VISION GROUP

NATIONAL PRIDE • GLOBAL EXCELLENCE

HOME SCHOOLING MATERIAL

SECONDARY

S1 & S2

THE REPUBLIC OF UGANDA
Ministry of Education and Sports

NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

THE REPUBLIC OF UGANDA

Ministry of Education and Sports

O' LEVEL

SELF STUDY MATERIALS

SENIOR ONE

SCIENCE PACKAGE

NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

CHEMISTRY

TOPIC ONE: CHEMISTRY AND SOCIETY

Learning Outcomes

After going through the activities in this topic you should be able to;

i)know the appropriate activities to explain the distinct nature of Chemistry.
ii) understand why chemistry is studied and how it overlaps with other subjects such as Biology, Physics, Mathematics and Geography.
iii) understand the importance of chemistry and relate knowledge of chemistry to relevant careers.
iv) know the contribution of chemistry to the Ugandan economy.

***Lesson One*: The Nature of Chemistry**

INTRODUCTION

In primary seven you learnt about integrated science. I hope you remember what integrated science is.

Here in secondary school, we have science separated into mainly three(3) branches and those are:

- **Biology**: deals with living things.
- **Physics**: deals with relationship between energy and matter.
- **Chemistry**: *(you will find out about this in a while)*

In this lesson, we shall find out what Chemistry deals with and also the common things we use in everyday life that are made with the knowledge of Chemistry, by carrying out the given activities.

ACTIVITY 1.1

Identify the common things we use in everyday life that you think are made of chemicals. Write your findings in your chemistry note book.

ACTIVITY 1.2

INSTRUCTIONS

- Look for the following products/items and assemble them in one place.
  - Bar soap, Vim, Toilet paper, Jik, Soda, Tooth paste, Pens, Detergent (e.g Omo,sunlight,Nomi),mineral water bottle,a cloth,a comb,shoe polish,a book,Tomato sauce,Blueband
- Observe the products/items critically and answer the given questions, answers should be written in your chemistry note book.

a) Give at least one use of each of the products/items.
b) Are these products a result of the knowledge of Chemistry?
c) Name any other products produced using the knowledge of Chemistry.

CONCLUSION

Chemistry is all around us. The common chemicals in pharmaceuticals, cosmetics, plastics, foods&beverages, soaps&detergents, water treatment, alcohol preparation at home, are all related to Chemistry.

Question

What careers require the study and knowledge of Chemistry? Write the solutions in your chemistry note book.

***Lesson Two*: The Meaning of Chemistry**

Introduction

Chemistry deals with the study of materials that make up our world. Carry out the following activities to explore the meaning of chemistry further.

Activity 2.1.

Steps

1.Burn a piece of paper using a lighted match stick. Observe and write the changes that happen to the paper during the burning.
2.Now consider the following processes that take place in everyday life;
i)the rusting of a panga
ii)the boiling of water
iii)the rotting of fruits
a)What changes take place in each of the given processes above(i-iii)?
b)What are the necessary conditions for each of the above changes to take place?
3.Name any other processes in which materials change from one form to another?

Conclusion

The changes you have just observed and many others show what the study of chemistry is about.
Therefore, *Chemistry is the study of matter and the changes that occur to substances under different conditions*.

***Lesson Three*: Why Is Chemistry Studied And How It Overlaps With Other Subjects?**

Chemistry helps us to;

- Understand what different materials/substances are made of and their properties, some are poisonous, corrosive, toxic, etc
- Know the effects of chemicals to the environment hence we learn how to conserve and protect our environment.
- Get knowledge to advance in science and technology for better and quality human life.
- Acquire knowledge relevant in making new materials which are relevant and useful in our everyday life e.g making of food supplements, distillation of crude oil, making of plastics, making of cosmetics, making of dental creams, manufacture of soap&detergents, making of insecticides&herbicides, etc
- Get knowledge and skills of how to extract and use materials from the earth e.g Gold, Copper,etc

ACTIVITY 3.1

Using relevant Chemistry text books and the internet, research about more reasons why Chemistry should be studied and how Chemistry relates with other subjects. Write your findings in your Chemistry note book.

***Lesson Four*: Importance of Chemistry in Everyday Life.**

There are many examples of chemistry in everyday life which show how prevalent and important chemistry is.

Activity 4.1

Complete the following statements by filling in the blank spaces

- Digestion relies on chemical reactions between ……. and enzymes to breakdown large substances into …… that the body can ……..
- Soaps and ……. are chemical substances that "dissolve"……when we wash our clothes, ……. and ……
- Drugs work because of chemistry and its chemistry knowledge helps us know which drugs are ……. or harmful to us as humans.
- Cooking is a chemical change that alters food to make it ……..,kills dangerous …… and makes food more ……

ACTIVITY 4.1

Summarise the mentioned examples in your chemistry note book. Use the internet and research for more ways how chemistry is important in everyday life, write your findings in your chemistry note book.

***Lesson Five*: Contribution of Chemistry to The Economy of Uganda.**

ACTIVITY 5.1

Using the knowledge of common industrial products in our country and their uses, ask older people around you, use books/magazines/newspapers and also the internet, to research about how chemistry contributes to the economy of Uganda. Base your research in the fields of medicine, industries, transport and Agriculture. Write a short report in your chemistry note book, showing the areas in chemistry which contribute to the economy of Uganda.

***Lesson six*: Laboratory rules and risk assessment**

Introduction:

At home there is a place where you prepare meals from. Although this place is worthy visiting, it can expose you to danger. The breakable equipment in this place further make it necessary to have guidelines in regard to its access.

Just like there are guidelines followed in almost all the places at home, similarly a science laboratory has guidelines set up to ensure safety.

It is important for you to make safety evaluation of the environment we live in. The evaluation of likely dangers in our environment is called **risk assessment.** Have you realised that when the floor is wet you reduce speed? Why?

By the end of this lesson, you should able to;
a) Know laboratory rules and regulations
b) Understand the importance of risk assessment in order to work safely

Activity 6.1: **Understanding laboratory rules and risk assessment**

Materials you need:

- Chart/paper or note book and marker/pen
- Picture of learners in a laboratory

Procedure:

Step 1: Study the picture below that show's unsafe behaviour of learners in a chemistry laboratory.

a) Identify and write the risks likely to happen in this laboratory.

b) If any of the dangers identified in a) above happened, write down what you would do.

c) If you were in charge of this laboratory, write down 5 rules you would setup.

Summary

- In this exercise, you have assessed risks in the picture. Do you realise it is important for you make risk assessment in order to work safely?
- When risks assessment is done and corrective action taken, then the likely danger(s) is/are avoided.

Follow-up activity:

a) Visit a kitchen or a general store or garden at home. Observe and identify areas which can be of risk.

b) Write 3 dangers that are likely to happen if you accessed the place without taking precaution.

c) As a responsible person, which measures or rules can you put in place to safe guard other family members at home?

***Lesson seven*: Scientific method of investigation**

Introduction:

The scientific method of investigation enables you increase on your skills in the field of chemistry research. It involves a systematic method of investigation to study and understand events in a natural world. This systematic approach to investigation ensures relevance of risk assessment to yourself and others. Mixtures are common substances we handle in life, separating them is an easy task when we use a scientific method of investigation.

By the end of this lesson, you should able to understand the scientific method to carryout investigations

Materials you need:

A detergent e.g *Omo, Nomi*, etc.

- Tea spoon
- 3 equal glasses
- Hot water
- Water at room
- temperature.
- Warm water

Investigation question: Does temperature affect formation of bubbles by detergents?

Prediction: The higher the temperature of water the more bubbles formed.

Procedure:

1. Measure equal amount of water at different temperature into 3 separate glass glasses,
2. To each glass, add a spoonful of detergent and agitate gently for 15 seconds,
3. Measure and record the height (in millimetres) of bubbles formed in each glass.

Observations and conclusion:

Table

Glass	Glass with hot water	Glass with warm water	Glass with water at room temperature
Height of bubbles recorded(mm)			

4. Plot a bar graph to represent information in table above.
5. Draw a conclusion to summarise the relationship between amount of bubbles formed and temperature of water.
6. Prepare a report on this investigation and how it can help you at home?

Summary:

Follow –up activity:

a) Using the scientific method of investigation, investigate why rainwater or boiled water readily forms bubbles with soap than any other locally available water.

b) What are the possible risks in your investigation

c) How is the knowledge of risk important to you and others?

Lesson Eight: States and Changes of States of Matter

By the end of this lesson, you should be able to:

a. appreciate that matter is anything which occupies space and has mass and can exist in a solid, liquid, gas and plasma form

b. understand that solids, liquids and gases have different properties including shape, pouring and compressing

Materials you will need

- ice
- water
- saucepan or tea kettle
- source of heat
- notebook

Introduction

You probably know already that a substance may be in the form of **a solid**, **a liquid** or **a gas**. These are the **three states of matter**. With your prior knowledge of states of matter, predict in what state a flame is? Everyone knows that water has a solid state, which is ice, a liquid state, which is water, and a gaseous stage, which is water vapour. In this lesson you will learn about what happens to the different states of matter when subjected to certain conditions.

Procedure

In this activity you will differentiate between a gas, a solid and a liquid

Activity 8.1. Identifying the different states of matter

Step 1: Sketch the arrangement of molecules in solids, liquids and gases i.e. draw three rectangles and label them solid, liquid and gas respectively. Draw circles within each of the rectangles to represent the arrangement of molecules). (Compare your sketches with those in a textbook you can access).

Step 2: Look at the diagram below and give responses to the questions that follow.

a) How many states of matter can you identify? Name the states.

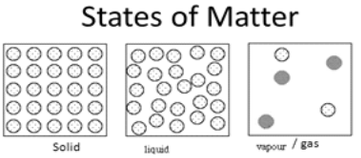
b) Which of the states do you think occur naturally on Earth and which one(s) does not?

c) Give at least three examples of the states of matter which occur naturally on Earth and two which does not occur naturally.

Activity 8.2. Finding out how states of matter can undergo a change

Step 1: What do you think causes matter to change from one state to another? A change in state of matter means a change in structure and properties of matter. You will use water in this activity.

Step 2: Obtain ice cubes and liquid water.



Solids – shape and volume don't change (definite or fixed)
Liquids – volume doesn't change but takes shape of container
Gas – takes volume and shape of container; compressible (can press particles closer together)

i) Place some ice cubes in a glass. What have

you noticed about the space they occupy

and their shape relative to the glass in which

they are placed? You might have observed

that the shape of the ice did not change with

the container it is placed in. Why? *This is*

because it is a solid and has a definite

volume and definite shape.

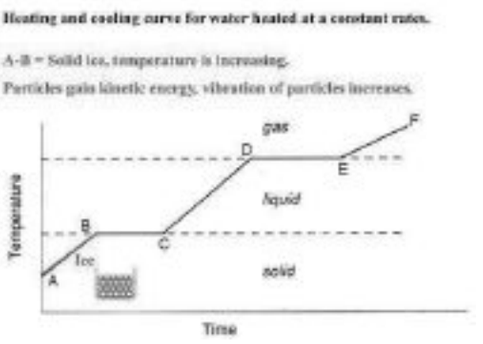
ii) Measure half a glass of water. Pour the same

amount of water in different size of containers. What did you observe? You might have observed that liquid water has a definite volume but not a definite shape.

iii) the water vapour is all around us, but is invisible! You might have observed that water in its gas state has no definite volume and no definite shape.

Step 3: Is it possible for matter to change from one state of matter to another? If so, when does matter change from one state to another? Matter can change states through heating or cooling, and it is sure to change states when it reaches its boiling point or freezing point. The change can be represented on a graph called heating and cooling curve for water at a constant rate.

Look at the graph of temperature against time, and describe how these states can change.



i) A – B shows solid ice. Predict what is happening to the temperature, energy of particles and movement of the particles?

ii) What happens between B-C?

iii) What happens between C-D?

iv) D-E shows liquid water. Predict what is happening at this stage.

v) What is happening between E-F?

Step 4: How to explain the particle arrangement in states of matter.

The kinetic theory of matter helps us to explain why matter exists in different states (i.e. solid, liquid and gas), and how matter can change from one state to the next. The kinetic theory of matter also helps us to understand other properties of matter.

Therefore, it helps to explain particle arrangement, inter-particle forces, movement of particles and the properties of solids, liquids and gases.

Follow-up activity

1. In which state of matter are molecules moving slowest?
2. What causes a solid to change to a liquid?
3. What point has water reached when it turns from a liquid to a solid?
4. What occurs when liquid turns into a gas?
5. In which state of matter are molecules moving the fastest?
6. What effect does the speed of molecules have on matter?
7. What happens when water reaches its boiling point?

PHYSICS

Chapter 1:
Lesson1: INTRODUCTION TO PHYSICS
Competences:
By the end of this lesson, you will be able to:

- explain the meaning of Physics.
- describe the relationship between Physics and other subjects like Biology /Chemistry.

Introduction
In primary school level, you studied science as a single subject. However, at secondary school level, Science is split into independent subjects like Physics and Biology. Can you name other cience subjects?
Look at the pictures in Figure 1 below:

Figure 1
What is happening in each picture?

To answer these questions and many more, you need knowledge of a new subject known as Physics. Did you know that Physics is all around us? All things surrounding us are either in form of matter or energy. This is what the study of Physics is all about.

Activity

- Are there some things that you have always wondered how they work, or how they happen?
- Make a list of all those things and ask your parents or brothers/sisters for explanations where possible.
- Are these things related to Physics?

Lesson 2: Branches and applications of Physics.
Competences:
By the end of this lesson, you will be able to:

- identify the branches of physics.
- explain the application of physics inside and outside the classroom.

Materials you need:

- A bulb (or a torch)
- Water in a saucepan
- A bar of soap
- Pieces of Firewood
- Flat iron with wooden handle
- Poles to construct a house
- Phone (even a spoilt one)
- mineral water bottle with holes
- A television
- A stove (either charcoal or kerosene)
- A radio (even a spoilt one)

Introduction
In your home environment, there aremany things and machines which do exist because of knowledge of Physics. The knowledge of Physics has helped many people to invent many things/ machines and apply them in different fields. These fields are the branches of Physics.

Activity 1
What to do:
Look at the pictures in Figure 1 and answer the following questions:

i) explain what is happening in each picture.
ii) which branches of primary Science are related to the activities in each of the pictures?

Figure 2

From this activity, you find that there are different branches of Science. The branches of Science indicated in Figure 2 are some of the branches in Physics. Can you now name some of the branches of Physics?

Activity 2

(i) Now that you know what physics is and what it involves, are there domestic equipment in the home that were made using the knowledge of Physics?

(ii) Think of ways in which Physics is important to you, your family or the community

Lesson 3: The Laboratory and its safety rules
Competences:
By the end of this lesson you will be able to:

- explain what a laboratory is
- state the rules and regulations of the laboratory**.**
- explain the importance of laboratory rules and regulations.

Materials:

- Saucepan,
- Small lamp or candle
- Match box
- Charcoal stove/ Firewood
- Plastic cup
- Water
- Variety of kitchen equipment
- Small jerrycan (5 *l*)
- stirring rode
- sugar
- Manila paper and Marker/pen
- Room (Kitchen)

Activity 1: Make a visit to the Kitchen at your home
What to do:

(a) Make a tour of the kitchen at home and try to establish various equipment and how they are used.

(b) How can you take care of the kitchen equipment?

(c) Suggest rules to follow while you are in the kitchen

From Activity 1, you have found out that there is equipment in the kitchen for different purposes. A school laboratory is much similar to the kitchen. Most of the practical works in Science, for example, experiments, tests, observations or investigations are conducted in a laboratory.

A laboratory is a building, part of a building or other place specifically designed for scientific work. It contains many pieces of apparatus and materials for practical use.

Apparatus is equipment or tools needed for a particular scientific activity or purpose. We use apparatus when we are carrying out an experiment. Laboratory apparatus is similar to the kitchen equipment.

Experiment is a scientific step-by-step process undertaken to make a discovery, test a proposed law or theory, or demonstrate a known fact.

Activity 2:
Now that you have seen that a laboratory is similar to a kitchen, answer the following questions:

1. Suggest some rules which you must follow while working in the laboratory
2. Why is is important to follow laboratory rules and regulations
3. Give the name and importance of the apparatus shown below.

Why is it important to always wash your hands after working from a laboratory?
The tests for the different diseases such as covid-19 are done in the laboratory

Chapter 2:
MEASUREMENTSIN PHYSICS

Lesson 1: Estimation and measurement
Competence:
By the end of this lesson, you will be able to:

- Explain the meaning of measuring and estimating
- Identify the major physical quantities that are measured

Materials you need

- A ruler
- A watch/clock

Introduction
When you go to a butchery, you buy meat in kilograms. When you go to a tailor, your cloth is cut according to your size. What is the general term used to describe the above cases?

Give examples of everyday life situations where the above process is applied, and explain what is done in each case.

Note: In the above process, you assign a numerical value and a unit to a physical quantity.

When you are carrying out the above process, you use an instrument such as the ones in Figure 3 below. Can you identify these instruments?

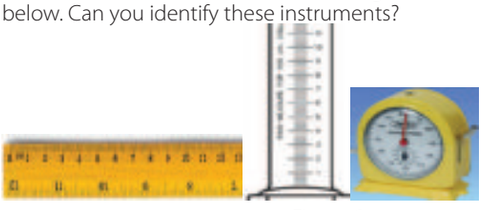


Figure 3

Is it possible to obtain a value of a quantity by simply looking at an object without an instrument? If you do so, then you are estimating.

For your knowledge
There are different physical quantities that are measured. Some are shown in the table below, with their units and instruments used to measure them

Physical Quantity	Name of Unit	Abbreviation	Instrument
Mass	Kilogram	kg	Beam balance
Length	Metre	m	Metre rule
Time	Second	s	Clock
Temperature	Kelvin	K	Thermometer
Weight	Newton	N	Spring balance
Volume	Cubic metre	m^3	Measuring cylinder

Are there otherphysical quantities not indicated in the table? Identify them
Can you differentiate between measuring and estimating?

Lesson 2: Measuring length
Competence:
By the end of this lesson,you will be able to;

- Make an instrument for measuring length
- Measure length and express it in different units

Materials you need

- A ruler
- Stick almost your height

Introduction
In lesson one, you saw that length is one of the quantities measured in physics. Its a distance between two points or objects. In this lesson you will measure length conveniently and express it appropriately.
Activity 1

Procedure
Using your set ruler, measure and record the length of;

(a) Your book

(b) One side of your house

You may have discovered that measuring the length of one side of your house was quite hard. But to simplify this, you need a different instrument.
Activity 2
Procedure

- Using the ruler, make divisions on the stick several times until you have formed a metre rule.
- Record the length of the formed metre rule
- Estimate the following
  (a) the length of one side of your house
  (b) your height
  (c) the height from the ground to the window of your house
  (d) the height of your house
- Now using this metre rule, measure the above distances and compare with your estimates as shown in figure 4.

Figure 4: Measuring vertical distance
Please do not forget to indicate your answer in cm

For your knowledge: 1 m= 100 cm

Now you can alsoexpress the **above** estimate and measurements in metres as well.

Figure 5: Estimating measurement using stride/ pace

You should try to measure different lengths on the ground using your pace as shown in Figure 5.

Lesson 3: Measuring mass
Competence:
By the end of this lesson, you will be able to;
- Define mass and state its units
- Describe how to measure masses

Materials you need
- A small bottle of mineral water
- Water
- Bucket
- Basin

Introduction
Ask yourself about this: What is the amount of matter in a block of wood, a lump of sand, a heap of stones or a bottle of water?

Activity
- Fill up a small bottle of mineral water with water.
- Pour this water into a big container such as a bucket or basin
- Do this until you have poured water ten times into the bucket or basin

What is the amount of matter in the water you have poured into the bucket or container?
The amount of matter in the water in the container is called **mass. It is measured in grams.**

The mass of a small bottle of water filled with water is about 500 g. So what is the mass of water in the big container?
Using this activity, try to estimate the mass of water in a jerrycan.

Do you know your mass?
For your knowledge: Mass is measured in laboratories using a beam balance

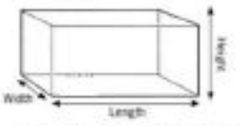
Lesson 4: Volume
Competence:
By the end of this lesson, you will be able to;
- Define volume and state its units
- Describe how to measure volume

Materials you need
- A small bottle of mineral water
- Some water
- A ruler
- A rectangular object such as a brick or bible

Introduction
What happens when you pour water or sand in a container? How do you record the amount of water or sand? What you record is the amount of space occupied by the water or sand, or the **volume of water/sand**.

Acivity 1
Measuring the volume of a regular object such as a rectangular object
What you need
- Ruler

What to do
1. Estimate the length and width and height of the rectangular object such as the bible or brick and find their product to estimate the volume of the object
2. Now measure the length, width and height of the bible or brick with a ruler (Figure 6) and calculate the real volume of the book or brick



volume = length x width x height

Figure 6: Illustration of measuring volume of a rectangular object

How close was your estimate to the measured value?

Note: If you measure the sides of the rectangular block in *centimetres* (cm), the volume will be in *cubic centimetres* (cm^3). If you measure the sides of block in *metres* (m), the volume will be in *cubic metres* (m^3). However, the SI unit of volume is *cubic meters* (m^3).

Try this one out: How many cm^3 are in $1m^3$?
What to do
- Convert 1m to cm.
- Multiply 1m by 1m by 1m to $1m^3$.
- Multiply also 100cm by 100cm by 100cm. What do you get?
- Compare the volume in m^3 to the volume in cm^3.

Did you know? $1000cm^3$= 1 litre

Lesson 5: Finding the volume of a liquid
Competence:
By the end of this lesson you will measure volume of liquids

What you need
- Small bottle of mineral water (its volume is 500 cm^3 or 0.5 litres)
- Some water in a cup

Procedure
1. Estimate the volume of the water in the cup in litres
2. Pour the water into the mineral water bottle.
3. Try to estimate the volume of the water using the mineral water bottle. Remember to read the bottom of the meniscus

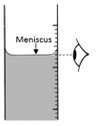


Figure 7: Position of eye while measuring volume of a liquid
Can you make a measuring cylinder out of a plastic bottle? How accurate can it be?

Lesson 6: Finding the volume of an irregular object
Competence:
By the end of this lesson, you should be able to measure volume of an irregular object

Introduction

A regular solid is one with straight sides, for example a book. An irregular solid does not have straight sides, for example a stone. You can measure the volume of irregular shaped solids by putting them in water in a marked container and finding out how far the water rises. We can only do this for objects which sink in water.

Activity
You need;
- Marked water bottle
- Water
- stone (small enough to go into the water bottle)

What to do
1. Estimate the volume of the stone.
2. Put some water in the marked water bottle and read the volume (*x cm^3)* .
3. Put the stone in the water in the marked water bottle and read the new volume (*y cm^3).*
4. The difference between the two volumes is the volume of the stone.

Lesson 7: Measuring time
By the end of this lesson, you should be able tomeasure time using different methods

Materials you need
- A watch/clock
- A small polyethene bag containing sand

Introduction
Our great grandfathers used different ways to measure time. These included observing the shadow, flowing sand, heartbeat and cockcrow. Some of these are indicated in Figure 8 below.

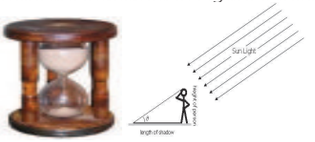


Figure 8: Ancient ways of measuring time

However, many of these methods were inaccurate or unreliable. Nowadays, engineers have developed more accurate clocks and watches for measuring time (Figure 9)

Figure 9: Modern ways of measuring time

How good are you at estimating time? Can you count so that you say one number each second? Try it.

A good way of measuring a second is to make a pendulum by tying a stone to a piece of string. If the string is 1 m long, the stone moves from one side to the other in 1 second. The SI unit of time is second. Other units of time are minutes, hours, days and weeks. Can you think of other units of time?
Follow up activity
State the most appropriate units in which you can express the following times
a) Your age
b) The time it takes to drink a cup of tea

c) The time the school assembly takes
d) The gestation period of a goat

Lesson 8: The scientific method
Competence:
By the end of this lesson you will be able to explain the steps followed in the scientific method

Introduction
In the previous lessons, you may have seen that Physics relies upon the practice of making observations and carrying out experiments. In Physics, you observe, raise questions, experiment, make conclusions. You may also make discoveries. That is called **'the scientific method'.**

Figure 10: The steps followed in a scientific method

1. Make an observation, for example:A torch does not light.
2. Ask a question, for example:Why doesn't the torch light?
3. Form a theory, or an explanation that you can test, for example: may be the torch doesn't light because the bulb is blown.
4. Predict what will happen based on the theory, for example: A new bulb will make torch light.
5. Test the prediction through experimentation, for example:Remove the top and replace the bulb with a new one.
6. Use the results to conclude or make new theories, for example:
   The torch did not light because the bulb was blown, or failure to light is not due to a blown bulb.
   In the second case look for another theory to answer your question and test it. Repeat until you get the correct theory.

The scientific method follows these steps:

Figure 10:

Did you know?

When we **observe** in science, we normally use four of our senses to notice things.

- We look at things when we use our sense of *sight*.
- We feel things when we use our sense of *touch*.
- We listen to things when we use our sense of *hearing*.
- We smell things when we use our sense of *smell*.

(We do not usually use our sense of taste as that could be dangerous.)

Activity: Solving a problem using the scientific Method

What you need
- A radio which does not work but with old dry cells inside.
- A pair of new dry cells.

What to do
1. Copy the table below in your book.
2. Use the guideline provided in steps 1 – 6 above to carry out an investigation to identify the problem with the torch and record your results in Table 1 below.

Table 1

Observation	
Question	
Theory	
Prediction	
Experiment	
Conclusion	

Lesson 9: Density
Competence:
By the end of this lesson, you will will be able to;
- Define density and state its units
- Solve numerical problems related to density

Materials you need
- A pumpkin or any other large fruit available
- A small bottle of mineral water
- A block of wood or brick
- A container such as jug

Introduction
How do you compare two objects to see which one is bigger than the other? The task may be difficult, because even if the size of a body is larger, it does not necessarily mean that the particles in the body are closely packed. It may not even be heavier.
In this section, you will learn a more convenient way of comparing objects and why it is important to compare objects using the concept of density.

Now do this activity.
Look at the objects in Figure 11

Figure 11

(a) Which of the objects is the biggest? How do you know?
(b) Which object has the greatest mass?Which object has the most matter in it?

Some objects in **Figure11** have a small mass but with a large volume. The plastic bottle is one of these. The brick, however, has a large mass but with a small volume.We say that the brick has a large **density** but the plastic bottle has a small density. Therefore what is density?

The **density** of a substance is the mass of 1 cm^3 of the substance or **mass per unit volume**.

To find the density of a substance we divide its mass by its volume:

$$\boldsymbol{density = \frac{mass}{volume}}$$

Think back to what you did earlier in this chapter to remind yourself about how you measure mass and volume.

Now that you know the method of obtaining density of an object, can you obtain the units of density?

Try out these problems:

1. The density of a metal is 8.9 g cm^{-3}. What does it mean? What is the importance of this value?
2. A rectangular piece of glass has a mass of 145.8 g and measures 2 cm by 9 cm by 3 cm. Find its density and express your answer in kg m^{-3}.

Lesson 10: Comparing densities of substances using water
Competence
By the end of this lesson, you will be able to compare densities of different materials using water

Activity
Materials you need
Some different solids such as:
- Pieces of metal
- Piece of plastic
- Piece of wood
- A small stone
- Some water in a container

What to do
1. Take different solids and put them in water
2. Observe whether they float or sink

Those substances with a density of less than that of water (1 g cm^{-3})willfloat in water. What can you say about the densities of the objects that sink?
Look at Table 1 below.
Table 1: Densties of commn substances

Substance	Density (g cm^{-3})	Substance	Density (g cm^{-3})
Aluminium	2.7	Methylated spirits	0.8
Brass	8.5	Paraffin	0.8
Copper	8.9	Petrol	0.7
Cork	0.3	Polyethene	0.9
Glass	2.5	Sand	2.6
Gold	19.3	Tin	7.3
Steel	7.9	Wood	0.6
Lubricating oil	0.9	Water	1.0
Mercury	13.6		

Which of the substances in Table 1 float in water?

Did you know that the floating of ships is a result of density of the ship material and its contents? (Figure 1). The material has more density than water but it floats because it contains air and occupies a large volume. Hence its density becomes less than that of water.

BIOLOGY

Revision activity 1:

Cells are the tiny building blocks of life that make up living organisms. Most cells are too tiny to be seen by unaided eye. You can only observe cells using a microscope. A microscope is an instrument used to observe things that are too small to be seen by an unaided eye. It makes them appear much larger and clearer. The egg of a bird is actually a cell and can be seen without the use of a microscope.

Things you will need:

i) Picture of an animal cell as seen under a microscope
ii) Raw chicken egg in a clear plate/saucer
iii) notebook
iv) pen /pencil

Activity set-up

Get a raw chicken egg and carefully crack it from the side of the airspace, hold the egg at the edge of a flat clear plate/saucer and gently pour out the contents onto the plate.

Procedure:

Step 1: Observe the raw egg on the plate/saucer. Look at the different layers.

i) How many layers are you able to see?
ii) Describe the size (big or small or thin) and position (outer, central, inner) of the layers
iii) Record the information from (i) and (ii) above in the table below. You will use it later in this activity.

Step 2: Study the picture of an animal cell as seen under a microscope

Step 3: Now compare the observation of the picture of an animal cell with that of the raw egg.

	Raw egg	Animal cell
Number of layers		
Size of layers		
Position of layers		

The central part of the animal cell is called the nucleus.

The fluid part surrounding the nucleus is called the cytoplasm.

The outer boundary surrounding the cytoplasm is the cell membrane.

Step 4: Draw and label the parts of the animal cell

Follow-up activity

1. Complete the following statements by filling in the blank spaces

_____ is a thin, outer layer surrounding the contents of the cell. It allows some substances to go in and some to come out of the cell.

_____ is a mucus-like liquid in the cell. This is where some of the life processes take place.

_____ is the "brain" of the cell. It controls all the chemical activities that take place in a cell. For example, _____, _____ and _____

2. The coronavirus is a microscopic organism, how different or similar is it to the animal cell?

Revision activity 2

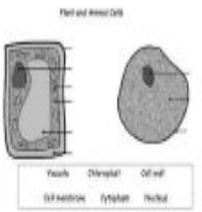
Introduction: The plant cell has parts that are the same as those found in an animal cell. It also has parts that are unique to it. The structure of the plant cell is also different from that of the animal cell.

Things you will need:

i) Picture of a plant cell as seen under a microscope
ii) notebook
iii) pen /pencil

Procedure:

Step 1: Study the picture of a plant cell as seen under a microscope



The thick outer polygon-shaped layer is called the cell wall. The small green oval-shaped structures scattered in the cytoplasm are called chloroplasts. The vacuole is the large centrally located area of the cell found within the cytoplasm.

Step 2: Draw the plant cell and label its parts.

Follow-up activity - Complete the following statements by filling in the bank spaces

The cell wall is made up of a tough material called cellulose hence it provides _____ to the plant cell. The chloroplasts are numerous round structures that are green in colour because they contain chlorophyll which is used to trap _____ energy needed in the process of _____. The vacuole stores waste materials and useful substances such as _____, _____ and _____.

Revision activity 3

Cells are grouped together or organised at various levels in order to carry out specific functions and key life processes in the body. This ensures efficient functioning of the body for the survival of the organism. In this lesson, you will find out the different levels of cell organisation and what they do.

Things you will need:

i) notebook
ii) pen /pencil

Procedure:

People in a group can perform more complex tasks than one person alone. Consider what happens when there is a social gathering at your home and three families are supposed to prepare a meal for the function.

Step 1: List the categories of foods that form the meal going to be prepared.

Step 2: For each of the categories you have identified, sort them out according to the number of people that would be required to prepare that category of food i.e.

- 1 person
- 2 to 3 people
- 4 to 8 people (one family)
- more than 9 people (2 or more families)

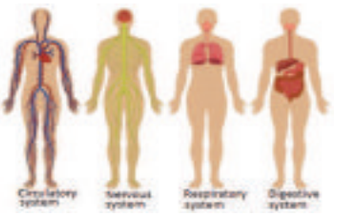
Write what you have done in a notebook

Step 3: Like people, similar cells in our bodies are organised into groups to make them work more effectively.

- *A group of **similar cells** performing a particular function is a **tissue** e.g. muscle tissue*
- *A group of **different tissues** form an **organ** to perform a particular function e.g. heart*
- *A group of **different organs** form an **organ system** to perform a particular function e.g. circulatory system*
- *A group of **different organ systems** form an **organism** e.g. a human*

Compare what you wrote down in step 2 with the information given in step 3. Write down what would be the equivalent of a cell, tissue, organ, organ system and organism.

Step 4: Study the figure below



Identify;

i) The four systems shown in the figure
ii) The organs that make up each of the systems shown

State the function of each of the systems you have identified.

MATHEMATICS

Topic: Working with Integers

This topic is to guide you to work with positive and negative integers.

LESSON ONE

In this lesson you will be able to identify, read and write natural numbers as numerals and words in million, billion and trillion.

Materials Required

A pen and book.

Review

In your day-to-day life, you use numbers to count items, to keep information, to transact business and many others. Since you use numbers in your day-to-today situations, knowledge of integers will be helpful to you.

In lower primary, you learnt counting items using numbers one, two, three and so on. In mathematics these numbers are called counting or natural numbers.

Activity 1

Look around your homestead.

i. How many cows or hens or goats or ducks or banana plantains or cups do you have:
ii. Write each of the numbers in words.

Brain teaser:

When do you start counting? Is it at 0 (Zero) or 1 (one)?

TIPS FOR LEARNING.

When zero is included in the set of natural numbers/ counting numbers, they become whole numbers.

N is a set of Natural numbers $\{1,2,3,4,5,------\}$

W is a set of Whole numbers $\{0,1,2,3,4,5.------\}$

Activity 2

Match the following correctly

One million and three	1000003
One million three	1030000
One zero zero zero zero three	One billion three hundred fifty million sixty-four thousand five hundred seventy-six thousand.
1,350,064,576	One billion three fifty thousand sixty-four thousand five hundred seventy-six
	One billion three hundred fifty million six hundred forty thousand five hundred seventy-six

Exercise

Write the following in words:

1. 8,008,008
2. 606,520,060
3. 9,000,909,800
4. 1,629,284,729,000

Write the following in figures:

1. Six hundred five million three thousand and eight
2. Seven billion eighty-nine million four thousand seven
3. Five trillion two hundred fifty billion eight hundred seventy-five million three hundred sixty thousand

LESSON 2:

By the end of this lesson you will be able to relate natural numbers and integers

Activity 1: Relating natural numbers and integers

The average normal body temperature of a human being is 37^{0}C. In one of the markets, temperatures of 5 people were taken and recorded as follows. Use the results to answer the questions that follow.

PERSON	TEMPERATURE RECORDINGS
A	36^{0}C
B	37.5^{0}C
C	38^{0}C
D	38.5^{0}C
E	34^{0}C

Questions

1. Which of the persons had a normal temperature?
2. Which person has a low body temperature? How does it compare with the normal person's body temperature?
3. Which person has the highest body temperature? How does it relate with the normal person's body temperature?
4. If a patient has his/her temperature measured at 34.5^{0}C, explain the difference from the normal body temperature of 37^{0}C
   b. What special name is given to the difference you obtained in (4) above?
5. If a patient has his/her temperature measured at 39.5^{0}C, explain the difference from the normal body temperature of 37^{0}C
6. What special name is given to the difference you obtained in (5) above?

Which of the following is a true statement?

a. The natural numbers include fractions
b. The natural numbers can be positive or negative
c. The natural numbers are the counting numbers
d. The natural numbers go up to 100

Sort out the natural numbers from the following list

20, 1555, 63.99, 5/2, 60, −78, 0, −2, −3/2

Write an integer to represent each situation:

STATEMENT	INTEGER
3 degrees above 0	
A loss of UGX.20,000	
A gain of 7 points	
5 steps backward	

Brain teaser

Are the following statements **TRUE** or **FALSE**? Give reasons.

1. Addition of natural numbers gives a natural number
2. Subtraction of natural numbers is equal to an integer.
3. Multiplication of integers is always equal to a natural number.
4. Subtraction of natural numbers is equal to a natural number
5. Division of integers is equal to a natural number.

Tips for Learning

The relationship between integers, whole numbers and natural numbers

Lesson 3:

By the end of the lesson you will be able to use Directed Numbers (Limited to Integers) in Real-life Situations

Activity 1

Read the story below and answer the questions.

Once upon a time, there lived an old woman. She had hot and cold stones and a big pot of water. If she put one hot stone in the water, the temperature of the water would rise by 1 degree. If she took the hot stone out of the water again, the temperature would go down by 1 degree.

Question 1

If the temperature of the water is 24 degrees and the old woman adds 5 hot stones, what is the new temperature of the water?

Now imagine that the temperature of the water is at

29 degrees. The old woman takes a spoon and takes out 3 of the hot stones from the pot.

Question 2

What is the temperature of the water when the old woman removes 3 hot stones? Explain your answer.

The old woman also had cold stones. If she adds 1 cold stone to the water, the temperature goes down by 1 degree. The temperature of the water was 26 degrees. Then the old woman added 4 cold stones.

Question 3

What is the temperature of the water after the old woman added 4 cold stones? Give a reason for your answer.

Just like the old woman could remove the hot stones and the temperature would decrease she could also remove the cold stones.

Question 4

Imagine that the temperature of the water was 22 degrees and the old woman removes 3 cold stones. What happens to the temperature of the water?

What is the new temperature of the water? Explain your answer.

Activity 2

Get a cup of hot water and dip your finger. Note the time at which you have dipped the finger and how you felt. Give an interval of 30 minutes, and dip the finger again in the cup of water. What do you feel? Explain the effects using the knowledge of integers.

Five steps to kicking out coronavirus

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SENIOR ONE
SELF STUDY MATERIALS

HUMANITIES PACKAGE

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History and Political Education

Senior 1 Term 1

Lesson 1: The Relationship between History and Political Education

By the end of this lesson, you should be able to:

1. define the terms history and political education.
2. explain the relationship between history and political education.
3. understand the importance of studying history and political education.

Materials you will need:

- Pen
- Notebook

Instructions:

1. Use a handbook for Senior One History.
2. You can make reference to other related books.
3. If possible, consult an adult and search the Internet while doing the activity.

Introduction

In Primary Seven you studied Social Studies. Social Studies has contents of History and Geography. This year you will learn about History as an independent subject. What do you think the subject History is about?

History is the subject that studies past events, it makes a comparison with the present in order to forecast the future. ***Why do you think it is important to learn about past events?*** It is a relevant subject since it helps us find out and learn from the successes and failures of people, organizations and nations.

Political Education is made from two words: Political which is a set of activities associated with government of a country/an area that makes decisions that affects the group members; and Education which is the process of acquiring knowledge, skills, values, beliefs, and habits by a facilitator or a teacher.

Can you now try to give the meaning of Political Education?

Political Education is, therefore, the process of teaching learners about the politics of a group, country or organization where the individuals belong. This prepares them for their future political engagement at group organization, community or national levels. It is sometimes called the study of civics.

Activity 1

1. Have you been a leader or worked with a leader before?
2. Where did you get leadership skills from?
3. What are some of the challenges that you faced as a leader?

Relationship between History and the Political Education

History provides a background for Political Education. The two subjects both deal with humanity and have relationship with society in terms of social, political and economic set up. The only difference is that History deals with past events while Political Education deals mainly with the current issues.

History and Political Education are both social sciences, which means they are both studies of how society operates in two different disciplines—History, through time while Political Education, through a society's government and its relationship with its citizens.

Can you think of any other subject which addresses society's problems like History and Political Education?

Why study History?

There is a good reason for you to study History and Political Education. History helps us understand change and manage change, and also understand how society which we live in today came into existence. It provides the origin and the foundation of all subjects for example Physics, Mathematics and others.

History helps learners develop the acquisition of knowledge and critical thinking skills which help in developing citizenship and constitutional knowledge. It provides lessons for the present by analyzing the past. Studying History prepares you for further education and employment. The learners of History may later become lawyers, teachers, archaeologists etc. Studying History also provides cultural awareness.

Political Education

What is happening to you is a result of a system believed and practised by political leaders. Early political awareness and socialization can enable you to adopt political views through democratic debates. This will help you to develop independent mind about political governance. You will become politically aware and develop skills for future legislation and leadership.

Political Education prepares young citizens for future democratic leadership and governance. It prepares citizens for future multi-party politics due to different lines of thought. The ideologies of the political parties we choose to associate with often grow in our minds from early childhood. We should be knowledgeable about different political affiliations to know the best form of democracy to associate with. The more politics discussed at school, the more you are able to seek political democracy in future.

Now that you have a fair background information about History and Political Education, do **Activity 2**.

Activity 2

In your notebook, write at least three sentences on each of the following:

1. In your opinion why should every learner study history and political education?
2. What challenges are you facing at school that would be solved by knowledge got from history and political education?
3. Where is the similarity between students' leadership at school and political education?

Lesson Summary

History and Political Education are society building subjects which are closely related. The subjects help the learner understand and prepare for a effective social democratic society in future.

Follow-up Activity

1. Ask an elder at home about the history of your village/area and write your findings in your notebook.
2. As a student of History write a one-page summary of the benefits of studying History and Political Education.

Lesson 2: Sources of History

By the end of this lesson you should be able to:

1. classify the sources of history.
2. explain the primary sources of history.
3. identify the secondary sources of sources.
4. describe the scientific sources of history.

Materials you will need:

- Textbook of History
- pen
- notebook
- computer/cellular phone with internet, where possible

Instructions

1. Use a handbook of Senior One History.
2. You can make reference to other related books.
3. If possible, consult an adult and search the Internet while doing the activity.

Introduction

Historical source is the original information that contains important historical information. These sources inform us about history at the most basic level and these sources are used as clues in order to study about our past events. This historical information can be obtained from sources like the oral traditions, archaeology, anthropology, linguistics, videos, written documents, museums, traditional folk songs, monuments, among others. These sources are classified into primary, secondary and scientific forms.

Primary Sources

This is first-hand information obtained from the persons who witnessed the historical event. These people provide first-hand evidence about what happened on an event, object or to a person. This makes them more accurate in providing the correct history to us. The common primary sources we rely on include: the oral traditions of storytelling, tape recorder, photos, lab reports, experiments, observations. Such information is acquired through the first person's accounts found in diaries, memoirs, letters, interviews, speeches and others.

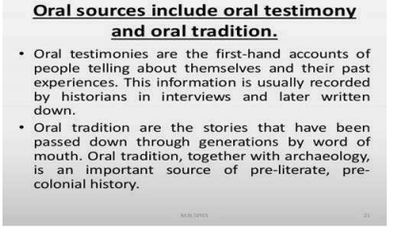


Figure 2.1: Oral traditions of story telling

Activity 1: Gathering historical information

1. Why do you think the primary sources are the most reliable sources of history?
2. What are the weaknesses of this source of information?
3. Suggest ways of overcoming weaknesses of this method.

Secondary Sources

This is known as second-hand information. Secondary sources are usually produced after an event has occurred. It contains information that has been interpreted, commented on, analysed and processed from the original information. The common source of such information include historical research project. Secondary sources are generally scholarly books and articles. A secondary source interprets and analyses the primary sources. These sources are one or more steps removed from the event. Secondary sources may contain pictures, quotes or graphics of primary sources. **Figure 2.2** to **2.5** are examples of secondary sources. Secondary sources of historical information include: manuscript collections, collected writings, notes, letters, and other unpublished works. When Ms Monica watches a movie and explains to her friends at school what it was about, that is an example of secondary source of information**.** The person who saw the movie being authored/ developed/acted is a primary source**.**

What other examples of secondary sources can you give?

Figure 2.2: Newspaper

Figure 2.3: Bible

Figure 2.4: Quotation by Winston

Figure 2.5: Computer research

Activity 2

1. Describe a situation through which you can teach your guardian/parent about a secondary source of historical information.
2. Outline the benefits of using the secondary source of historical information.
3. What can be the challenges of such sources of historical information?

Scientific Source of History

Science has mainly relied on the findings of **archaeology** to trace our history. The leading person under this study was called Dr Leakey with his wife, Mary.

Archaeology is the study of the material remains used by man many years ago. The remains are termed as **fossils.** Some of the material remains are the tools used by early people which include: spears, bows, arrows, chisels, hammer among others. See **Figure 2.6** below. People who study these fossils are called archaeologists.

Archaeologists dig deep to excavate and study the artefacts, tools, pottery, sculptures, paintings, buildings, among others. They use scientific methods to evaluate their work. For example, Dr Leakey and his wife, Mary, whose pictures are seen in **Figure 2.7** below, provide a good example of archaeologists in East Africa. Some key excavations that took place in East Africa include: Oldivai Gorge in Tanzania, Bigobyamugyenyi in present day Sembabule in Masaka and Magosi in Karamoja—North East Uganda.

Figure 2.6: Archaeology tools

Figure 2.7: Dr Leakey & Mary

Activity 3

1. Explain the benefits of using the scientific method in finding out about our past.
2. Other than archaeology, give other scientific methods we can rely on to study our past.

Summary

There are many sources of history and all of them can be reliable if their risks are minimized in course of their use.

Follow-up Activity

1. Other than the primary, secondary and scientific sources of history seen in this topic, list other ways through which one can find out about the past.
2. Prepare an interview guide that you would like to ask an elder how cultural morals were taught to young people before the introduction of formal education.

Lesson 3: Historical Site

By the end of this lesson, you should be able to:

1. explain the term 'historical site'.
2. locate historical sites on the map of East Africa.
3. state the importance of historical sites in East Africa.

Materials you will need:

- textbook
- pen
- notebook
- computer or phone with Internet access, where possible
- Atlas of East Africa

Instructions

1. Use History of Senior One, Learner's Textbook.
2. You can make reference to other related books.
3. If possible, consult an adult and search the Internet while doing an activity.

Introduction

A historical site is an official location where cultural, military, political or social history is preserved because of its heritage value. It is also referred to as a heritage site. Historical sites are usually protected by law and have been recognized with official national historical status. A historical site may be any building, area or feature that is of local or international importance. Examples of historical sites in Uganda include: Sipi Falls, Nyero Rock Paintings, Vasco Da Gama Pillar, the source of River Nile, Kasubi Tombs, and many others**.** Can you mention any other historical site in your locality?

Location of Historical Sites in East Africa

Uganda	Kenya	Tanzania
Kasubi Royal Tombs	Garissa	Songea
Uganda National Museum	Wajir	Slave caves in Zanzibar
Uganda Martyrs Shrines	Marsabit	Mtwara
Nyero Rock Paintings	Moyale	Karibu Heritage Sites
Dufile	Mt. Kenya	Shinyanga
Nshongezi Lock Shelter	Lodwar	Mbeya
Sezibwe Falls	Fort Jesus	National Museum of Zanzibar.
Fort Lugard	Nairobi National Museum	Tangoni ruins

Sipi Falls		
Bahai Temple		

Activity 3: Locating historical sites in East Africa

1. In your notebook, draw the map of East Africa.

2. Mark and locate the above sites on the map you have drawn.

Importance of Historical Sites in East Africa

Historical sites provide a sense of identity and continuity for future generations through preservation of culture and its heritage. Culture and its heritage shape values, beliefs, and aspirations of people, and define their national identity. Historical sites, when preserved, bring development to the communities in that area. They provide employment and livelihoods to the East African peoples. The community benefits from the tourism industry and all other related advantages. They lead to infrastructure development. Historical sites provide powerful tangible and intangible connections to our past. Generally, historic sites provide economic, cultural, environmental, and educational benefits to East Africa. **Table 1.4** provides some of the historical sites and their purpose.

Table 1.4 Historical Sites in Uganda.

Source of the Nile Speke Monument
Source of Nile is the site where the British Explorer, **Speke,** first discovered the River Nile

Kasubi Tombs Heritage

Kasubi tombs is the site of the burial grounds of four Kabakas and other members of the Buganda royal family. As a result, it remains an important spiritual and political site for the Ganda people

Uganda Martyrs Catholic Shrine Namugongo

Uganda Martyrs Catholic Shrine Namugongo is one of the best religious and cultural sites in Uganda drawing many travellers from Africa and all over the world. it is built in memory of the Christians who died for their faith.

Sir Samuel Baker's Fort
Sir Samuel Baker Fort was a military **fort** built by Samuel Baker

Bahai Temple Church
Bahai Temple Church in Uganda teaches essential worth of all religion**s.**

Bigo Bya Mugyenyi
Bigo Byamugyenyi, the Chwezi **Site,** is found in Ntusi in Sembabule district and is believed to be the place for the vanished Bachwezi people.

Karambi Royal Tombs

Karamba Royal Tombs is the tombs of the royal family of Toro.

Mparo tombs

Mparo Tombs serve as Bunyoro Kingdom›s **burial** grounds for the Kings and other royals.

Sezibwe Falls

Sezibwe Falls are Located in Mukono. The spectacular waterfalls are believed to have been born by humans many hundred years ago. The falls are one of the most spiritual and cultural centres where many natives flock for blessings, wealth, and fortunes.

Nakayima tree

Nakayima tree is one of strongest and oldest trees in existence today. It is also known as the witch-tree located in Mubende.

Nkokonjeru Tombs

Nkokonjeru Tombs are located in Kakiika 3 km from the city centre of Mbarara, inside a deserted colonial styled house, marked by two concrete slabs. They are Ankole Kingdom burial grounds.

Nyero Rock Paintings

Nyero Rock Paintings sites are found in eastern Uganda in eastern Uganda in Kumi district. The rock art sites are believed to have been sacred places of the gods. The red and white paintings remain valuable to the people of Teso but are also mysterious since the painters are unknown. In the past, the Iteso people of Nyero would sacrifice and pay offerings to the gods for problems of rain, misfortune, blessings and childbearing.

Nagalabi Budo

Naggalabi-Buddo was established back in the 14th Century on a hill where the kings (Kabakas) of Buganda Kingdom are enthroned for the past 8 centuries, including the reigning king, Kabaka Ronald Muwenda Mutebi II.

Wamala Tombs

Wamala tombs are where one of the greatest ancient kings of Buganda, Kabaka Suuna II was laid to rest. Kabaka Suuna II was the first Kabaka to allow outside traders into Buganda.

Ndere Troupe

The Ndere cultural troupe was founded by Rwangyezi Stephen as a cultural organization in 1986 for universal unity through music, dance and drama. The troupe is among the over 1600 Uganda development theatre association groups entertaining and educating people through music, dance and drama. The word 'Ndere' means a **"Flute"**

Igongo Cultural Centre

Igongo Cultural Centre: The proprietor, James Tumusiime, said the facility promotes research, people who make handcrafts, musicians and singers. He said it also promotes herbal medicine, forestry and other issues relevant to African history and culture. It is located in Mbarara district.

Itaaba Kyabanyoro

Itaaba Kyabanyoro is a cultural site in the history of the Ankole kingdom. This spot is exactly where the very last king of the great Bachwezi empire, Wamala, crafted the sacred Bagyendanwa royal drum from. Itaaba Kyabanyoro is situated just a few kilometres from Mbarara on Kabale Road.

Katereke Prison

The **Katereke Prison** ditch is claimed to have been dug by former king of Buganda, Kabaka Kalema in the late 19th Century. It's a ditch of 70 metres wide and 10 metres deep. It is located in Nsangi near Kampala. In the struggle for power in 1889, Kabaka Kalema killed 30 of his sisters and brothers and buried them there.

Task:

1. What is the importance of preserving a historical/cultural site in Uganda?
2. What are the challenges of keeping historical sites?
3. Suggest solutions to these challenges.

Lesson Summary

Historical sites are of great importance. Some sites are natural while others are artificially made, but they all provide benefits to the communities where they are found. However they have some challenges which hinder their operational capacities.

Follow-up Activity

1. If you were a resident near a historical site, propose a project you would set to earn a living.
2. What are the benefits of historical/cultural sites to Ugandans and the tourism industry?
3. Suggest how a country can manage cultural sites in the modern times of external religions.

Topic 2: Origin of Man

Lesson 1: Traditional Beliefs about the Origin of Man

By the end of this lesson, you should be able to:

1. explain the meaning of traditional beliefs.
2. understand the Kintu and Nambi legend
3. know the story of Kaang and creation.
4. understand the story of Kintu and his three sons.

Materials you will need:

- textbooks
- pen
- notebook
- computer/phone with the Internet access, where possible
- Atlas of East Africa

Instructions

1. Use Senior One History, Learner's Textbook.
2. You can make reference to other related books.
3. If possible, consult an adult and research the Internet while doing the activity.

Introduction

East African Traditional Beliefs

There are many African oral traditional beliefs on the origin of man. The oral traditions were messages that were transmitted orally from one generation to another through folktales and fables, heroic histories and narrations, proverbs or sayings, and songs. Different ethnic groups in East Africa have their own different beliefs on the origin of their ancestry that has been passed on through generations. The traditional beliefs of these ethnic groups have shaped the culture of the people within those groups.

The Baganda Legend

Read the text below and answer the questions that follow.

Kintu and Nambi Theory

In the distant past, Kintu was the only person on earth, living alone with his cow. Ggulu, the creator of all things, lived up in heaven with his many children who occasionally came down to earth to play. On one such occasion, Ggulu's daughter, Nambi, and some of her brothers encountered Kintu and his cow in Buganda. Nambi instantly took a liking to Kintu and decided to stay and marry him. Her brothers pleaded with her, eventually convincing her to return to heaven with Kintu, to ask for her father's permission for the marriage.

Ggulu was not pleased and only blessed the marriage after Nambi had pleaded so much. Ggulu advised Kintu and Nambi to leave heaven secretly, so that Walumbe, one of Nambi's brothers would not find out about the marriage. It was feared that Walumbe which means "the cause of sickness and death" would insist on going with them and bring them misery.

Kintu and Nambi set out for earth the next morning, taking with them a few things that Nambi packed, and her chicken. While they were descending, Nambi remembered that she had forgotten to bring the millet that her chicken would feed on. Kintu tried to persuade her not to return to fetch the millet, but she left him and returned to fetch the millet. On the way back from fetching the millet, she met Walumbe. She did not tell him where she was going, but filled with curiosity, Walumbe insisted on going with her. Kintu and Nambi were, therefore, forced to go to earth together with Walumbe.

Walumbe's presence on earth caused suffering and conflicts. That, according to the legend, is how sickness and death started.

The area where Walumbe is traditionally thought to have fallen to earth and to have hidden from Ggulu is the Tanda Pits, west of Kampala on the south side of the road to the town of Mityana.

Note:

The story above is a myth. A myth is a traditional anonymous story, originally religious in nature, told by a particular cultural group in order to explain a natural or historical event.

Activity 1

1. According to you, how is the above myth related to the current life of the Baganda community?
2. What lessons do you learn from this myth as a student?
3. What are the weaknesses of this source of historical information?

African Bushmen and Creation of Myth (Kaang story)

People did not always live on the surface of the earth. At one time people and animals lived underneath the earth with Kaang (Käng), the Great Master and Lord of All Life. In this place people and animals lived together peacefully. They understood each other. No one ever wanted for anything and it was always light even though there wasn't any sun. During this time of bliss, Kaang began to plan the wonders he would put in the world above.

First, Kaang created a wondrous tree, with branches stretching over the entire country. At the base of the tree he dug a hole that reached all the way down into the world where the people and animals lived. After he had finished furnishing the world as he pleased, he led the first man up the hole. He sat down on the edge of the hole and soon the first woman came up out of it. Soon all the people were gathered at the foot of the tree, awed by the world they had just entered. Next, Kaang began helping the animals climb out of the hole. In their eagerness, some of the animals found a way to climb up through the roots of the tree and come out of the branches. They continued racing out of the world beneath until all the animals were out.

Kaang gathered all the people and animals about him. He instructed them to live together peacefully. Then he turned to the men and women and warned them not to build any fires, or else a great evil would befall them. They gave their word and Kaang left to where he could watch his world secretly.

As evening approached the sun began to sink beneath the horizon. The people and animals stood watching this phenomenon, but when the sun disappeared fear entered the hearts of the people. They could no longer see each other as they lacked the eyes of the animals which were capable of seeing in the dark. They lacked the warm fur of the animals also and soon grew cold. In desperation, one man suggested that they build a fire to keep warm. Forgetting Kaang's warning, they disobeyed him. They soon grew warm and were once again able to see each other.

However, the fire frightened the animals. They fled to the caves and mountains and ever since the people broke Kaang's command, people have not been able to communicate with animals. Now fear has replaced the seat of friendship once held between the two groups.

Comments

The Bushmen of Africa believe that not only are plants and animals alive, but also rain, thunder, the wind, spring, etc. They claim:

What we see is only the outside form or body. Inside is a living spirit that we cannot see. These spirits can fly out of one body into another. For example, a woman's spirit might sometime fly into a leopard; or a man's spirit fly into a lion's body (Fahs and Spoerl 6).

This may be part of the reason that animals play such an important role in their myth.

Activity 2

1. What lessons do you learn from such myths?
2. Ask your guardian/parent to tell you the myth about the origin of man.
3. What are the weaknesses of such stories as sources of historical information?

Lesson Summary

Traditional beliefs are in form of myth that makes East Africans know their kinship linkage that disagrees with other theories of creation. Good examples are the Kintu legend and the Baganda; of Kaang, Nduhura and Nyinamwiru; of Kintu and his 3 sons (Keino).

Follow-up Activity

1. Find out the story about Kintu and the creation of three classes of people in society.
2. In your own tribe/clan write the traditional theory about the origin of man/earth.

Lesson 2: Bible Story about the Creation and Origin of Man

By the end of this lesson, you should be able to:

1. explain the meaning of Bible creation story.
2. identify the main scenes in the creation story of man.
3. understand the significance of Adam and Eve to our life.

Materials you will need:

Textbooks, pen, notebook, internet, Bible and Atlas of East Africa.

Instructions

1. Use a hand book for Senior 1 history.
2. You can make reference to other related books.
3. If possible, consult an adult and Google/internet while doing an activity.

Introduction

According to the Bible, Genesis Chapter one, man and all modern living creatures were created by God. He gave man dominion over all things on earth. He created man and female from the man's rib, blessed them to produce and have descendants over the earth under his control. Before then, the earth was formless, empty, and dark, and God's Spirit moved over the waters preparing to perform God's creative Word. God began to speak through the existence of his creation.

Scenes in the creation of man

Figure 2.2: God creating a woman

The third passage is Genesis 2:18-25, where God noted that "it is not good for the man to be alone." Whereas it took God only one line to form man, God spent several lines to create woman! See figure 2.2 above. It is natural for a man and woman to unite in love and harmony for continuity of God's creation, the human race. God gave the man the authority to name everything, a sign of dominion over the world.

Activity 3: Creation of man

1. Read the Bible story on the creation of man in first book of the Old Testament (Genesis) and write the brief account on the creation of man.
2. With your brothers/sisters role play the scenes of creation of man, woman and the fall of man from God
3. Compare the traditional and the bible theory about the creation of man.

Bible Story about Adam and Eve

Figure 2.3: Garden of Eden.

The Garden of Eden also called Paradise is a beautiful garden containing the tree of life. God made Adam from the dust and organized him to live in peaceful and contented innocence, effortlessly reaping the fruits of the Earth. The garden also contained the tree of knowledge of good and evil, from which Adam was forbidden to eat. God later created Eve from the rib of Adam to live together and complement each other. However, a serpent later deceived Eve to eat the forbidden fruit that picked some and gave Adam. When they disobeyed and ate the forbidden fruit, God drove them from the garden and sent to the world of work and suffering. Their sin and consequent loss of God's grace threw them out of paradise a phenomenon known as the Fall of Man. God also cursed the serpent (snake).

Earlier they were shameless and naked to each other. But after eating the forbidden fruit, they gained knowledge of what was good and bad. See the **Figure 2.4** below.

Figure 2.4: Adam and Eve (After eating the forbidden fruit)

It was disobedience of Adam and Eve, who had been told by God not to eat fruits from the tree (Genesis 2:17), that caused disorder in the creation, thus humanity inherited sin and guilt from Adam and Eve's sin. In Western Christian art, the fruit of the tree is commonly depicted as the apple, which originated in central Asia.

Thereafter Adam and Eve were thrown out of Paradise because they had eaten from the tree of knowledge. As a result, apple became a symbol for knowledge, immorality, temptation, the fall of man and sin. After this, man had to work in order to have food on the table. They lost the intended paradise that had been created for them by God.

Other than being a religious symbol, the apple is also an ancient fertility symbol. It represents love, temptation and spiritual growth as well.

Activity 4

1. Based on the above story, show the relationship between religion and history in the modern world.
2. Using the Bible story, comment on the history of sin.
3. How significant is the story of Adam and Eve in the creation of humankind?
4. Describe the most reliable historical theory of the origin of man in the Bible.

Lesson Summary

Bible creation story in Genesis Chapter 1 is important in explaining the origin of man. Man was created on the 6th day of creation. The first person to be created was Adam and later Eve. Eve was created from the rib of Adam.

Follow-up Activity

1. Write what you learn from the Bible story about the creation of man in your notebook.
2. Discuss the importance of the story of Adam and Eve to our life today.

Lesson2: Scientific View about the Origin of Man

By the end of this lesson, you should be able to:
1. explain the career of Charles Darwin the founder of the creation theory.
2. discuss the scenes about scientific theory and the origin of man.
3. examine the concept of human evolution.

Materials you will need:

Textbooks, pens, notebooks, internet, Bible and Atlas of East Africa.

Instructions

1. Use a text book for Senior 1 history.
2. You can make reference to other related books.
3. If possible, consult an adult and Google/internet while doing an activity.

Introduction

Scientific Creation Theory

The scientific theory of creation also known Darwins theory is the most reliable on the scientific explanation about the creation of man. The theory was founded by Charles Darwin. He claims that man originated from a single celled organism that multiplied into an ape. Today apes are intelligent animals that live in Africa and Asia. They are in a class of gorillas, Orangutan, Chimpanzees, baboons and the gibbons etc. See the figure 2.5 below.

Figure 2.5: Apes kingdom

Charles Darwin claims that the above animals many millions years ago, evolved into a man. These apes used to survive on fruits jumping from one tree to another. They lived in trees but due to climatic changes, trees reduced and these animals began living on ground in grasslands. They found other animals on ground like; lions, leopard, and crocodile which began killing and eating them.

This created a need to protect themselves and they began to walk on their behind limbs in order to rise up and look far ahead and hide after detecting their enemies. The two hide limbs were then modified to be used for running whenever they were attacked by their enemies. The two forelimbs developed into arms with hands and fingers to be used for eating and fighting enemies.

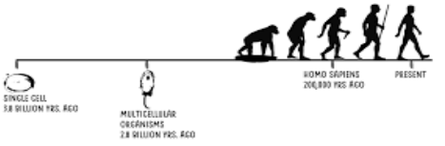


Figure 2.6: Darwin's theory

Activity

Darwin's theory

1. Use ICT and read more about the scientific view on the origin of man. Present your findings to your guardian. Is it the same as above?
2. What are the weaknesses of Charles Darwin's theory on creation of man?
3. Identify the similarities between a human being and a Chimpanzee.

The Concept of Human Evolution

Human evolution is about the origin of human beings. All humans belong to the same species, which has spread from its birthplace in Africa to almost all parts of the world. Its origin in Africa is proved by the fossils which have been found there. The term 'human' in this context means the genus Homo.

The family to which human beings belong is called Hominidae. The evolution of man began about 15 million years ago when the first known man walked this earth. Humans today developed through many stages of evolution from primates that are now extinct. This evolutionary process from the primates who walked on all four limbs to the humans today who walk on two hind limbs has been a very long process. Dryopethicus was the first in the evolution of man in the stages of evolution and some believe him to be the common ancestor of man and apes.

In Eastern Africa the earliest human –like creatures (Hominids) were first discovered by the famous archaeologists Richard Leakey and his wife Mary Leakey in Tanzania and Donald Johansson in Ethiopia. Their findings showed that humans in Eastern Africa region changed from one stage to another evolving main 8 stages. Their history dates back as the presented years below.

1. Dryopethicus - 25 Million years ago.
2. Ramapethicus -12 Million years ago
3. Australopithecus -4 million years ago
4. Homo –habilis -2.5 million years ago

5. Homo-Erectus -1.8 million years ago
6. Homo-sapiens -100,000 years ago
7. Neanderthalensis -250,000 years ago
8. Cro-magnon - 40,000 years ago.

Evolution is not a activity of the past, it is continuing even now. Humans are undergoing 'natural selection' for many different traits based on their life and environment in the present. It is believed that the jaw size is reducing further.

Stages of Human Development

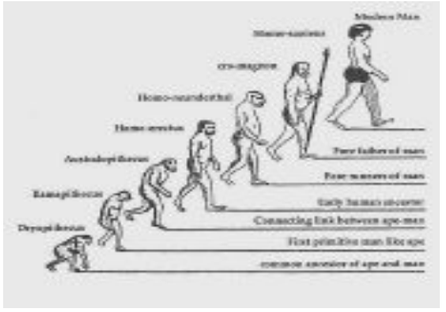


Figure2.6: Stages of human evolution

Key Changes Witnessed in Evolution Process of Man

1. A large brain size with greater functional ability (maximum in the gorilla = 650 c.c., minimum in man = 1,000 c.c.). The brain case is larger than the face region.
2. The face is flatter, with a less protruding lower jaw.
3. Continuous growth of long hair on the head, which is spare and short on the body.
4. Generalised hands with better-developed thumbs and long legs with non-opposable big toes.
5. Man is terrestrial in habit and walks erect on two feet.
6. Man surpasses all other animals by possessing the 'human features', which are exclusive to them.
7. A switchover from the four-legged gait of apes to the bipedal gait of man.
8. Perfection of the hand for tool making.
9. Increase in intelligence and the size of the brain.
10. Change of diet from fruits, hard nuts and hard roots to softer foods.
11. Increase in the ability to communicate with others and the development of community behaviour. See figure 2.7below.

Figure 2.7: Development of man

Task 3: Stages of the evolution of man

1. What differences do you notice between Dryopithecus and Cro-Magnon.
2. Look at yourself or someone next to you and identify the bodily features that are similar to those of apes.
3. What makes man different from animals?
4. Participate in a debate on the theory of creation in bible and the theory of evolution of man.

Lesson Summary

Scientific theory of evolution is fundamental in explanation of origin of man. It was founded by Charles Darwin who explains how human beings originated from the ape kingdom. This supplements the human evolution theory that explains the origin of ape from the single celled animal that multiplied into many cells turning into an ape.

Follow-up Activity

1. Distinguish between the Charles Darwin's theory of creation and Human evolution theory
2. What is the importance of the scientific theory of origin of man today?

Lesson 2: Out of Africa Theory

By the end of this lesson, you should be able to:

1. explain the out of Africa theory.
2. mention the scenes of out of Africa theory.
3. understand the multi-regional theory of origin of man.

Materials you will need:

Textbook, pen, notebook, internet and Atlas of East Africa, where possible.

Instructions

1. Use a handbook of Senior One History, Learner's Textbook.
2. You can make reference to other related books.
3. If possible, consult an adult and internet search while doing an activity.

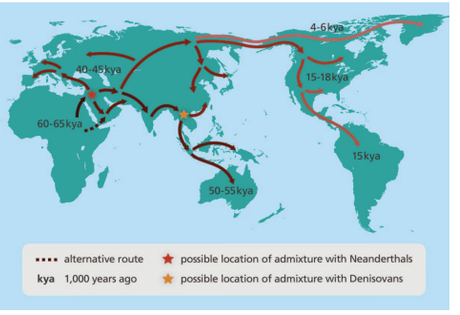
Introduction

Out-of-Africa theory confirms that man originated from Africa and expanded to Eurasia about one million years ago. Early humans came from Africa and migrated to the rest of the world when the environment allowed them to and when their survival could allow them stay for food or shelter in the new areas. *What could have been the challenges that man met in this migration into Eurosia?*

Application of the theory

It involved African exodus by tribes of *Homo erectus*, followed by the scattering of *Homo sapiens* that eventually became human civilization. This wave of migration steadily washed over the entire world for tens of thousands of years. The pockets of primitive hominids, such as Neanderthals, eventually disappeared. Perhaps they were not able to compete with *Homo sapiens* for limited resources. The map below shows how this migration was carried out between 1.8million to 5 million years ago.

The second migration happened about 100,000 years ago and modern humans of African origin conquered the world replacing the archaic human populations (Homo sapiens) they had found in place. They feared competition and they could not race with new comers for resources and they moved further to other areas in Europe.



Map of out of Africa migrations

Activity 4: Out of Africa theory

1. Use ICT or related textbook and find out the reasons for this early migrations from Africa to Eurasia around 1 million years ago.
2. Why do you think it was mainly the human evolution stages of Homo erectus and Homo sapiens that were able to migrate to Europe?
3. Suggest reasons why Neanderthals that were found in Europe by these migrants had to go far away and did not want to mix with them.

The Multi-Regional Theory of Origin of Man

Before 100,000 years ago, there were genetic exchanges between Africa and Eurasia, which left marks of cross breed between the Neanderthals original race in Europe and these migrants from Africa.

Today's modern humans of Eurasia derive most of their ancestry from the population that existed before 70,000 years ago whose origin was Africa. This population had originated from African ancestors within the last 150,000 years, but where it lived in Eurasia is not known to many historians and the origin of the term "Multiregional theory". As they spread across Asia, the descendants of this population mixed with Neanderthals and with another archaic human population, the Denisovans. The modern human populations that ultimately arrived throughout Asia, Australia, the Americas, and Europe all carried a small fraction of the Neanderthal genes.

Some scientists describe the current picture as a multiregional evolution scenario, others describe it as an out of Africa scenario, and still others describe it as a blend or middle ground between the two.

Map showing multi-regional theory

Activity 5: Multiregional theory

1. Compare the theories of Out of Africa and multi-regional theory for the origin of man.
2. Using the internet or any textbook find out the theories for creation of man among the white race and make your presentation.
3. Discuss the realities of the traditional theory and the Bible story about the origin of man

Lesson Summary

Many scholars write and affirm that the first man lived in Africa and later migrated into Europe. The out of Africa theory and the multi-regional theory are closely related and both supplement on the work done by Charles Darwin and the Human evolution theory to explain the origin of man.

Follow-up Activity

1. What can you say about the out of Africa theory? Share with your guardian.

How important is the out of Africa and the multiregional theory to East Africans today?

Entrepreneurship Education

PROJECT: Making charcoal briquettes, designing a poster for advertising them and making a package for the briquettes

By the end of this project, you should be able to:

1. Identify the right materials needed for making charcoal briquettes.
2. Make charcoal briquettes.
3. Explain three benefits of using charcoal briquettes in relation to ordinary charcoal.
4. Write a brief report on making charcoal briquettes explaining some of the challenges faced while making the briquettes, how these were overcome and any lessons learnt from the project work.
5. Design a poster for advertising your charcoal briquettes.
6. Identify the right materials for making packages, design a package for your charcoal briquettes and Label it.

NOTE: You can use any material you think will make your package attractive.

Read the scenario below and respond to the instructions given.
SCENARIO

HOME MADE SOLUTIONS TO EFFECTS OF THE CORONAVIRUS PANDEMIC
The world registered the first case of Coronavirus (COVID 19) in December 2019, in Wuhan City in China. The disease was declared a global pandemic by the World Health Organisation on 11th March 2020. By 14th April 2020, the pandemic had spread to 210 countries infecting over 2,000,000 people with close to 120,000 deaths registered.

To mitigate the spread of the virus and to avoid creating a fertile ground for its spread, His Excellency the President of the Republic of Uganda, Mr. Yoweri Kaguta Museveni ordered the closure of public gatherings like Schools, Churches and Bars, and suspended public transport on 20th March 2020. He further put in place a Task Force to steer the fight against the **spread** of the disease. Among the measures taken, was to declare a national lock down and curfew from 7:00pm to 6:30am for 14 days.

The effects of the coronavirus are enormous, ranging from health, social and economic among others. Indeed, following the lockdown, a number of people have complained about failure to feed their families. Consequently, government provided food for such families. However, due to the lock down, fuel specifically charcoal, became expensive and scarce yet majority of families especially in the urban areas use it as a source of energy. As a learner of entrepreneurship, you are expected to provide solutions to business challenges.

Activity one
At your home, you have several resources like domestic waste, peelings and soil which you can use to make charcoal briquettes, to solve the problem at hand.

Task

i. Identify the right materials needed for making the charcoal briquettes.
ii. Make charcoal briquettes using the materials you have identified following the step by step procedure provided below.
iii. Write a report, explaining some of the challenges you faced while doing the project work. How did you overcome the challenges? Mention any lessons you have learnt from the project work.
iv. Explain three benefits of using charcoal briquettes.
v. Assuming you want to make briquettes for sale, design a poster to advertise your charcoal briquettes, using either your exercise book or a plain sheet of paper whichever is available. Make your poster as attractive as possible.
vi. Design a labelled package for your charcoal briquettes. You will present your report, the poster and the package to your class teacher when schools reopen after the lockdown.

Note: The project may not be finished in one day, you may choose to take a few days doing it. You can keep some of the briquettes for home use but keep some for presenting to your teacher as part of your project work when schools reopen.

MATERIALS REQUIRED

SN	ITEM	ALTERNATIVE	QUANTITY
1	charcoal dust	Fresh cow dung	4 (tumpeco) cups
2	Soil	Anti-hill soil/brown soil/Clay	2 (tumpeco) cups
3	Water		4 (tumpeco) cups
4	Basins	Container	3
5	Gloves	Polythene bag/open hand	1pair
6	Plastic cup (tumpeco) = ½ litre	Mug	1

Instructions

1. Make charcoal briquettes using some of the readily available materials at your home.
2. Use the cup (tumpeco) or mug to measure the materials.
3. Place the materials in different containers.
4. In case you do not have charcoal dust you can use cow dung in the same quantities.
5. Make sure you do not miss out on any step.
6. Record every step followed in the making of briquettes in your note book, because you will have to write the report for submission to your teacher.
7. Using your note book or a sheet of paper, design an advert for your charcoal briquettes.

8. Design a package for your charcoal briquettes. You will submit the report, the advert and the package to your teacher on the day of reporting to school.

Step by Step Procedure of Making Charcoal Briquettes
Please pay attention to every detail outlined in the step by step process provided below.

Step one: Preparing the waste materials
Using a pair of gloves, polythene bags or your free hands collect the waste materials to use as guided below. Be very careful with the safety of your hands.

Fig. 1. Putting on Gloves

Collect four cups of charcoal dust and put it in a container. If you do not have charcoal dust, you can use carbonized charcoal dust or fresh cow dung in the same quantities and follow the same procedure.

Fig. 2. Charcoal dust

Fig.3. Carbonized charcoal dust


Fig. 4. Fresh Cow dung **Fig. 5. Plastic cup**

Step two: preparing the charcoal dust

Sieve/filter the charcoal dust and remove the big particles, plastics and any other unwanted materials using your hands to remain with fine charcoal dust. (You can also crash the bigger particles into powder form and use it).

Fig. 6. A boy sieving charcoal dust.

Step three: preparing the soil

Collect two cups of soil preferably brown or anthill soil or Clay soil if its available but normal soil can also be used. Put it in a second container.

Sort the soil removing the bigger particles, sticks, broken glass, stones and plastics**.**


Fig.7. Brown Soil **Fig. 8. Any other soil**

Fig. 9. Clay Soil

Step four: Measuring the quantity of water

Get a small Jerrycan/Jug or any other container and pour in four cups of water.

Step five: Making the mixture

Measure off two cups of charcoal dust and one cup of soil. Put them in a third container and mix them well using your hands until they are thoroughly mixed.

Fig.10 Mixing Charcoal dust, soil & water

Add water. Start with a small amount of water and mix it into the mixture using your hands. Keep adding water until the mixture becomes easily moldable. When squeezed, your mixture should hold together easily. When the mixture is too soft add more charcoal or soil, and if it is too hard add more water.

Step six: Molding the briquettes

Take a hand full of your mixture and mold using your two hands until it is hard enough. The mold or briquette can be in a round shape or any other shape you want. You can make briquettes of any reasonable size.

Fig. 12. Picking a handful of mixture

Fig. 13. Molding the mixture into briquettes

Step seven: Drying the briquettes

Place the molded briquettes on a flat surface ready for drying. Set your briquettes in a dry place. Briquettes need 2-3 days to dry properly before you can use them. If placed in an open place do not leave them outside because in case it rains they can get spoilt. Alternatively, you can dry them under a shade.

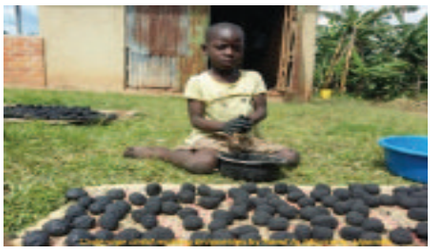


Fig.14. Laying molded briquettes on a flat surface for drying.

Step eight: Using your briquettes

Light your charcoal stove using a few usual charcoal pieces. When it is hot enough add the briquettes and cook.

Fig. 15. Lighting the charcoal briquettes and cooking.

Summary
After going through the step by step process, it is assumed that you now know what briquettes are. Below is an explanation of what briquettes are.

These are small, compact blocks made from organic waste which you can use for cooking in the charcoal stove or fire. While some briquettes require expensive machinery to make, others can easily be made at home from the locally available waste materials with no machinery required.

Fig. 16. Sample of Charcoal briquette

Fig. 17. Briquettes burning in a charcoal stove

Follow up activity

i. Continue practising the making of charcoal briquettes until you perfect the process.
ii. You can sell the excess briquettes to your neighbours at the end of the lockdown. This will help you to save your earnings.
iii. In case you have access to the internet, you can make further research using Google on the other ways and materials you can use to make charcoal briquettes.
iv. Practice designing several adverts for the briquettes to have a variety from which to choose the best.
v. Practice designing several packages for the briquettes to have a variety from which to choose the best.

NOTE: This project will enable you to answer Paper one at senior four during examinations.

English Language

SENIOR ONE

ENGLISH LANGUAGE LESSONS

LESSON 1

TOPIC: ABSTRACT NOUNS

Before we start our lesson, do not forget that COVID19 is a disease affecting every country in the world:

We are advised:

- *not touch our **soft parts** (**eyes, nose, mouth**) because the virus can pass through them and enter the body*
- *to wash our hands thoroughly with soap and water*
- *not to spit anywhere*
- *to cover our mouth with a tissue when we are **coughing***
- *to use a tissue for our nose when **sneezing.***

By the end of this lesson, you should be able to:

1. tell the difference between abstract nouns and concrete nouns
2. identify abstract nouns from a given


The beauty of good manners

Last Thursday, a huge, tall man clad in a three-piece suit drove up to our school and parked his posh car outside the Principal's office. He got out of the car, strode into the office and announced his presence by shouting in a rough voice, "I want Shangaya."

"I beg your pardon, Sir," said Mr Pertet, the school secretary. "Do you mean you would like to see Mr Shangaya?"

"Yeah!" bellowed the man. "I want to see Shangaya, the boss."

"I am sorry, Sir," said Mr Pertet, "but Mr Shangaya is holding a meeting with the staff. Would you like to wait, please, while I contact him?"

Adopted from Head Start Book 1

Activity 2

Read through the passage above again and write down all the abstract nouns which have been used.

Activity 3

Write two sentences for each of the abstract nouns you have written down in your notebook.

For example: Ms Pertet was now totally disgusted with the man's rudeness.

Activity 4

Read the extract below and identify all the nouns and group them into abstract and concrete nouns.

Did you know that tongue-twisters do not tease only our tongues but they tease and twist all our speech organs: the lips, the teeth, the windpipe, as well as our ears and brains? The emphasis is mainly on the rattle of sound. Some tongue-twisters are short and easy to remember. All human beings love having fun and find the word-game in tongue-twisters a challenge.

For example: Betty made a bit of butter but the bit of butter that Mary made was very bitter.

Follow up activity

Create three tongue twisters and share with anybody at home. You can even use those in your local language.

LESSON 2

TOPIC: PERSONAL PRONOUNS

By the end of this lesson, you should be able to:

1. use personal pronouns to replace the proper nouns
2. identify the two types of personal pronouns
3. compose sentences using personal pronouns
4. compose sentences using verbs of preference to express preferences
5. read and correctly respond to a given passage.

INTRODUCTION

Personal pronouns are always used in the place of the names of people, places and things.

Personal pronouns are used for people, objects, ideas and places.

Read the following examples of sentences using personal pronouns.

1. **We** wanted to talk to **her** but she refused to see **us.**
2. **He** wanted to invite **them** but **they** were out of town.
3. **I am** planning to buy **it** but **you** have not given **me** the money.
4. **They** want to employ **him** as a cleaner.
5. **You** asked **me** to come with **her.**

Activity 1

What is common about the words in bold ink? These words are called personal pronouns. They refer to human beings, objects, ideas and places.

Write 10 sentences of your own using any of the pronouns given in the sentences above.

Activity 2

Personal pronouns fall in two categories: the singular and the plural forms as seen in the table below:

Pronoun	Singualr form	Plural form
First Person	I, me	we/us
Second Person	You	You
Third Person	she/her/he	they/them

.

The personal pronouns are used, when the name of the noun has been used before. For example:

- James bought three motor cars. ***He*** really loves ***them***.

In the first part of the sentence, there are proper nouns i.e. 'James' and 'cars'. In the second sentence, there are two personal pronouns, which have replaced the proper nouns. These are "he" which takes the place of "James" while the personal pronoun "them" takes the place of the "car."

Subject and Object Pronouns

There are two cases of personal pronouns: **subject pronouns** and **object pronouns**.

Subject pronouns include **I, you, she, he, it, we, they**. Subject pronouns replace the name of the subject in the sentence. For example:

- *I* went to the market.
- *You* are my best friend.
- *He* studied hard but did not make it in life.
- *She* went to church with friends.
- *It*'s a boy!
- *We* want to take part in the elections.
- *They* are not party of this team.

Object pronouns **include me, you, her, him, it, us,** and **them**. Object pronouns are used as the object in the sentence. Object pronouns are used as both direct objects and indirect objects. For example:

- Show *me* the book.
- Father will help you when you come back.
- Put *her* in bed after *her* meal.
- My sister will take *him* home.
- I went back to buy soap for ***them***.
- The fruit we bought was not ripe so we gave it to the chicken.

Personal Pronouns

Personal pronouns are used instead of repeating the nouns which have been mentioned earlier. It is important to choose the correct personal pronoun. For example:

- President Museveni delivered a number of speeches to remind the public about the dangers of the COVID virus. *He* spoke for more than an hour.

It is important to know that personal pronouns are used according to number (singular or plural), person (first, second or third person), gender (masculine, feminine, neuter), and case (subject or object). For example:

- Paul and Jane were new in the school, but *they* were able to make many friends.

There are two subjects, "Paul and Jane," so the plural pronoun "they" is needed here. And as Paul and Jane are the subjects, we use "they" instead of "them."

Activity 3

Read the passage below. After reading, rewrite it in your note book replacing the repeated nouns with the appropriate personal pronouns.

MUSA THE RICH MAN

Musa was one of the rich men in Buwaiswa Village. Musa owned cows, goats, sheep and two donkeys. Yokana, Musa's son, used to look after those animals every day. Yokana always took the animals to graze. Yokana would stay in the fields all day long. Yokana got in a habit of calling for help even when Yokana was not in danger. Yokana would shout, "Lion, lion, please help, help ... heeeelp the lion has taken a goat."

Whenever Yokana shouted, people came to help in chasing away the lion but they found none. They always warned Yokana not to lie about something as serious as that, but Yokana never listened. One day, a tiger came and grabbed a goat. Yokana shouted for help, but this time nobody responded to his cry. The tiger killed two goats and a sheep and went away with another sheep.
Yokana went home crying and feeling very miserable and scared. When Yokana told the story to his family, everybody blamed him for being naughty. Musa blamed Yokana for always telling lies which act led to the loss of Musa's animals.

Activity 4

Every day in our lives we express, consciously or unconsciously, preferences, likes and dislikes about things, people or activities that are performed daily.

The most common verbs used to express these likes and dislikes are **love**, **enjoy**, **like** and **hate**. These are called **verbs of preference**. They are used in the simple present tense because they are routines or habitual actions.

1. Write sentences using the verbs **love, enjoy, like** and **hate**.
2. Write a composition about activities you, your parents or your friends enjoy doing.

LESSON 3

TOPIC: COMPARATIVE AND SUPERLATIVE ADJECTIVES

By the end of this lesson, you should be able to:

1. tell the difference between comparative and superlative adjectives
2. write sentences using comparative and superlative adjectives
3. read and correctly respond to a given reading comprehension.

INTRODUCTION

An **adjective** is a word that describes or qualifies or tells us more about a noun**.** When there is more than one noun we use **comparative adjectives.** For example: **Mary is shorter than Juma**. In doing so, the word '**than**' follows the adjective.

In cases where we want to compare more than two nouns we use **superlative adjectives**. Superlative adjectives are also used to compare one thing against the rest of a group. When using superlatives the article 'the' is used before the superlative and unlike the comparative adjective, the superlative is not followed with 'than'. For example:

Mary is the shortest learner in Senior One.

Activity 1

Complete the following sentences using the **comparative adjectivethan** construction.

For example: Sarah is (tall) than her brother.

Sarah is taller than her brother.

1. He is (young) his sister.
2. The river is (shallow) it was a month ago.
3. She speaks our local language (well) me.
4. Oranges are (cheap) than mangoes.
5. The new head teacher is (strict) the previous one.
6. Most people understand a language (well) they speak it.
7. His health is (poor) it was last month.
8. He reads (fast) Samuel.
9. Kampala is (big) Jinja.
10. John works (slowly) Opio.
11. My brother arrived (soon) I expected.
12. Peter has stayed in Arua (long) Freddie.
13. Water is (good) soda during the outbreak of the virus.

Activity 2

Adjectives of one syllable/beat, make the comparative and superlative by adding **–er** and **–est** as seen in the table below. An example has been given to you. Using the example, complete the table below.

Simple Form	Comparative form	Superlative Form
Tall	Taller	Tallest
Big		
Fast		
Cheap		
High		
Early		
Good		
Tough		
Sweet		
Quick		
Clean		

Activity 3

Adjectives of two syllables/beats ending in **–y,-er and –ow and –le,** form the comparatives and superlatives with **–er and –est** respectively.

For example

Pretty Prettier Prettiest

Now use the example above to give the comparative and superlative forms of the following adjectives:

Clever Narrow
Gentle Happy
Simple Busy
Angry

Activity 4

Adjectives which have three or more syllables/beats form comparatives and superlatives with **more and most**

For example:

beautiful more beautiful most beautiful
careful more careful most careful
Write in your note book 5 more adjectives which change using **more and most.**

With reference to exercise below, put the words in brackets into either the comparatives or superlative form as necessary. You may or may not use article 'the'.

1. This is one of (beautiful) cities in the world.
2. Eria plays quite well but Martin is (good) player in the team.
3. (Many) babies die of malaria than any other disease.
4. (Many) birds can fly, but not all.
5. Which of these people is (important)?
6. I shall buy the car that goes (fast)
7. I can do (many) of the questions but not all.
8. He is (interesting) person I have ever met.
9. I am sure this is (good) of the two.
10. He is (skilful) politician in/of the country.

Activity 5

Finally, there are adjectives which neither use **er, -est, more** or **most**. These adjectives have **irregular comparatives and superlatives forms.**

For example:

many more most

good better best

bad worse worst

well better best

Make 10 sentences using the irregular adjectives in the examples above**.**

Follow Up Activity

How much do you know about the Internet? There is a lot of information on the Net. This information is more recent than what you would find in the textbooks which we have at home or at school. Read the passage below about the use of the internet and correctly respond to the questions which follow.

The use of the Internet

In addition to the various books in the library, today we can get a lot of information on almost any topic and also communicate using the internet. The Internet is a means of connecting a computer to any other computer anywhere in the world through routers and servers. When two computers are connected over the Internet, they can send and receive all kinds of information such as texts, graphics, voice, video, and computer programmes.

Today the email has become the **most popular** way of communication. People are spending more of their everyday lives **online** than ever before in order to communicate. Such communication includes giving directions, checking **movie listings,** reading novels and getting the latest news. As the Internet becomes more and more **accessible** worldwide, the number of people using it continues to rise as they move to even conducting business online as opposed to offline. Online video and **social networking** sites like Facebook and WhatsApp have played a big role in creating **traffic** on the Internet as people spend a lot of time watching online movies and communicating with each other.

Although the Internet has so many benefits, there is need to know how to make use of the benefits and not to be affected negatively by the misuse. The internet, when misused, can corrupt the mind, which could greatly affect one's academic, social and spiritual being. And yet the internet has lots of new information on whatever we learn and could easily be used to make learning more interesting and useful.

So be aware of what you do with the internet and stay away from the **sites** that may affect your well being.

Questions:

1. Give the meanings of the following phrases/words as used in the passage above.

i. most popular
ii. online
iii. movie listings
iv. accessible
v. social networking
vi. sites

2. Why is the Internet becoming the most popular way of getting information?
3. What type of information are people getting from the Internet?
4. Give any two benefits that you think could be got from using the Internet.
5. Give two dangers that could result from misusing the Internet.
6. Identify three main points from the passage on the use of the Internet.

Art and Design

ART AND DESIGN SENIOR ONE SELF STUDT MATERIAL
Lesson 1
Theme: Art Theory
Topic: Appreciation of Art and Design

Introduction
Art and design is a subject made of two forms of creativity; Art and Design. To clearly understand this subject you need to know what is art and what is design. **Art** is a diverse range of human activities or feeling to creating visual objects (artworks). In the general form, the activities of art include painting, sculpture and architecture. A **design** is a plan to do something with a specific purpose or the **process** to form a product. You will be doing both; a skilful plan or process and a creation of objects hence the study of "art and design".

Why do we learn Art and Design?
There is a good reason for you to study art and design. You will begin to understand why things are created and their value to society. You will learn Art and Design to:

i. develop your creativity
ii. communicate using visuals
iii. develop your understanding about cultures and
iv. connect your learning to the society.

Practicing art and design activities will develop your mental (cognitive) and employment (vocational) skills so that you can compete in the 21st century. The 21st century requires you to possess the following key competences:

• Critical thinking and problem solving
• Creativity
• Collaboration
• Communication

The language of design

Just as a child learns a language in order to communicate with the community, an Art student needs to learn a different language of visual Arts. Art is a language used to communicate in two ways of **Art response** and **Art making.** When you look at something, you will like or dislike its appearance. You will somehow **appreciate** it by describing it; Is it small or big, colourful, pleasant or frightening? Appreciation is **a response** to an artwork.

Practice

Activity 1.1 Appreciating art
1. Look for a cup/mug or a bowl in your home.
2. List down at least three things you like about the cup/mug or the bowl.
3. If you have a chance of adding something on your cup/mug or bowl what would you add on?

Art response is a theoretical recalling, understanding and communicating knowledge in a clear and coherent manner. Appreciation involves describing what you see, discussing how an object was done in terms of colour, shape or texture.

The other method is **creating** or **making** something out of the available materials using handy tools. It is **practical** and **skill based**. Art making is the application of knowledge and skills (selection and control of materials, media and processes) to create an object. Creating is designing. You will make your own designs as you go through several activities of art making. The Design language has three basic parts: form, colour, and concept.

Form	Is the composition of the fundamental elements of design. It is the way things look like-the shape, proportion, balance, and harmony of the parts (relationship between them).
Colour	plays an important part of adding variety and mood as well as spatial dimension.
Concept	is the idea or thought behind a design, the processes that artists go through to find an artistic solution to the problem.

These components are what constitutes the language of design.

Art and design has several areas of study called art disciplines. Do you remember them? For example there is drawing, painting, graphic design and others. Each discipline is meant to produce different artworks for the society. These areas of art turn into **careers** of which you may become one.

Practice

Activity 1.2 Careers in Art and Design
1. In your art book draw a table with three columns.
2. Label the columns as art discipline, art form and career respectively.
3. Fill the table with at least six disciplines of art and its corresponding art forms and career

Remember:
1. Art is a visual language with many dialects. Design is one of them.
2. There are two ways of studying Art and design: **Art response** and **Art making.**
3. You study art and design to fit in the 21st century requirements of: **Critical thinking and problem solving, creativity, collaboration, and communication**
4. **There are many careers associated with the study of Art.**

Lesson 2

Project Theme: Decorative arts

Topic: Making Collage

Introduction
Collage is a technique of creating decorative art works sticking together pieces of one material of different sizes, shapes, colours, values and textures. These materials may be cut, torn, folded, twisted or woven and later on glued or pasted on a hard flat surface. Materials used commonly is paper, textile or natural plant fibers.

You will practice the making of collage to develop the your planning skills through; Planning appropriate compositions for the given task following a theme, carrying out research and make use of information and available materials to create artworks, and creating and presenting artistic ideas based on a technique of collage to suit decorative purposes.

There are several ways of expressing ideas to serve different purposes. Decorative art is one way artists produce works. In this project you are going to learn how to use the visual elements and principles (line, shape, colour, value, form, texture and space) to make a decorative artwork of **Collage**. You will go through stages of art making called **a process.**

Resources
You will need:
- Note book, pencils, coloured pencils
- Paper, hard paper, glue, strings, cutters
- Any found or discarded materials or objects
- Paints and brushes if possible
- Computer with internet if possible

Technique
In collage, objects or pieces of paper, fabric, or other materials are pasted onto a surface to create a work of art. When planning your collage consider such things as:
Overlapping: The sticking of a second layer of materials over the first so that parts of the past of the first layers are exposed while other parts are not.

Interpenetration: The sticking of layers of material so that it moves above, then under, a previous layer, then above it again.

Variation: The use of different shapes, sizes, and colour schemes of your pieces that adds interest.

Gradation: The subtle shifts in an element of art, for instance, the use of tones of a colour. Or the increase in the size of shapes used in a design. Study figure 1.1 to appreciate how the technique of collage making was applied.

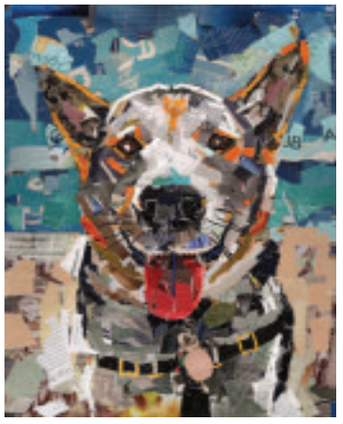


Figure 1.1 Sample work of Collage

Collage Making Process

1. Research on decorative art -making technique and processes

This is finding about something. You have to make use of the available information as a base to your artistic development.

- Make a plan of translating your ideas or imaginations into tangible work of a sketch.
- Have a reason as to why you want to create the collage work.
- Collect and or prepare materials (natural and man- made) needed for your collage activity.
- Experiment to improve as you create new ideas and ways for doing your own work.

Have you got an idea of what you want to do? Sometimes you will have so many ideas but you have to pick the most interesting one after sketching.

2. **Select the topic**/theme or brief

- Choose an object, topic or theme (if not given) that is simple to design.
- Create more than one drawing to open up your imagination.

3. **Create the design**

- From your research and sketching, select pictures of the theme or subject you will use.
- Sketch appropriate compositions for the collage following an artistic plan of elements and principles.
- Once you have selected, decide on the size of the surface or base for your art work. Collage requires a hard paper base, preferably white paper, card or hard board.

4. **Transfer the design**

- Reproduce you design drawing on the base. Do this by cutting out the paper drawing, placing it on your base and tracing its outline on the base.
- Draw out the objects you wish to represent. You may use coloured pencils to guide you in the location of your colours.

5. **Create the artwork**

- Cut or tear out your material into small pieces. Separate them by layers, then by the designs for each layer. Use little glue to temporarily hold the pieces as you build up the design.
- Use glue to firmly hold the paper cuttings to the base on which you work. Begin by sticking first layer of pieces into their positions. Paper does not require much glue. A clear –drying glue is recommended. As you build up the layers, take care to avoid sticking pieces before techniques of folding, overlapping or inter-penetration are applied.

6. **Finish the art work**

- See that all edges are well stuck. Again, work carefully to avoid glue or paint where they are not needed. Keep flat and in a dry place, pinned to a flat surface, and allow to dry for some minutes.

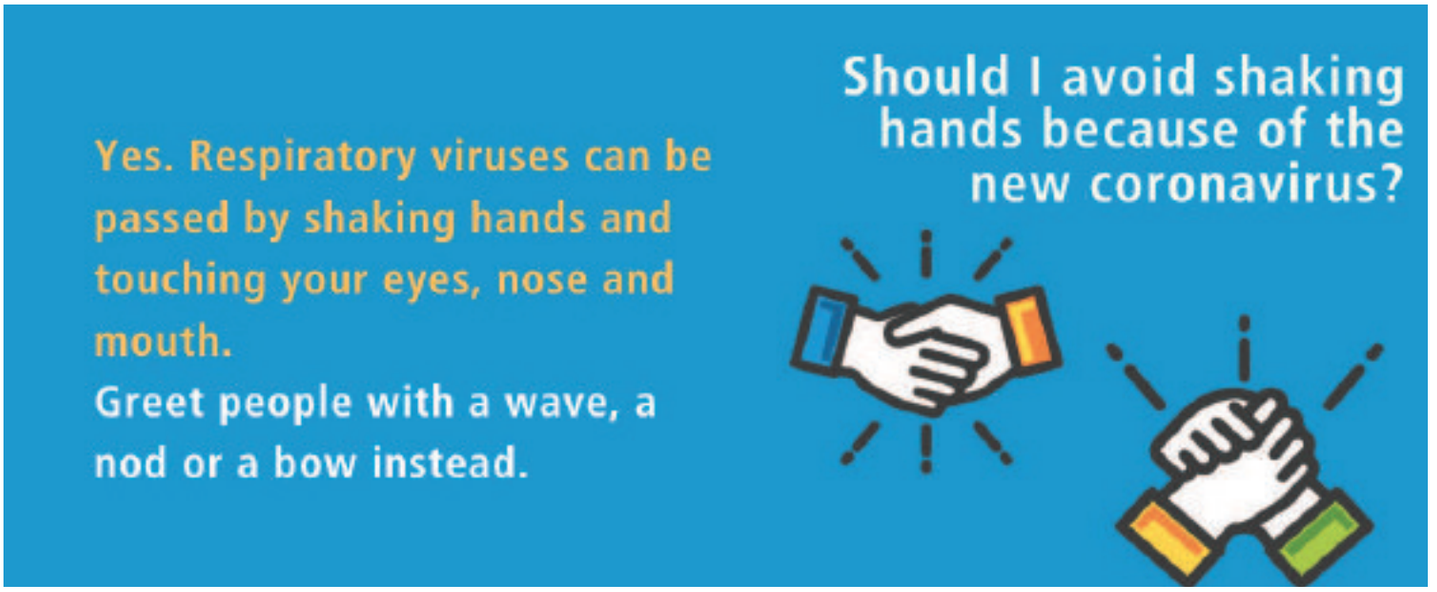
7. **Present the art work**

- Be sure to autograph (signature) your decorative piece. This may be done anywhere, but best at the lower left or right side.
- Your work will look complete with a frame around it.

Create

Task: The whole world is fighting to survive the killer virus. Thousands of people have died of this virus. Information regarding the causes and control of this disease has been circulating in newspapers and audio-visual media. Make a research in the print media on the subject and following the design process, create a Paper Collage artwork based on a theme **"The tales of Covid- 19".** The intention is to document and communicate the horrors of the virus to the public.

When you finish working show your Collage work to your parents and other family members. What do the family members say about your art work? Where can your art work be exhibited? How can you improve to make it a career for you to earn from your art?



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SENIOR TWO

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CHEMISTRY

Topic: Structure of the Atom

Learning outcomes

By the end of these lessons, you should be able to:

- **a)** define an atom
- **b)** state the components of an atom
- **c)** draw a structure of an atom
- **d)** define isotopes

Lesson 1: Structure and Components of an Atom

Introduction

An atom is the smallest electrically neutral indivisible particle of an element that takes part in chemical reactions.
An atom consists of an extremely dense region called a ***Nucleus*** which is surrounded by circular paths called ***Energy levels***. The nucleus contains two sub-atomic particles called,

a) **Protons** which are positively charged.

b) **Neutrons** which have no charge.

Energy levels hold the electrons which are negatively charged.

Activity 1

Using the information in the introduction, draw the general structure of an atom.

Activity 2

Study the given table and complete it correctly

Particle	Symbol	Charge	Mass	Position in atom
Proton				
Electron				
Neutron				

Question:

Why are atoms electrically charged yet both protons and electrons are electrically charged?

Lesson 2: Atomic number and Mass number

Introduction

Each element has an atomic number and a mass number. These numbers can be used to calculate the number of each of the sub-atomic particles in the atom of every element.

Atomic number refers to the number of protons in the nucleus of an atom. **Mass number** or **atomic mass** refers to the sum of the protons and neutrons in the nucleus of an atom, i.e *mass number=number of protons+ number of neutrons*

Example

Consider an atom of sodium element $^{23}_{11}Na$

The symbol of sodium atom is Na

The atomic number of sodium atom is 11

The mass number of sodium atom is 23

Sodium atom has 12 neutrons i.e 23-11=12

Activity 1: The given table shows mass numbers and atomic numbers of atoms P, Q and R, where the letters used are not the actual symbols of the elements. Answer the questions that follow.

Atom	Mass number	Atomic number
P	4	2
Q	9	4
R	11	5

a) How many protons are there in P?
b) How many electrons are there in Q?
c) How many neutrons are there in R?

Activity 2:
Atom T contains 11protons and 13neutrons

a) State the i) atomic number of T
ii) number of electrons in T
b) Determine the atomic mass of T

Lesson 3: Electronic *configuration*

Introduction

Electronic configuration is the arrangement of electrons in the energy levels around the nucleus.

The first energy level takes a maximum of two (2) electrons.

The second energy level takes a maximum of eight (8) electrons.

The third energy level takes a maximum of eight (8) electrons.

Example:

The atomic number of Potassium is 19 and the mass number is 39. Potassium has 19 electrons, 19 protons and 20 neutrons. In the electronic configuration of Potassium atom, two electrons go into the first energy level which is then complete; eight electrons go into the second energy level which is then complete; the other eight then occupy the third energy level and the remaining electron goes to the fourth energy level.

The electronic configuration of Potassium atom is 2:8:8:1

Activity 3:

The table given shows the first twenty elements of the Periodic Table arranged in order of their atomic numbers. Study it well and complete it correctly.

Element	Symbol	Atomic number	Electronic configuration
Hydrogen			
Helium			
Lithium			
Beryllium			
Boron			
Carbon			
Nitrogen			
Oxygen			
Fluorine			
Neon			
Sodium			
Magnesium			
Aluminum			
Silicon			
Phosphorus			
Sulphur			
Chlorine			
Argon			
Potassium			
Calcium			

Activity 4:
Draw the electronic structures for each of the first twenty elements of the Periodic Table.

ACTIVITY: ***Making models of atoms***

- Materials needed:
- small size seeds,
- beads,
- small stones,
- glue
- large sheet of Paper e.g a newspaper

Procedure:

Step1:
pick and arrange seeds, beads and stones for the model, where seeds represent electrons; beads represent protons; and stones represent neutrons.

Step 2:

Draw the outline of the structure of Carbon atom on the large sheet of Paper or the newspaper.

Step 3:

Place the seeds, beads and stones in their right positions on the outline of the Carbon atom structure drawn in step 2.

Step *4*:

Display the completed model of the Carbon atom structure. Follow the above procedure and make models for these atoms, Lithium, Oxygen, Neon, Sulphur and Calcium.

LESSON 4: ISOTOPES

Introduction

Isotopes are atoms of the same element having the same number of protons but different numbers of neutrons.

An atom of any element is represented by, ^{A}X where A is the mass number of element X and Z is the atomic number of element X.

Examples of elements that show isotopy are; Chlorine, Hydrogen, Carbon, Potassium and Oxygen.

The Isotopes of Carbon are;

-carbon 12, ^{12}C

-carbon 13, ^{13}C

-carbon 14, ^{14}C

NOTE:
For all the isotopes of any element, Z is constant and A varies because there are different numbers of neutrons in the different isotopes of the element.

Activity 4

a) Define the term Isotopy
b) mention any six (6) uses of isotopes.

Topic: Periodic table

Learning outcomes

By the end of these activities you should be able to:

1. identify groups and periods in the periodic table
2. describe the arrangement of elements in the periodic table

Introduction:

Visit a place where you keep utensils, how is your storage stand organized? Are plates mixed with cups and saucepans?

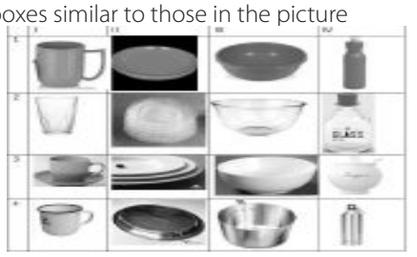
In a good store, materials are classified and kept according to use, shape, materials or size.

Activity 1.1: Making a kitchen-ware storage order sheet
Materials needed:

- A paper and pen
- Picture of items found in the kitchen

Procedure:

1. The picture below shows how kitchen items were arranged in store shelf, study the pattern in which they are organised.
2. On a sheet of paper, draw a table with boxes similar to those in the picture



3. Identify and write the name of each item in a matching box on paper.

Observations and conclusion:

- Which name can you give to items in each row and column?
- Why is it important to organize items at home?

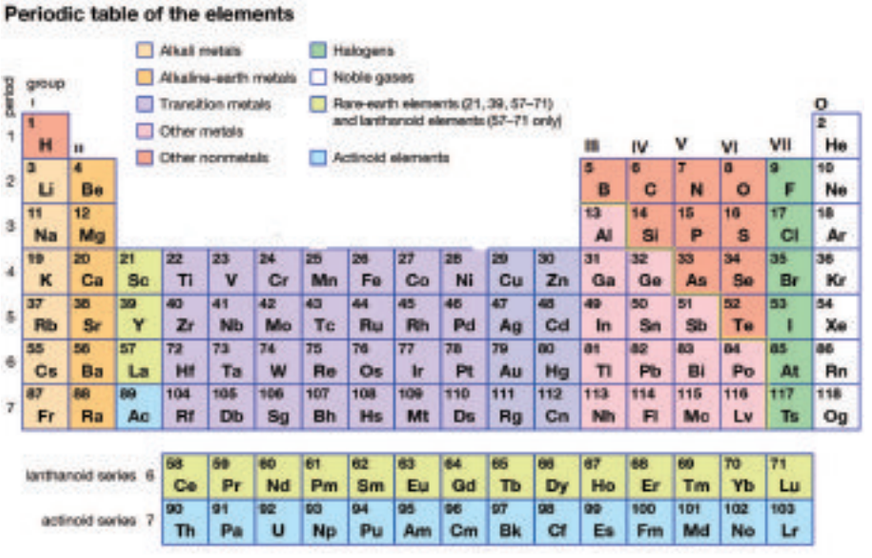
Just like you have discovered that the items above were logically organized in patterns and that this is important in your daily life.
In the world, there are 118 chemical elements. For these elements to be easily studied, they were logically arranged into vertical sections (columns) called **groups** and horizontal sections (rows) called **periods.** Elements in periods and groups form the **periodic table** of chemical elements as shown below.

Activity 1.2: Analysing the arrangement of elements in the periodic table
Materials needed:

- The periodic table
- Pen and paper

Procedure:

1. Count and write the number of periods and groups in the periodic table.
2. Study group I and II, how is the atomic number of the elements used determine their arrangement in the groups?
3. Draw the electronic structure of lithium, sodium and potassium. How does their atomic size vary down the group?
4. Write the electronic configuration of sodium, magnesium, aluminium and chlorine. How does atomic number and atomic size vary across the period?



CHAPTER ONE
Reflection on curved surfaces

Lesson 1: Types of curved mirrors
Competence:
In this lesson, you will be able to:
- Identify the types of curved mirrors
- Explain the features of curved mirrors

Materials you need:
- A spoon
- An orange
- A motorcycle/car side mirror

Introduction
In S1, you learnt about reflection at plane surfaces. Plane mirrors reflect light to our eyes for an image to be formed. In this lesson you will look at different type of mirrors.

Part 1
Look at the shape of a spoon or fold your palm so that it forms a shape of a spoon. What do you notice?
The folded palm of the hand has two surfaces: the inner one and the outer one. If light falls on the inner face and is reflected, you have a concave mirror and if light is reflected on the outer face, then you have a convex mirror. Curved surfaces are shown in Figure 1.

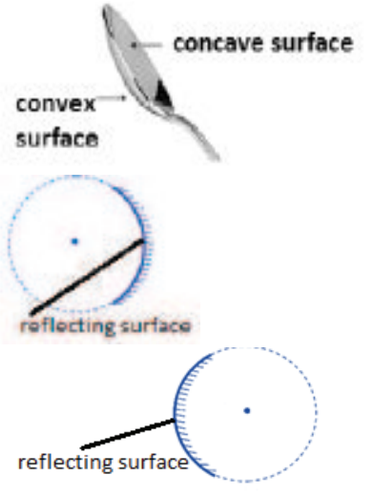


Figure 1: Curved surfaces

Now you are able to identify the two types of curved surfaces. These are the ones that form curved mirrors. So what are the types of curved mirrors?

Project: Try to make models of concave and convex mirrors using an orange.

Part 2: Identifying the features of curved mirrors
You will need a compass, a pencil, a ruler and a piece of paper for this part.
Procedure:
- Draw a circle in the middle of the paper and mark its centre, C.
- Draw a line that passes through the circle through the centre C.
- Mark the point, P at which the line touches the circle. Obtain the mid-point of the line PC and label this point F.
- Now cut off some section of the circle to remain with a part that represents the curved mirrors. Label this curved section M.

In this way you can identify features of the curved mirrors as shown in Figure 1 below:

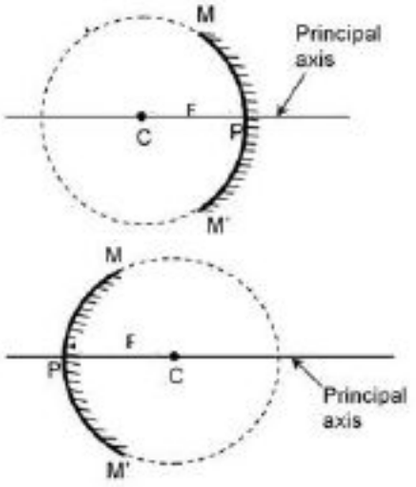


Figure 2: Features of a curved mirror

Now that you have identified the key features of the curved mirrorsas indicated on the figures above, can you explain the meaning of each feature?

Lesson 2: Drawing images in curved mirrors
Competence:
In this lesson you will be able to:
- Draw diagrams to show how curved mirrors form images
- Describe images formed by curved mirrors

Introduction:
In the previous lesson, you saw the different types of curved mirrors and their features. In this lesson you will use the features of the mirrors to show how the curved mirrors form images. You will also describe the nature of images formed by the curved mirrors.

Procedure:
- Draw a curved mirror and the principal axis
- Draw a ray that is parallel to the principal axis that strikes the reflecting surface of the mirror and then show how it is reflected through the point F
- Draw a ray that is incident through the point F and is reflected parallel to the principal axis.
- Now mark the point where the reflected rays meet
- Connect this point to the principal axis, vertically to form the image.

Try to go through this procedure several times until you have clearly understood
Note: If the tip of the image faces upwards, the image is upright (erect) and if the tip faces downwards the image is inverted

Follow up activity: Now that you know the rays to use to draw images formed in curved mirrors, draw diagrams to show how images are formed by curved mirrors when the object is:

- Very near the mirror i.e. between F and P
- Between F and C
- Beyond C

In all these cases, describe the nature of the image.
Lesson 3: Construction of ray diagrams in curved mirrors

In this lesson, you will be able to:
- locate images in curved mirrors using scale drawing
- determine magnification in curved mirrors

Materials you need:
- A graph paper
- A long ruler

Procedure Now that you are able to draw images in curved mirrors, you should go ahead and try to construct images using accurate scale drawing.

In this lesson, a curved mirror will be represented by a vertical line with a cup at the top. This is to avoid the different forms of curving that can be drawn by different people.
Then you will use the rules in lesson 2 to draw an accurate diagram. You will use a graph paper and simple scales e.g 1:2, 1:5 and 1:10

Now try this activity:
An object 2cm high is placed at 10 cm from a concave mirror whose focal length is 8 cm. Using an accurate scale drawing find the height of the image and its distance from the mirror.

After this trial, divide the height of the image to that of the object. What do you obtain? What you obtain is called magnification.

Follow up activity:
An object 10 cm high is placed at 5 cm from a concave mirror whose focal length is 7.5 cm. by construction you need to find the magnification of the image formed.

Lesson 4: Applications of curved mirrors

In this lesson ,you will be able to identify the

applications of curved mirrors

In the previous lessons, you have seen how curved mirrors form images. The nature of images formed by curved mirrors determines their applications.

Some of the applications of curved mirrors are indicated in Figure 3 below. Look at each picture carefully.

a  b 

c  d 

Figure 3: Applications of curved mirrors

Can you identify the applications ofcurved mirrors in each case?

Lesson 5: Determination of focal length of a concave mirror

This can only be done in a laboratory setting.

CHAPTER TWO

Turning effects of forces, Centre or gravity

Lesson 1: Explaining the moment of a force

In this lesson, you will be able to:
- Explain the meaning of a moment of a force
- State instances where moments are applied
- State the principle of moments

Materials you need
- A log of wood or stick
- Some sand or soil tied in a cloth or polythene
- A sharp edge

Introduction

Many times when we apply forces to objects, the force causes them to turn or spin about a fixed point (pivot/fulcrum).
Have you ever wondered what happens when children are playing on a seesaw?

Figure 2.1: Children playing on a seesaw

Look at the children in the above figure. What would happen if one of the children left or moved far away from the position where he/she is?

Activity /procedure
- Balance the log of wood on a sharp edge until it is balancing horizontally (Figure 4).
- Put one lump of sand/soil in a sack on one side of the wood using a string and the other on a different side of the sharp edge.
- Adjust the lumps of sand until the two sides balance
- Now slightly move one of the lamps of sand

What do you notice?

Figure 2.2: A balanced log of wood with loads

For your knowledge

If one of the children left or changes position, the other one would fall over from the other side or be raised upwards; i.e would experience a turning effect. This turning effect is also called moment of a force. It is obtained from: **moment of a force=force x distance of force from the fulcrum**
The direction of the turning (moment) is compared to the movement of the hands of a clock i.e clockwise or anticlockwise

Follow up activity:
Now that you know the meaning of a moment of a force:
1. State the units of moment of a force
2. Identify instances in everyday life where turning effects/moments occur or are applied
3. describe the ways of increasing the turning effect

Lesson 2: The Principle of Moments

In this lesson, you will be able to:
- State the principle of moments
- Apply the principle of moments to determine the mass of objects such as a log of wood

When a body balances, it is said to be in equilibrium. Equilibrium is very essential and is a situation where the resultant force on a body is zero.
Activity 1: To derive the principle of moments

Materials you need
- A sharp edge
- A log of wood or stick
- Ruler
- Two known masses such as a bottle of mineralwater completely filled with water is 500 g while a half filled mineral water bottle is 250 g

Procedure:

1. Balance thelog of wood on a sharp edge as shown in the figure 2.3 and note the balance point.
2. Suspend a mass m_1(bottle completely full of water=500g) at a distanced_1 less than 20 cm from the balance point.
3. Without changing the position of the balance point and the position of m_1 suspend a mass m_2=bottle half filled with water (250 g) the other side of the wood and adjust the mass slowly until the wood balances horizontally (Figure 2.3)
4. Measure the distance $d_2$between m_2 and the balance point

Figure 2.4

5. Record m_1, distance d_1, m_2 and distanced_2 as shown

m_1=…g	distance d_1=…….cm	m_1 x d_1=
m_1 =...g	distance d_2=…….cm	m_2 x d_2=

What do you notice about the values of m_1 x d_1 and m_2 x d_2?
The result verifies the principle of moments which states that:
"When a body is in equilibrium, the sum of clockwise moments about any point is equal to the sum of anti-clockwise moments about the same point".
Activity 2: To determine the mass, M of a log of wood using the principle of moments

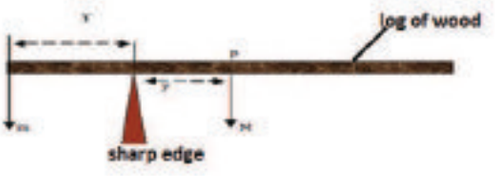


Figure 2.5
What you need:
- A sharp edge
- single mass m=500 g (a small bottle of mineral water completely filled with water)
- Log of wood

Procedure
1. Balance the log of wood on a sharp edge, until it balances horizontally and note the balance point P.
2. Suspend a mass m=500 g at the end of the log of wood as shown in the figure 2.5.
3. Without adding another mass, adjust the log of wood on the sharp edge slowly until it balances horizontally
4. Measure the distance x between the mass m and the sharp edge and the distance *y* between P and the sharp edge
   If **M** is the mass of the log of wood, then it acts at P.
   Using principle of moments, find the value of **M**.

Lesson 3: Centre of gravity

In this lesson, you will be able to:
- Determine the centre of gravity for regular and irregular objects
- Explain the importance of the position of the centre of gravity of objects

Introduction: In the previous lesson, you

balanced a log of wood on a sharp edge until a balance point was obtained. There is only one balance point on each body. This balance point is where all the mass or weight is assumed to be concentrated and is the centre of gravity.

Activity 1: Determination of centre of gravity of regular objects.

Materials you need

- Log of wood
- Sharp edge
- Irregular cardboard from a used box
- String
- Small object like a stone

Procedure

Balance the log of wood on a sharp edge until it balances horizontally
Mark the balance point on the log of wood (Figure 2.6)

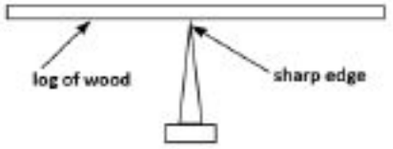


Figure 2.6

What do you say about the balance point of the log of wood?

Activity 2: Determination of centre of gravity of irregular objects
Materials you need:

Procedure (steps):

- Make three holes A, C and B at the edges of an irregular cardboard.
- Hung the cardboard through A so that it swings freely on a nail clumped in a stand.
- Tie the small object like a stone to the nail and trace a line where the string passes (Figure 2.7).
- Hung the cardboard at another hole, C and trace a line where the string passes.
- Locate a point where the two lines intersect.

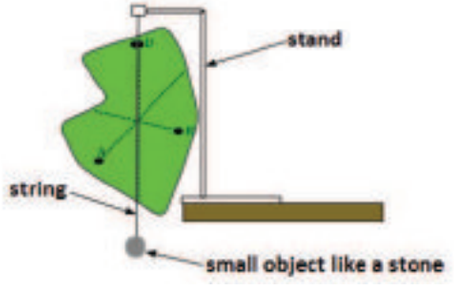


Figure 2.7

What do you say about the point of intersection of the two lines?

Lesson 4: Stability

In this lesson, you will be able to:

- Explain the three types of equilibrium
- Explain how position of centre of gravity affects the stability of objects

Introduction

Have you ever wondered why some bodies when displaced from their positions, the bodies come back to their original positions while others completely fall off to new positions? This is a result of the position of their centre of gravity.

Activity

Materials you will need

- A small ball (you can make one using waste papers, polyethene or banana fibre or grass)
- A short stem of a tree or short section of bamboo stem (each about 5 cm to 10 cm long)
- A small irregular object such as a plastic bottle filled with water

Procedure:

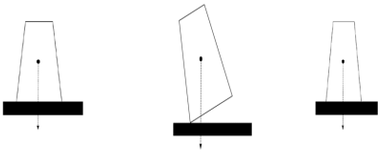
Slightly displace a bottle filled with water to one side and then release it. What do you observe?

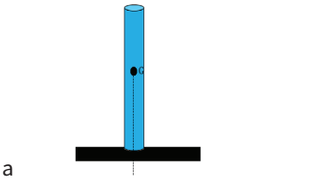
Slightly displace a short stem of a tree or the bamboo stem that is standingvertically upwards and release it. What do you observe?

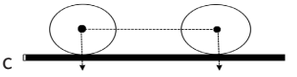
Slightly displace the ball from its position and release it. What do you observe?

In the above three activities, you may have noticed that some of the objects come back to the original position, others acquire new positions and become stable while others may not appear to change positions, though they become stable in new positions.
This results from the change in the position of the centre of gravity.

(a) Now using the diagrams below, can you explain the behaviour in the above three activities in terms of the centre of gravity?







(b) Now using the three situations, can you explain the three types of equilibrium?
(c) How does the idea of centre of gravity affect the construction of cars/ buses/lorries?

In summary, if the body returns to its original position, it is in stable equilibrium. If the body does not return to its original position but acquires a new position in which it settles, then it is in unstable equilibrium. If the body acquires a new position but without change in appearance, then it is in neutral equilibrium.

CHAPTER THREE

Machines

Lesson 1: Meaning of machines

In this lesson, you will be able to:

- Explain what a machine is
- Explain the terminologies related to machines

Materials you need

- A log of wood
- A knife
- Bottle opener

Introduction

Have you ever wondered why you can push two bags of cement using a wheel barrow but it is even difficult to carry one bag of cement without any other device? The wheel barrow simplifies the carrying of the cement. It is a machine. Many more things can be done more easily using these devices called machines. These machines are either simple or many simple machines put together to form complex machines. Can you identify some simple machines and complex machines?

Activity: Terms used in machines

Procedure 1:
Try to lift a heavy object such as a stone from the ground using a log of wood. The object like a stone is the load, L and you apply the effort, E using your hands.

For your knowledge: If the values of L and E are known, the ratio L/E is called mechanical advantage

Now try this: When using a certain machine a force of 250N must be used to raise a load of weight 1000 N. Calculate the mechanical advantage of the machine.

Procedure 2:
Try to measure the distance through which the load is moved and the distance through which the effort moves. What values do you get? Now divide the distance moved by the effort to the distance moved by the load.

For your knowledge: If the value of the effort distance is divided by the load distance, the value obtained is called the velocity ratio

Now try this: What are the units of mechanical advantage and velocity ratio? Try to explain this.

Now try out this example:
When using a certain machine, a force of 250N must be used to raise a 100kg mass through a distance of 1m. If the effort distance is 5m, calculate;

a. Mechanical advantage
b. Velocity ratio
c. Divide the mechanical advantage by the velocity ratio. What do you obtain? Express the answer as a percentage and comment on the answer. Try to ask whether this value can exceed 100 or not and why?

Lesson 2: Levers

In this lesson, you will be able to:
- Classify the three types of levers
- Explain the reason for the classification

Materials you need
- A log of wood
- A knife
- Bottle opener
- Hammer
- Pair of scissors
- Sea-saw
- Wheel barrow
- Your arm
- A hoe with handle
- Panga
- Nail cutter

Introduction
There are a variety of simple machines in the home which are used to simplify work. However, they are not the same. They are not constructed on the same plan. This brings about three categories of levers.

Now look at the following imagesin Figure 3.1below:

a  b 

c  d 

e  f 

g  h 

Now from the table, try to explain the reason for the classification of the levers

Lesson 3: Pulleys

In this lesson, you will be able to:
- construct a pulley
- Identify applications of pulleys

Materials you need
- A rope
- A tree/stick
- Two supports/stands whose tops the tree/ stick can easily rotate
- A piece of heavy material such as soil/sand tied in a cloth, or a bucket

Activity 1: To construct a pulley
Procedure
- Support a tree/stick between two supports. Ensure that the tree/stick can easily rotate between the supports/stands
- Tie the rope over the soil
- Run the rope over the tree or stick
- Pull the free end of the rope slowly but continuously

What happens to the soil or bucket?

In the above activity, you have formed a pulley. A common pulley looks like the one shown in Figure 3.2 below.

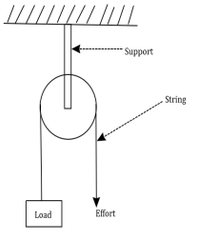


Figure 3.2: A common simple pulley

A pulley is a wheel with a grooved rim in which a rope passes.

Pulleys are also simple machines. The velocity ratio is equal to the number of wheels or pulleys. Look at the pulleys in Figure 3.3below. Try to re-draw each of the pulleys.

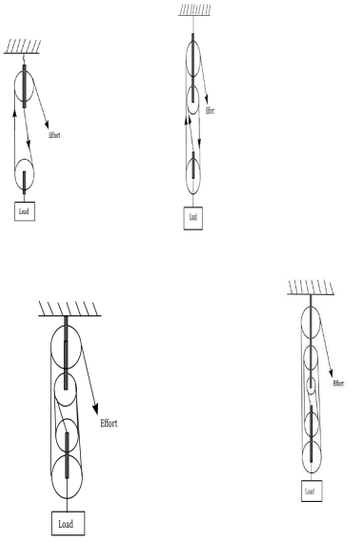


Figure 3.3: Different pulleys

What is the velocity ratio of each of the pulleys? How do you know?

Activity 2
In our ordinary life, pulleys can be applied in a number of ways. Some are indicated in the Figure 3.3 below. Look at each figure carefully.

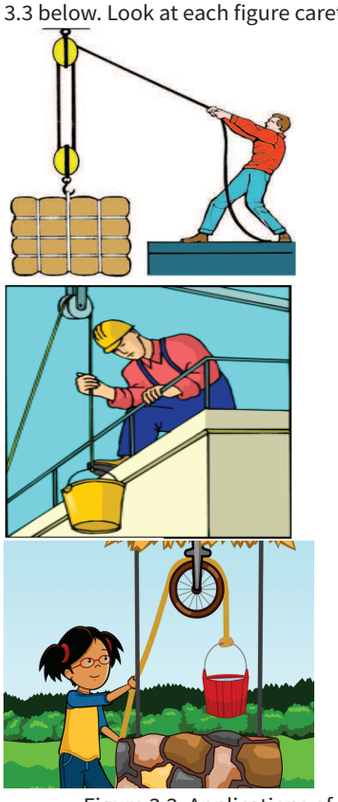


Figure 3.3: Applications of pulleys

(i) Explain what the pulley is being used for in each case
(ii) Identify complex machine systems where pulleys are applied

Lesson 4: Other simple machines

In this lesson, you will be able to:
- Identify other simple machines
- Explain how these other simple machines simplify work

Materials you need
- A wedge (inclined plane)
- Used gear system of a bicycle
- Jack (if available)
- Screw (where possible)

Introduction
In the previous two lessons, you looked at the two types of simple machines, i.e levers and pulleys. In this lesson, you will look at the other different simple machines.

Activity
Look at the images of simple machines shown in Figure 3.4 below:

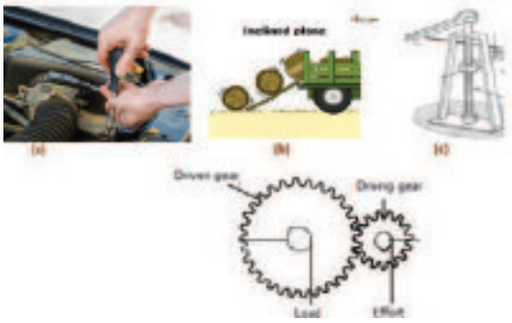


Figure 3.4: Different machines

(a) Where is each of the simple machines applied?
(b) How does each of the simple machines simplify work?

Project work: Now that you have learnt how simple machines work, design a machine that combines many simple machines and can be used to simplify work, for example a crane or excavator. You are allowed to use many components and explain how it works

CHAPTER FOUR

Work, Power and Energy

Lesson 1: Work

In this lesson, you will be able to:

- define work and state its units
- solve numerical problems related to work
- identify instances in everyday life in which work is done and explain why

Materials you need

- A brick or large piece of wood or a jerrycan containing water

Introduction

The word "work" is quite often used in our day to day lives to mean occupation or job.

But in physics, work has a different meaning. When you go to fetch water, you have done work, though it may not be your continuous job.

Look at the children in the Figure4.1 below.

Figure 4.1

Can you say that the children are doing work? Why or why not?

Now assume that the children are playing in the compound. Are they doing work?

Activity:

Procedure:

- Lift the brick or piece of wood or the jerrycan containing water
- Move five large steps while holding this object

Suppose the object you are holding has a mass of 5 kg and the distance covered in the five steps is 5 metres, then;

- convert the mass into weight i.e5x10=50 N
- multiply this weight by the distance covered i.e 50 x 5= 250

What you have obtained in this case is the value of work you have done while carrying the object through that distance.

For your knowledge: Work is done whenever force moves through a distance. Hence work is the product of force and distance in the direction of force. The SI unit of work is the Joule (J)

So human beings and machines do work when they move objects through distances. Do you do work when you move in the compound without carrying any object? Try to explain this.

Now try these problems and express the answer to the appropriate units: ($g = 10 ms^{-1}$)

1. A body of mass 5kg is lifted through a distance of6m. Calculate the work done.
2. A man lifts a box of mass 3 kg vertically upwards through 2 m. Calculate the work done by the man in lifting the box.
3. Try to identify other instances in everyday life in which work is done.

Lesson 2: Power

In this lesson, you will be able to:

- define power and state its units
- solve numerical problems related to power
- identify instances in everyday life in which power is expended

Materials you need

- A brick or large piece of wood or a jerrycan containing water
- A watch

Introduction

In the previous lesson, you learnt the meaning of work. When a person or machine does a lot of work very quickly, such a person or machine is said to have power. So what does **power** mean in Physics? To understand the meaning of power, you are going to do the following activity.

Activity

Procedure:

- Lift the brick or piece of wood or the jerrycan containing water
- Move five large steps while holding this object. As you move the five steps, count and record the time (in seconds) it takes you to make the five steps (you may use a watch or the counting of figures 1,2,……. for seconds if you have no watch)

Suppose the object you are holding has a mass of 5 kg and the distance covered in the five steps is 5 metres, then;

- convert the mass into weight i.e5x10=50 N
- multiply this weight by the distance covered i.e 50 x 5= 250

What you have obtained in this case is the value of work you have done while carrying the object through that distance.

Now divide this work done by the time you measured i.e

What you have obtained is called power. Can you suggest a definition for power?

For your knowledge: The SI unit of power is the Watt(W).A watt is defined as the power developed when one joule of work is done in one second.

Now try out this problem. Do not forget to express the answer using appropriate units

A machine lifts a load of 2500N through a vertical height of 3m in 1.5s. Find:

(a) The power developed by the machine
(b) Using the same power, how long would it take to lift a body of 6000N through a vertical height of 5m.

Lesson 3: Energy

In this lesson, you will be able to:

- define energy and state its units
- identify the different sources of energy
- categorize energy resources as renewable and non-renewable resources

Materials you need

- pieces of paper or firewood

Introduction

In **lesson 1** you saw the meaning of work. People and machines are able to do work because they have the ability to do the work. This ability is the energy possessed by the person or the machine.

Did you know? The SI unit of energy is joule (J)

The energy of people and machines can be seen in a number of forms such as light, heat and mechanical or physical energy for lifting objects. This energy comes from different sources such as food, fuel and water.

Activity 1:

Procedure

- Burn small pieces of wood or small pieces of paper until they completely burn

(a) What do you observe?
(b) What forms of energy are produced during this activity?
(c) Can you get the wood or paper back or use it again?

From the above activity, you saw that some of the sources of energy are used only once while others can be used several times.

Activity 2:
Look at the images in the Figure 4.2 below





Figure 4.2

(a) Identify the energy source in each case
(b) Which of the energy sources can be used only once?
(c) Which of the energy source can be used several times without being exhausted?

Summary
If an energy resource can be used only once and is exhausted, it is a **non-renewable** resource while one that can be used several times without being exhausted is a **renewable resource**.
Can you identify other renewable and non-renewable energy resources in Uganda, apart from those in Figure 4.2

Lesson 4: Mechanical energy

In this lesson, you will be able to:
- Identify the forms of mechanical energy
- Solve numerical problems related to mechanical energy

Materials you need
- Two small stones

Introduction
In lesson three, you saw that there are different forms of energy. One of the forms of energy is mechanical energy. Mechanical energy enables us to do mechanical work such as moving and carrying objects. In this lesson, you will distinguish between the two types of mechanical energy.

Activity
Procedure
- Place one small stone on the ground or on the table
- Throw the other small stone upwards or drop it from some point towards the ground

Which of the two stones possesses energy?
Explain your answer
Now consider this.
A person sitting at one position and a person running, who of the two possesses energy?
Explain your answer.

In summary, all bodies possess mechanical energy. Bodies at rest possess potential energy due to their position and this energy is given by

Where we have g being the acceleration due to gravity, and h is the height above the ground.
On the other hand, moving bodies possess kinetic energy given by the expression
Where m is the mass of the body and v is the velocity of the body.
Hence all mechanical energy results from masses of bodies

Using the above equations, try out these problems:
1. A stone of mass 8kg is lifted through a height of 2metres.Find the potential energy the stone develops (Take g = 10ms^{-2})
2. Find the kinetic energy of a body of mass 2kg moving with a speed of 4ms^{-1}

Lesson 5: Transformation and conservation of energy

In this lesson, you will be able to:
- Identify energy transformations in life
- State law of conservation of energy
- Describe energy transformations using a pendulum

Materials you need
- A torch
- A small stone
- A string

Introduction:
In lesson 3, you learnt the sources of energy. One of the sources of energy is the dry cell. Can the energy stored in a dry cell do something? Try this activity.

Activity 1
Switch on a torch. What do you observe?
Try to explain this observation.

The energy stored in the dry cells changes into light energy in the torch. The energy stored in the dry cell is chemical energy. Energy is transformed from one form to another. Transformation of energy is very useful to our lives.

Now identify as many instances/devices in everyday life where energy is changed from one form to another. State energy changes that occur.

Activity 2
Procedure
- Hold a small object such as a stone above the ground on a support
- Then release the body and let it fall to the ground (Figure 4.3 below)

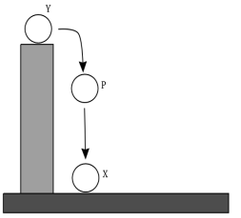


Figure 4.3

Now answer the following questions.
What form of energy does the stone posses when;
(a) It is held above the ground i.e at Y?
(b) It is falling to the ground i.e at P?
(c) It falls and rests to the ground i.e at X?

As you answer these questions, you may discover that same object may have different energy forms. But the total amount of energy is constant. This is summarized in the law of conservation of energy which states that'**energy can neither be created nor destroyed, but only changes from one form to another**'.

You can also explain different energy forms using a pendulum.

Activity 3
Procedure
- Tie a small stone on a string that is about 1 m long
- Suspend the stone from a support
- Set the pendulum into oscillations and observe how it swings (Figure 4.4 below)

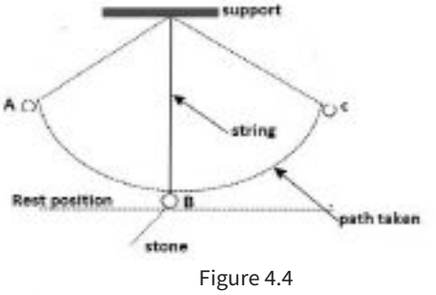


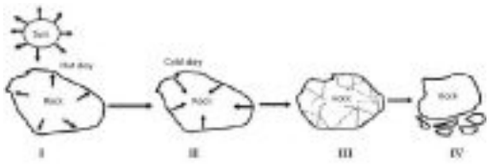
Figure 4.4

From Figure 4.4 above, identify the forms of mechanical energy at positions A, B and C.
Explain your answer.

BIOLOGY

Revision Activity 1

Weathering is the process of soil formation by the breaking down of rocks into small particles. Weathering can be a biological process involving living organisms or a chemical process involving chemicals substances like acids or a physical process involving physical factors of the environment. Weathering is a slow and continuous process.



Study the figure above.

a) What is happening to the rock at Stage I
Why is it happening?
b) What is happening to the rock at Stage II
Why is it happening?
c) What is happening to the rock at Stage III
Why is it happening?
d) What is happening to the rock at Stage IV
e) Do you think this is a physical or chemical or biological process?

Revision activity 2

Soil is grouped basing on the size and nature of the soil particles. Have you ever asked yourself why different types of soils are used for different purposes? In this lesson you will learn how to distinguish clay from loam and sand soil.

Materials you will need:

Soil Sample A, Soil Sample B, Soil Sample C, Water

Activity set up

1. Collect two cups full of soil from the following sites
   I. Soil from the top layer of a well mulched garden/soil near a rubbish pit/soil under leaves in a forest/soil by the roadside where grass is growing **(**Labelled **Soil Sample A)**
   II. Soil from a place where pots or charcoal stoves are made/ from a big anthill **(**Labelled **Soil Sample B)**
   III. Soil from sand pits or mines/ soil that remains by the roadside when slow moving water has drained. **(**Labelled **Soil Sample C)**
2. Place the soils on separate sheets of paper to dry
3. Remove any non-soil material from your samples
4. Keep the soils in separate containers for use in other activities

Caution: wash your hands with soap and water after this activity

Procedure:

Step 1: Take a pinch of soil sample A between your thumb and your forefinger. Press and rub gently. Describe the size of the soil particles. Are they small/ fine (powder-like)/big? Record your description in the table below.

Step 2: Repeat the procedure in step 1 using soil sample B and soil sample C.

Step 3: Take a pinch of soil sample A between your thumb and your forefinger. Pour ONE or TWO drops of water onto the soil between your fingers. Press and rub gently. Describe how the soil feels (texture). Is it smooth/rough/slippery/ gritty? Record your description in the table below.

Step 4: Repeat the procedure in step 3 using soil sample B and soil sample C.

Step 5: Take a handful of soil sample A, add a little water at a time and mix it with the soil. Try and mould the soil into a ball. Throw the ball into the air about 50cm and then catch it. Describe what happens to the ball. Does it remain intact/ it falls apart? Record your observation in the table below.

Step 6 Repeat the procedure in step 5 using soil sample B and soil sample C.

	Soil Sample A	Soil Sample B	Soil Sample C
Size of the soil particles			
Feel (texture) of soil			
Behavior of soil when thrown in air			

Read the characteristics below and use them to identify soil samples A, B and C.

Sand soil; feels gritty when wet, has relatively big particles that do not easily clamp together when wet.

Clay soil; feels smooth and slippery when wet, has very fine particles that strongly clamp together when wet.

Loam soil; feels like an intermediate between gritty and smooth, has small particles that readily clamp together when wet.

Soil Sample A is ……..

Soil Sample B is ……..

Soil Sample C is ……..

Follow-up activity:

Soil in Uganda is used for various economic activities or in making different products. Think about your community and identify the economic activities that use soil or products made from soil. For each activity/product identified, mention the type of soil used and give reasons why that soil type is preferred.

Revision activity 3

Soil drainage is the soil's natural ability to let water pass through it while water retention refers to the amount of water soil can hold. Why do you think it is important to understand these two properties of soil? In this lesson you will compare drainage in two types of soil.

Materials you will need:

4 empty clear plastic bottles (500/600mls) as receivers, cotton wool, dry sand and clay, clock/ watch, water, 4 funnels *(If you cannot fine a ready-made funnel, then use a cutter (knife/razor blade) to cut* ***½*** *of upper portion of the empty clear plastic bottles and use them as funnels and the lower portions as receivers/containers. In this case, you will need a cutter (knife/razor blade)).*

Caution: Wash your hands with soap and water after this activity.

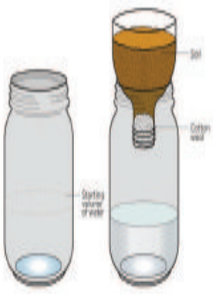
Procedure:

Step 1: Measure an equal volume of each soil sample, for example 30cm^3

Use a piece of cotton wool to plug each funnel

Step 2: Put clay in one funnel and the sand in the other funnel

Step 3: Place the funnels with their contents over the receivers.



Step 4: Pour (at the same time) an equal volume (50cm^3) of water on each of the soil samples. Look at your clock or watch and let the experiment run for 20 minutes

Step 5: Observe and take note of the following:

i. The soil from which water started dripping first.
ii. The volume of water collected after the experiment.

Step 6: Record your findings in a table of your choice.

What explained conclusions can you draw about:

i. Drainage in:
   - Clay soil
   - Sandy soil

ii. Water retention:
   - Clay soil
   - Sandy soil

Follow-up activity

Comment on how the knowledge of drainage and water retention of clay and sand is used in the following areas:

i. Agriculture
ii. Building construction
iii. Craft making

MATHEMATICS

Class: SENIOR TWO

Mathematics

Topic: Numerical Concepts

Lesson 1

Learning outcome

By the end of this lesson, you should be able to know the Rational, Irrational and Real Numbers. You will work out problems involving these numbers and apply them in real life situations.

Materials: You will need grid papers. The grid papers will be used when dealing with Square numbers and Square roots.

Introduction

You have already learnt about some types of numbers like Natural numbers, Whole numbers, Fractions, Decimals, Integers and many others. All these numbers can be expressed in different bases.

In term one of Senior one, you learnt *Bases* where you carried mathematical operations, converted numbers from one base to another and vice versa. **Remember** that Integers have positions on a number line.

Activity 1

Represent the following numbers on the same number line

(a) -3, -1, 1, 2, 5, 10
(b) 0.1, 0.4, 0.5, 0.8
(c) 1/3, 1/2, 1/4, 2/5, 1/7

Rational Numbers

Remember, Integers and decimal numbers can easily be represented on a number line.

In the previous activity, you might have converted fractions to decimals in order to present them on a number line.

When fractions are converted into decimals, **they** are terminating, recurring and others are neither terminating nor recurring.

Note. Terminating and recurring decimals can be expressed in form of **a/b** where **a** and **b** are integers. This means that all integers can be written in form of **a/b**

Activity 2.

Express the following numbers in form of **a/b**

(a) 2, 7, 9, 11, 15, -3, -5

(b) $1\frac{1}{3}, 1\frac{1}{3}, 3\frac{11}{55}$, 2.2, 4.8, 1.02

You have seen that integers, terminating and recurring decimals can be written in form of **a/b** where **a** and **b** are integers.

Numbers which can be expressed in form of **a/b** are called Rational numbers.

Activity3.

Are all Decimal Numbers Rational numbers? With examples, justify your answer.

Irrational Numbers

Activity 4: Using a Calculator, find the square roots of the following numbers

(a) 1 (b) 4 (c) 9 (d) 3 (e) 2 (f) 13

Write the answers for (a)……(f) in form of **a/b** where **a** and **b** are integers

Have you been able to write your answers for (a) …..(f) in form of **a/b**?

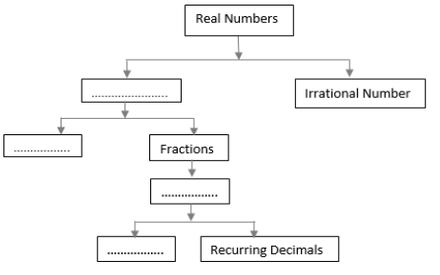
Note: All numbers which cannot be written in form of **a/b** are called irrational numbers

All Irrational numbers have corresponding positions on the Number line

Real Numbers

Remember Rational and Irrational numbers have positions on the Number line

Activity 5: Complete the following chart of Real numbers



Converting Recurring Decimals into Fractions

Activity 6: Convert $\frac{2}{5}, \frac{1}{8}, \frac{3}{505}, \frac{2}{8}, \frac{1}{50}, \frac{3}{50}, \frac{11}{33}$ into decimals.

Note that decimals can be converted into Fractions.

Example: Convert 0.2, 0.5 into fractions

Solutions: $0.2 = \frac{2}{10} \frac{2}{10} = \frac{11}{55}$

$0.5 = \frac{5}{10} \frac{5}{10} = \frac{11}{22}$

Convert $\frac{22}{33}$ into decimal

Answer: $\frac{22}{33} = 0.6666\ldots$.

The answer 0.666… is a non-terminating **but a** recurring decimal

0.666 can be converted to fractions.

The recurring number is 6 and it starts recurring after the tenth position

So, take r to be 0.6666 i.e. r = 0.666 equation (i)

Multiply equation (i) by 10 i.e. 10r = 6.666 equation (ii)

Subtract equation (i) from equation (ii) i.e. 10r – r = 6.666 – 0.666 = 6.0

9r = 6

$r = \frac{66}{99} = \frac{22}{33}$

Activity 7

Convert the following recurring decimals into fractions

(a) 0.77…
(b) (b) 0.2424…
(c) (c) 0.01666….
(d) (d) 0.185353…
(e) (e) 4.203203…

Class: Senior Two

Topic: Algebra:

Lesson 1: Use of Symbols, substitution

Learning outcome : By the end of this lesson, you should be able to:

- interpret word problems
- Write a formula using symbols and correct.

Materials:

You will need a note book, pen, paper, razor blade or scissor to help you explore relationships between different shapes and how they can be used to build a formula.

Introduction

In your primary school and S.1, you were introduced to a number of mathematical symbols representing mathematical statements.

Activity 1

1. What are some of the symbols that you regularly interact with?
2. What do these symbols mean**? (MISSING SYMBOLS)**

SYMBOL	MEANING

Look around your homestead and construct a statement. Use the statements drawn from situations in your homestead and represent it using symbols.

Statement	Symbol
Number of boys in my family is **not equal to** the number of girls	≠

Exercise

1. Which of the symbols is not used to show multiplication?
   a. @ b. * c. × d. ( )
2. Which of the following statements is true?
   a. π is a special number
   b. There is only one way to show multiplication symbol
   c. 90^0 is the symbol for representing a right angle in a triangle.
   d. √ is a square root.

Lesson 2:

Learning outcome

By the end of this lesson, you should be able to:

- Write statements in algebraic form using symbols.

An Algebraic expression is formed from variables and constants using different operations.

Expressions are used to write word problems in math terms.

Expressions are like instructions that tell you what you have to do to a number or variable.

Words (statement)	Algebraic Expression
A number b is added to 6	b+6
9 is subtracted from x	x-9
A number t is multiplied by 8	t×8
A number z is divided by 3	z÷3 or $\frac{z}{33}$

Activity

Choose the correct answer for each of the questions

1. The subtraction of 5 times of y from x is

(a) 5x – y

(b) y – 5x

(c) x – 5y

(d) 5y – x

(a) –1 × b

(b) 1 – b – 0

(c) 0 – (–1) × b

(d) – b – 0 – 1

3. The length of a side of square is given as 2x + 3. Which expression represents the perimeter of the square?

(a) 2x + 16

(b) 6x + 9

(c) 8x + 3

(d) 8x + 12

4. A fruit basket contains the same number of mangoes and oranges. If Eric eats 5 mangoes and 1 pear, there will be twice as many oranges as mangoes. How many oranges remain in the basket?

(a) 4
(b) 8
(c) 9
(d) 10
(e) 11

Lesson 3:

Learning outcome

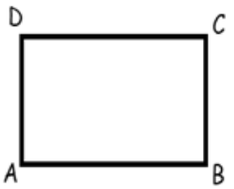
By the end of this lesson, you should be able to express one variable term in terms of another.

Activity 1

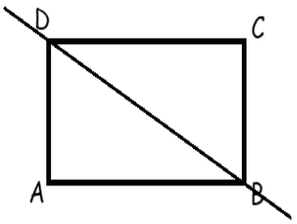
Let us use the area of a square to generate the formula of finding the area of a right-angled triangle.

Hint

Here is a piece of paper in a square shape labelled ABCD



Cut the piece/ fold the paper along diagonal from one end of the vertex to its opposite.



.

You will observe there are two equal right-angled triangles formed.

Use the Length, width and the area of the shape ABCD to derive a formula for finding the area of triangle.

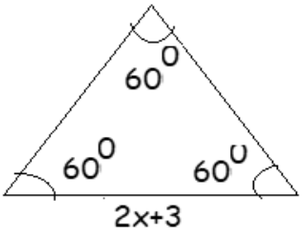
Activity

1. Use the formula you have generated to obtain solutions to the following
a. Base = 4 units, Height = 10units
b. Base =12units, Height= 3units

2. Use the following information to obtain the;
c. Height, when Area= 16square units, Base= 6units
d. Base when Area= 24 square units, Height = 10units
3. Find the values of the following algebraic expressions when a = – 2 and b = 3:
   a. 8a
   b. 5b
   c. a+3b
   d. 4a-2b
   e. $a^2 + 2ab + b^2$
4. Make x the subject in the following algebraic equations
   a. y=x+a
   b. y=2x-a
   c. y=2x+7
   d. ax-y=2y
5. Make x the subject of the formula in each of the following cases**.**
   a) a (x+b) =c
   b) $\frac{x}{a} = 1 + \frac{yx}{ba} = 1 + \frac{y}{b}$
   c) $\frac{x+y}{y} = \frac{y}{a} + \frac{ax+y}{y\ y} = \frac{y}{a} + \frac{a}{y}$

Follow up Activity

1. Find each side of an equilateral triangle given below, if the perimeter of the equilateral triangle is 240 cm.



2. Cut out shapes of two right angled triangles and a rectangle, Join them to form a shape of a trapezium
a. Paste the shape in your exercise book.
b. Draw the shape of the trapezium.
c. Use the right-angled triangles and a rectangle to derive a formula for **the** area of a Trapezium.
d. Write the formula in your notebook.
e. Use the formula to;
   (i) Express the base of the trapezium in terms of the height and Area
   (ii) Express the height of the trapezium in terms of the base and Area

Topic: Business arithmetic

Lesson 1: Calculating Profit and Loss.

Learning outcomes:

By the end of this lesson, you should be able to:

i. Calculate profit and loss
ii. Express profit and loss as a percentage
iii. Calculate discount and commission
iv. Calculate simple interest.

Materials:

For this lesson, you will need to collect items that are used in a home, those that were bought from a shop. You will need receipts, price tags, a pen/ pencil and a rough book to try out the exercises.

Introduction:

Dear student, you must agree with me that buying and selling is part of any trade. The goods we use at home are bought from shops, markets and supermarkets. People who sell to us also buy from other wholesalers and sell them to us at a higher price. The extra money the goods are sold for is the **profit**. If the goods are sold at a *lower price* than the price at which they were bought, the difference is the **loss**.

The price at which the goods are bought is called the **cost price *(C.P)***

The price at which the goods are sold is called the **selling price (S.P)**

Now, try to reflect on issues discussed above with the following activity.

Activity 1

1. A bicycle bought for 180,000/= was sold for 150,000/=.
   i. What was the cost price?
   ii. What was the selling price?
   iii. Was the bicycle sold at a profit or loss? Give a reason for your answer.

2. Musa bought a radio at 60,000 UGX and sold it to his brother at 55,000 UGX. Calculate the profit or loss made on this item.

3. A box of mineral water has 24 bottles. A shopkeeper bought it from the wholesale shop at 18,000 UGX. He sold each bottle at 1000 UGX. Calculate the profit or loss made by the shopkeeper.

Lesson 2: Percentage loss and profit

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

In the previous lesson, you were able to calculate the profit or loss made by reselling an item. In this lesson, you will learn to express the profit or loss as a percentage. You can determine the percentage profit or loss using the formulae below;

$$\text{Percentage profit} = \frac{Profit}{Cost\ Price} \times 100$$

$$\text{Percentage loss} = \frac{Loss}{Cost\ Price} \times 100$$

Example 1:

A bicycle bought at 180,000/= was sold for 150,000/=. Calculate the percentage loss.

$$\text{Percentage loss} = \frac{Loss}{Cost\ Price} \times 100$$

$$= \frac{C.P - S.P}{C.P} \times 100$$

$$= \frac{180{,}000 - 150{,}000}{150{,}000} \times 100$$

$$= \frac{30{,}000}{150{,}000} \times 100$$

$$= \frac{\cancel{30{,}000}}{15\cancel{0{,}000}} \times 100$$

$$= 20\%$$

The loss on the bicycle is 20%.

Activity 2

1. Mangoes are bought by a fruit shop for 300 shillings each and resold at 500 shillings each.
    a. What is the cost price?
    _____
    b. What is the selling price?
    _____
    c. What is the profit?
    _____
    d. Calculate the percentage profit on the cost price. _____

2. Josephine makes school uniforms. It costs her 30,000/= to make a girl's skirt. She then sells them for 48,000/= each.
    a. What is the cost price?
    _____
    b. What is the selling price?
    _____
    c. What is the profit?
    _____
    d. Calculate the percentage profit._____

3. Ahmed bought a used car for $14 500, spent another $2000 on repairs, before selling it for $19 000. Find:
    a. the total amount Ahmed spent on the car _____
    b. the profit he made
    _____
    c. the percentage profit on the total amount he spent. _____

4. A company selling newspapers spends 15,00/= to produce a copy of the newspaper and sells it at 2,000/=. On a given day, **the** company produced 2000 copies and managed to sell 1000 copies only.
    a. Did the company make a profit or loss on that day?
    b. Calculate the percentage profit/ loss for the day.

5. Copy the table shown below and fill in the missing values.

Item	C.P	S.P	Profit/ Loss	comment	% Profit/ loss
Dress	20000	30000			
Shirt	18000	22000			
Cow	700000	900000			
House	80 million	72 million			
TV	300000	360000			
Smart phone	250000	200000			
Bag of Irish potatoes	100000	120000			
Pair of shoes	45000	40000			

Lesson 3: Discount

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

In the areas of competition, shops find ways of encouraging customers to buy. One way of encouraging customers is offering them a discount. This is done by reducing an amount from the usual price of an item. This reduction in price is called **Discount.** It is usually calculated as a percentage of the selling price.

Example: Sarah buys a dress for cash whose marked price is shillings 50,000. A shopkeeper offers 10% discount for cash payments.

a) How much is the discount?
b) How much does she actually pay for the dress?

a) $Discount = \frac{10}{100}\frac{10}{100} \times 50{,}000$
= 5,000 shillings

b) She pays 50,000 – 5,000
= 45,000 shillings

Activity 3

1. The marked price of a watch is 46,500. The shopkeeper offers an off-season discount of 18% on it. Find its selling price.

2. The price of a sweater was slashed from 9600 shillings to 8160 shillings by a shopkeeper in a rainy season. Find the rate of discount given by him.

3. Find the percentage discount being given on a shirt whose selling price is 54,600 shillings after deducting a discount of 10,400 on its marked price.

Hint. Market Price = (SP) + (discount).

4. After allowing a discount of 8% on a toy, it is sold for $ 216.20. Find the marked price of the toy.

5. A set of kitchen utensils was bought for 52,800 after getting a discount of 12% on its marked price. Find the marked price.

6. A dealer marks his goods at 35% above the cost price and allows a discount of 20% on the marked price. Find his gain or loss per cent.

7. A cell phone was marked at 40% above the cost price and a discount of 30% was given on its marked price. Find the gain or loss percent made by the shopkeeper.

8. A dealer purchased a fan for UGX 10800. After allowing a discount of 25% on its marked price, he gains 25%. Find the marked price of the fan.

Lesson 4: Commission

Materials: You will need a pen/ pencil and a rough book to try out the exercises.

Introduction

Commission is a fee paid for services. It is usually calculated as a percentage of the total cost of the goods. This amount can be paid to salesmen as sales commission. Sales commissions is the amount of money paid to employees or companies that sell goods in stores or by calling on customers. The commission is meant to motivate sales persons to sell more.

For example, if a salesperson receives a 10% commission on their sales, a salesperson sells goods worth 15,000 shillings, they would earn 1,500 shillings in commissions.

So, commission $= \frac{10}{100} \times 15000$

= 1500 shillings

Activity 4

1. A salesman gets a fixed salary of $2000 per month and a commission of 2% on sale. If total sale for the month of April was $30,000, find his total salary for that month?

2. Joan makes a commission of 2% when a house is sold by his company. How much money will Joan make as a commission if her company sells the house for 300,000,000 shillings?

3. Mike makes **a** commission of 10% on each TV set sold at store. Each TV costs $120. How much money will he make as commission if **the** store sells 25 TV sets?

4. John is selling sets of knives and makes a 10% commission on all sales. What would his commission be on the sale of a $3250 set of knives?

5. Sonny works as a furniture salesman and earns a base salary of $350 per week plus 6% commission on sales. What was Sonny's weekly gross salary if his total sales were $3750?

Lesson 5: Simple Interest

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

Dear students, do you know that Money is not borrowed for free?

When money is borrowed from the bank, the bank

charges for the use of the money. This charge is called **interest** usually denoted by **(I)**.

Also when money is deposited with the bank, the bank **pays interest to** the owner of the money. The amount borrowed is called the **Principal** usually denoted by **(P).**

The interest is usually calculated as a **Percentage Rate** usually denoted by **(R).** Interest also depends on the length of **Time (T)** that the money is borrowed or invested for. The principal together with the interest is called the **Amount (A)**

Simple interest can be calculated using the formula

$I = P \times R \times TI = P \times R \times T$

For example: Annette deposited 500000 shillings on her fixed account in a financial institution which pays an interest rate of 12% per annum. How much interest will she earn after 2 years?

In this example, the principal is 500,000

The rate is 12% per annum which is the same as $\frac{12}{100}$ per annum.

The time of investment is 2 years.

Using the formula $I = P \times R \times T|$

$$I = 500{,}000 \times \frac{12}{100} \times 2$$

I = 120,000 shillings.

Activity 5

1. If you borrow 675,000 shillings for six years at an interest rate of 10%, how much interest will you pay?
2. If the balance at the end of eight years on an investment of $630 that has been invested at a rate of 9% is $1,083.60, how much was the interest?
3. How much interest is earned on 5,000,000 at 4% for seven years?
4. Jane borrowed 2,250,000 shillings from the bank for eight years at an interest rate of 6%. How much interest will she pay?
5. If you put 624,000 shillings into a savings account that earns 5%, how much money will you have at the end of four years?

Topic: Numerical Concepts

Lesson 1

Learning outcome

By the end of this lesson, you should be able to know the Rational, Irrational and Real Numbers. You will work out problems involving these numbers and apply them in real life situations.

Materials: You will need grid papers. The grid papers will be used when dealing with Square numbers and Square roots.

Introduction

You have already learnt about some types of numbers like Natural numbers, Whole numbers, Fractions, Decimals, Integers and many others. All these numbers can be expressed in different bases.

In term one of Senior one, you learnt *Bases* where you carried mathematical operations, converted numbers from one base to another and vice versa. **Remember** that Integers have positions on a number line.

Activity 1

Represent the following numbers on the same number line

(d) -3, -1, 1, 2, 5, 10
(e) 0.1, 0.4, 0.5, 0.8
(f) 1/3, 1/2, 1/4, 2/5, 1/7

Rational Numbers

Remember, Integers and decimal numbers can easily be represented on a number line.

In the previous activity, you might have converted fractions to decimals in order to present them on a number line.

When fractions are converted into decimals, **they** are terminating, recurring and others are neither terminating nor recurring.

Note. Terminating and recurring decimals can be expressed in form of **a/b** where **a** and **b** are integers. This means that all integers can be written in form of **a/b**

Activity 2.

Express the following numbers in form of **a/b**

(c) 2, 7, 9, 11, 15, -3, -5
(d) $1\frac{1}{3}, 3\frac{1}{5}$, 2.2, 4.8, 1.02

You have seen that integers, terminating and recurring decimals can be written in form of **a/b** where **a** and **b** are integers.

Numbers which can be expressed in form of **a/b** are called Rational numbers.

Activity3.

Are all Decimal Numbers Rational numbers? With examples, justify your answer.

Irrational Numbers

Activity 4: Using a Calculator, find the square roots of the following numbers

(b) 1 (b) 4 (c) 9 (d) 3 (e) 2 (f) 13

Write the answers for (a)……(f) in form of **a/b** where **a** and **b** are integers

Have you been able to write your answers for (a) …..(f) in form of **a/b**?

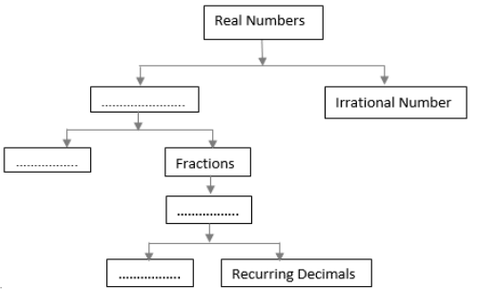
Note: All numbers which cannot be written in form of **a/b** are called irrational numbers

All Irrational numbers have corresponding positions on the Number line

Real Numbers

Remember Rational and Irrational numbers have positions on the Number line.

Activity 5: Complete the following chart of Real numbers



Converting Recurring Decimals into Fractions

Activity 6: Convert $\frac{2}{5}, \frac{1}{8}, \frac{32}{505}, \frac{1}{8}, \frac{3}{50}, \frac{11}{33}$ into decimals.

Note that decimals can be converted into Fractions.

Example: Convert 0.2, 0.5 into fractions

Solutions: $0.2 = \frac{2}{10} = \frac{1}{5}$

$0.5 = \frac{5}{10} = \frac{1}{2}$

Convert $\frac{2}{3}$ into decimal

Answer: $\frac{2}{3} = 0.6666..$

The answer 0.666… is a non-terminating **but a** recurring decimal

0.666 can be converted to fractions.

The recurring number is 6 and it starts recurring after the tenth position

So, take r to be 0.6666 i.e. r = 0.666 equation (i)

Multiply equation (i) by 10 i.e. 10r = 6.666 equation (ii)

Subtract equation (i) from equation (ii) i.e. 10r – r = 6.666 – 0.666 = 6.0

$9r = 6$

$r = \frac{6}{9} = \frac{2}{3}$

Activity 7

Convert the following recurring decimals into fractions

(f) 0.77…
(g) (b) 0.2424…
(h) (c) 0.01666….
(i) (d) 0.185353…
(j) (e) 4.203203…

Class: Senior Two

Topic: Algebra:

Lesson 1: Use of Symbols, substitution

Learning outcome : By the end of this lesson, you should be able to:

- interpret word problems
- Write a formula using symbols and correct.

Materials:

You will need a note book, pen, paper, razor blade or scissor to help you explore relationships between different shapes and how they can be used to build a formula.

Introduction

In your primary school and S.1, you were introduced to a number of mathematical symbols representing mathematical statements.

Activity 1

3. What are some of the symbols that you regularly interact with?
4. What do these symbols mean**? (MISSING SYMBOLS)**

SYMBOL	MEANING

Look around your homestead and construct a statement. Use the statements drawn from situations in your homestead and represent it using symbols.

Statement	Symbol
Number of boys in my family is **not equal to** the number of girls	≠

Exercise

3. Which of the symbols is not used to show multiplication?
   b. @ b. * c. × d. ( )
4. Which of the following statements is true?
   e. π is a special number
   f. There is only one way to show multiplication symbol
   g. 90^0 is the symbol for representing a right angle in a triangle.
   h. √ is a square root.

Lesson 2:

Learning outcome

By the end of this lesson, you should be able to:

- Write statements in algebraic form using symbols.

An Algebraic expression is formed from variables and constants using different operations.

Expressions are used to write word problems in math terms.

Expressions are like instructions that tell you what you have to do to a number or variable.

Words (statement)	Algebraic Expression
A number b is added to 6	b+6
9 is subtracted from x	x-9
A number t is multiplied by 8	t×8
A number z is divided by 3	z÷3 or $\frac{zz}{33}$

Activity

Choose the correct answer for each of the questions

2. The subtraction of 5 times of y from x is

(a) 5x – y

(b) y – 5x

(c) x – 5y

(d) 5y – x

(a) –1 × b

(b) 1 – b – 0

(c) 0 – (–1) × b

(d) – b – 0 – 1

3. The length of a side of square is given as 2x + 3. Which expression represents the perimeter of the square?

(a) 2x + 16

(b) 6x + 9

(c) 8x + 3

(d) 8x + 12

4. A fruit basket contains the same number of mangoes and oranges. If Eric eats 5 mangoes and 1 pear, there will be twice as many oranges as mangoes. How many oranges remain in the basket?

(a) 4
(b) 8
(c) 9
(d) 10
(e) 11

Lesson 3:

Learning outcome

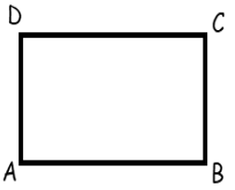
By the end of this lesson, you should be able to express one variable term in terms of another.

Activity 1

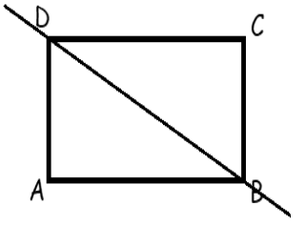
Let us use the area of a square to generate the formula of finding the area of a right-angled triangle.

Hint

Here is a piece of paper in a square shape labelled ABCD



Cut the piece/ fold the paper along diagonal from one end of the vertex to its opposite.



.

You will observe there are two equal right-angled triangles formed.

Use the Length, width and the area of the shape ABCD to derive a formula for finding the area of triangle.

Activity

6. Use the formula you have generated to obtain solutions to the following
   e. Base = 4 units, Height = 10 units
   f. Base =12 units, Height= 3 units

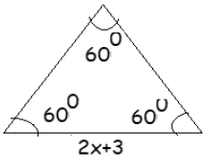
7. Use the following information to obtain the;
   g. Height, when Area= 16 square units, Base= 6 units

h. Base when Area= 24 square units, Height = 10 units

8. Find the values of the following algebraic expressions when a = – 2 and b = 3:
   f. 8a
   g. 5b
   h. a+3b
   i. 4a-2b
   j. $a^2 + 2ab + b^2$
9. Make x the subject in the following algebraic equations
   e. y=x+a
   f. y=2x-a
   g. y=2x+7
   h. ax-y=2y
10. Make x the subject of the formula in each of the following cases**.**
    d) a (x+b) =c
    e) $\frac{x}{a} = 1 + \frac{yx}{ba} = 1 + \frac{y}{b}$
    f) $\frac{x+y}{y} = \frac{y}{a} + \frac{ax+y}{y\ y} = \frac{y}{a} + \frac{a}{y}$

Follow up Activity

1. Find each side of an equilateral triangle given below, if the perimeter of the equilateral triangle is 240 cm.



2. Cut out shapes of two right angled triangles and a rectangle, Join them to form a shape of a trapezium
f. Paste the shape in your exercise book.
g. Draw the shape of the trapezium.
h. Use the right-angled triangles and a rectangle to derive a formula for **the** area of a Trapezium.
i. Write the formula in your notebook.
j. Use the formula to;
   (iii) Express the base of the trapezium in terms of the height and Area
   (iv) Express the height of the trapezium in terms of the base and Area

TOPIC: VECTORS AND TRANSLATIONS.

Lesson 1

Learning Outcome: By the end of this lesson you should be able to describe a translation.

Materials:

- Squared paper
- Sisal/Thread
- Mat/table
- Cup
- Plain paper

Introduction

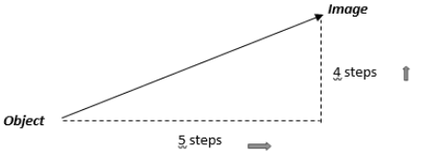
In senior one, you handled how to change the position of a shape by reflection. You are now going to handle translation. Translations is sliding or moving a shape in a straight line. In life, we move objects but the direction should be put into consideration. In reflection, you looked at "object" and "Image". In translation, we have "object" and "image". We describe the translation using specific values. Translations are also shown geometrically using the **X** and **Y** axes on the coordinate plane.

Instructions

I place a book on a table and I move it to another position in a straight line. This is a **translation.** The first position is the "object" position and the second position is the "image" position.

SPECIFIC VALUES

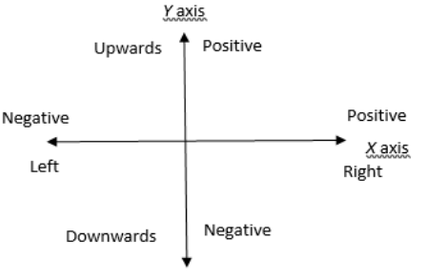
I move from one corner of a room to another. My former position is the "object" position and the new one is the "Image" position. I draw a line to connect the object to the image position. I count the steps from the object position to the right and upwards towards the image position.



The translation is described as 5 steps to the right and 4 steps upwards.

Cartesian plane

On the X and Y axes we represent the X direction (for left and right) and Y direction. (For upwards and downwards)



From the illustration above:

- Right 5 steps is +5 in the x direction.
- Upward 4 steps is +7 in the y direction.

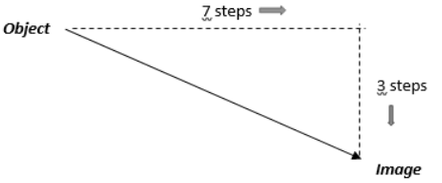
In coordinates, you write the X coordinate first ,then the Y-coordinate ,next like (x,y) with normal brackets but for the translation, it is written with longer brackets with the x-value first on top and the y-value on below.

$\begin{pmatrix} x \\ y \end{pmatrix}$

My translation with 5 steps to the right which is+5 and 4 steps forward which is +4 is written as

$\begin{pmatrix} 5 \\ 4 \end{pmatrix}$

We can also have



7 steps to the right which is +7

3 steps downwards which is -3

ACTIVITY

a) Place a cup on one corner of the mat/ table and then move it to the other corner in a straight line. Connect the two positions with a straight line using a thread or sisal. Use your hands and count the steps to the right and upwards and write the translation as a column vector.
b) Move the cup to any point on the mat/ table and repeat the above steps but count the steps to left and upwards depending on the direction you took.

Write these translations in column vector.

a) 4 steps to the right and 2 steps upwards.
b) 3 steps to the left and 5 steps downwards

Describe these vectors translations using left, right, upwards, downwards.

a) $\begin{pmatrix} -9 \\ 6 \end{pmatrix}\begin{pmatrix} -9 \\ 6 \end{pmatrix}$

b) $\begin{pmatrix} 8 \\ -3 \end{pmatrix}\begin{pmatrix} 8 \\ -3 \end{pmatrix}$

Topic: TRANSLATION

LESSON 2

Lesson Outcome: **By the end of this lesson, you should be able to:**

1. **Represent a translation on axes.**
2. **Show coordinates of the object and image.**
3. **Determine image for a given object and translation, Object for a given image and translation, Translation for given object ad image.**

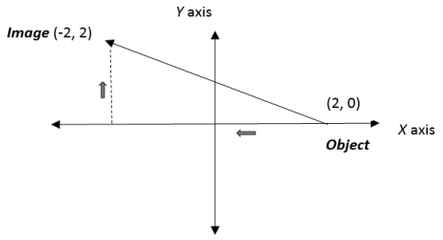
Materials: Graph paper, Ruler, Pencil.

Introduction:

A translation is represented on axes and the image and objects are identified by the coordinates. A line is drawn between the two and this is a vector for the translation. Using a graph paper, the position of the object or **image is** obtained when the vector of the translation is given. Likewise, get the translation vector when coordinates of either object or image are given.

Instruction:

Representation on the axes:

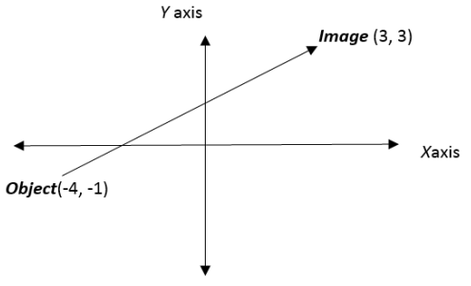


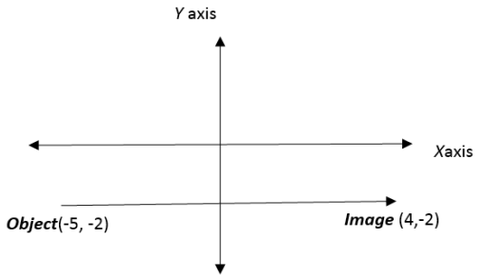
The translation of the object (2, 0) to the image (-2, 2) is then described as four steps to the left, -4 and two steps upward, 2 whose column vector is $\begin{pmatrix}-4\\2\end{pmatrix}$ $\begin{pmatrix}-4\\2\end{pmatrix}$.

ACTIVITY 1

Use your graph paper for this activity. Draw the X and Y axes on the graph paper.

1. Show the following column vectors on the graph axes:
$\begin{pmatrix}3\\5\end{pmatrix}, \begin{pmatrix}-4\\9\end{pmatrix}, \begin{pmatrix}-2\\-6\end{pmatrix}, \begin{pmatrix}8\\-3\end{pmatrix}$.
2. Write the column vectors of the following translations.





3. An object at a point (1,-5) is translated by a vector $\begin{pmatrix}-3\\7\end{pmatrix}\begin{pmatrix}-3\\7\end{pmatrix}$. Write the coordinates of the image.
4. The object at (-3,-2) is translated to a point (-4,-6). What is the column vector of the translation?

LESSON 3: VECTOR NOTATION

Learning Outcome.

By the end of this lesson, you should be able to identify:

- A vector using letters and geometrically;
- Equal and opposite vectors.

Materials: Plate, Mat/Table, Squared paper, Ruler.

Introduction

You have drawn translations with arrows and also written them as column vectors. So vectors which represent translations are also represented using letters on lines with arrows on axes. We also have vectors that are equal vectors and opposite vectors.

Instructions

Notations

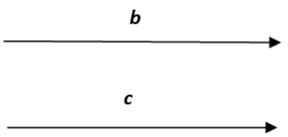
This represents a vector which is written as ***AB*** (bold in text books) or $\underline{AB}$ or $\overrightarrow{ABAB}$ that you write in your exercise books.

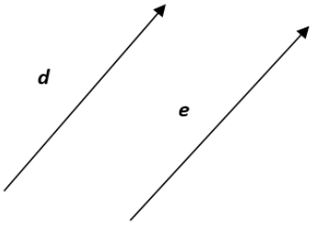
The tail of the vector is at A and the head is at B hence the direction AB. Using translation, A is the object position and B is the image position.

A vector can also be written with only one small letter e.g. $\underline{a}$, $\underline{b}$ or $\underline{c}$ and in text books, they will be bold **a, b** and **c.**

EQUAL VECTOR

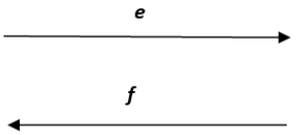
We identified vectors by their length and the direction.





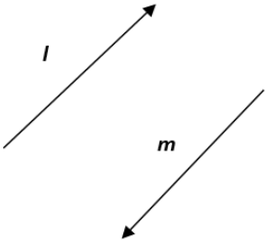
Vectors b and c have the same length and are facing in the same direction then we say the two vectors are equal. Also vectors d and e are equal. Therefore we write **b**=**c** and **d**=**c**

Look at the vectors ***e*** and ***f***. Comment on their length and direction.

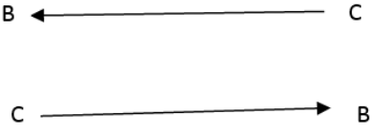


Did you notice that ***e*** and ***f*** have the equal length but facing opposite direction**?** Then we say that they are equal but opposite vectors and we write ***e*** = -***f***.

Write a math statement for vectors ***l*** and ***m***.



We have also seen that when writing vectors, we also use capital letters. For equal and opposite vectors, we write ***BC*** = -***BC*** as shown in the diagram below.



Column Vectors

If$\boldsymbol{AB} = \begin{pmatrix}2\\7\end{pmatrix}\boldsymbol{AB} = \begin{pmatrix}2\\7\end{pmatrix}$, then vectors ***PQ*** and ***RT*** that are equal to ***AB*** are also written as $\boldsymbol{PQ} = \begin{pmatrix}2\\7\end{pmatrix}$ $\boldsymbol{PQ} = \begin{pmatrix}2\\7\end{pmatrix}$ and $\boldsymbol{RT} = \begin{pmatrix}2\\7\end{pmatrix}\boldsymbol{RT} = \begin{pmatrix}2\\7\end{pmatrix}$.

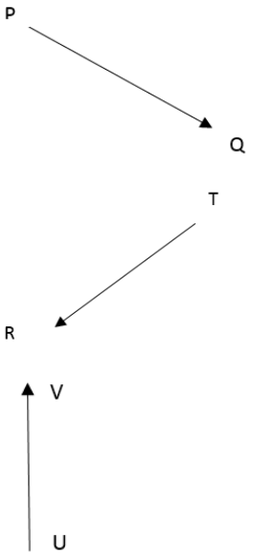
Then vectors ***DE*** and ***FG*** that are equal but opposite to ***AB*** are written as $\boldsymbol{DE} = \begin{pmatrix}-2\\-7\end{pmatrix}\boldsymbol{DE} = \begin{pmatrix}-2\\-7\end{pmatrix}$ and

$FG = \begin{pmatrix}-2\\-7\end{pmatrix} FG = \begin{pmatrix}-2\\-7\end{pmatrix}$ since ***BA***=-***AB***=-$\begin{pmatrix}2\\7\end{pmatrix}\begin{pmatrix}2\\7\end{pmatrix}=\begin{pmatrix}-2\\-7\end{pmatrix}$ $\begin{pmatrix}-2\\-7\end{pmatrix}$.

ACTIVITY 1

1. Draw the following vectors: ***CD,DC*** using arrows**.**

2. Name the vectors below.



3. Draw on a plain paper

- Two equal vectors and write the vector notation of the vectors
- Two equal and opposite vectors. Write down their vector notations.

4. Place a plate **in** one corner of a mat or table. Slide the cup in a straight line to any position on the mat right down the column vector of the translation. Slide the plate in a straight line back to its original position. Write down the column vector of the translation. What do you observe between the two column vectors**?**

LESSON 4

Topic: Combined vectors

Learning outcomes:

By the end of this lesson you should be able to:

- Write a math statement showing a combination of vectors.
- Represent the combined vectors on a graph paper.
- Write combined vectors using column vectors

Materials

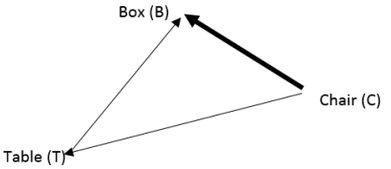
- Charts with letters A, B, C, D, E, F
- Graph paper

Introduction

We combine two or more vectors to form one vector. We also combine translations to obtain one translation. These combinations may be represented using letters, column vectors or graphs.

Instruction:

In my room, there is a table (T), a chair (C) and a box (B) that are not arranged in a straight line as shown in the figure below.



- Am sitting on the chair (C), then I move in a straight line to the table (T).
- From the table (T), I then move to the box (B) in a straight line.

This is a combination of two translations and the result is that I have moved from **the** chair to the box passing the **table.**

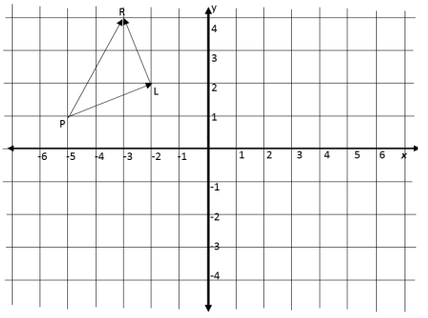
However, I can also move from the chair (C) directly to the box (B) without first going to the table.

Let use the letters to write the vectors of each translation.

- Chair to table is written ***CT***
- Table to box is written ***TB***
- Chair to box is ***CB***

We write the mathematical statement for the combined translations using vectors as ***CT***+***TB***=***CB***

Graphically:



Combinations of vectors

Mathematical Statement is ***PL***+***LR***=***PR***

From the graph, the column vectors are

$PL = \begin{pmatrix}3\\1\end{pmatrix}$, $LR = \begin{pmatrix}-1\\2\end{pmatrix}$, $PR = \begin{pmatrix}2\\3\end{pmatrix}$

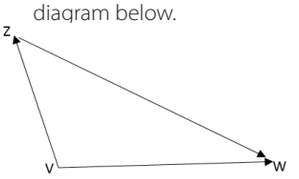
We now substitute the column vectors in the mathematical statement

PL + ***LR*** = ***PR***

$\begin{pmatrix}3\\1\end{pmatrix} + \begin{pmatrix}-1\\2\end{pmatrix} = \begin{pmatrix}2\\3\end{pmatrix}$

ACTIVITY 2

1. Write a mathematical statement to represent the combined vectors in the diagram below.



2. Identify any three objects inside your house or outside in the compound beginning with different letters. **Place them on papers** with the first letter of each object like Tree put 'T', shirt put 'S' and Hole 'H'
   a) Write different mathematical statements which represent the combined vectors **you have** form out of three objects.
   b) Draw the combinations on a piece of paper.
3. Draw the following column vectors on axes of a squared paper.

$EF = \begin{pmatrix}3\\5\end{pmatrix}$ and $FG = \begin{pmatrix}-2\\1\end{pmatrix}$

   a) Obtain from the graph the column vector of ***EG***
   b) Write the **mathematical** statement from the graph using both letters and column vectors.

Class: Senior Two

Lesson 5

Learning outcomes: By the end of this lesson, you should be able to add vectors and obtain a single vector which represents the other vectors.

Materials: Graph paper.

INTRODUCTION

We earlier in Lesson 4 looked at combined vectors. These are represented as addition of two vectors. A combination of vectors can also be more than two vectors.

INSTRUCTIONS

a) We add vectors by adding the x values and y values then finally obtain the vector.

$\begin{pmatrix}3\\1\end{pmatrix} + \begin{pmatrix}9\\4\end{pmatrix} = \begin{pmatrix}3+9\\1+4\end{pmatrix} = \begin{pmatrix}12\\5\end{pmatrix}$

Or

$\begin{pmatrix}-6\\8\end{pmatrix} + \begin{pmatrix}7\\-3\end{pmatrix} = \begin{pmatrix}-6+7\\8+-3\end{pmatrix} = \begin{pmatrix}1\\5\end{pmatrix}$

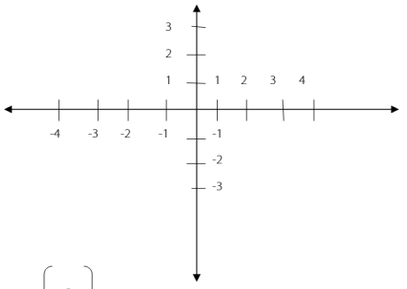
Or

$\begin{pmatrix}-5\\-2\end{pmatrix} + \begin{pmatrix}1\\-1\end{pmatrix} = \begin{pmatrix}-5+1\\-2+-1\end{pmatrix} = \begin{pmatrix}-4\\-3\end{pmatrix}$

a) On axes, draw these vectors and find the

vector that result from the combination.

$$\begin{pmatrix} -1 \\ 3 \end{pmatrix} + \begin{pmatrix} 4 \\ 2 \end{pmatrix}$$



$$= \begin{pmatrix} 3 \\ 5 \end{pmatrix}$$

Do you observe that in the last lesson that combined vectors were added? Check and confirm.

ACTIVITIY 1

1. Draw axes on squared paper and add the following vectors.

a) $\begin{pmatrix} 5 \\ -1 \end{pmatrix} + \begin{pmatrix} 7 \\ 2 \end{pmatrix}$

b) $\begin{pmatrix} -3 \\ 4 \end{pmatrix} + \begin{pmatrix} -2 \\ -8 \end{pmatrix}$

1) Add the following vectors without drawing.

a) $\begin{pmatrix} 2 \\ 11 \end{pmatrix} + \begin{pmatrix} -9 \\ -4 \end{pmatrix}$

b) $\begin{pmatrix} 8 \\ -10 \end{pmatrix} + \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Topic: Business arithmetic

Lesson 1: Calculating Profit and Loss.

Learning outcomes:

By the end of this lesson, you should be able to:

v. Calculate profit and loss
vi. Express profit and loss as a percentage
vii. Calculate discount and commission
viii. Calculate simple interest.

Materials:

For this lesson, you will need to collect items that are used in a home, those that were bought from a shop. You will need receipts, price tags, a pen/ pencil and a rough book to try out the exercises.

Introduction:

Dear student, you must agree with me that buying and selling is part of any trade. The goods we use at home are bought from shops, markets and supermarkets. People who sell to us also buy from other wholesalers and sell them to us at a higher price. The extra money the goods are sold for is the **profit**. If the goods are sold at a *lower price* than the price at which they were bought, the difference is the **loss**.

The price at which the goods are bought is called the **cost price *(C.P)***

The price at which the goods are sold is called the **selling price (S.P)**

Now, try to reflect on issues discussed above with the following activity.

Activity 1

4. A bicycle bought for 180,000/= was sold for 150,000/=.
   iv. What was the cost price?
   v. What was the selling price?
   vi. Was the bicycle sold at a profit or loss? Give a reason for your answer.

5. Musa bought a radio at 60,000 UGX and sold it to his brother at 55,000 UGX. Calculate the profit or loss made on this item.

6. A box of mineral water has 24 bottles. A shopkeeper bought it from the wholesale shop at 18,000 UGX. He sold each bottle at 1000 UGX. Calculate the profit or loss made by the shopkeeper.

Lesson 2: Percentage loss and profit

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

In the previous lesson, you were able to calculate the profit or loss made by reselling an item. In this lesson, you will learn to express the profit or loss as a percentage. You can determine the percentage profit or loss using the formulae below;

$$\text{Percentage profit} = \frac{Profit}{Cost\ Price} \times 100$$

$$\text{Percentage loss} = \frac{Loss}{Cost\ Price} \times 100$$

Example 1:

A bicycle bought at 180,000/= was sold for 150,000/=. Calculate the percentage loss.

$$\text{Percentage loss} = \frac{Loss}{Cost\ Price} \times 100$$

$$= \frac{C.P - S.P}{C.P} \times 100$$

$$= \frac{180{,}000 - 150{,}000}{150{,}000} \times 100$$

$$= \frac{30{,}000}{150{,}000} \times 100$$

$$= \frac{30{,}000}{150{,}000} \times 100$$

$$= 20\%$$

The loss on the bicycle is 20%.

Activity 2

6. Mangoes are bought by a fruit shop for 300 shillings each and resold at 500 shillings each.
   a. What is the cost price? _____
   b. What is the selling price? _____
   c. What is the profit? _____
   d. Calculate the percentage profit on the cost price. _____

$$Profit = S.P - C.P$$

$$Loss = C.P - S.P$$

7. Josephine makes school uniforms. It costs her 30,000/= to make a girl's skirt. She then sells them for 48,000/= each.
   a. What is the cost price? _____
   b. What is the selling price? _____
   c. What is the profit? _____
   d. Calculate the percentage profit._____ ___

8. Ahmed bought a used car for $14 500, spent another $2000 on repairs, before selling it for $19 000. Find:
   a. the total amount Ahmed spent on the car _____
   b. the profit he made _____
   c. the percentage profit on the total amount he spent. _____

9. A company selling newspapers spends 15,00/= to produce a copy of the newspaper and sells it at 2,000/=. On a given day, **the** company produced 2000 copies and managed to sell 1000 copies only.
   a. Did the company make a profit or loss on that day?
   b. Calculate the percentage profit/ loss for the day.

10. Copy the table shown below and fill in the missing values.

Item	C.P	S.P	Profit/Loss	comment	% Profit/loss
Dress	20000	30000			
Shirt	18000	22000			
Cow	700000	900000			
House	80 million	72 million			
TV	300000	360000			
Smart phone	250000	200000			
Bag of Irish potatoes	100000	120000			
Pair of shoes	45000	40000			

Lesson 3: Discount

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

In the areas of competition, shops find ways of encouraging customers to buy. One way of encouraging customers is offering them a discount. This is done by reducing an amount from the usual price of an item. This reduction in price is called **Discount.** It is usually calculated as a percentage of the selling price.

Example: Sarah buys a dress for cash whose marked price is shillings 50,000. A shopkeeper offers 10% discount for cash payments.

c) How much is the discount?
d) How much does she actually pay for the dress?

c) $\text{Discount} = \frac{10}{100} \times 50{,}000$
$= 5{,}000 \text{ shillings}$

d) She pays $50{,}000 - 5{,}000$
$= 45{,}000 \text{ shillings}$

Activity 3

1. The marked price of a watch is 46,500. The shopkeeper offers an off-season discount of 18% on it. Find its selling price.

2. The price of a sweater was slashed from 9600 shillings to 8160 shillings by a shopkeeper in a rainy season. Find the rate of discount given by him.

3. Find the percentage discount being given on a shirt whose selling price is 54,600 shillings after deducting a discount of 10,400 on its marked price.

Hint. Market Price = (SP) + (discount).

4. After allowing a discount of 8% on a toy, it is sold for $ 216.20. Find the marked price of the toy.

5. A set of kitchen utensils was bought for 52,800 after getting a discount of 12% on its marked price. Find the marked price.

6. A dealer marks his goods at 35% above the cost price and allows a discount of 20% on the marked price. Find his gain or loss per cent.

7. A cell phone was marked at 40% above the cost price and a discount of 30% was given on its marked price. Find the gain or loss percent made by the shopkeeper.

8. A dealer purchased a fan for UGX 10800. After allowing a discount of 25% on its marked price, he gains 25%. Find the marked price of the fan.

Lesson 4: Commission

Materials: You will need a pen/ pencil and a rough book to try out the exercises.

Introduction

Commission is a fee paid for services. It is usually calculated as a percentage of the total cost of the goods. This amount can be paid to salesmen as sales commission. Sales commissions is the amount of money paid to employees or companies that sell goods in stores or by calling on customers. The commission is meant to motivate sales persons to sell more.

For example, if a salesperson receives a 10% commission on their sales, a salesperson sells goods worth 15,000 shillings, they would earn 1,500 shillings in commissions.

So, commission = $\frac{10}{100}\frac{10}{100} \times 15000$

= 1500 shillings

Activity 4

6. A salesman gets a fixed salary of $2000 per month and a commission of 2% on sale. If total sale for the month of April was $30,000, find his total salary for that month?

7. Joan makes a commission of 2% when a house is sold by his company. How much money will Joan make as a commission if her company sells the house for 300,000,000 shillings?

8. Mike makes **a** commission of 10% on each TV set sold at store. Each TV costs $120. How much money will he make as commission if **the** store sells 25 TV sets?

9. John is selling sets of knives and makes a 10% commission on all sales. What would his commission be on the sale of a $3250 set of knives?

10. Sonny works as a furniture salesman and earns a base salary of $350 per week plus 6% commission on sales. What was Sonny's weekly gross salary if his total sales were $3750?

Lesson 5: Simple Interest

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

Dear students, do you know that Money is not borrowed for free?

When money is borrowed from the bank, the bank charges for the use of the money. This charge is called **interest** usually denoted by **(I)**.

Also when money is deposited with the bank, the bank **pays interest to** the owner of the money. The amount borrowed is called the **Principal** usually denoted by **(P).**

The interest is usually calculated as a **Percentage Rate** usually denoted by **(R).** Interest also depends on the length of **Time (T)** that the money is borrowed or invested for. The principal together with the interest is called the **Amount (A)**

Simple interest can be calculated using the formula
$I = P \times R \times TI = P \times R \times T$

For example: Annette deposited 500000 shillings on her fixed account in a financial institution which pays an interest rate of 12% per annum. How much interest will she earn after 2 years?

In this example, the principal is 500,000

The rate is 12% per annum which is the same as $\frac{12}{100}$

$\frac{12}{100}$ per annum.

The time of investment is 2 years.

Using the formula $I = P \times R \times TI = P \times R \times T$

$$I = 500{,}000 \times \frac{12}{100} \times 2$$

I = 120,000 shillings.

Activity 5

1. If you borrow 675,000 shillings for six years at an interest rate of 10%, how much interest will you pay?
2. If the balance at the end of eight years on an investment of $630 that has been invested at a rate of 9% is $1,083.60, how much was the interest?
3. How much interest is earned on 5,000,000 at 4% for seven years?
4. Jane borrowed 2,250,000 shillings from the bank for eight years at an interest rate of 6%. How much interest will she pay?
5. If you put 624,000 shillings into a savings account that earns 5%, how much money will you have at the end of four years?

Topic: Numerical Concepts

Lesson 1

Learning outcome

By the end of this lesson, you should be able to know the Rational, Irrational and Real Numbers. You will work out problems involving these numbers and apply them in real life situations.

Materials: You will need grid papers. The grid papers will be used when dealing with Square numbers and Square roots.

Introduction

You have already learnt about some types of numbers like Natural numbers, Whole numbers, Fractions, Decimals, Integers and many others. All these numbers can be expressed in different bases.

In term one of Senior one, you learnt *Bases* where you carried mathematical operations, converted numbers from one base to another and vice versa. **Remember** that Integers have positions on a number line.

Activity 1

Represent the following numbers on the same number line

(g) -3, -1, 1, 2, 5, 10
(h) 0.1, 0.4, 0.5, 0.8
(i) 1/3, 1/2, 1/4, 2/5, 1/7

Rational Numbers

Remember, Integers and decimal numbers can easily be represented on a number line.

In the previous activity, you might have converted fractions to decimals in order to present them on a number line.

When fractions are converted into decimals, **they** are terminating, recurring and others are neither terminating nor recurring.

Note. Terminating and recurring decimals can be expressed in form of **a/b** where **a** and **b** are integers. This means that all integers can be written in form of **a/b**

Activity 2.

Express the following numbers in form of **a/b**

(c) 2, 7, 9, 11, 15, -3, -5
(d) $1\frac{1}{3}, 3\frac{1}{5}$, 2.2, 4.8, 1.02

You have seen that integers, terminating and recurring decimals can be written in form of **a/b** where **a** and **b** are integers.

Numbers which can be expressed in form of **a/b** are called Rational numbers.

Activity3.

Are all Decimal Numbers Rational numbers? With examples, justify your answer.

Irrational Numbers

Activity 4: Using a Calculator, find the square roots of the following numbers

(c) 1 (b) 4 (c) 9 (d) 3 (e) 2 (f) 13

Write the answers for (a)……(f) in form of **a/b** where **a** and **b** are integers

Have you been able to write your answers for (a) …..(f) in form of **a/b**?

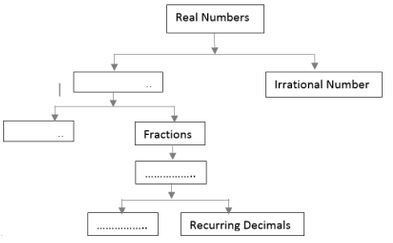
Note: All numbers which cannot be written in form of **a/b** are called irrational numbers

All Irrational numbers have corresponding positions on the Number line

Real Numbers

Remember Rational and Irrational numbers have positions on the Number line.

Activity5: Complete the following chart of Real numbers



Converting Recurring Decimals into Fractions

Activity 6: Convert $\frac{2}{5}, \frac{1}{8}, \frac{3}{50}, \frac{1}{3}$ into decimals.

Note that decimals can be converted into Fractions.

Example: Convert 0.2, 0.5 into fractions

Solutions: $0.2 = \frac{2}{10} = \frac{1}{5}$

$0.5 = \frac{5}{10} = \frac{1}{2}$

Convert $\frac{2}{3}$ into decimal

Answer: $\frac{2}{3} = 0.6666\ldots$

The answer 0.666… is a non-terminating **but a** recurring decimal

0.666 can be converted to fractions.

The recurring number is 6 and it starts recurring after the tenth position

So, take r to be 0.6666 i.e. r = 0.666 equation (i)

Multiply equation (i) by 10 i.e. 10r = 6.666 equation (ii)

Subtract equation (i) from equation (ii) i.e. 10r – r = 6.666 – 0.666 = 6.0

9r = 6

$r = \frac{6}{9} = \frac{2}{3}$

Activity 7

Convert the following recurring decimals into fractions

(k) 0.77…
(l) (b) 0.2424…
(m) (c) 0.01666….
(n) (d) 0.185353…
(o) (e) 4.203203…

Class: Senior Two

Topic: Algebra:

Lesson 1: Use of Symbols, substitution

Learning outcome : By the end of this lesson, you should be able to:

- interpret word problems
- Write a formula using symbols and correct.

Materials:

You will need a note book, pen, paper, razor blade or scissor to help you explore relationships between different shapes and how they can be used to build a formula.

Introduction

In your primary school and S.1, you were introduced to a number of mathematical symbols representing mathematical statements.

Activity 1

5. What are some of the symbols that you regularly interact with?
6. What do these symbols mean**? (MISSING SYMBOLS)**

SYMBOL	MEANING

Look around your homestead and construct a statement. Use the statements drawn from situations in your homestead and represent it using symbols.

Statement	Symbol
Number of boys in my family is **not equal to** the number of girls	≠

Exercise

5. Which of the symbols is not used to show multiplication?
   c. @ b. * c. × d. ( )
6. Which of the following statements is true?
   i. π is a special number
   j. There is only one way to show multiplication symbol
   k. 90^0 is the symbol for representing a right angle in a triangle.
   l. √ is a square root.

Lesson 2:

Learning outcome

By the end of this lesson, you should be able to:

- Write statements in algebraic form using symbols.

An Algebraic expression is formed from variables and constants using different operations.

Expressions are used to write word problems in math terms.

Expressions are like instructions that tell you what you have to do to a number or variable.

Words (statement)	Algebraic Expression
A number b is added to 6	b+6
9 is subtracted from x	x-9
A number t is multiplied by 8	t×8
A number z is divided by 3	z÷3 or $\frac{z}{3}$

Activity

Choose the correct answer for each of the questions

3. The subtraction of 5 times of y from x is

(a) 5x – y
(b) y – 5x
(c) x – 5y
(d) 5y – x

(a) –1 × b
(b) 1 – b – 0
(c) 0 – (–1) × b
(d) – b – 0 – 1

3. The length of a side of square is given as 2x + 3. Which expression represents the perimeter of the square?

(a) 2x + 16
(b) 6x + 9
(c) 8x + 3
(d) 8x + 12

4. A fruit basket contains the same number of mangoes and oranges. If Eric eats 5 mangoes and 1 pear, there will be twice as many oranges as mangoes. How many oranges remain in the basket?

(a) 4
(b) 8
(c) 9
(d) 10
(e) 11

Lesson 3:

Learning outcome

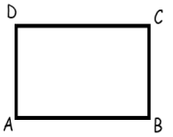
By the end of this lesson, you should be able to express one variable term in terms of another.

Activity 1

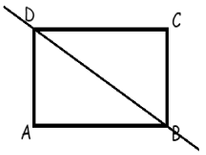
Let us use the area of a square to generate the formula of finding the area of a right-angled triangle.

Hint

Here is a piece of paper in a square shape labelled ABCD



Cut the piece/ fold the paper along diagonal from one end of the vertex to its opposite.



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You will observe there are two equal right-angled triangles formed.

Use the Length, width and the area of the shape ABCD to derive a formula for finding the area of triangle.

Activity

11. Use the formula you have generated to obtain solutions to the following
i. Base = 4 units, Height = 10 units
j. Base =12 units, Height= 3 units

12. Use the following information to obtain the;
k. Height, when Area= 16 square units, Base= 6 units
l. Base when Area= 24 square units, Height = 10 units
13. Find the values of the following algebraic expressions when a = – 2 and b = 3:
    k. 8a
    l. 5b
    m. a+3b
    n. 4a-2b
    o. $a^2 + 2ab + b^2$
14. Make x the subject in the following algebraic equations
    i. y=x+a
    j. y=2x-a
    k. y=2x+7
    l. ax-y=2y
15. Make x the subject of the formula in each of the following cases**.**

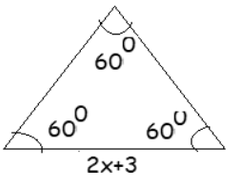
g) $a(x+b)=c$

h) $\frac{x}{a} = 1 + \frac{y}{b}$

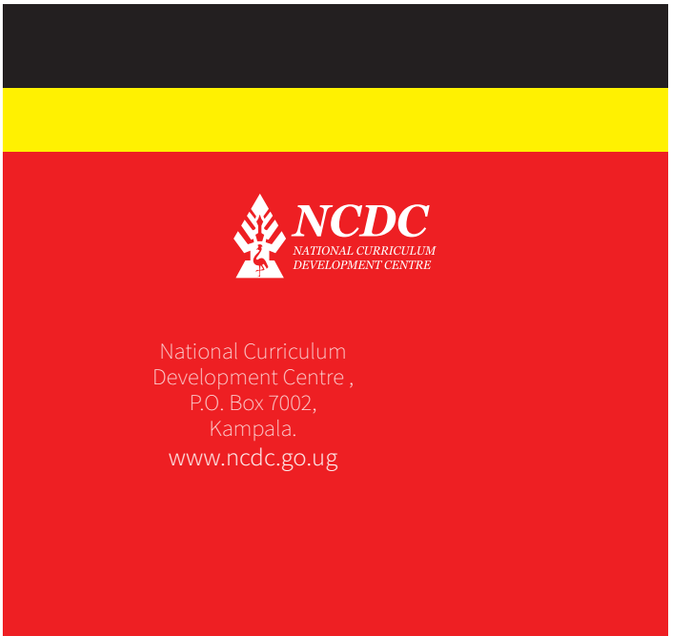
i) $\frac{x+y}{y} = \frac{y}{a} + \frac{a}{y}$

Follow up Activity

3. Find each side of an equilateral triangle given below, if the perimeter of the equilateral triangle is 240 cm.



4. Cut out shapes of two right angled triangles and a rectangle, Join them to form a shape of a trapezium
k. Paste the shape in your exercise book.
l. Draw the shape of the trapezium.
m. Use the right-angled triangles and a rectangle to derive a formula for **the** area of a Trapezium.
n. Write the formula in your notebook.
o. Use the formula to;
   (v) Express the base of the trapezium in terms of the height and Area
   (vi) Express the height of the trapezium in terms of the base and Area



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SENIOR TWO

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Geography

LESSON1: Location and Position of the Great Lakes and St. Lawrence Seaway

Learning Outcomes

By the end of this lesson, you should be able to:

i) list the Great Lakes of North America.
ii) describe the location of the St. Lawrence Seaway.
iii) locate the Great Lakes and St. Lawrence Seaway on a map.
iv) draw a map to show the Great Lakes and St. Lawrence Seaway.

Materials you need:

- a map showing the countries of North America
- a notebook
- a pen
- a pencil
- an eraser

Instructions

- You will be studying one lesson each day. Try to do all activities programmed for each day.
- Remember that some activities may take you more than one hour to complete.
- Read the instructions carefully before you begin doing each activity.
- In case you find an activity difficult, ask an older person around you to assist you.

Introduction

In Senior One you learnt about the major lakes and rivers of North America. In your notebook, write two lists; one of the major lakes and the second one of the major rivers of North America. Do you remember how important these lakes and rivers are to USA and Canada? In this lesson you are going to learn more about the Great Lakes and St. Lawrence River and how the two have been developed for transport.

Activity 1

Look at Figure 1 which shows the map of USA and Canada and use it to do the tasks that follow.

Figure 1: Map showing part of USA and Canada

1. Identify the lakes which are crossed or lie close to the border of USA and Canada.
2. Copy the map into your notebook and on it mark and name the:
   i) lakes which you have identified in step 1 above.
   ii) St. Lawrence River and its tributaries.
   iii) towns and ports along the lakes and St. Lawrence River.
   iv) estuary at the mouth of the St. Lawrence River.
   v) ocean in which the St. Lawrence River pours its waters.
3. When the school re-opens, hand in your work to your teacher of Geography for comments and further assistance.

The five lakes which you have marked and named on your map are called the Great Lakes of North America. You can always remember them from the west to the east by the statement "***Some Men Have Eaten Oranges***" or "***Sister Mary Hates Eating Orange***s". The first letter on each word in the statement represents the first letter of the name of a lake. Such a statement is called a pneumonic.

In your notebook, list the Great Lakes following the order given by one of the above pneumonias. Try to create your own pneumonic for these lakes.

Activity 2

Using the sketch-map you have drawn in your notebook:

1. write two paragraphs to describe the location of the Great Lakes and St. Lawrence Sea way.
2. determine which of the Great Lakes is:
   - the largest
   - the smallest
3. explain why St. Lawrence River is called a Seaway.

Summary

In this lesson you have learnt that:

- the Great Lakes and St. Lawrence River form a natural boundary between the United States of America and Canada.
- the Great Lakes, the St. Lawrence River and its tributaries form the most important water way in North America - the St. Lawrence Seaway.
- many cities and ports have grown up along the shores of the Great Lakes and in the St. Lawrence valley. This has been due to the presence of plenty of fresh water for domestic and industrial use, fertile soils which support farming, numerous industries and businesses which employ many people.
- the Great Lakes region and St. Lawrence valley is one of the most densely populated areas in North America.

Follow up Activity

1. Use the atlas/a textbook on North America or ICT tools to find out the positions of the following:
   - Cities and ports: Thunder Bay, Duluth, Superior, Cleveland, Sault Ste. Marie, Buffalo, Milwaukee
   - Gulf of St. Lawrence
2. Mark and name the cities and ports, and the gulf you have identified in (1) above on the sketch map which you drew in **Activity 1**.
3. Why do you think there are many towns and cities along the shores of the Great Lakes and the valley of the St. Lawrence River?

LESSON 2: Problems that faced water transport on the Great Lakes and St. Lawrence River before the Seaway project

Learning Outcomes

By the end of this lesson, you should be able to:

i) describe the problems that affected

transport in North America before the Seaway project.

ii) identify areas which had bottlenecks on a map.

Instructions

- Try to do all activities programmed for this topic.
- Remember that some activities may take you more than one hour to complete.
- Read the instructions carefully before you begin doing each activity.
- In case you find an activity difficult, ask an older person around you for assistance.

Materials you need:

- atlas
- textbook
- photographs
- a notebook
- a pen
- a pencil
- an eraser

Introduction

You now know the Great Lakes of North America. You also know that one can sail along the Great Lakes and St. Lawrence River from the interior of North America to the Atlantic coast; and to overseas countries. This is a 3,700kmjourney. It takes only about 8 sailing days. In this lesson you are going to learn why in the early times, before 1959, it was not easy to use the Great lakes and St. Lawrence River as one waterway.

Activity 1

Read the passage and do the tasks that follow.

The Great Lakes and St. Lawrence Seaway is a 3,700 km route from the Atlantic Ocean to Lake Superior in the American interior. Sometimes it is called a "marine highway". The Great Lakes and St. Lawrence River have served as major North American trade routes since long before the US or Canada became an independent nation. Today, more than 200 million tonnes of cargo are transported on the seaway every year.

In 2020, it is expected that the St. Lawrence Seaway will reach a total of three billion tonnes of cargo since it was opened in 1959.

The cost of constructing the Seaway from 1954 to 1959 was over a thousand million US dollars (about 2,800 billion Uganda Shillings). It was shared between the governments of USA and Canada through international agreements which are still respected up to today.

However, before 1959 it was not possible for large ocean-going ships to sail from Atlantic coast to Duluth on Lake Superior. Large ships had only been able to sail either on the Great Lakes or from the Atlantic Ocean along the St. Lawrence River up to Montreal.

The St. Lawrence rapids had always been a major barrier along the water high way between Lake Ontario and Montreal. There were numerous sections with under-water rocks which used to affect navigation. Only small ships could sail along the shallow canals which had been constructed to by-pass the rapids. There were lots of delays as it took a whole week for these ships to sail from Montreal to Lake Ontario! The Niagara water falls between Lakes Erie and Ontario, which is almost 100 metres (300ft) high, was another barrier to navigation.

There was a conflict of development if these water falls were destroyed. They were, and still are, an important tourist attraction for USA; attracting over 2million visitors each year. Again, they were needed for producing hydroelectricity. In fact, the greatest concentration of developed hydroelectric power in the world is around Niagara Falls.

Though the idea to construct the Seaway had been discussed for many years, it faced strong opposition, especially from USA. The American railways, New York Port and other Atlantic ports, Montreal and Buffalo, New Orleans and other Gulf ports all opposed the seaway project.

A new era in marine transportation was made possible by construction of the 306-kilometer stretch of the St. Lawrence Seaway between Montreal and Lake Ontario during the mid to late 1950s.

i) Describe at least six problems that faced transport in North America before the St Lawrence Seaway project was undertaken.

ii) Identify one problem which used to affect navigation on the Great Lakes and St. Lawrence River which is shown on the map but not mentioned in the passage.

iii) Draw a diagram and use it to explain how waterfalls can affect the movement of boats and ships on a river.

iv) Do you think ships can sail along river Nile from Lake Victoria to the Mediterranean Sea? Give reasons to support your opinion.

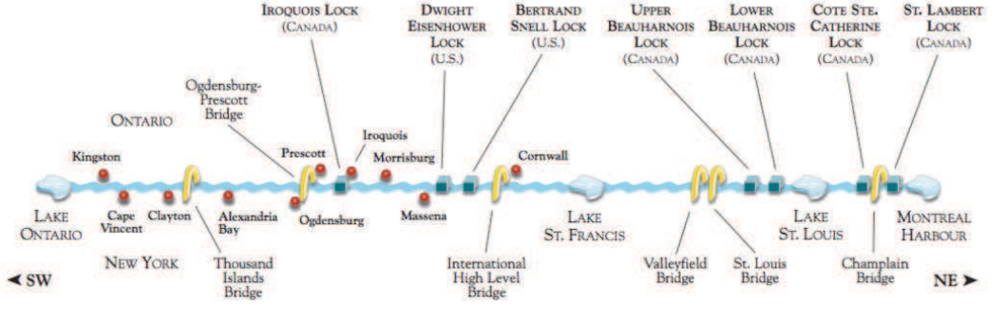
Activity 2

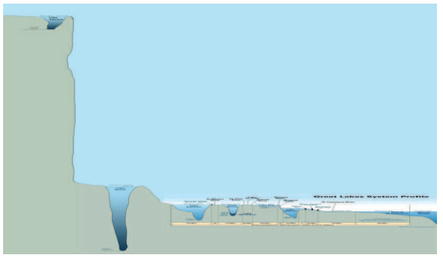
Suggest reasons why the following had strongly opposed the Seaway project thereby delaying it:

i) The American railways
ii) New York Port
iii) Montreal and Buffalo
iv) The Gulf ports

The difficulty to sail along the Great Lakes and St. Lawrence River was worsened by the fact that the Great Lakes lie at different heights. So it was not easy to sail from one lake to the other.

Figure 3: A Cross section through the Great Lakes and St. Lawrence Seaway





Activity 2

1. Copy Figure 3 in your notebook and on it mark and name the:
    - Great Lakes and their heights in metres
    - St. Lawrence River and Atlantic Ocean
    - Welland Canal
2. Identify the points at which navigation was very difficult. Give reasons to support your suggestions.

Summary

In this lesson you have learnt that:

- the Great Lakes and St. Lawrence River form a natural boundary between the United States of America and Canada.
- the Great Lakes, the St. Lawrence River and its tributaries form the most important water way in North America - the St. Lawrence Seaway.
- many cities and ports have grown up along the shores of the Great Lakes and in the St. Lawrence valley. This has been due to the presence of plenty of fresh water for domestic and industrial use, fertile soils which support farming, numerous industries and businesses which employ many people.
- the Great Lakes region and St. Lawrence valley is one of the most densely populated areas in North America.

Follow up Activity

1. Copy the table below in your notebook and use it to classify the problems which used to affect transport in North America before the Seaway project.

Natural/ Physical Problems	Human Problems

2. Explain what Uganda can learn from the historical geography of the St. Lawrence Seaway.

LESSON 3: Steps taken to solve the problems that faced water transport on the Great Lakes and St. Lawrence River before the Seaway project

Learning Outcomes

By the end of this lesson, you should be able to:

i) explain the steps which were taken to solve the problems that affected transport in North America before the Seaway project.
ii) identify areas of these solutions on a map.
iii) recognise the solutions on diagrams and photographs.

Instructions

- Try to do all activities programmed for each day.
- Remember that some activities may take you more than one hour to complete.
- Read the instructions carefully before you begin doing each activity.
- In case you find an activity difficult, ask an older person around you for assistance.

Materials you need:

- textbook
- photographs
- diagrams from the Great Lakes and St. Lawrence valley
- a notebook
- a pen
- a pencil
- a foot ruler
- an eraser

Introduction

Now that you know the problems that used to affect water transport on the Great Lakes and St. Lawrence River, think about how such problems could have been solved. In this lesson you are going to learn how the problems to navigation were solved, the steps involved and the difficulties which were faced by both governments and engineers.

Activity 1

Look at Figure 3 in Lesson 2 again.

Initiated in 1954 and completed in 1959, building the Seaway required:

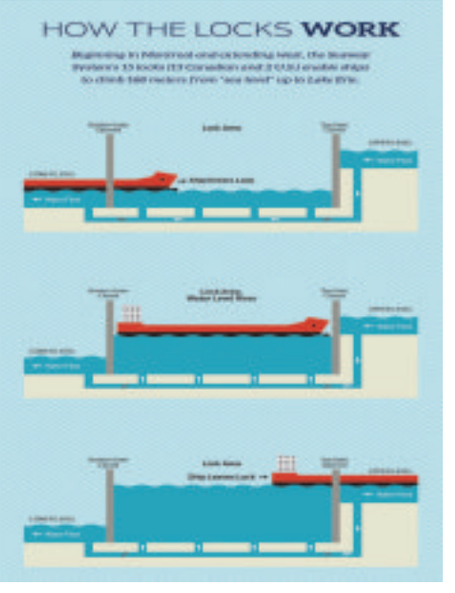
- Some 22,000 workers
- Moving 210 million cubic yards of earth and rock
- Pouring over 6 million cubic yards of concrete

In 2020, it is expected that the St. Lawrence Seaway will reach a total of three billion tonnes of cargo having transited its locks since it initially opened in 1959. This rapidly approaching milestone serves as a strong testimony to the Seaway's ongoing role as a vital trading gateway connecting the heart of North America to over 50 trading nations across the globe.

In a typical year, about 25% of Seaway traffic travels to and from overseas ports, especially in Europe, the Middle East, and Africa.

Administration of the St. Lawrence Seaway

The St. Lawrence Seaway was built as a binational partnership between the U.S. and Canada through international agreements that carry the weight of treaties, and continues to operate as such. Administration of the waterway is shared by two entities, the Saint Lawrence Seaway Development Corporation in the US, a federal agency within the US Department of Transportation, and the St. Lawrence Seaway Management Corporation in Canada, a not-for-profit corporation established by the Government of Canada.



Over the last 200 years, navigation improvements in both the U.S. and Canada have enhanced the waterway. The resulting deep-draft inland navigation system is the longest in the world, extending 3,700 kilometres (2,300 miles) into the North American heartland.

The Great Lakes St. Lawrence Seaway System has remained a vital deep draft waterborne transportation link for moving goods between North America's heartland and international markets since it opened in 1959. The Seaway System encompasses the St. Lawrence River and the five Great Lakes, extending from the Gulf of St. Lawrence at the Atlantic Ocean to the western end of Lake Superior at the twin ports of Duluth, Minnesota, Superior and Wisconsin. Management Corporation (Canadian partner) and the St. Lawrence Seaway is a model of binational cooperation between the St. Lawrence Seaway Development Corporation (US partner).

Over 80 percent of seaway traffic is made up of bulk cargoes such as grains, iron ore, coal, chemicals and oil. Manufactured goods of all kinds, including finished and semi-finished steel products make up the rest of the Seaway cargoes. Ships from more than 50 nations call at the Seaway ports in Canada and the United States. Since its opening, the St. Lawrence Seaway has moved more than 2.5 billion metric tons of cargo with an estimated value of more than $375 billion. Almost 25 percent of this cargo travels to and from overseas ports.

Cargoes include iron ore, coal, steel, aluminum, machinery, stone, cement, grain, sugar, fertilizers, road salt, petroleum products and containerized goods.

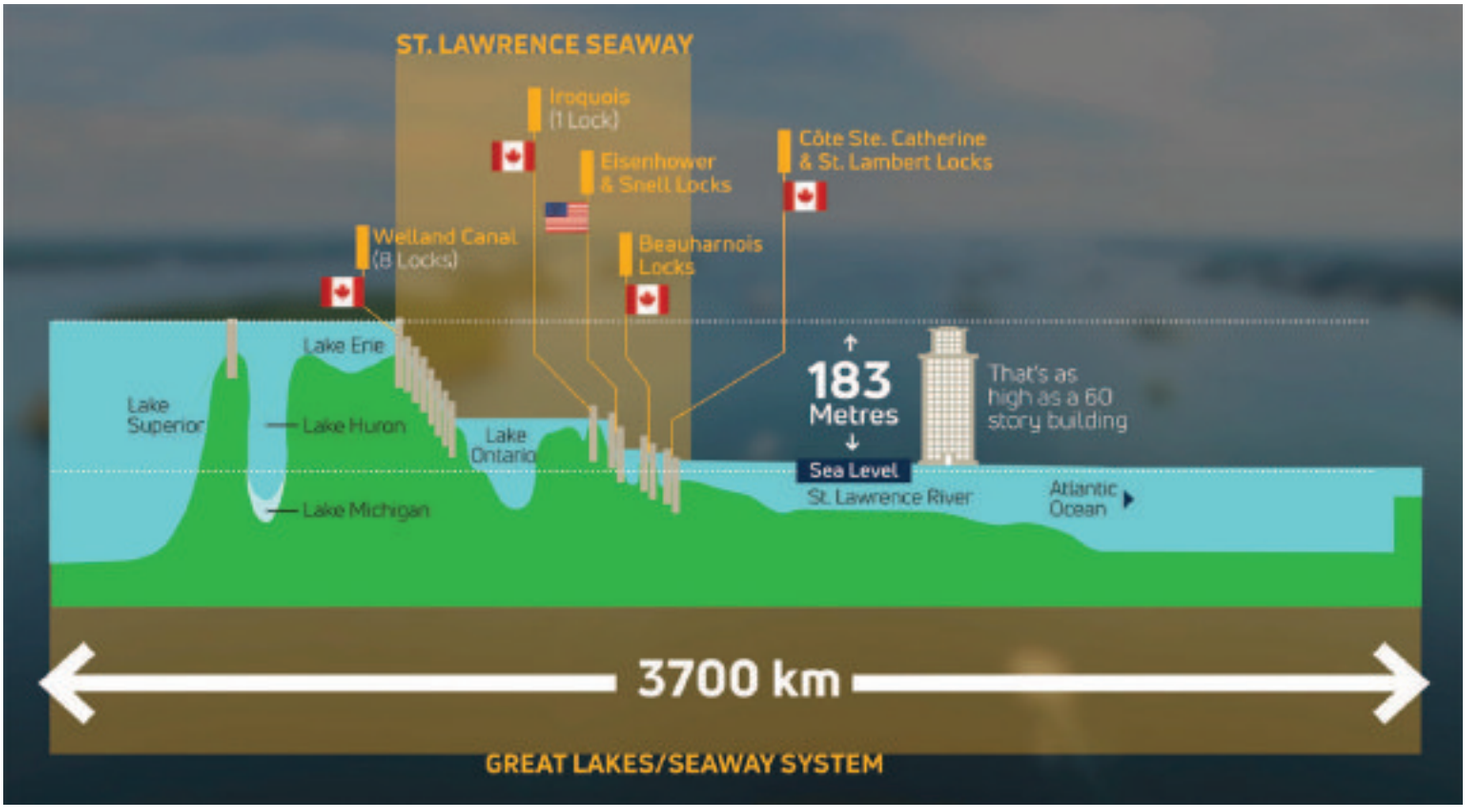
Benefits of the Seaway --Jobs on the Seaway

For every ton of cargo, there are scores – often hundreds – of human faces behind the scenes. On board, there are the mariners themselves, while on the shore side there are: lock operators and longshoremen; vessel agents and freight forwarders; ship chandlers and shipyard workers; stevedores and terminal operators; Coast Guard personnel and port officials; railroad workers and truck drivers–wide web of service providers.

Summary

In this lesson you have learnt that:

- the Great Lakes and St. Lawrence River form a natural boundary between the United States of America and Canada.
- the Great Lakes, the St. Lawrence River and its tributaries form the most important water-way in North America - the St. Lawrence Seaway.
- many cities and ports have grown up along the shores of the Great Lakes and in the St. Lawrence valley. This has been due to the presence of plenty of fresh water for domestic and industrial use, fertile soils which support farming, numerous industries and businesses which employ many people.



History

Senior 2 Term 1

Lesson 1: The Ngoni Invasion into East Africa

By the end of this lesson, you should be able to:

i) state the background of Ngoni people.
ii) explain the reasons for migration of Ngoni people
iii) describe the course of Ngoni migrants.

Materials you will need:

Textbooks, pen, notebook, Atlas and internet access, where possible.

Instructions

1. Use a hand book for Senior 1 history.
2. You can make reference to other related books.
3. If possible, consult an adult and Google/ internet while doing an activity.

Introduction

Who were the Ngoni?

The Ngoni were the Bantu speaking people of Africa who for long time had lived in South Africa North of Zululand until sometime when they could not stand the bad leadership of King Shaka. In 1820 they were led by Chief Zwangendaba into Tanzania. By 1835 they had crossed River Zambezi, matched through Malawi and Zambia and by 1840 they had settled at Ufipa plateau of southern Tanzania and by 1860 they had settled near Lake Victoria.

Reasons for their Migration

Many reasons caused the Ngoni to move from South Africa. One of the main reasons was the character of King Shaka. He was very aggressive and attacked and annexed every nearby territory. When he attacked and annexed part of Nguni society the Ngoni group decided to move away to East Africa.

Shortage of land and overpopulation was another challenge. They lived in Drekersnberg Mountains and they faced a problem of overpopulation and shortage of land. To reduce this challenge they moved away into South Africa.

A number of societies around the coast competed for profitable trade with the Portuguese traders and this made the weaker states to migrate and leave South Africa. Societies like Mthethwa, Zwinde, xhosa among others were tougher than Ngoni who decided to move away and settle in East Africa.

The military age evolution of the Zulu kingdom where Shaka Zulu had trained his soldiers some of whom were the Ngoni people. This caused them to desire to export and discover their military strength and it resulted into the migration of the Ngoni people**.**

Activity 1: Reasons for the Ngoni migration

1. What challenges were met by the Ngoni migrants into East Africa between 1820 and 1860?
2. What are some of the current reasons that cause people to migrate today?

Course of the Ngoni Movement

The Ngoni moved Northwards across Mozambique, Angola into East and Central Africa. Their movement was characterized by raids, destruction of property, and devastation of villages leading to a time of trouble commonly referred to as "Mfecane".

Zwangendaba was their leader and they left their cradleland in 1821, and by 1836 they had temporarily settled among the Tonga people in South West Mozambique. Using the unique experience of Zulu kingdom, Zwangendaba's followers proved quite strong and displaced the Tonga from their area. The Ngoni did not settle here for a long time. They later moved northwards capturing and absorbing people into the regiment and recruiting many others for the expansion of the Ngoni areas.

By 1840, Zwangedaba's followers had entered Ufipa plateau north of Malawi and they made their first settlement in East Africa on this land. The local population was defeated and forced to shift to unfavourable mountainous areas of South Tanganyika.

About 1844, Zwangendaba died and his group split into other five smaller ones. After a series of succession disputes, two of these groups i.e. Tuta and Gwangara moved northwards into Tanganyika while Mbewa and Quasi Ngoni groups moved into present Zambia and founded a new smaller state there.

The Tuta Ngoni inside Tanganyika are responsible for amalgation of many dispersed Nyamwezi chiefdom into one organized loosely centralized Nyamwezi state in need of protection against Ngoni invaders.In the process they captured Mirambo as a young man and when he was released, he became a military genius and a statesman who established the Nyamwezi kingdom to its 19th century climax. Meanwhile some of the Ngoni speakers in the same period migrated to other parts of East and Central Africa like the Ndebele people today residing in Zimbabwe. They were led by Mzilikazi.

Another group from South Africa under the leadership of Mzilikazi moved Northwards across Drakensberg mountains. They first settled in Transvaal republic but due to Zulu and Boer pressure, they were forced to cross River Limpopo and finally settled in present day Zimbabwe where they founded a famous Ndebele kingdom. Holoholo currently residing in Zambia migrated from the Barotseland.

Activity 1

1. Draw a map of East Africa and show the routes that were used by the Ngoni migrants.
2. Give reasons for the success of the Ngoni migration.
3. Explain the results of the Ngoni migration into East Africa.

Lesson Summary

The Ngoni migration is responsible for the

many current social, political and the economic issues in East Africa. Reasons for their migration, success and their effects are quite clear in East Africa.

Follow-up Activity

1. Find out the nature of current migration and identify its related problems.
2. Suggest ways of solving such challenges.

Lesson 2: Long Distance Trade

By the end of this lesson, you should be able to:

i) explain the meaning of the term Long distance trade.
ii) find out the reasons for growth and development of long distance trade.
iii) describe the organization of long distance trade.

Materials you will need:

Textbook, pen, notebook, Atlas and internet access where possible.

Instructions

1. Use a hand book for Senior 1 history.
2. You can make reference to other related books.
3. If possible, consult an adult and Google/ internet while doing an activity.

Introduction

Long distance trade involved long distance movements by the people in search of trade items and delivering of the imported goods to the interior. The trade was conducted by the people of East Africa and foreign traders largely centred at the East African coast. Many interior tribes like; the Yao, Chagga, Akamba,Kikuyu, Maasai, Baganda, Banyoro, Galla, Basoga and the Itesots were involved in this trade. The foreign traders were the Arabs, Indians, British and Portuguese among others.

Reasons for growth and development of long distance trade

Many factors worked jointly to explain the rise of long distance trade. The key ones include the following;

- Tribes in East Africa produced surplus goods and there was need to find market outside their communites for them.
- Some of these goods like iron implements were on high demand all over East Africa and this gave them unlimited market
- Similarly foreign goods such as guns, beads and cloths were on high demand and so people had to move long disances in search of them.
- The opening of of trade routes in the interior enabled traders to reach all corners and this enabled them to collect and transport their goods with ease.

Division of labour among East Africans facilitated the development of long distance trade. Men specifically carried out hard work such as clearing the gardens and later they devoted the rest of their time to trade as the women did the work of planting , harvesting and other domestic work.
The introduction of guns improved security along the trade routes, people would transact without fear of being robbed or attacked by enemies. See the figures below.

Figure 7.2.4: Gun

Figure 7.2.5: Pistols

The nature of the land especially for the Nyamwezi facilitated the development of long distance trade, It was very flat and enabled easy movement of people and goods from one place to another,

There was co-operation and good working relations between the interior tribes and the coastal people, this helped the trade to develop.

The settement of Sayid Said in Zanzibar increased the demand for slaves because he needed them to work on his clove farms. He provided security for incoming traders and his other activities further developed the trade because he encouraged trade caravans into the interior.

Traditional love for traveling long distance by some interior tribes ,like the Yao caused trade to develop.In addition Zanzibar's creation of market for a wide range of goods and playing the middleman role helped long distance tradeto develop.
Some societies had superior skills that enabled them to make superior products compared to their neighbours like high quality iron products that were demanded by other societies. This boosted the development of Lond distance trade.

Activity: Benefits of long distance trade

1. Use ICT or textbook research, to identify the benefits of Long distance trade.Present your findings to your family.
2. Mention the traditional leaders who were involved in this trade.

Organisation of Long Distance Trade

It covered long distances and that is why it was called long distance trade. The Yao were the most active long distance traders in East Africa. The Arabs and Waswahili traders organized caravans into the interior and set up markets and trade routes. They established trade routes such as the route from Ujiji via Tabora to Bagamoyo. They travelled to Katanga in DRC for iron, salt and copper. Trade in East Africa was known as "the long distance caravan trade". The caravan trade was started by African peoples,

the Yao, Nyamweji, Kamba, in about the first decade of the 19th century. They extended trade routes upcountry.

By 1700, the Mijikenda controlled the trade between the coast and the interior and later the Akamba from around 1750 replaced them. The Akamba became leading caravan traders because of three main reasons. These reasons were the environment, their strategic geographical position and entrepreneurship.

The Nyamwezi organized trading expeditions under their chiefs up to the coast with ivory, copper, slaves, wax hoes, salt and copra. They returned with cloths, beads and mirrors. They established trade routes such as the route from Ujiji via Tabora to Bagamoyo. They travelled to Katanga in DRC for iron, salt and copper.

Activity

1. Draw a map of East Africa and locate these trade routes.
2. Identify the problems that were met by the long distance traders.

Lesson Summary

In this lesson you learnt the meaning of the term "long distance trade", the reasons for its growth and expansion plus the organisation of the long distance trade.

Follow-up Activities

1. Find out the results of long distance trade in East Africa.
2. Discuss the significance of this long distance trade today.

Entrepreneurship Education

PROJECT: Making charcoal briquettes, designing a poster for advertising them and making a package for the briquettes

By the end of this project, you should be able to:

1. Identify the right materials needed for making charcoal briquettes.
2. Make charcoal briquettes.
3. Explain three benefits of using charcoal briquettes in relation to ordinary charcoal.
4. Write a brief report on making charcoal briquettes explaining some of the challenges faced while making the briquettes, how these were overcome and any lessons learnt from the project work.
5. Design a poster for advertising your charcoal briquettes.
6. Identify the right materials for making packages, design a package for your charcoal briquettes and Label it.

NOTE: You can use any material you think will make your package attractive.

Read the scenario below and respond to the instructions given.
SCENARIO

HOME MADE SOLUTIONS TO EFFECTS OF THE CORONAVIRUS PANDEMIC

The world registered the first case of Coronavirus (COVID 19) in December 2019, in Wuhan City in China. The disease was declared a global pandemic by the World Health Organisation on 11th March 2020. By 14th April 2020, the pandemic had spread to 210 countries infecting over 2,000,000 people with close to 120,000 deaths registered.

To mitigate the spread of the virus and to avoid creating a fertile ground for its spread, His Excellency the President of the Republic of Uganda, Mr. Yoweri Kaguta Museveni ordered the closure of public gatherings like Schools, Churches and Bars, and suspended public transport on 20th March 2020. He further put in place a Task Force to steer the fight against the **spread** of the disease. Among the measures taken, was to declare a national lock down and curfew from 7:00pm to 6:30am for 14 days.

The effects of the coronavirus are enormous, ranging from health, social and economic among others. Indeed, following the lockdown, a number of people have complained about failure to feed their families. Consequently, government provided food for such families. However, due to the lock down, fuel specifically charcoal, became expensive and scarce yet majority of families especially in the urban areas use it as a source of energy. As a learner of entrepreneurship, you are expected to provide solutions to business challenges.

Activity one
At your home, you have several resources like domestic waste, peelings and soil which you can use to make charcoal briquettes, to solve the problem at hand.

Task

i. Identify the right materials needed for making the charcoal briquettes.
ii. Make charcoal briquettes using the materials you have identified following the step by step procedure provided below.
iii. Write a report, explaining some of the challenges you faced while doing the project work. How did you overcome the challenges? Mention any lessons you have learnt from the project work.
iv. Explain three benefits of using charcoal briquettes.
v. Assuming you want to make briquettes for sale, design a poster to advertise your charcoal briquettes, using either your exercise book or a plain sheet of paper whichever is available. Make your poster as attractive as possible.
vi. Design a labelled package for your charcoal briquettes. You will present your report, the poster and the package to your class teacher when schools reopen after the lockdown.

Note: The project may not be finished in one day, you may choose to take a few days doing it. You can keep some of the briquettes for home use but keep some for presenting to your teacher as part of your project work when schools reopen.

MATERIALS REQUIRED

SN	ITEM	ALTERNATIVE	QUANTITY
1	charcoal dust	Fresh cow dung	4 (tumpeco) cups
2	Soil	Anti-hill soil/brown soil/Clay	2 (tumpeco) cups
3	Water		4 (tumpeco) cups
4	Basins	Container	3
5	Gloves	Polythene bag/open hand	1pair
6	Plastic cup (tumpeco) = ½ litre	Mug	1

Instructions

1. Make charcoal briquettes using some of the readily available materials at your home.
2. Use the cup (tumpeco) or mug to measure the materials.
3. Place the materials in different containers.
4. In case you do not have charcoal dust you can use cow dung in the same quantities.
5. Make sure you do not miss out on any step.
6. Record every step followed in the making of briquettes in your note book, because you will have to write the report for submission to your teacher.
7. Using your note book or a sheet of paper, design an advert for your charcoal briquettes.
8. Design a package for your charcoal briquettes. You will submit the report, the advert and the package to your teacher on the day of reporting to school.

Step by Step Procedure of Making Charcoal Briquettes
Please pay attention to every detail outlined in the step by step process provided below.
Step one: Preparing the waste materials
Using a pair of gloves, polythene bags or your free hands collect the waste materials to use as guided below. Be very careful with the safety of your hands.

Fig. 1. Putting on Gloves

Collect four cups of charcoal dust and put it in a container. If you do not have charcoal dust, you can use carbonized charcoal dust or fresh cow dung in the same quantities and follow the same procedure.

Fig. 2. Charcoal dust

Fig.3. Carbonized charcoal dust

Fig. 4. Fresh Cow dung Fig. 5. Plastic cup

Step two: preparing the charcoal dust

Sieve/filter the charcoal dust and remove the big particles, plastics and any other unwanted materials using your hands to remain with fine charcoal dust. (You can also crash the bigger particles into powder form and use it).

Fig. 6. A boy sieving charcoal dust.

Step three: preparing the soil

Collect two cups of soil preferably brown or anthill soil or Clay soil if its available but normal soil can also be used. Put it in a second container.

Sort the soil removing the bigger particles, sticks, broken glass, stones and plastics**.**

Fig.7. Brown Soil Fig. 8. Any other soil

Fig. 9. Clay Soil

Step four: Measuring the quantity of water

Get a small Jerrycan/Jug or any other container and pour in four cups of water.

Step five: Making the mixture

Measure off two cups of charcoal dust and one cup of soil. Put them in a third container and mix them well using your hands until they are thoroughly mixed.

Fig.10 Mixing Charcoal dust, soil & water

Add water. Start with a small amount of water and mix it into the mixture using your hands. Keep adding water until the mixture becomes easily moldable. **When squeezed, your mixture should hold together easily.** When the mixture is too soft add more charcoal or soil, and if it is too hard add more water.

Step six: Molding the briquettes

Take a hand full of your mixture and mold using your two hands until it is hard enough. The mold or briquette can be in a round shape or any other shape you want. You can make briquettes of any reasonable size.

Fig. 12. Picking a handful of mixture

Fig. 13. Molding the mixture into briquettes

Step seven: Drying the briquettes

Place the molded briquettes on a flat surface ready for drying. Set your briquettes in a dry place. Briquettes need 2-3 days to dry properly before you can use them. If placed in an open place do not leave them outside because in case it rains they can get spoilt. Alternatively, you can dry them under a shade.

Fig.14. Laying molded briquettes on a flat surface for drying.

Step eight: Using your briquettes

Light your charcoal stove using a few usual charcoal pieces. When it is hot enough add the briquettes and cook.

Fig. 15. Lighting the charcoal briquettes and cooking.

Summary

After going through the step by step process, it is assumed that you now know what briquettes are. Below is an explanation of what briquettes are.

These are small, compact blocks made from organic waste which you can use for cooking in the charcoal stove or fire. While some briquettes require expensive machinery to make, others can easily be made at home from the locally available waste materials with no machinery required.

Fig. 16. Sample of Charcoal briquette

Fig. 17. Briquettes burning in a charcoal stove

Follow up activity

i. Continue practising the making of charcoal briquettes until you perfect the process.
ii. You can sell the excess briquettes to your neighbours at the end of the lockdown. This will help you to save your earnings.
iii. In case you have access to the internet, you can make further research using Google on the other ways and materials you can use to make charcoal briquettes.
iv. Practice designing several adverts for the briquettes to have a variety from which to choose the best.
v. Practice designing several packages for the briquettes to have a variety from which to choose the best.

NOTE: This project will enable you to answer Paper one at senior four during examinations.

English Language

SENIOR TWO ENGLISH LANGUAGE LESSONS.

LESSON 1.

TOPIC: Auxiliary verbs in verb phrases.

LESSON OUTCOMES:

By the end of this lesson, you should be able to:

a) understand what auxiliary verbs are.
b) use auxiliary verbs in sentences.

INTRODUCTION

Auxiliary (or Helping) verbs are used together with a main **verb** to show the verb's tense or to form a negative or question. The most common auxiliary verbs are **have, be**, and **do**.

a) Does Sam write all his own reports?
b) The secretaries **have** not written all the letters yet.
c) Terry **is** writing an e-mail to a client at the moment.

Main Verbs and Auxiliary Verbs

The **main** verb is the most important verb. The **helping** verb comes before it. Some Common auxiliary Verbs are; **am, was, has, is, were, have, are, will and had.**

The main verbs in the sentences below are in bold print. Auxiliary verbs are in italics.

1. Alfredo *is* **training** for the Olympics.
2. He *has* **run** five miles each day.
3. His coach *will* **help** him next week.

Activity 1.

Underline the **helping** verb with a **single** line and the **main** verb with **two** lines in the following sentences.

Here is an example for you:

I am ***reading*** about the Junior Olympics.

1. She was racing in a wheelchair race.
2. Sarah had joined the Wheelchair Athlete Club.
3. The racers were using special racing wheelchairs.
4. They are training several times a week.
5. They have lifted weights too.

'Used to' as an Auxiliary verb.

Used to helps to form a special tense. It is used to indicate the **past** and never the **present**. Here is an example:

In the olden days, people used to travel everywhere on foot or on horseback.

This tells us that people did something at different times in the past.

'**Used to'** is also used to indicate a length of time, never just one particular moment. Here is an example:

I used to like palm-wine, but now it gives me a headache.

This tells us that the speaker liked something all the time in the past.

'Used to' meaning 'familiar with'

'Used to' can also be used as an adjective to mean 'accustomed to or familiar with. For example:

The hoeing and digging soon made the clerk very tired, as he was not **used to** this sort of work.

Activity 2.

With reference to the current lockdown due to COVID 19, construct five sentences about the things you used to do in the past and five sentences about the things you have now become used to doing while at home.

NB : Ensure that what you have written are sentences (should give complete meanings).

Activity 3.

Write a brief description of your stay at home during the government lockdown. Use as many auxiliary verbs as possible.

Activity 4.

Identify the auxiliary verbs in the following sentences and use them to form sentences of your own.

1. Jerry caught his thumb in the car door as coffee spilled from his cup onto his favorite shirt.
2. Jerry is always spilling things.
3. Since Jerry is also accident prone, he should have been drinking coffee from a mug with a lid, which would not have spilled on his favorite shirt.
4. If he doesn't arrive on time, he'll have to take a later flight.
5. Unfortunately, our dinner has been eaten by the dog.

Activity 5:

(a) As you read the poem, state the importance of education.

EDUCATION

Education my bread earner,
Education my life giver,
Education the source of everything.

Everywhere you go there is education,
In schools there is education,
In hospitals education treats the sick,
Every office treasures education.

Without it there is misery,
Without it there is poverty,
Without it there is slavery,
Without it there is no liberty.

If you want money, get education,
If you want a job get education,
If you want a posh car get education,
If you want bread be educated.

It is a key to success,
It is a way to life,
It is a source of hope,
It is a path to eternity.

By Osiine Asenath Bamureeba

(b) There are figures of speech in this poem which give education human characteristics. List the expressions that personify education. Look over your list and explain what each expression means in the poem.

Adopted from: Teaching and studying Poetry: A guide for Teacher Trainers, Teachers and students; Editor, Connie Hab'Lyalemye

Activity 6

Create a poster advertising your own charity organization that is to help people affected by COVID 19.

Follow up Activity

Imagine you are an LC1 chairman of your village. Write instructions to your community about how to avoid contracting COVID 19.

LESSON 2

TOPIC: Descriptive Writing

LESSON OUTCOMES : By the end of this lesson, you will be able to:

Use adjectives, adverbs, active verbs and imagery in descriptive compositions.

Descriptive writing has got a number of purposes and can be meant for a number of audiences. The main purpose of any descriptive writing is to give readers a mental picture of what they are reading. When writing a description, you may wish to be either subjective (giving a personal point of view in which the feelings and reactions of the writer are an important part of the impression being created) or objective (standing back and trying to give a factual, unbiased account). When writing a description, we use adjectives, adverbs, action verbs and the proper tense.

Activity : 1.

At the end of the current lockdown, you return to school and your English teacher asks the entire class to write something about COVID 19. **Write a description of the effect of COVID 19 in your own community.**

Activity 2.

Write a short description of your home during this lockdown period and try to create a strong visual impression of what the place is like.

You might want to use the five senses namely: sight, touch, smell, taste and hear. Remember to use long sentences to create an impression of detailed description.

Activity 3.

Read and enjoy the following passage.

After the jackal and the lion had become friends, they often used to go out hunting together. But fearing that their friendship was not going to last very long, the jackal left his den and made a house for his wife and children on top of a very high rock. This he used to climb by means of a long rope, which his wife would let down for him when he arrived back from his travels and gave a necessary ***signal.***

The lion, of course, always took a lion's share of everything that he and the Jackal had captured. This sometimes made the jackal angry, especially when it was he who discovered the game and tracked it down, down and all that the lion had done was to kill it. Further, the lion had become so lazy that he would not even take the trouble to carry home his share 'Take all the best parts to my lair,' he used to say,' and then you can come back and have the worst parts for yourself'.

The jackal ***resolved*** to pay the lion out for this, and one day, when they had brought down a splendid lot of game the jackal took all of it to his own wife. The next morning the angry lion came to the foot of the rock and said 'just throw down your rope. I want to come up and have friendly talk'.

The jackal's wife and children were very frightened when they heard the lion's voice and they all began to ***tremble.*** But the ***cunning*** jackal had thought out what he would do.

Calling out to the lion that he would lower a rope he let down a piece of weak cord, which broke in the middle just as the lion had got halfway up down fell the lion who was killed on the rocks.

Activity 4. Now use the above passage to answer the following questions.

1. Which sentence explains the phrase, "a lion's share of everything'?
2. How do you know that the jackal was cunning?
3. In one way, the lion was cunning, and in another, he was stupid. Explain.
4. How far up was the lion when the cord broke?
5. Explain what is meant by "a lion's share".
6. Give the meaning of the following words as used in the passage.
   a) 'signal'
   b) 'lair'
   c) 'resolved'
   d) 'cunning'
   e) 'tremble'

Follow Up Activity:

Imagine your village has been invaded by a swarm of locusts. Write an email to your friend describing the damage caused by the locusts to the environment.

LESSON 3

TOPIC: Direct and Indirect Speech

LESSON OUTCOMES:

By the end of this lesson, you will be able to:

a) understand the difference between direct and reported speech
b) use speech marks to punctuate my direct speech
c) Convert between direct and reported speech.

You will need a pen, pencil and paper.

In reported speech (sometimes called indirect speech), the words someone speaks are 'reported'; the actual words spoken are not written down.
Let's look at the following sentences:

1. 'My favorite fruit is banana,' she said.
2. She said that her favorite food was banana.

In the first sentence, the actual words spoken are written down. This is direct speech. In the second sentence, the words are reported. As the speech that is being reported happened in the past, the present tense of direct speech becomes past tense in reported speech. In this case, this means **my** becomes **her** and **is** becomes **was.**

Here are the rules that guide you when changing from direct speech to reported speech.

Tense Changes in Reported Speech

a) Present Simple Tense into **Past Simple Tense**
b) Present Continuous Tense into **Past Continuous Tense**
c) Present Perfect Tense into **Past Perfect Tense**
d) Past Simple Tense into **Past Perfect Tense**
e) Past Continuous Tense into **Past Perfect Continuous Tense**
f) Past Perfect Tense (The tense remains unchanged)
g) Will into **Would**
h) Will be into **Would be**
i) Will have into **Would have**
j) Will have been into **Would have been**

Other Verb Form Changes in Indirect Speech

a) Can into **Could**
b) Could (The verb remains unchanged)
c) Have to into **Had to**
d) Must into **Must/Had to**
e) May into **Might**
f) Might (The verb remains unchanged)
g) Should (The verb remains unchanged)

Changes in Time and Place in Reported Speech

a) Now turns into *then*
b) Today becomes *that day*
c) Here turns into *there*
d) This becomes *that*
e) Tomorrow becomes *the following day/ the next day/the day after*
f) Next week becomes *the following week/ the next week/ the week after*
g) Yesterday becomes *the previous day* or *the day before*
h) Last week becomes *the previous week/ the week before*
i) Ago becomes *previously* or *before*
j) Tonight becomes *that night*.

Introductory Verbs in Indirect Speech

a) Tell, say, ask
b) Verb + that + clause: complain, deny, explain, exclaim, remark, promise, boast,

inform somebody, claim, agree, suggest
c) Verb + to + infinitive: agree, offer, refuse, demand, threaten, promise, claim
d) Verb + indirect object + to + infinitive: advise, allow, beg, command, encourage, forbid, invite, want, instruct, permit, urge, order, remind, warn.
e) Verb + "ing" form: admit (to), accuse somebody of, apologize for, boast about/ of, complain to somebody of, deny, insist on, suggest.
f) Verb + how: explain to somebody.
g) Wonder.

Changes of Pronouns in Reported Speech

a) ***I*** becomes ***he*** or ***she***
b) ***we*** becomes ***they***
c) ***you*** becomes ***I***, ***she***, ***he***, ***we***, ***they***
d) ***she*** remains ***she***
e) ***he*** remains ***he***
f) ***it*** remains ***it***.
g) ***my*** becomes ***his/hers***
h) ***our*** becomes ***their***
i) ***ours*** becomes ***theirs***
j) ***mine*** becomes ***his/hers***

Activity 1.

Put the following sentences into indirect speech:

1. Mr West said, «I am very tired.»
2. He said, «I am flying to Rome tomorrow.»
3. George said, «I have lived in this village all my life.»
4. Helen said to me, «I hope you have enjoyed yourself.»
5. 'I will see you tomorrow,' said Sarah.

Activity 2.

Change the following sentences from indirect into direct Speech:

1. He asked me if I knew the manager.
2. She asked me if I liked her new house.
3. She asked the driver to give her a lift.
4. Helen said that she would give up trying.
5. George said he would do his best.

Activity 3.

Read and enjoy the passage below.

When Apire placed the gun clattering on the desk top, the policeman leaped up, eyes wide open with fear, and began backing towards the wall behind him.
'Hey, Officer,' Apire said, 'there's nothing to fear. I'm not mad, if that is what you think, I'm here only to report a crime I committed last night. Do you hear me?'
'What the hell do you mean by a crime you committed?' the cop finding his voice at last, bawled.
'I told you, didn't I? I killed a man and a woman last night. My wife and her boyfriend. I caught them in the act. I want to make a statement.'
'I'm not going to make a statement from someone who might be demented for all I know. 'Then you may lock me up and go on to investigate.'

Activity 4.

Now answer the following questions.

1. Why did the policeman leap when he saw Apire?
2. Describe Apire's reaction when he saw the policeman.
3. Why did Apire commit the crime?
4. Describe the policeman's attitude towards Apire.

Follow Up Activity.
Imagine you have listened to or watched the president of Uganda give his weekly address about COVID 19. Write a 10 line paragraph reporting what the president has said about the government's decision to control the spread of corona virus.

LESSON 4

TOPIC: Active and Passive Voice

LEARNING OUTCOMES:

By the end of this lesson, you will be able to**:**

1. Understand meaning of voice
2. Distinguish between active and passive voice
3. Construct own sentences in active and passive voice.

Active voice means that a sentence has a subject that acts upon its verb.

Passive voice means that a subject is a recipient of a verb's action.

Active voice examples

a) Monkeys adore bananas.
b) The cashier counted the money.
c) The dog chased the squirrel.

All the three sentences have a basic active voice construction: subject, verb, and object. The subject ***monkey*** performs the action described by ***adore***. The subject ***the cashier*** performs the action described by ***counted***. The subject ***the dog*** performs the action described by ***chased***. The subjects are doing, doing, doing—they ***take action*** in their sentences.

Passive voice

A sentence is in the passive voice, on the other hand, when the subject is acted on by the verb. The passive voice is always constructed with a conjugated form of ***to be*** plus the verb's past participle. Doing this usually generates a preposition as well.

Passive voice examples

a) Bananas are adored by monkeys.
b) The money was counted by the cashier.
c) The squirrel was chased by the dog.

Let's take a closer look at the first pair of sentences, "Monkeys adore bananas" and "Bananas are adored by monkeys." The active sentence consists of ***monkeys*** (subject) + ***adore*** (verb) + ***bananas*** (object). The passive sentence consists of ***bananas*** (object) + ***are adored*** (a form of '***to be'*** plus the past participle (***adored***) + ***by*** (preposition) + ***monkeys*** (subject).

Activity 1.

Decide whether each of the following sentences is active or passive.

a) The golf ball was driven down the fairway.
b) The train crashed into the buffers.
c) The film was released nationwide at the beginning of the month.
d) The managing director congratulated the staff on their work.
e) The staff were congratulated on their work by the management.

Activity 2.

Fill in the gaps in the following sentences with an active or passive verb, whichever is correct in the context. Indicate whether the verb you have used is active or passive.

a) The pilot (verb)……the signal to land.
b) The dog (verb)……..the bone in the garden.
c) The experiment (verb)…….by the chief scientist at the plant.
d) In the ensuing confusion, the secret plans (verb)…….by the spy.
e) In the lush green field the cattle (verb) ……contentedly.
f) The lawn (verb)……by the gardener.

Activity 3

Change the following active sentences into passive voice.

a. I did not beat her.
b. I will never forget this experience.
c. Mother made a cake yesterday.
d. The boy teased the girl.
e. Did she do her duty?

Activity 4.

Read and enjoy the following passage.

What is a myth?

Long, long ago when the world was very young, Nanabozo, the creator, as the Indians believed, found himself very much alone. There

was nothing but water and air everywhere. He became very lonely. So as not to be alone, he created the muskrat, beaver, and otter, but soon they grew tiresome as companions.

He wondered why he grew tired of their company. He decided he needed different creatures as companions. But there was too much water.

'The water is not solid enough,' he said to himself. 'I need something on which to rest my feet. I think that if I could stand on something solid, I could put one foot in front of the other and walk around.' After further thought, he tied his longest fishing line to the muskrat, and told him to dive as deep as he could and try to bring something up from the bottom of the water. The muskrat was gone a long, long time, and when he finally came up he was so tired that he died. But Muskrat did not fail, because between his tiny paws was a little ball of mud.

Nanabozo took this little piece of mud and rolled it, and rolled it and shaped it until it grew larger and larger and larger. When he was through with rolling and kneading and molding, the ball of mud was so large that thousands and thousands of creatures could live with Nanabozo as companions. Plants could grow and rivers could flow.

Being in such a hurry to create, Nanabozo left wet stretches here and there which will never be dry. These lands we know as muskeg.

Nanabozo could now rest happily and proudly because of his handiwork. He had more companions and he could put one foot in front of the other and move about the beautiful world which he had built.

Follow Up Activity.

Write about any two myths you have heard about in your community.

SYMPTOMS OF CORONAVIRUS DISEASE 2019

Patients with COVID-19 have experienced mild to severe respiratory illness.

Symptoms* can include

***Symptoms may appear 2-14 days after exposure.**

Seek medical advice if you develop symptoms, and have been in close contact with a person known to have COVID-19 or if you live in or have recently been in an area with ongoing spread of COVID-19.

Art and Design

Senior 2 ART AND DESIGN

Project Theme: Decorative arts

Topic: Multimedia: Mosaic art

Introduction

Mosaic is a branch of visual arts. It is an area that allow you to use almost any material to create a decorative artwork. Mosaic is done using a similar discarded material, or found items from the environment. These may be banana fibers, broken glasses, or broken floor tiles. There are many advantages when you use discarded or found items. These materials:

- Incur little or no cost
- Are always readily available
- Encourage re-use or recycling
- Are generally environment-friendly, and make you environmentally aware
- Give you the opportunity to be creative in finding, exploring and using materials.

Why make Mosaic art?

As a student of art and design, you need to be creative as you produce unique artworks to compete in the modern world. You have to practice the creative use of found and recycling of materials to produce something new and also to responsibly make use of the environment.

Resources

You will need:

- Note book, pencils, coloured pencils
- Paper, hard paper, glue, strings, cutters
- Any found or discarded materials or objects-ends of paper, broken tiles, stones, beads, leaves, seeds
- Paints and brushes if possible
- Computer with internet if possible

Mosaic Making Process

The process is formed by setting small pieces of a **similar material** on a firm base. Common materials used include stone, ceramic tiles, glass, beads, or wood. These materials are not easily bent like paper of fabric. They must be cut or broken to fit the design, or be used in their original shape and size. Different tools and adhesives are required to separate or unite these materials. Look at figure 2.1 to study the materials used in a composition.

2.1 Figure showing examples of Mosaic art

Mosaic Techniques

Mosaic is similar to collage but due to the nature of materials used they slightly differ. The common techniques include:

Variation=the use of different shapes, sizes, and colour schemes of your pieces that adds interest.

Gradation=the subtle shifts in an element of art, for instance, the use of colour to vary its tones, or the increase in the size of shapes used in a design.

Creating shapes, patterns and motifs. These thoughtful use of multiple pieces to create lines and shapes that generates movement within the work. The more pieces you use the more possible it is to have a motif in your design.

Like any art work mosaic art is based on the three parts of: Subject, Composition and Content. The elements and principles of art are used as a vehicle to realise the project.

Key term

Motif: the main element or repeated symbol in an artwork

Step 1. Research on what you intend to do. Find out about something either by interviewing your parents, reading art books or using a computer with internet. Having prior information before is very key. Make a plan of translating your ideas or imaginations into tangible work of a sketch. Have a reason as to why you want to create the collage work.

Have you got an idea of what you want to do? Sometimes you will have so many ideas but you have to pick the most interesting one after sketching.

2. **Select the topic**/theme or brief
   - Choose a topic or theme (if not given) that is simple to design.
   - Create more than one drawing to open up your imagination.

3. **Create the design**

From your research and sketching, select drawings you have made based on the theme or subject you will use.

4. **Transfer the design**
   - Reproduce you design drawing on the base.
   - Draw out the objects you wish to represent in simplified lines to ease the application of the hard material.
5. **Create the artwork**
   - Cut out your material into small pieces. Use adhesives to hold the pieces as you build up the design. Follow the contours of your lines as you create the images.
6. **Finish the art work**
   - See that all edges are well stuck. Again, work carefully to avoid glue or paint where they are not needed. Keep flat and in a dry place, pinned to a flat surface, and allow to dry for some minutes.
7. **Present the art work**

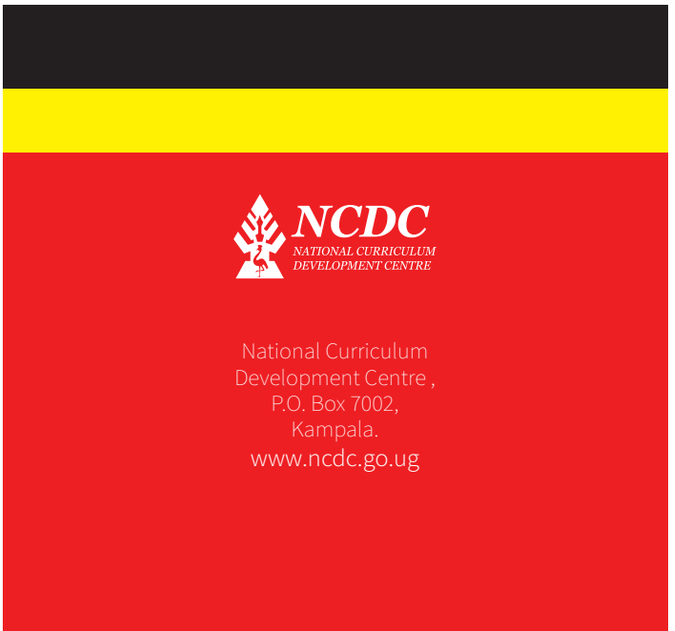
   People at home will be curious to see what you have done. Present your work to them and receive their criticism to help you improve the next project.

Create

Task: Based on the theme "Roundness" design and create a mosaic art using found and or discarded materials. When you are done, invite your parents to take a look. Provide a page for them to make comments about your artwork. Keep these safely as in future they can become a source of inspiration for your art.

Reflection: Mosaic and Collage art have similarities and differences. What identifies them?

Examples of mosaic art



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