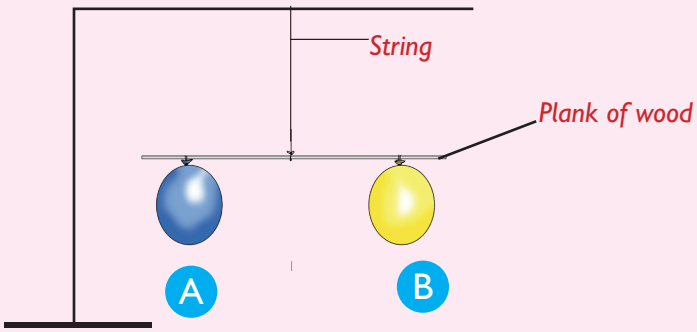
Item	Mass(g)
Bottle of water	
Stone	

2. Open the bottle of water. Pour the water into the measuring cylinder. Record the volume of the water.
3. Pour some water in a eureka can until half-way. Place the measuring cylinder at the mouth of the eureka can as shown below.
4. Tie the stone using a string then immerse it into the water inside the eureka can.



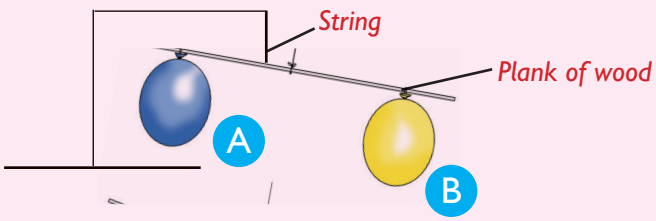
Record the volume of the water in the measuring cylinder. What does it represent?

5. Blow air into the two balloons until they are equal in shape and size.
6. Tie the two balloons using a piece of string. Suspend them on the plank of wood as shown below.



- Are the two balloons balanced?

7. Prick one balloon (A) using a pin. What happens? Why is this the case?



- When air was deflated from the balloon, its mass dropped. As a result, the balance tilted to the side with balloon **B**. This was because the air that was inside the balloon had some **mass** (weight) and when it was pricked, the air escaped leading to the drop in mass.
- All the things in these experiments are **examples of matter**. Therefore, anything that occupies space and has mass is referred to as **matter.**
- Matter is anything that occupies **space and has mass** or **weight**. Matter is found in three states, that is **solids**, **liquids** and **gases**.

16.2 Identification of difference between the three states of matter

Find out

Various properties of different states of matter.

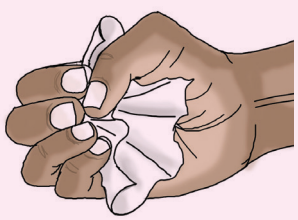
Activity 16.2 Investigating properties of matter

What you will need

Water, juice, stone, wood, cooking oil, book, soil, milk, methylated spirit, air in an inflated balloon.

What to do

1. Try to pour the things above. Which ones flow? Which ones do not? Why?
2. Compress the things using your hands as shown below.



- Were you able to compress the things? Why?

3. Come up with a table like the one below.

Things that flow	Things that do not flow	Things that compress	Things that do not compress

4. Feel the weight of each item above. Which is heavier? Why?
5. Discuss the findings in this activity. Come up with a table on characteristics of the three states

The experiments above show the various properties of the different states of matter.

a) Properties of solids are:

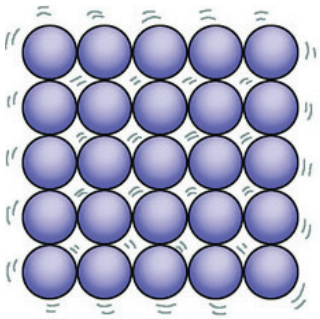


Fig 16.2 (a) Arrangement of particles in a solid

1. Have definite shape.
2. Have definite volume.
3. Have definite mass.
4. Do not flow.
5. Cannot be compressed.
6. Particles in solids are closely packed together.

b) Properties of liquids are:

1. Have no definite shape but take the shape of the container.
2. Have definite volume.
3. Have definite mass.
4. Easily flows.
5. Cannot be compressed easily.
6. The particles in liquids are not closely packed.

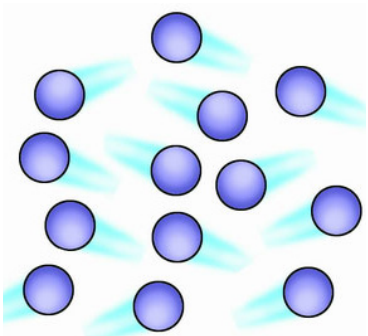


Fig 16.2 (b) Arrangement of particles in a liquid

c) Properties of gases are:

1. Have mass.
2. No definite shape. Instead, they spread in all directions.
3. Lack definite volume.
4. Can be compressed easily.
5. The particles in gases are far apart.

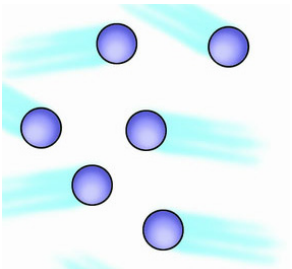


Fig 16.2 (c) Arrangement of particles in gases

16.3 Change of state in water

Find out

How water changes into various states.

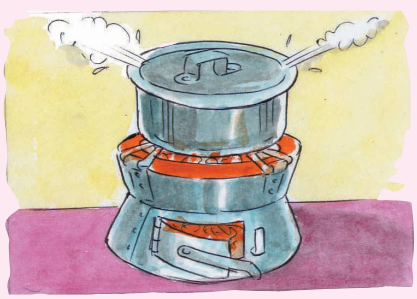
Activity 16.3 Changing the state of water

What you need

Water in a freezer, clock, source of heat, tin with lid or metallic beaker, thermometer, ice cubes, test-tube.

What to do

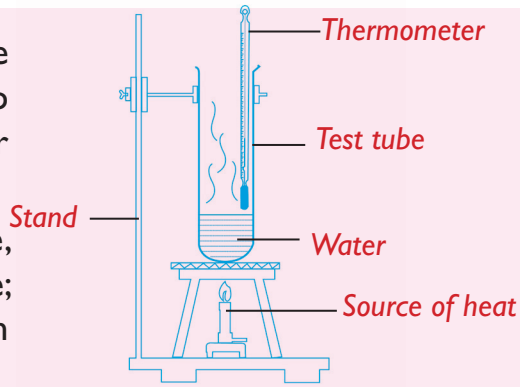
1. Put some water in the tin with the lid. Heat the water for some time. What happens to the water?
2. Allow the water to boil for some time. Remove the lid and observe its underside. What can you see?



3. Leave some ice in a bowl under direct sunlight. Observe what happens after sometime.

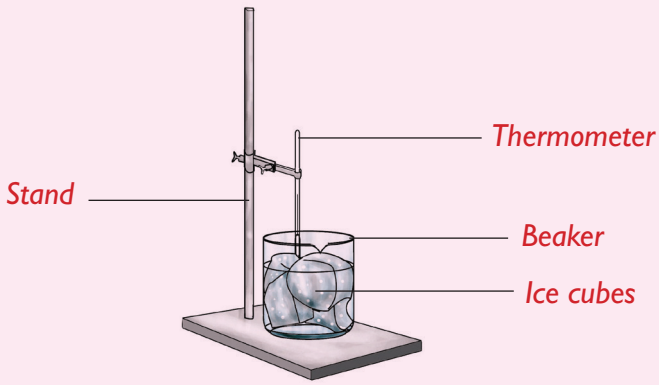
4. Put some water in a bottle then place the bottle in a deep freezer. Observe the water after sometime. What forms?

5. Put some water in a test tube, boil the water, but this time; insert a thermometer as shown alongside.



   - Record the temperature at which the water boils.

6. Put some ice in a bin or beaker, then insert a thermometer as shown below.



   - Leave the set up under direct sunlight.
   - Record the temperature at which the ice melts.

Study questions

a) What changes occur on ice and in water vapour when heated and cooled respectively?

b) What makes the changes to occur?

c) What is the boiling point of water?

d) What is the melting point of ice?

- When temperature is increased through heating, ice **melts** at 0°C to form **liquid** water. This process is known as **melting**. The water **boils** at 100°C on further heating to form water vapour (or steam).

- The three states of water that exists therefore are **ice**, **water** and **water vapour** or **steam**.

- If ice is heated, it changes to liquid water. When the liquid water is heated further, it changes to water vapour (steam). This process is known as **evaporation**.



Fig 16.3 Change of state of water

- On cooling the water vapour, it forms liquid water. This process is known as **condensation**. When liquid water is cooled further, it forms ice. This process is called **freezing /solidification**

Note : Water can change its state depending on temperature.

Melting and boiling points of water

Melting is changing a solid to a liquid. **Melting point** is the temperature at which a substance changes from solid to liquid.

Note :0°C is the melting point of ice.

Boiling or evaporation is the change of state from liquid to gaseous state. **Note :100°C, is the boiling point of water.**

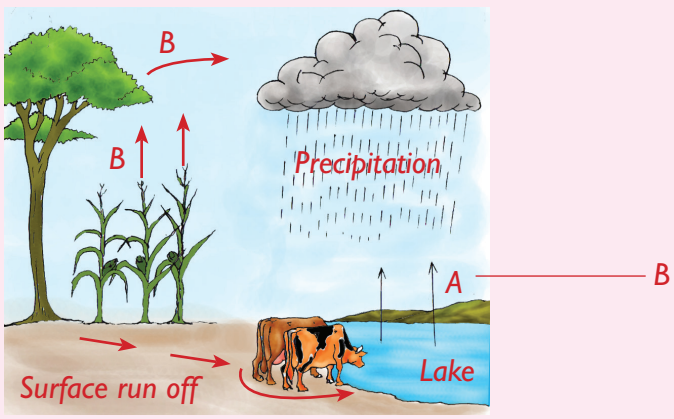
Self –Test 16.1

1. What is matter?
2. Name the three states of matter.
3. Give the meaning of "change of state".
4. Distinguish between cooling and heating.
5. Which one of the following shows the correct order of change of state?
   a) Solid ⟶ gas ⟶ liquid
   b) Solid ⟶ liquid ⟶ gas
   c) Gas ⟶ solid ⟶ liquid
   d) Liquid ⟶ solid ⟶ gas
6. Solid state of water is _____ whereas its liquid state is _____.
7. What is the boiling point and melting point of water?

16.4 Changes in states of water and the water cycle

Activity 16.4 Investigating the water cycle

1. Study the picture below.



2. Find out what is happening at points **A, B** and **C**? How are these processes important during rain formation?
3. Comment about the states of water in the diagram as a whole.

The picture above shows the **water cycle**.

- Processes **A**, **B** and **C** lead to formation of rain during the water cycle. Process **A** is **evaporation** of water vapour from water bodies.
- Process **B** is **transpiration**. This is the process by which plants lose excess water in form of water vapour to the atmosphere. The water vapour from both evaporation and transpiration rise into the sky where cooling takes place.
- **Condensation** is the process of cooling water vapour to form liquid water. It leads to formation of rain. The rain droplets form **clouds** which later precipitate to the earth's surface as **rain**.
- When it rains, **surface runoffs** water get their way into water bodies such as lakes and rivers. This later **evaporates.** Also, some water sips into the soil. This is absorbed by plants which later gets into the atmosphere through **transpiration.** All these processes form the water cycle.

16.5 Transformation of states of matter

Find out

How matter changes its state.

Activity 16.5 **Investigating the transformation process of state of matter**

What you need

- Naphthalene solid
- Iodine solid

- A transparent tin with lid
- Source of heat
- Bottle top

What to do

1. Put some iodine solid in a transparent tin.
2. Cover the tin with the lid.
3. Put the tin on top of the source of heat. Heat the solid for some time. What happens?
4. Remove the source of heat then allow the apparatus to cool. Observe the lid. What can you see?
5. Put some naphthalene in the bottle top then heat. What happens?

The word 'transformation' refers to changing something completely from one state to another.

- From the above experiments, we can conclude that, some matter can be transformed from solid state to gaseous state directly without undergoing liquid state,
- Iodine solid when heated, changes directly to vapour. This is called **sublimation**.
- Iodine vapour when cooled forms iodine solid without going through the liquid state. This is called **deposition**. When naphthalene is heated, it changes to liquid at 80°C. Further heating leads to formation of a gas at 140°C. This is called **evaporation**.
- The vapour when cooled changes back to liquid naphthalene. This is **condensation**. When liquid naphthalene is cooled, it changes back to solid. This is known as **freezing**.

Note: Matter either losses or absorb energy when it changes from one state to another.

These transformations can be summarised as shown in the following diagram.

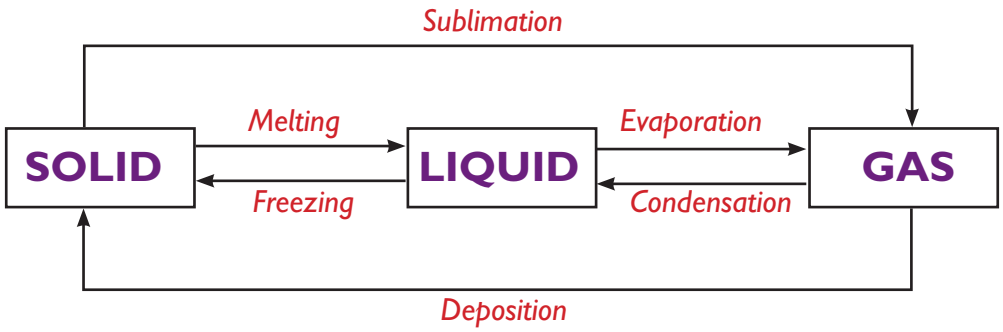


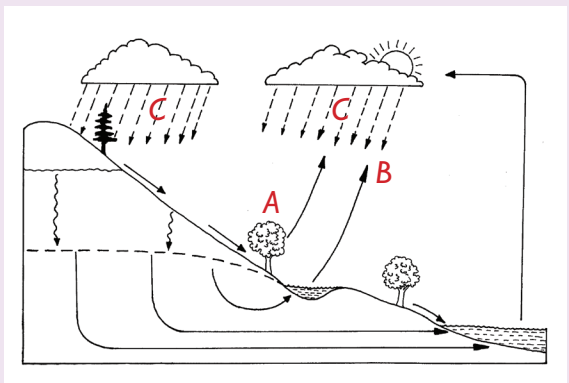
Fig 16.4 Summary of transformation process of states of matter

Self –Test 16.2

1. What is water cycle?
2. State the importance of the following in water cycle:
   a) Trees b) Surface run-off c) Water bodies
3. What processes are involved during water cycle?
4. What is the meaning of the phrase 'transformation' of states of matter?
5. Differentiate between:
   a) Sublimation and deposition.
   b) Evaporation and condensation.
   c) Melting and freezing.

UNIT TEST 16

1. Matter is anything that _____and has mass.
2. How are solids different from liquids in terms of:
   a) flow? b) compressibility?
3. Describe an activity that you would carry out to show change of state in water.
4. Which one of the following does not involve a change of state?
   A. Boiling of water to steam.
   B. Melting of ice to liquid water.
   C. Freezing of water to ice.
   D. Crushing of a stone to form powder.
5. Mass is defined as the _____.
6. Study the diagram below and use it to answer the questions that follow.



   a) Name the processes marked **A** and **B**.
   b) What forms when the processes marked **A** and **B** occur?
   c) The process of forming rain from clouds (process C) is called _____.
7. a) Describe the process of rain formation. Why is rain important in our lives?
   b) Explain why it is important to plant at least two trees whenever we cut down one.
8. Given naphthalene solid, how would you determine:

a) its melting point?

b) its boiling point?

9. When a solid is heated and becomes bigger, we say it has _____.

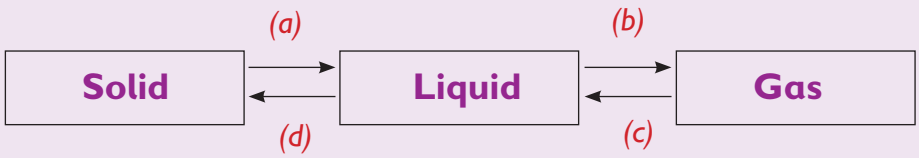
A. Contracted

B. Melted

C. Expanded

D. Condensed

10. Fill gaps in the flow chart below.



11. A glass containing ice cubes was placed in open air and after sometime, the outer surface of the glass became wet. This shows that _____.

A. Air can be cooled.

B. Air contains water vapour.

C. Ice melts to form water.

D. Air is a mixture of gases.

12. The temperature at which a substance freezes is the same temperature at which the substance _____.

Glossary

AbiWord is a free word processing program similar to Microsoft Word.

Abstinence (or to abstain) the act or practice of restraining oneself from indulging in something, for example sexual intercourse.

Alveoli these are tiny airspaces found in the lungs where gaseous exchange occurs.

Animation the state of being full of life or vigour, liveliness. An animation project is a project that is an animation, short movie (often humorous), or music video. Animation can involve programming sprites that talk and interact.

Antherosclerosis this is a condition that refers to hardening of arteries and/or veins. This causes the narrowing of the lumen or blocking of the affected artery/vein due to formation of a clot.

Antibiotics these are powerful medicines that fight certain infections or diseases caused by germs.

Antibodies these are special proteins that are produced in the body as a result of introduction of an antigen (which is a foreign body) in the body. Antibodies help to fight diseases in the body.

Arteries blood vessels which are usually narrower than veins and which carry blood away from the heart to other body parts.

Assembling to fit together separate parts of a machine.

Atmosphere this is a thin layer of gases that surrounds and protects the earth.

Auricles the upper chambers of the heart where blood is received from the rest of the body. They have thinner walls than ventricles.

Background the circumstances or situation prevailing at a particular time or underlying a particular event.

Baseball bat a smooth wooden or metal club used in the sport of baseball to hit the ball after it is thrown by the pitcher.

Biofuel a gaseous, liquid, or solid substance of biological origin that is used as a fuel.

Biogas a gas, mainly methane that is produced by the action of bacteria on organic waste matter often used as a fuel.

Blacksmith a person who makes various objects by heating then shaping iron metal or its alloys.

Blood the red fluid consisting of plasma, blood cells and platelets that nourishes and supplies oxygen to tissues.

Blood vessels these are the tubes through which blood is transported throughout the body. They are of three types: arteries, veins and capillaries.

Breathing this refers to the process of taking fresh air into the lungs and removing waste air out of the lungs. It involves breathing in and out.

Bronchi (singular – bronchus)– These refers to the two main branches of the trachea, which go into the lungs. They are divided into bronchioles in the lungs.

Bronchioles these are the final branches of bronchi, which communicate directly with alveoli in the lungs.

Browser is a program that lets you locate and view web pages. The most widely used browser is Internet explorer.

	Others are mozila, safari, opera mini, chrome among others.
Bucks	these are male goats.
Burns and scalds	a burn is damage to the skin caused by dry heat such as hot metals or fire, while a scald is damage to the skin caused by wet heat such as hot water or steam.
Calyx	many sepals put together.
Capillaries	these are the smallest blood vessels which form a network at tissue level. They have thin walls and tiny pores which allow for exchange of materials between blood and body tissues.
Catalytic converters	these are devices, which help to protect the environment by cleaning up and reducing vehicle emissions.
Cell	is the intersection between a row and a column on a spreadsheet that starts with cell A1.
Chemical reactions	this is a process when one or more substances react to form other substances.
Chimneys	a part of a building through which smoke rises into the outside air especially; the structure extending above the roof.
Column	is a vertical series of cells in a chart, table, or spreadsheet.
Condensation	change of state from gas to liquid as a result of reduction in temperature.
Conduction	the process by which heat moves through solids.
Contamination	this is the adding of dangerous substances in air, water, soil or food that can cause harm to living organisms.

Contraceptive this term refers to a device, medicine or any other substance that prevents pregnancy.

Convection the process by which heat travels through liquids.

Copy is to make a duplicate of a file, folder or selected text in another location.

Corolla many petals put together in a flower.

Costume is one out of possibly many "frames" or alternate appearances of a sprite. They can be named, edited, created and deleted, but every sprite must have at least one costume.

Crash a strongly built stall or cage for holding cattle safely when they are being examined or given treatment. It minimizes injury to the animal or the person working on it.

Crude oil a term often used to refer to unrefined petroleum. It is a mixture of diesel, petrol, kerosene, bitumen among others.

Current electricity electricity in motion or a form of electricity found in things like dry cells, car batteries, hydro-power, generators among others.

Cut and Paste to move files, folders and selected text to another location. Cut removes the item from its current location and places it into the clipboard. Paste inserts the current clipboard contents into the new location.

Deposition direct change from gaseous state to solid state. It is the opposite of sublimation.

Desktop environment Collection of software running on top of an operating system that makes up the desktop graphical user interface. It usually includes everything from how the windows look and feel, to the style of the icons, files, folders and the mouse pointers. A desktop

	environment also dictates what file manager to use, default text editor, image viewer, wallpapers and the interface used to log in and log out of the local system.
Device	a machine or tool that does a special job.
Dialogue box	is a small area on screen in which the user is prompted to provide information or select commands.
Diaphragm	this is the muscular flap of flesh that separates the chest cavity and the abdominal cavity, which is involved during breathing process.
Dicotyledonous	seed with two cotyledons.
Seed dipping	to put down into a liquid quickly or partially and lift out again. Cows and goats are dipped into pesticides that kill pests like ticks.
Disinfectants	these are antimicrobial agents that are applied to the surface of objects to kill microorganisms like germs.
Does/ Nannies	these are female goats.
Drought	this is a long period of time without rainfall or with little rainfall that is not enough to support the lives of people, animals and plants.
Electrical appliance	any device that uses current electricity.
Electromagnet	a magnet consisting of a coil of insulated wire wrapped round a steel or iron core that is magnetized only when current flows through the wire. When current is switched off, it loses its magnetic properties.
Energy	capacity to do work.
Energy transformation	changing energy from one form to another.

Eureka can a container used to determine the volume of an irregular object such as a stone done by measuring the volume of liquid displaced.

Evaporation change of state from liquid to gas or vapour as a result of increase in temperature.

Exhalation the act of breathing out. It is also known as expiration.

Fertilization fusion of male and female gametes to form a zygote. The zygote later develops into embryo, foetus then finally baby.

File is an object on a computer that stores data, information, settings, or commands used with a computer program. In a graphical user interface (GUI) such as Microsoft Windows, files display as icons that relate to the program that opens the file.

First Aid emergency care or treatment given to a patient or injured person before complete medical treatment is secured.

Folder is a storage space that many files can be placed into to group them together and organize the computer.

Fossil fuels these are forms of energy sources obtained from organic materials such as oil, coal and natural gas. They are formed in the earth from plant and animal remains over many years ago.

Freezing change of state from liquid to solid by reducing temperature.

Fumes these refer to vapors, dust and / or smoke given off by substances as a result of chemical reactions.

Function predefined formula that helps save you time. For example, use the SUM function to add lots of numbers or cells, and the PRODUCT function to multiply them.

Garage building or house where vehicles are serviced or repaired.

Global warming this is the current increase in temperature of the earth's surface both land and water as well its atmosphere.

GNOME Is a graphical user interface (GUI) and a set of computer desktop applications for users of the Linux computer operating system.

Gnumeric spreadsheet is part of the GNOME desktop environment. It is an open-source spreadsheet program.

Groove a long, narrow cut or depression in a hard material.

Hay is grass, legumes or other herbs that have been cut dried and stored for use in future.

Heart the muscular organ located in the chest between the lungs that pumps blood throughout the body.

Heart attack one of the diseases of the circulatory system that is as a result of blocked arteries or high blood pressure.

High blood pressure a disease of the circulatory system associated with increased blood pressure as a result of faster pumping action of the heart.

Hormones chemical messengers which are protein in nature and are produced by the endocrine glands that help in controlling body functions.

Humps this is a mixture of muscle and fat on the back of some cows.

Immunization this refers to the act of vaccinating a person to make them immune to a particular disease.

Inhalation the act of breathing in. It is also known as inspiration.

Isolation the state of being in a place that is separate from others.

Keyboard is a panel of keys that operate a computer or typewriter.

Keyword	the word that you input in a computer to search its meaning through the Internet.
Kids	the young ones of goats.
Knitting	this is a method of creating fabric cloth from a single strand of cloth/yarn using two needles.
Leather	is a durable and flexible material created by tanning animal hides and skins. People use leather to make: shoes, bags, hats, trousers, skirts, sofa seats and belts.
Lever	a simple machine with effort, load and fulcrum used to make work easier.
Lungs	the two organs of respiration located in the chest cavity.
Machine	a system or device for doing work.
Magnet	a special type of object/item that produces a special type of force, which either attracts or repels other materials.
Magnetic compass	an instrument or a device that uses magnetized steel bar to indicate direction relative to the Earth's magnetic poles.
Magnetic field	an area around a magnet where magnetic force is experienced. It is usually represented using magnetic lines of force.
Magnetic material	any material that can be attracted by a magnet such as iron or steel and can be magnetized.
Magnetism	a property associated with magnets, which causes attraction or repulsion of substances that are magnetic.
Magnetite	a type of mineral found in Earth's crust that is magnetic by nature.
Mass	the amount of matter in a body.
Matter	anything that occupies space and has weight.

Meandering a road that is not straight i.e. with many corners.

Mechanic a worker with skills in making, using or repairing machines, vehicles and tools.

Melting change of state from solid to liquid as a result of increase in temperature.

Monocotyledonous seed seed with only one cotyledon.

Nectar the sweet smelling substance found at the base of a flower that often attracts insects and birds.

Non-magnetic material any material that cannot be attracted by a magnet such as plastic or wood. They can neither be magnetized.

Non-renewable energy these refer to sources of energy that can get exhausted.

energy Nuclear energy form of energy which is as a result of nuclear reaction such as fission or fusion.

Opportunistic disease any infection caused by a microorganism that does not normally cause disease in human beings. It usually occurs in persons with abnormally functioning immune systems such as those with HIV and AIDS.

Oxen are any breed of cattle that are at least four and are taught to work

Pasture perennial grasses for grazing animals.

Permanent magnet a type of magnet that retains its magnetism after it is removed from a magnetic field.

Photosynthesis the process by which green plants make their own food using energy from the Sun.

Pistil female parts of a flower.

Plasma the liquid part of blood which is mostly water but which contains digested food materials, mineral salts, dissolved metabolic waste products and hormones.

Plasticine	synthetic material which is a substitute for clay used in modelling.
Platelets	one of the many components of blood which are responsible for the clotting process.
Plumule	part of embryo of a seed that develops into a shoot.
Pollination	the process by which pollen grains are transferred from the anther to the stigma of a flower.
Pre-marital sex	this term refers to engaging in sexual intercourse before marriage.
Predators	this is an animal that eats other animals.
Pregnancy	this is the term used to refer to the period from conception until childbirth.
Prick	making a small hole or holes in the surface of something or body.
Program	a program is a set of instructions that tells a computer or other electronic devices what to do.
Project	is a series of activities that allows the students to study, do research and act by themselves using their abilities, interests, personal experience and aptitudes.
Quarantine	this is when animals and their products movements are restricted from one region to others in order to control disease outbreaks.
Radiation	the process by which heat travels through a vacuum.
Radicle	part of embryo of a seed that develops into a root.
Ramp	is a sloping surface between two places that are at different levels.
Redo	is a function performed on a computer that does any undo function again.

Renewable energy these refer to sources of energy that cannot get finished or exhausted. They can either be recycled or re-used. Examples include solar energy biofuels, hydro power or geothermal power.

Repair to restore something that is damaged, faulty or worn out in order to restore its good working condition.

Reproduction this is a term that refers to any of various processes, by which an animal or a plant produces one or more individuals similar to itself. It can be either sexual (involving male and female gametes) or asexual (no gametes are involved).

Resistant It means being immune or to be able to resist or fight off.

Respiration the act of taking air into the lungs or removing waste air from the lungs. It is also known as breathing. However, in advanced biology, respiration refers to the process of burning food particles in the body to release energy.

Row is the range of cells that go across (horizontal) the spreadsheet/worksheet.

Rust reddish or yellowish-brown coating that forms on iron or steel metals in the presence of moisture.

Scarf a long broad strip of wool, cotton or other materials worn round the neck, shoulder or head.

Scoop to pick up and move something with using a spade.

Search engine specialized websites that help you find what you're looking for on the Web. Examples are google, bing, yahoo and ask.

Sexual intercourse sexual union between a male and a female organism involving insertion of the penis into the vagina.

Smog this is fog, which contains smoke or soot in it, smoke occurs mainly due to air pollution.

Solar panel a piece of equipment, usually installed on a roof, that absorbs energy from the sun to heat water or turn it into electricity.

Sphygnomanometer the instrument used to measure blood pressure.

Sprite is an animated character or object in scratch programme.

Stamen male parts of a flower.

Static electricity an electrical charge, often created by friction, consisting of stationary ions that do not move. It is the opposite of current electricity.

Steep this is a sharply angled, rising or falling ground level or object.

Steering wheel this is a wheel used by a driver, pilot when he or she wishes to change direction.

Sterile insect techniques or STI is a method of biological insect control whereby overwhelming numbers of sterile insects are released into the wild. The sterile males compete with wild males to mate with females; females that mate with sterile males do not produce offspring.

Stiff Something that can't be easily bent.

Stroke a disease of the circulatory system which causes parts of the body not to move due to damage of sections of the brain.

Sublimation direct change from solid to gaseous form without undergoing liquid state.

Suckle allow taking milk at the breast or teat.

Suffocation this is a term, which refers to the act of causing to dies by preventing access to oxygen or air.

Sugar it is a free and open source computer desktop environment designed for interactive learning by children.

Supplements any product taken by animals containing minerals.

Surface run-off water that flows on the Earth's surface after it has rained, often due to the fact that enough water has infiltrated the soil such that it cannot accommodate more.

Synonyms words or phrases that have the same meaning.

Teenagers a boy or a girl at puberty, usually between the ages of 13 – 20 years.

Temporary magnet a type of magnet that does not retain its magnetism after it is removed from a magnetic field. An example is the electromagnet.

Tennis racket a bat with a long handle attached to a round frame with a network of tight strings over it; used to hit the ball in tennis.

Thrombosis this refers the condition whereby an artery or a vein is obstructed by a blood clot. It may lead to heart attack.

Tool box a box or container used for keeping tools safely.

Tools these are implements especially ones held in the hands and are used to carry out particular functions.

Transformation this is a term that refers to changing something completely from one form into another.

Transpiration the process by which plants lose water in form of water vapour to the atmosphere through the leaves.

Tubal ligation this is a method of female sterilization in which the fallopian tubes are usually surgically tied or cut.

Tweezers these are small tools used for picking up objects too small to be handled by human hands.

Undo is a command included in most software programs. It is typically located at the top of the Edit menu and has the standard shortcut "Control+Z" in Windows. The Undo command allows you to undo the last action you performed in the program.

Vaccination is a biological procedure that improves immunity to prevent a particular disease.

Valves flaps of flesh found either in the heart or veins that ensure that blood flows only in one direction.

Vasectomy this is a method of male sterilization in which the sperm ducts are usually surgically tied or cut to prevent passage of semen.

Veins blood vessels which are usually broader than arteries and which carry blood towards the heart from the rest of the body except the pulmonary vein.

Ventilation this is to provide fresh air to a room or building and getting out bad air.

Ventricles the lower chambers of the heart where blood is received from auricles and pumped away from the heart. They have thicker walls than auricles.

Weaving weaving is a method of fabric production in which two distinct sets of threads are interlaced at right angles to form a cloth.

Weight the force experienced by a body due to gravitational pull.

Windmill a piece of equipment that extracts usable energy from winds.

Wire a flexible strand or rod of metal.

Workbook is the MS Excel file in which you enter and store related

data. A worksheet (also known as a spreadsheet) is a collection of cells on a single "sheet" where you actually keep and manipulate the data. Each workbook can contain many worksheets.

Workshop a room or building in which goods are made or repaired.

Www world wide web.

Zygote this is the cell resulting from the union of an ovum and a sperm.

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