



USAID | MALAWI
FROM THE AMERICAN PEOPLE

MALAWI TEACHER TRAINING ACTIVITY (MTTA)
In collaboration with
MALAWI EDUCATION SUPPORT ACTIVITY (MESA)

SECOND CYCLE TRAINING HANDBOOK

March – April 2005

Funded by the United States Agency for International Development
under USAID Contract No. GS 10F-0112J Order No: 690-M-04-00260-00



**AMERICAN
INSTITUTES
FOR RESEARCH**

In consortium with



Miske Witt & Associates

Malawi Institute of Education

Save the Children /US

TABLE OF CONTENTS

Acknowledgement	p. 3
Introduction	p. 4
How to use this handbook	p. 6
MTTA and how it works with MESA	p. 8
February 2005 Baseline Survey Results	p. 9

SECTION I: ENGLISH

Unit 1: The Verb and Personal Pronouns	p. 10
Unit 2: Subject-Verb Agreement	p. 14
Unit 3: Comprehension	p. 16
Unit 4: Punctuation	p. 18
Unit 5: Reading and Composition	p. 20

SECTION 2: MATHEMATICS

Unit 1: Approximations	p. 23
Unit 2: Problem Solving	p. 25
Unit 3: Rate, Ratio and Proportion	p. 28
Unit 4: Angles	p. 31
Unit 5: Parallel Lines	p. 36

SECTION 3: SCIENCE

Unit 1: Static Electricity	p. 41
Unit 2: Simple Circuits and Electrical Symbols	p. 42
Unit 3: Conductors and Non-conductors of Electricity	p. 43
Unit 4: Series and Parallel Circuits	p. 44
Unit 5: Plugs and Electrical Faults	p. 45
Unit 6: Uses and Sources of Electricity	p. 45

APPENDIX 1: SUGGESTED ANSWERS

SECTION 1: ENGLISH	p. 47
SECTION 2: MATHEMATICS	p. 49
SECTION 3: SCIENCE	
Suggested improvised materials for teaching electricity	p. 51
Suggested solutions to activities	p. 54

APPENDIX 2: REFERENCES	p. 56
-------------------------------	-------

ACKNOWLEDGMENT

The Malawi Teacher Training Activity (MTTA) Secretariat would like to acknowledge the people who contributed to the production of this second cycle handbook in various ways. First, the Secretariat is thankful to the people who participated in the prioritization of topics identified in the baseline survey results, development of course outline and this training manual.

The following are people who participated in the above-mentioned activities: Mr. Wilson Makowa Banda, Mr. Ezekiel Kachisa, Mrs. Wotchiwe Kalande, Mr. Master P. Kalulu, Mr. Harry Kamwaza Mr. Christopher E Khoropa, Mr. Andrew Malisawa, Dr. Hartford Mchazime, Mr. Joseph Mshanga, Mrs. Sophie Mhoni, Mr. Andrew Nchesi, Mrs. Nerissa Boatman Phiri, Mrs. Eneret Santhe, Mr. Rath E.M. Kathewera, Mr. Chaplain Katumbi, Ms. Kara Janigan, Dr. Fritz Kadyoma, Mr. Douglas Mbingwa and Mr. Jackson Yekha.

Second, MTTA is sincerely grateful too to Dr. Shirley Miske for providing the technical assistance and invaluable suggestions for the development of the manual and training processes.

Third, the Secretariat acknowledges the contributions of Support Staff in the production of this manual. Deserving particular mention are Ms Brenda Makanani and Ms Jacqueline Mwale for typing the manuscript and Mr. Maxwell Nikisi for photocopying and binding the materials into a handbook.

Finally, MTTA Secretariat extends gratitude to the MTTA and MESA Chiefs of Party for their support, and the American Institutes for Research (AIR) through USAID for funding the project. The Secretariat is also indebted to Ministry of Education for both technical and professional support at various levels of handbook development.

INTRODUCTION

The Malawi Teacher Training (MTTA) is a three - year USAID/ Malawi funded activity that aims to improve the quality of education in Malawi by improving the professional skills of primary school teachers through pre-service and in-service training and support. The Government of Malawi and USAID/Malawi devised the MTTA in response to the need for additional teacher training opportunities. American Institutes for Research (AIR) is leading a consortium that brings together Save the Children (SCF)/US, the Malawi Institute of Education (MIE) and Miske Witt & Associates (MW&A), with additional support from Howard University to work in collaboration with the Ministry of Education on the activity.

MTTA is operating in the four districts of Mzimba South, Kasungu, Machinga and Phalombe identified by the Malawi Education Support Activity (MESA) as target areas. In December, 2004 a total of 6,300 teachers from these districts started receiving in-service training in English, mathematics and science. Such in-trainings Workshops will be conducted to respond fully to teachers' needs. They will primarily focus on content knowledge using a cluster - training approach. A core group of trainers will lead district – level training of trainers workshops. The newly trained “mentor teachers” will conduct training session(s) for teachers in their cluster of nearby schools. These workshops will complement the work being done by the Malawi Education Support Activity (MESA), also led by AIR, which focuses on improving the instructional skills of teachers. In addition to the cluster level training, opportunities for academic enrichment of teachers will be available through the development and provision of zonal in – service facilitators at the Teacher Development Centres (TDCs). Other opportunities for teacher development include radio programs on Malawi Broadcasting Corporation (MBC) and “ teacher training troupes” that will move around the district(s) to provide supplementary training. MTTA will lead these “teacher training troupes”.

The baseline survey conducted in October 2004 in Mzimba South, Kasungu, Machinga and Phalombe districts revealed that the majority of primary school teachers' proficiency in English, mathematics and science is in non-mastery level. The survey also revealed the topics which primary school teachers find difficult to teach because of their knowledge and non-mastery in content areas. These include parts of speech, composition writing and classroom language in English; length, multiples, factors, lowest common multiples and highest common factors in mathematics; and machines in science.

Thus, the handbook has attempted to deal with and demonstrate how to teach basic concepts and knowledge in English, mathematics and science in which teachers have difficulty.

To make learning of the topics in the three subject areas interesting and effective, this handbook emphasizes the use of participatory and integrated approaches. For this reason, every presentation is activity oriented. It also emphasizes on activities that help learners to develop skills, such as, creative thinking, problem solving and analytical skills.

Rationale

As the topics, concepts and/or skills included in this handbook were based on the needs of primary school teachers and pupils, materials are therefore, intended to assist the teachers to compute and develop the teaching and learning skills.

Theme

The theme for the first cycle training is creative thinking for enhanced teaching and learning.

Main objectives

- To improve the quality of education through training in mathematics and science and pedagogy
- To develop creative thinking for enhanced teaching and learning
- To appreciate the problems primary school teachers and pupils encounter in English, mathematics and science

Specific objectives

- To make the National Core Trainers (NCTs), Trainer of Trainers (TOTs) and primary school teachers aware of the problems school teachers and pupils encounter in English, mathematics and science
- To discuss the problem areas in English, mathematics and science and ways of addressing them
- To improve the participants' knowledge on developing the four language skills with special emphasis on parts of speech, sentence construction, composition writing and comprehension exercises in English; measurement, multiples and factors in mathematics; and machines in science.

- To review the training manuals for English, mathematics and science.
- To discuss briefly the subsequent and/or follow-up training workshops.

Expected output

- Workshop participants, that is NCTs, TOTs and primary school teachers made aware of the problems, primary school teachers and pupils encounter in English, mathematics and science.
- Problem areas in English, mathematics and science and ways of addressing them discussed.
- The participants' knowledge on developing the four language skills with special emphasis on parts of speech, construction of sentences, composition writing and comprehension exercises in English; measurement, multiples and factors in mathematics; and machines science improved.
- The training materials for English, mathematics and science reviewed
- The subsequent/follow-up training workshops planned and prepared for

HOW TO USE THIS HANDBOOK

INTRODUCTION

One of the main aims of the Malawi Teacher Training Activity (MTTA) is to improve the competence of teacher in its target districts by conducting a series of trainings focusing on the content areas of English, Mathematics and Science. These training sessions are conducted in collaboration with Malawi Education Support Activity (MESA) whose focus is to improve teachers' use of active learning methods in the classroom. By working together MTTA and MESA use a holistic approach as these trainings focus on increasing teachers' content knowledge while also training the teachers to use participatory teaching methods in class with confidence.

The purpose of this Training Handbook is to guide those facilitating training session of the Malawi Teacher Training Activity (MTTA). Since MTTA is using the cascade method, this handbook has been developed for use by trainers at the three different levels, namely, the core group of trainers or National Core Trainers (NCT), the Trainer of Trainers (TOTs) and the Cluster Trainers (CT).

The training workshops have been developed using the integrated approach so that each of the three subject areas are covered during each workshop. While the main focus of this second training cycle is Mathematics, activities should be integrated to cover aspects relating to English and Science as well. Since learners' content knowledge is not limited to one subject area, the integration of subject areas helps the learners to see how the subjects are interrelated. Such an approach develops the learners' skill of applying ones' content knowledge to another.

It is important to understand the role of the facilitator who will lead these training workshops. The facilitator's role is to guide rather than to dominate in the presentation and activities of subject matter. The facilitator is the person who assists others in the acquisition of new knowledge and skills.

It is also important that all facilitators and teachers need to consider issues relating to gender when conducting activities and with all interactions with their learners. Facilitators and teachers need to treat all the participants/learners equally so that all will be given an equal opportunity to participate and learn.

THE CONTENT AND LAYOUT OF THE HANDBOOK

The handbook is divided into the following three sections:

Section 1	English
Section 2	Mathematics
Section 3	Science

Each section includes several units. Each unit in this Handbook contains the following:

- Unit topic
- Introduction
- Background information
- Objectives
- Suggested resources
- Suggested methods
- Suggested time
- Activities (practice and continuous assessment)
- Summary
- Unit assessment

Each section concludes with a course assessment for the facilitator to use with the participants to assess how much the participants have learned.

Appendixes containing suggested answers/responses to the unit and course assessments and references for each subject area are also included in the handbook.

DESCRIPTIONS OF THE COMPONENTS OF A UNIT

Background Information

This component provides brief information on the content to be covered in the unit. This information is intended **to support the facilitator** by ensuring that certain background or basic core information about the topic being covered is clearly understood. **NOTE: This information is not to be taught as it is to the participants.**

Objectives

Objectives are statements that express the skills and knowledge participants should acquire after participating in a given lesson. Objectives should be simple, clear and achievable.

Suggested Resources

The word *suggested* is used as the facilitators may use the resources given or can come up with others that may be just as effective as those suggested. Therefore, resources should suit each topic and the environment. Flexibility and common sense should be exercised.

Suggested Methods

Like resources, the methods contained in this component are considered possible strategies that could be used. As with all teaching situations, facilitators should not hesitate to adapt the methods to suit the needs of their learners and the teaching environment.

Suggested Time

Also included in each unit is the suggested length of time each activity and/or unit may take to be delivered. As with the methods, the length of time can be adjusted depending on the ability and needs of the learners

Activities

These activities include simple steps or processes to achieve the objectives of each unit. The activities were developed to be learner-centered. It is very important that facilitators conduct the training using learner-centered, participatory methods to enable the learners really learn what is covered in the unit.

Practice

This is work given to the learners. Learners should be given as much practice as possible orally and in written form to ensure that they, in fact, learn what is being taught.

Continuous Assessment

By assessing the learners in a continuous way, the facilitators can adjust their activities to suit the needs of the group they are training. Asking a series of questions guiding the learner towards the right thing could do this. Facilitators/teachers could be brainstorming questions aimed at finding out what participants/learners already know about the topic of the lesson to be covered.

Unit Assessment

This component comprises of questions intended to find out how much the learner has grasped after the unit has been taught. Unit assessment is intended to measure the performance of the facilitator. It is also intended to provide information to assist with planning to improve future trainings.

Summary

The summary contains a series of main points, ideas, concepts, skills or notions to be learnt. The summary is the final statement or statements of the unit.

Course Assessment

This is summative assessment at the end of each of the three sections. For example, there are some assessment activities for English at the end of section 1.

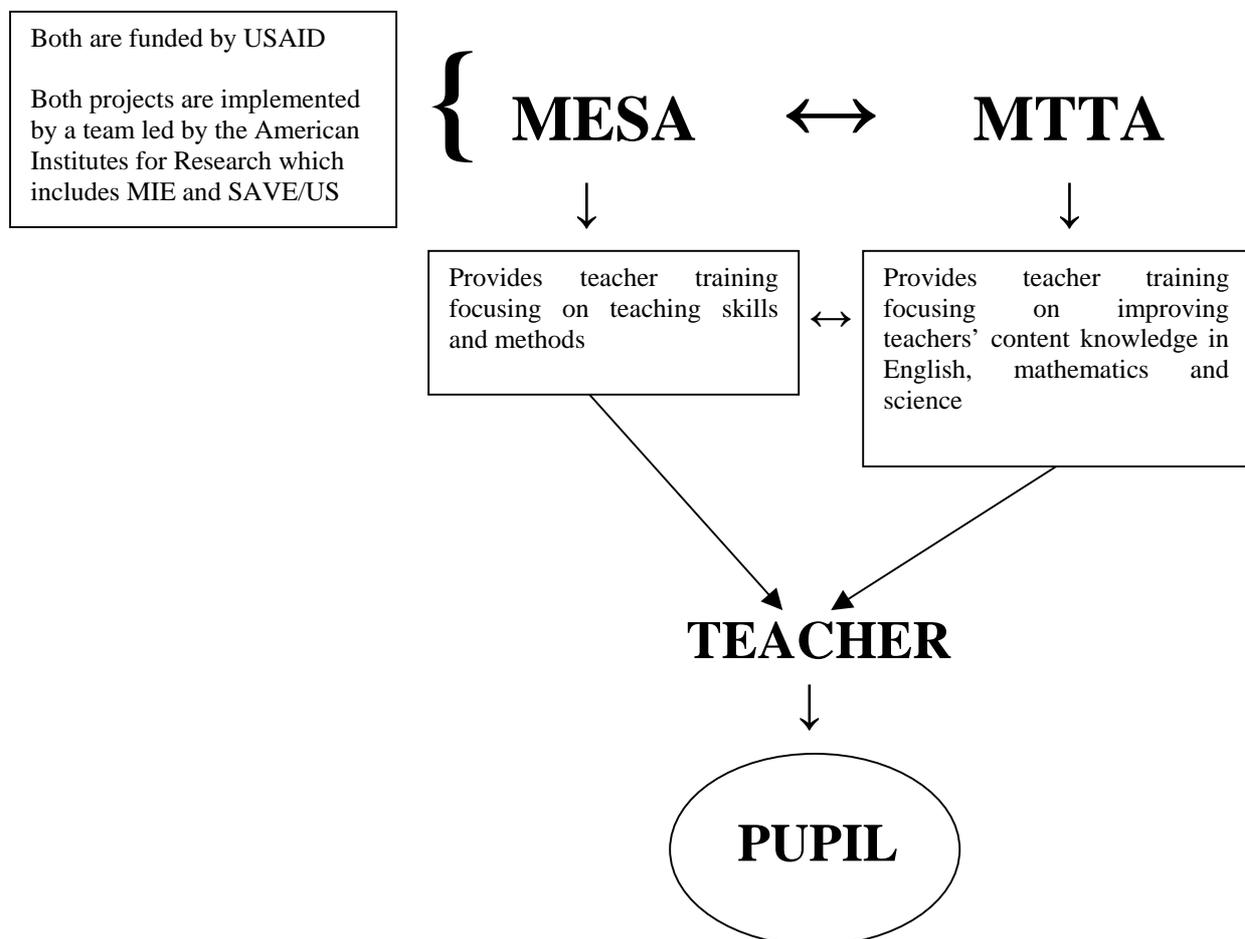
THE MALAWI TEACHER TRAINING ACTIVITY (MTTA) AND HOW IT WORKS WITH MESA

MTTA is a three-year USAID funded project developed by the Malawi Ministry of Education and USAID. MTTA was designed to work alongside MESA as both projects aim to improve the quality of education in Malawi by providing training to primary teachers. MTTA and MESA are working in the same four target districts of Kasungu, Machinga, Mzimba South, and Phalombe.

MTTA and MESA activities are implemented a group of organizations working together. The American Institutes for Research (AIR) leads both groups which include MIE and SAVE the children/US.

As you all know, MESA has been working over the past year to provide primary teachers with training that focuses on improving teachers' teaching skills and methods. However, it was found that many teachers also needed support to improve their content knowledge, particularly for English, mathematics and science. The main focus of MTTA is to provide training that focuses on improving teachers' content knowledge in those subject areas. Since MTTA and MESA will be planning and delivering teacher training together, this will enhance the training that MESA has been doing over the last year. By helping to improve teachers teaching skills and methods as well as content knowledge, pupils will be enabled to learn more effectively. The ultimate aim of both MTTA and MESA is to assist teachers so that their pupils can improve their academic performance.

How MTTA and MESA work in collaboration



MESA and MTTA Performance and Monitoring.

MESA and MTTA assess pupil performance by collecting the pupil grade at the beginning of the school year (February) and towards the end of the school year (October). MTTA assesses teacher proficiency levels in English, mathematics and science every October. During the October assessment teacher are asked to state topics they felt they needed more support to teach more effectively. Shown below are the grades obtained by standard 3 and 6 pupils during the February 2005 Baseline Survey.

February 2005 Baseline Survey Results

Key:

Levels of mastery	Description
Full	80 – 100%
Partial	31 – 79%
Non	0 – 30%

Table 1: Levels of Mastery in English for the February 2005 Baseline Survey (2005 School year)

Sex	Levels of Mastery	Standard 3			Standard 6		
		Reading	Compre-hension	Most used words	Reading	Compre-hension	Most used words
Girls	Full	0.6	0.0	1.6	48.6	0.8	1.8
	Partial	2.4	0.1	7.1	39.7	13.9	34.3
	Non	97.0	99.9	91.3	11.7	85.3	63.9
Boys	Full	0.9	0.0	1.4	43.8	1.4	2.2
	Partial	2.6	0.3	7.9	38.4	18.1	40.0
	Non	96.5	99.7	90.8	17.9	80.5	57.8

Table 2: Levels of Mastery in Mathematics for the February 2005 Baseline Survey (2005 School year)

Sex	Levels of mastery	Standard 3	Standard 6
Boys	Full	1.5	0.0
	Partial	78.4	2.4
	Non	20.1	97.6
Girls	Full	0.6	0.0
	Partial	73.5	2.4
	Non	25.9	97.6

Table 3: Levels of Mastery in Science for the February 2005 Baseline Survey (2005 School year)

Levels of mastery	Standard 3 <i>General Studies</i>	Standard 6 <i>Science</i>
Full	4.3	0.0
Partial	68.9	2.1
Non	26.8	97.9

SECTION I: ENGLISH

Unit 1: The Verb and Personal Pronouns

Introduction

A verb is one of the most commonly used parts of speech in the English language. In this unit, you will learn more about the verb (i.e., what the verb is), examples of verbs and different forms of the verb tense. Personal pronouns that are used with verbs are also introduced here.

Background Information

Verbs

A verb is a word that indicates an action, expresses a state of being or shows possession.

Examples:

- a. **Action:** Goats eat grass.
- b. **State of being:** She/he is tall.
- c. **Possession:** Vertebrates have backbones. She/he has K10.00 in her bag.

When expressing actions, states or possession, verbs relate time and action or state to the form of the verb. This relationship is what we call tense.

There are three main tenses. These are past, present and future. Verbs can also be simple, continuous or perfect. This topic discusses the simple present tense and the present continuous tense.

Example

Simple present tense:	She/he <u>eats</u> fruits.
Simple present continuous tense:	She/he <u>is eating</u> fruits.

Personal Pronouns

There are three types of personal pronouns which act as a subject of a sentence. These are the first person “I”, the second person, “you” and the third person “he/she”. These personal pronouns can be converted to plural forms, as follows:

- “I” (singular) becomes “we” (plural)
- “You” (singular) remains “you” (plural)
- “He/she” (singular) becomes “They” (plural)

In order to construct good sentences, a singular subject needs to be used with a singular verb. Similarly, a plural subject needs to be used with a plural verb.

Objectives

By the end of the unit, participants should be able to:

- state what a verb is
- demonstrate their knowledge of simple and continuous tenses
- use personal pronouns accurately

Suggested Resources

- pieces of paper
- facilitator’s written sentence
- activities with English Pupil’s Book 8

Suggested Methods

- Brainstorming
- Question and answer
- Group work
- Demonstration/Explanation
- Pair work

Suggested Time: One hour

Introduction to Verbs

Activity 1.

Action Verbs

1. Write words on cards (e.g., jumping, clapping, dancing, walking), give out cards to participants and ask each participant to do what the word says.
2. Write the verb, say, "jump" on the board as a participant says it. After four or five verbs have been written on the board, facilitator asks, "In parts of speech from English grammar, what are these words called?" Participant answers, "Verbs."
3. Invite two people to come to the front, one man and one woman and say to the man, "Please jump." The male participant begins jumping. The facilitator asks a participant, "What is he doing?" Participant answers, "He is jumping."
4. Facilitator says to the female participant at the front, "Please clap." The female participant begins clapping. Facilitator asks another participant, "What is she doing?" Participant answers, "she is clapping." Continue the activity using four to six additional action verbs.
5. Ask participants to give one definition of the term "verb" based on the words used to describe what the participants have just seen and heard .
Participants answer, "A verb is a word that indicates an action."
6. Let participants note that verb forms in English can show what is going on in time (e.g., past and present or future); this is called "tense."
 - The action verbs above show what is going on in the present; they are in the present tense.
 - A form of the verb "to be" (am, is, are) combined with the "-ing" form of the verb shows that the action is continuing or ongoing. These are verbs in the present continuous tense.

Introduction to Personal Pronouns

Activity 2.

Singular Personal Pronouns

1. Ask from participants to do a role play demonstrating the first person (singular), second person (singular) and third person (singular).
 - Ask participants to tell a story about herself/himself. He/she must do this one sentence at a time. You can use game's story in Unit 2 as an example. This story-teller will be called the first person (singular).
 - Have a second participant say what the first says. He/she must do this one sentences at a time. He/she will begin each sentence with "you" (while pointing at the first person). This person will be called the second person (singular).
 - Have a third participant tell (a fourth person) about the story of the first person. He/she must do this one sentence at a time. He/she will begin each sentence with "he" or "she". She should be pointing at the first person, while at the same time she/he is addressing the fourth person). This person will be called the third person (singular).
2. Do this role play again to demonstrate the first person (plural), second person (plural) and third person (plural).
3. Review the singular personal pronouns with participants, pointing to self and saying, "I"; pointing to someone and saying, "you"; pointing to the man at the front and saying, "he"; pointing to the woman and saying, "she." Write the singular pronouns on the board:

Personal Pronouns

Person	Singular	Plural
First	I (am)	
Second	You (are)	
Third	He/she/it (is)	

4. Let participants discuss common mistakes people make when using the first, second or third person pronouns in singular and plural forms with verbs in simple, continuous and perfect tenses
5. Then review the plural personal pronouns with participants, pointing to him/herself and the other two people at the front of the room, saying, "we"; pointing directly to the other two people saying, "you"; then pointing at the man and woman at the front and saying, "they". Then write the plural pronouns on the chart or board:

Personal Pronouns

Person	Singular	Plural
First	I	We (are)
Second	You	You (are)
Third	He/she/it	They (are)

6. In pairs, participants write six sentences using action verbs (either the verbs on the board or new ones) and using each at the different personal pronouns (first, second, and third person; singular and plural).
7. In plenary, each person reads three sentences to the group.

Activity 3.

Verbs of Possession

1. Demonstrate that verbs can also be used to show possession. Pick up an object that will be used in the science lesson on electricity (e.g., a battery or cell, a bulb, a comb, a spoon, a nail, a coin) and say, "I have a battery/cell"/ "I have a comb"; etc. Next, ask individual participants, "What do I have?"

Participants answer, "You have a battery/cell"; "You have a comb;" etc.

2. Invite four new participants (two men and two women) to the front of the room. Give two participants combs and the other two some coins.
Point to each person holding an object and then ask a seated participant, "What does he/she have?"
Participants answer.
3. Point to the two people holding the same object and ask them, "What do you have?"
Participants answer, "We have a comb/combs."/ "We have a coin/coins"/ ...
4. Ask a seated participant, "What do they have?"
Participants answer, "They have a comb/combs."/ "They have a coin/coins."/...
5. In pairs, ask participants write six sentences using a form of the verb "to have" and using each at the different personal pronouns (first, second, and third person; singular and plural).
6. In plenary, let each person reads two or three of her or his sentences to the group.

Activity 4.

Verbs for State of Being

1. Ask participants to note that verbs can indicate that someone or something exists and they can refer to the state or condition of a person or thing. This is called "state of being." He/She smiles at the group, points to his/her smiling face and says, "I am happy." Facilitator frowns at the group, points to his/her drooping face and says, "I am sad." He/she continues to act out different emotions, conditions, etc. (e.g., sick, angry, fat, hungry, etc.).

2. Facilitator individually asks five to six participants, "How are you?"

Participants answer, "I am happy"/ "I am sad"/ "I am hungry"; etc.

3. Facilitator then points to each of the participants who has just replied and asks the person sitting next to him or her, "How is he/she?"

The participant replies, "He is sick"/ "She is hungry"; etc. (Facilitator may write each of these words on the board as participants respond.)

4. Facilitator draws the four faces on the board; two are happy and two are sad. She/he points to the two happy faces and asks the group, "How are they?"

5. Participants reply, "They are happy" or "They are sad".

6. Facilitator invites three new participants to the front of the room and asks,

"Are you happy or are you sad?"

At least two out of three participants will give the same reply (e.g., happy). The facilitator then asks those two (or three) individuals, "How are you?"

They must respond, "We are happy (sad)."

7. The facilitator points to these same two or three people at the front of the room and asks a seated participant, "How are they?"

The participant replies, "They are happy" or "They are sad." Repeat this with five to six participants.

8. Divide participants into groups of four. In these groups participants will role-play different states of being. For example, one person will smile widely and another person will say, "You are happy." Another person in the group will say, "She is happy." In this way they will practise pronouns and state of being verbs.

9. Remind participants that the verb "to be" (and, it is, are) is part of the continuous present tense. Have them now act out the verbs and used when forming their sentences in the first activity (e.g., "He is jumping"/ "We are dancing" etc.).

Summary

A verb is a word that:

- indicates an action (see above verbs)
- shows possession - have, has - or
- expresses a state of being - the verb "to be" (am, is, are)

Personal pronouns are singular and plural and consist of first person, second person, and third person.

Unit 1 Assessment

1. Re-write the following sentence in first and second person singular: We are eating.
2. Re-write the following sentence in third person singular and first person plural: I have a book.
3. Re-write the following sentence in second and third person plural: She is humble.

Unit 2: Subject-Verb Agreement

Introduction

A sentence consists of a subject, verb and an object. A good sentence consists of a subject that agrees with the verb. The purpose of this unit is to give participants some practice in constructing correct sentences in which the subject agrees with the verb.

Background information

On the MTTA pupil assessment survey conducted in February 2005, some Standard 3 pupils were able to write between one and three English words only, and many pupils were not able to write any English words at all. The MTTA is committed to helping teachers help pupils significantly improve these scores. These workshop units have been developed to give teachers and pupils, especially at the lower primary levels, opportunities to improve their skills in reading and writing.

One way of teaching writing is to ask children to write a sentence, a paragraph or a story modelled after another sentence, paragraph or story that they have read. The children do not copy the passage; rather, they must first understand the meaning of the passage and then write something similar using their own words. In certain activities in this section the trainer will take the role of the teacher and participants will take the roles of pupils. The “pupils” will be asked to practise subject – verb agreement and to create some of their own sentences.

Objectives:

By the end of this unit, participants should be able to:

- identify subjects and verbs from given sentences and passages
- construct sentences to show subject-verb agreement
- apply rules of grammar when constructing sentences using nouns and plural subjects.

Suggested resources:

- Chart paper
- Teachers’ Guide
- Pupil Books
- Markers
- Strips of paper / sentence card

Suggested method:

- Pair work
- Group work

Suggested time: (1 hour)

Activity 1 (20 minutes)

1. Let participants read the passage (adapted from *Activities with English for Malawi, Pupils Book 3*, p. 24) and ask them to re-write it using the second person singular:

My name is Gama. I want some shoes. My feet get cold when I walk to school. And sometimes I cut them on stones. My mother is going to Zomba next week. She intends to buy the shoes there.

2. Ask the participants to exchange their work and discuss differences, if there are any.
3. Ask participants to re-write the passage using the *third person singular*. Ask the participants to exchange their work and discuss differences, if there are any.
4. Ask participants to re-write the passage the third time using *first person plural*. Thereafter, let them Begin the passage as follows:

My name is Gama. This is my sister. Her name is Brenda.....

After they have finished, ask the participants to exchange their work and discuss differences, if there are any.

5. Ask participants to re-write the story one more time using the *third person plural*. Ask the participants to exchange their work and discuss differences, if there are any.

Activity 2 (25 minutes)

1. With a partner, discuss the questions below:

What is your name?
What do you want?
Why do you want it?
Who is going to buy it for you?

2. Ask participants to write a paragraph answering the same questions. Participants may expand the paragraph, if they choose. For example, tell where the person is going to buy the item, when they will buy it, describe the item in greater detail, etc.
3. Next, let participants read the paragraph to the other people in their group, e.g., "I want a ...". After each person reads his/her paragraph, another person in the group will re-tell his/her story in the third person singular, e.g., "She wants a ...". Each person reads his or her paragraph, and each person in the group has a chance to re-tell the other person's story.

Activity 3 (10 minutes)

1. Take more practice with subject-verb agreement. Let participants, in groups, select the correct verb-form from the brackets in the following sentences:
 - a. Our offices (stays, stay) open until 5:00pm.
 - b. The witnesses (testifies, testify) tomorrow.
 - c. Two ships (is, are) missing.
 - d. The cause of most diseases (is, are) known.

2. Let participants, in pairs, identify the subject and verb in each of the following sentences and state if the subject and verb are plural or singular.
 - a. The application and the cheque are in the mail.
 - b. Men, women and children have a responsibility to the nation.
 - c. Every man, woman and child has constitutional rights.
 - d. Neither the desk nor the chair is what we ordered.
 - e. Neither robots nor computers replace humans.

Now write three additional sentences of your own.

Summary

A verb must agree in number and person with its subject. A singular subject takes a singular verb. A plural subject takes a plural verb. Attention should be paid when using a compound subject, collective nouns, indefinite pronouns, and when beginning a sentence with there.

Unit 2 Assessment

Choose the appropriate verb form from the brackets:

1. Chimwemwe (want, wants) some shoes from the store.
2. Gama and Brenda (has, have) a lot of fun swimming at the lake.
3. (Are, is) you going to the meeting?
4. I (are, am) writing a letter to my father.

Unit: 3 Comprehension

Introduction

Generating meanings out of comprehension passages sometimes poses problems to teachers. The aim of this unit is to provide teachers with knowledge and skills on how they can best use a comprehension passage to help learners understand the messages contained in a comprehension passage.

Background Information

There are many ways of using a comprehension passage for teaching and learning purposes. Teachers can help pupils derive the meaning of a comprehension passage by discussing the title of the passage, before reading the actual passage. Another way to understand a comprehension passage is to discuss questions based on the passage. Discussion of vocabulary and other grammatical structures can also help. The use of two or more of these methods provides a better understanding of a comprehension passage than the use of one method.

Objectives

By the end of the unit, participants will be able to:

- Provide meanings of sentences/words as used in a given passage
- State meanings of words and sentences in passages.
- Write the main points of each paragraph in note form.

Suggested resources

- Pieces of paper
- Pupils' book for Standard 7

Suggested methods

- Question and answer
- Group work
- Discussion

Suggested time: (1 hour)

Activity 1 (30 minutes)

1. Write the title on the board and ask participants to discuss the question, "Based on the title, what do you think the passage will be about?" After they discuss the title, then distribute the paragraph.

2. Let participants read the paragraph silently and mark any words they do not understand. Ask participants to suggest ways they can follow to help pupils understand the meanings of those words they found difficult to understand. Ask them to quickly read the passage and suggest a different title for it.

Reading Passage

School Announcements

It was still very early in the morning at Chingu School. Many pupils had already gathered in front of the staff room ready for the morning assembly. Then the head teacher, Mr Kalipa, led a group of other teachers onto the platform. All the pupils stood up and greeted their teachers. The head girl led the school in prayers. At the end everyone took his or her seat.

Mr. Kalipa stood up. He looked very serious. He did not smile at the pupils as he always did during school assemblies. His eyes shot at the pupils. Then he opened his mouth and began to speak.

"I want you to listen very carefully. I have received reports from your teachers that some of you ran away from classes especially after the second break. I would like this practice to stop immediately. Any pupil who runs away from class will be punished when he or she comes back."

A thunder of deep voices rolled through the gathering. This forced Mr Kalipa to stop talking for a while until all the pupils were quiet again.

“Secondly”, he started speaking again, “I have been told that some of you are smoking while at school.” At this point all eyes turned to a group of boys who were standing at the back of the assembly. These were the ones who were smoking at Chingu School.

“Smoking is not good for your health,” Mr Kalipa said. “It spoils your teeth and lungs. Therefore, from today onwards, no pupil will be allowed to smoke in this school.”

“Thirdly, I want cleanliness in this school. Do not throw rubbish anywhere while you are here. Use the rubbish bins which are outside every classroom.”

“Finally, on Friday this week, we will have visitors from Chimolo District Hospital. They will be here at 9 a.m. They will talk about the dangers of diseases in our society. Tell your parents to come to school on this day. Thank you.”

(Adapted from “**Activities with English Book 7**, page 135 – 136).

Activity 2 (8 minutes)

1. In pairs, ask participants to identify, from the passage, the following punctuation marks: commas, full stops, open and close inverted commas.
2. Let them explain how the punctuation marks have been used.

Activity 3 (12 minutes)

Ask participants to answer in their notebooks the following questions:

1. “Prayers were always led by the head girl at Chingu School.” Is this true?
2. When Mr. Kalipa talked about smoking, why did many pupils look at the group of the boys at the back?
3. What statement shows that the head teacher did not catch any of the smokers red-handed?
4. What does the statement, “a thunder of deep voices rolled through the gathering” suggest in this passage?
5. What suggests that Mr. Kalipa was a strict disciplinarian?
6. Which of the following statements is not true in the passage?
 - a. Cleanliness was a priority at this school.
 - b. The pupils were free to smoke at home.
 - c. Class abscondment was not allowed.
 - d. Only parents were invited to the meeting by District Health Officials.

Summary

In this unit, you have learned that no word or sentence in a passage is too difficult to understand. You can guess the meanings of words by looking at the way the words or sentences are used in the context. You have learned also that every paragraph contains a main message. Passages can be clearly understood if punctuated properly. A passage without punctuation marks cannot be understood. Punctuation marks are therefore important in every passage. When pupils are not able to understand a long passage the teacher can help them by asking a few questions at sentence level, paragraph or a few paragraphs.

Unit 3 Assessment (10 minutes)

Read the passage in Activity 1 of this unit, and answer questions 1, 2 and 3 below.

1. Give the meanings of the following words and/or phrases:
 - a) Assembly (*paragraph 1*)
 - b) Shot (*paragraph 2*)
 - c) Received reports (*paragraph 3*)
 - d) Thunder of voices (*paragraph 4*)
 - e) All eyes turned to (*paragraph 5*)
2. Explain the difference between sentences (a) and (b) below:
 - a) “Smoking is good for your health,” Mr. Kalipa, the head teacher said.
 - b) “Smoking is not good for your health, Mr. Kalipa,” the head teacher said.
3. State the main points in the head teacher’s speech.

Unit 4: Punctuation

Introduction

Many people have difficulties punctuating sentences properly when they write. It is important for teachers to know and use the various punctuation marks in order for them to teach children effectively. When speaking, one pauses naturally or changes the voice slightly between phrases or sentences. These pauses and changes help listeners to make sense of what one is saying. Without doing that, listeners would find it difficult to understand what is being said. In written communication, punctuation marks divide words into groups so that readers can see and understand words that belong together. Without that, written communication becomes a confusing string of words.

Background Information

Punctuation marks are essential in any communication because of the roles they play. For instance, full-stops (.) enable the reader to pause and take breath apart from showing the end of a sentence; commas (,) are essential when listing items; question marks (?) indicate that one demands an answer, open and close inverted commas (“ ”) help in denoting or showing words actually spoken among other uses.

Semi-colons (;) can be used instead of full stops to separate two statements that are closely related to each another. A capital letter is not required after a semi-colon. Sometimes individual items in a list consist of a group of words.

For example:

The Government's policy consists of the following: the lowering of direct taxes; the raising of VAT; and the granting of social benefits to those in need.

A colon is stronger than a semi-colon or a comma, but weaker than a full stop. It is used to introduce lists (not separating items in a list like commas or semi-colons).

For example:

Our remaining opponents for the season are teams like: Silver Strikers, Red Lions and Blue Eagles.

Objectives

By the end of the unit, participants should be able to:

- mention types of punctuation marks.
- state the functions of punctuation marks.
- punctuate words, sentences and paragraphs

Suggested Resources

- pieces of paper
- chart paper

Suggested Methods

- Pair work
- Group work
- Demonstration
- Question and answer

Suggested Time: 2 hours

Activity 1

1. In pairs, let participants look at sentences from the passage in Unit 3. This time, ask them to identify the punctuation marks used and state their functions.

2. Afterward, have participants look at the sentences below. Once again, ask them to identify the punctuation marks used and state their functions.

- a. Do you support experiments on animals?
- b. Stop where you are!
- c. What an intelligent answer!
- d. He bought mangoes, tomatoes, guavas and peaches.
- e. “Come here please,” he shouted.

3. Let participants discuss the answers to the questions above.

Activity 2

1. Ask participants, in pairs, to punctuate the following sentences:

1. I dont want to read now
2. I like reading she likes dancing
3. Why do you like mangoes
4. What did you say that made him jump
5. What a dreadful surprise that was
6. Don't do that said Harry.

2. Discuss the participants' answers in a plenary.

Activity 3

1. Let participants, in groups, discuss what the following sentences mean:

- a) Gladys, my aunt has died.
- b) Gladys, my aunt, has died.

2. Let them report the result of the discussions in plenary.

Activity 4

Ask participants to read the following passage and insert capital letters, full stops, question marks, commas and or exclamation marks where they think they are needed.

When some substances are heated they burn for example wood paper paraffin and petrol burn when heated other substances will change their state of matter e.g. solid candle wax changes into liquid candle wax when heated liquid candle wax will change into gas on further heating when a solid changes into a liquid we say it is melting when a liquid is changing into a gas we say it is evaporating

Summary

We have noted that punctuation marks play a very important role in communication. A comma marks a short pause in the flow of meaning. Its omission can cause confusion and poor communication. A full-stop pause is longer than that of the comma. Semi-colon is weaker than a colon. A question mark indicates that a sentence is in the form of a question. An exclamation mark shows that someone is expressing a feeling e.g. anger, excitement, surprise, etc.

Unit 4 Assessment

1. Mention some uses of a full stop and of a comma.
2. How is a semi-colon different from a colon?
3. Punctuate the following sentences:
 - a. I am afraid that the child will be hurt said John
 - b. Mary asked how will you know when it is time to leave
 - c. What a terrible storm we had last night
 - d. Now children said the mother be very careful when you are crossing the road

Unit 5: Reading and Composition

Introduction

Another way of teaching pupils to map out key ideas from something they have read or something they want or need to write is to use a “Concept Map.” A concept map is a way of organizing ideas in which you ask pupils to write down words or phrases that they will then develop into sentences, paragraphs, or stories. These concept maps may be based on more modeled after a passage, paragraph or story that they have read, or pupils may create them completely from their own ideas.

Background Information

Composition

A “concept map” is a way of either reviewing what one has read or of preparing to write. It allows us to write down words or phrases we know and may want to use in writing a paragraph, a story, a letter, a report, or just about anything.

In a concept map, the central character or idea is written in the center of a wheel in a circle. Lines radiating out from the circle like spokes of a wheel lead to related words, phrases, or ideas. Other sub-topics related to those ideas can be written around the end of the spoke, attached to other boxes or circles. (See diagrams in this section.)

Objectives

By the end of this unit, participants should be able to:

- understand what a concept map is and how it can be used
- know how to develop a concept map based on a story
- be able to develop their own concept map
- be able to write a story based on a concept map

Suggested resources

- Reading passages
- Pieces of paper

Suggested Methods

- Brainstorming
- Question and answer
- Pair work
- Group work
- Explanation

Suggested Time (90 minutes)

Reading Comprehension

Activity 1 (15 minutes)

1. Discuss the words below from the story with participants in advance of reading the story. Ask them to give a definition of the word, to use the word in a sentence, or both.

majority	rumored	bewitched
volunteered	rough	doubted

Read the passage below and answer the questions that follow.

In the village of Tswatswa something very sad happened. A young girl called Lisie lost both her parents while she was young. Her father, Mr Sirira, was the first to die. He died of malaria. Her mother died a year later and it was rumoured that she had been bewitched. Lisie had no parents and no home.

Mrs Lome, Lisie’s aunt, volunteered to take care of her. Mr and Mrs Lome had no children of their own. Many people said they were the right people to keep Lisie for she would just be like their daughter. On the other hand, some people doubted how good Mrs Lome would be to Lisie. She was known to be very rough to both relatives and friends.

After a while Lisie died. The cause of her death was not clearly known. Some people said it was fever. Others kept their silence, but the majority said that she died of starvation.

1. What title would you give to this story?
2. What was the name of the village? What was the name of the girl, her parents, and her aunt and uncle?
3. Did the village people think it would be good for Lisie to live with her aunt and uncle? Why or why not?
4. Do you think it was good for Lisie to live with her aunt and uncle? Why or why not?

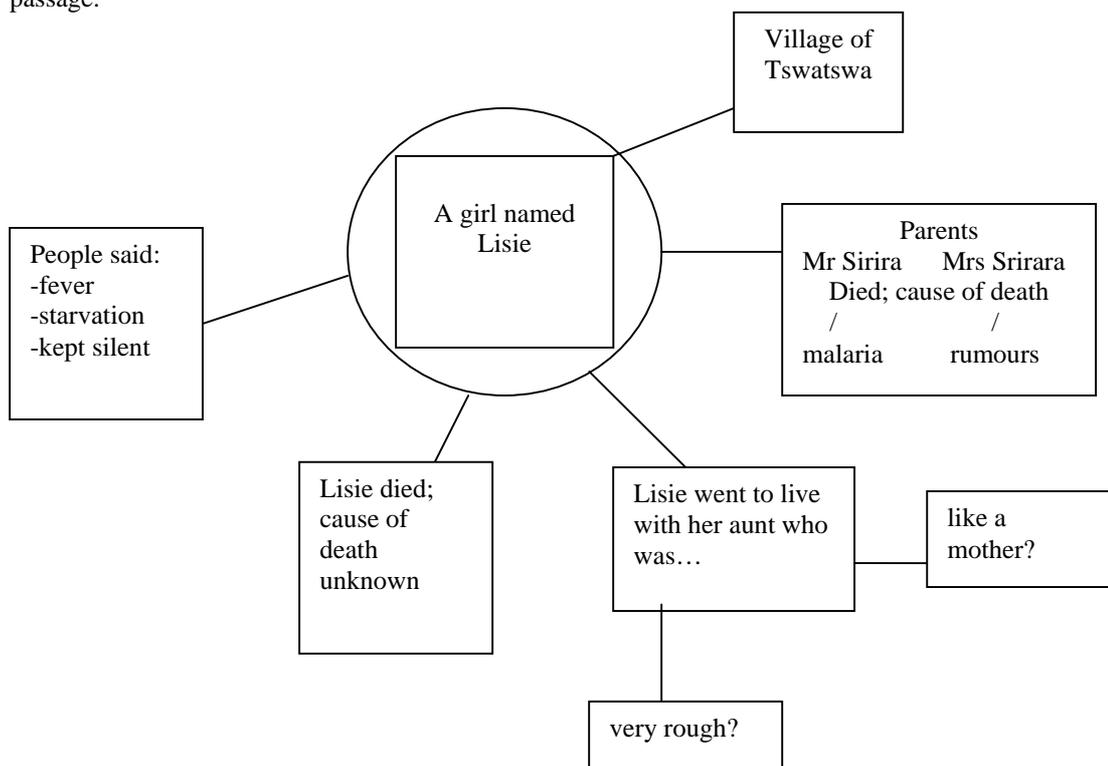
Composition: A Concept Map (30 minutes)

Activity 2

A concept map is a representation or a map of ideas, phrases, words, etc. it can be used either to map out to the key ideas of something you have read or of something that you wish to write. The first concept map below is based on the story of Lisie above. (Tell participants that concept maps can vary. What is important is to capture all the key information.)

Concept Map Based on Reading a Passage

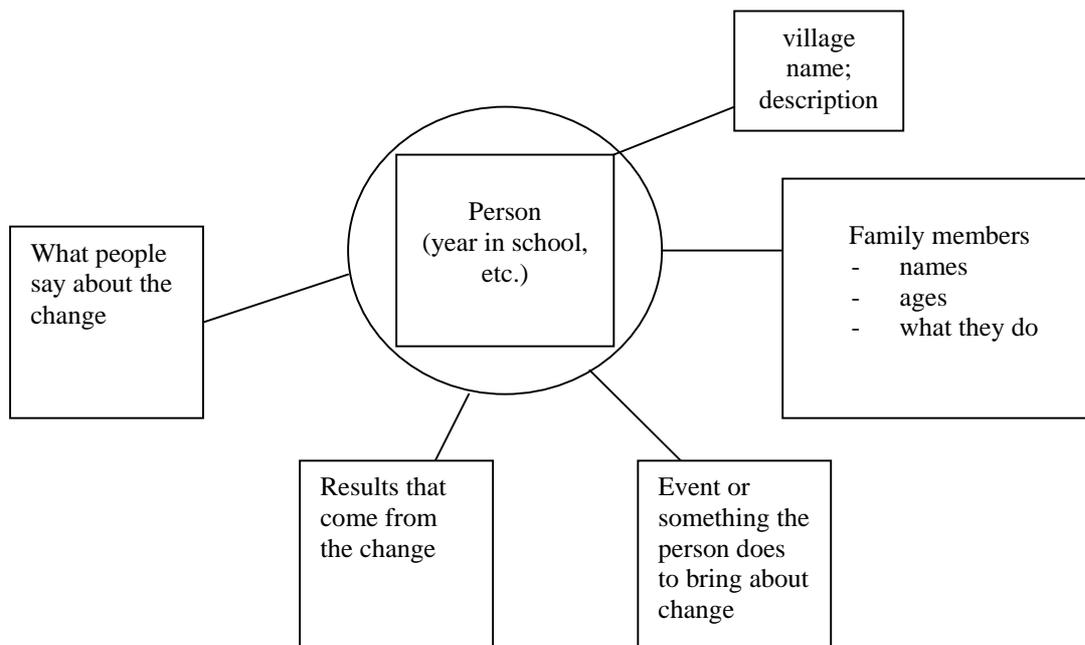
1. Draw a circle on the board for participants. Ask, "Who or what is the story about?" Someone answers, "Lisie" or "A girl named Lisie." Write her name in the center of the circle.
2. Tell them that the key features and ideas of the story now should be written at the end of lines that radiate out from the circle, like spokes of a wheel.
 - a. First, where is Lisie from? (Tswatswa.) Write this answer at the end of the first spoke.
 - b. Who were her parents? Write this answer in a box or a circle at the end of another spoke.
 - c. What do we know about her parents? (Their names, the cause of death of each parent.) This information can be clustered around the circle with the word (or written at the end of new spokes radiating out from the circle with the word "parents") that you wrote in "c" above.
 - d. Next, after her parents died, what happened to Lisie? (She went to live with her aunt.)
 - e. What do we know about her aunt? (She was either like a mother or very rough.) These pieces of information can be written at the end of spokes that radiate out from the box with "aunt" written in it.)
 - f. Next, what happened to Lisie? (She died.) Write this answer at the end of another spoke.
 - g. What other information do we know from the story? (What people said about how she died.) Write this information at the end of another spoke. ("fever," "starvation," "kept silent").
3. Review all the information in the concept map with participants. Ask someone to tell the story based on the information that you have mapped out.
4. Tell participants to rewrite the story based on the information on the board, without looking at the passage.



Activity 3 (45 minutes)

Concept Map Developed for Writing a Passage

1. Draw a circle on the board for participants. Ask, "Who will your story be about?" Write this information in the center of the circle.
2. Participants should now brainstorm ideas for the key features and ideas of the story or the passage they will write. The ideas should be written at the end of lines that radiate out from the circle like spokes of a wheel.
 - a. First, where does the action take place? Write this answer at the end of the first spoke. (Participants may describe this place by writing its characteristics on lines that radiate out from the name of the place.)
 - b. Tell about the person's family. Write this information in a box or a circle at the end of another spoke.
 - c. What do we know about her family? (Their names, what they do, other information.) This information can be clustered around the circle with the word (or written at the end of new spokes radiating out from the circle).
 - d. What event or action first takes place in your story? Write to that answer at the end of another spoke.
 - e. What change does that bring about? Write this information at the end of another spoke. What results from that change?
 - f. What do people say about the change or the outcomes?
3. Review the information in your concept map with your group. Tell the story to your partner based on the information that you have mapped out. If the participant wants to add anything while s/he is telling the story to her/his partner, s/he may do so.
4. Tell participants to tell the story they have developed in their concept map. They should begin by writing the first sentence based on the information in the circle in the center. Then they should proceed to write one or two sentences about the information at the end of the first spoke, the second spoke, etc. The sentences can then be made into paragraphs.
5. Put your paper on the wall. Someone else from your group should tell the story. Your homework for tomorrow is to write the story.



Unit 5 Assessment

The unit assessment is the story that is written based on the concept map above.

SECTION 2: MATHEMATICS

Unit 1: Approximations

Introduction

In real life situations we are constantly involved in measuring various quantities. For instance, when we talk about how much time we last shared in a friend's company we can say, "I was with him/her for about two hours yesterday." (Note: In this case we are interested in reporting our time using "hour" as the quantity or unit of measurement.) In this statement it is possible that we were together for a little over an hour or for slightly less than two hours. The phrase "about one hour" is a way of approximating or rounding off the time shared together to the nearest hour. In a similar way we make approximations in Mathematics, and the type of approximation depends on the unit of measurement in which we are interested.

Background information

In approximations, what we do depends on the unit of measurement in which we are interested. In mathematics usually you will be given this unit. For instance, you could be asked to write a number to the nearest 10 or to one decimal place; in which case the numbers 10 and 0.1 become your unit of measurement.

After identifying the unit of measurement, for the approximation you will take half that unit of measurement. So next you look at the number given and decide which numbers to retain and on which number(s) you will perform the approximation. For the approximation, any number less than half the unit of measurement is ***rounded down*** while those that are more than half the unit of measurement are ***rounded up***.

Note: The bold words in italics -- rounded down and rounded up -- are key to this topic and need to be explained well.

For example, 27, is nearer in value to 30 than 24. Therefore $27 \approx 30$ to the nearest 10 and $24 \approx 20$ to the nearest 10

Approximations also involve decimals, for example:

8.5676 - 8.568 to three decimal places [nearest thousandth]

8.5678 - 8.57 to two decimal places [nearest hundredth]

8.5678 - 8.6 to one decimal place [nearest tenth]

Approximations involving whole numbers and decimals are sometimes done using significant figures; for example:

49.51 - 50 correct to 2 significant figures.

0.00137 - 0.0014 correct to 2 significant figures.

2457 - 2460 correct to 3 significant figures.

In the example shown by bullet 1, 0 is significant because it maintains the value of five tens. In example shown by bullet 2, the two zeros after the decimal point are not significant because they only help us to see what our unit is (i.e., 0.0014 means "14 out of 1000;" and since the "14" is of two figures we say there are only two significant figures). In the example shown by bullet 3, the zero at the end is not significant.

Objectives:

By the end of the unit, participants will should be able to:

- approximate numbers to the nearest ten, hundredth, thousandth, etc.
- reduce given numbers to given number of decimal places
- round off given numbers to given number of significant figures
- develop ways of guiding pupils to make these approximations

Suggested Resources

- Place value charts
- Place value box
- Abacus
- Spike abacus

Suggested Methods

- Group Work
- Demonstration
- Discussion
- Problem solving

Suggested total time: One hour

Activity 1 (30 minutes)

1. Ask participants to think of some practical situations where approximations are necessary, especially at the level of the pupils in the standard in which you teach. Ask for volunteers to give their responses.
2. Ask participants about the number line in questions a – c shown below.

1 2 3 4 5 6 7 8 9 10

- a. Which numbers are less than half of 10?
 - b. Which number is half of 10?
 - c. Which numbers are more than half of 10?
3. a. Write numbers 33, 66, 74, 88 to the nearest 10.
b. Write 470, 106, 170, to the nearest 100.
c. Write 1870, 4562, 7230, 3330 to the nearest 1000.

Activity 2 (30 minutes)

1. Let participants recognize the fact that when we write decimal numbers to any given number of decimal places, we are actually, rounding off the given number to the nearest tenth, hundredth, thousandth, etc .
2. Ask participants to round off the following numbers:
 - a. 3.2567 (to 3 decimal places)
 - b. 0.0256 (to 2 decimal places)
 - c. 5.001 (to 1 decimal place)
3. Let the participants discuss the meaning of significant figures (i.e., significant figures are digits which must be maintained in a number in order to maintain the value of the given number).

Activity 3 (30 minutes)

1. Write a number on the board e.g. 45.6 and ask participants to identify two digits that they would maintain in the number in order to maintain the value of the number. Using the two digits, let participants suggest an explanation for a significant figure.
2. Ask participants to express the following numbers to three significant figures.
 - a. 49.51
 - b. 00137
 - c. 2457
 - d. 5.0361
 - e. 4.9

Summary

Approximations involve whole numbers and decimals. Numbers below 5 can be rounded down to zero (0). Whole numbers and decimals can be corrected to the nearest number in value and given significant figures.

Unit 1 Assessment

Write the following numbers to the given approximation:

- a. 678 to the nearest ten
- b. 9.00675 to the nearest thousandth.
- c. 499 to one significant figure
- d. 70650 to two significant figures
- e. 5.6708 to 2 decimal places
- f. 0,0800 to one decimal place
- g. 9 0772 to three significant figures
- h. 43298 to the nearest hundred
- i. 038974 to two significant figures

Unit 2: Problem Solving

Introduction

Problem solving in mathematics involves going through a series of steps to obtain a solution to a problem. When problem solving is mentioned to many children and adults, they often think of word problems. However, word problems are not prerequisites to solving a problem. One essential characteristic of problem solving is that in most of the problems a formula may not easily be available to the person solving the problem and (s)he may need to use a number of techniques or strategies to figure out how to solve the problem. This unit therefore will look at some of the techniques used in problem solving. Some of the problems we shall be solving are word problems while others are not.

Background Information

Mathematics means more than just dealing with numbers as we commonly use them in our everyday life. Mathematics helps us to understand and explain our world. Mathematics for communication and as such it must exist in some form of language. Describe real life experiences. As such the language used must relate to the readers experiences in order to understand and solve the problems. Problem solving in Mathematics describes the process an individual goes through to reach a solution. It involves more than just applying an algorithm.

Characteristics of word problems

- Solutions to word problems are usually not immediately obvious. It often takes an inverse operation to solve them.
- Problems may contain more than one sentence calling for the ability to grasp a thought of the question as a whole.
- For some word problems the way they are said is the way they are solved. These are easy ones. e.g: Tom has 8 apples, Mary has 5. How many apples do they have altogether?
 $8 + 5 = 13$
- The difficult ones are that are said in one way but it takes an inverse operation to solve them, e.g. Tom and Mary have 15 apples together. Mary has 3 more apples than Tom. How many apples does each one have?
- Let a represent Tom's apples. Mary's apples would be $a + 3$ apples.

$$a + a + 3 = 15$$

$$2a + 3 = 15$$

$$2a + 3 - 3 = 15 - 3$$

$$2a = 12$$

$$\therefore a = 6$$

So Tom has 6 apples while Mary has 9

The process

In 1973 George Polya proposed a four-stage model for the process of problem solving. Polya's model, though suggested more than three decades ago, continues to be one of the useful ways to approach solving problems in which a formula cannot be applied. The stages involved in the process suggested by Polya are these:

1. Understanding of the problem: This means trying to understand the problem as well as what it is asking for. Read the problem, even if it is several times. Try to understand the problem. Some of the questions to ask yourself at this stage include: Can I state what is being asked in my own way? What information am I given? What information is not known? Can I list them down – both the knowns and unknowns? What do some of the terms in the question mean?

2. Devising a plan: This is the stage where you think of the technique to use. Some of the techniques are listed below. Questions to ask yourself in devising your plan could include: Have I seen a similar problem before? Can I solve this problem by looking at a similar problem? Do I know a related problem? If so, will the approach I previously used work for this problem?

3. Carrying out the plan: This is the stage where you implement your plan. The techniques discussed below may be applied at this stage.

4. Looking back : After solving the problem you should always check to be sure that your answer is realistic. In other words, always check how reasonable the answer is. One way to do this is to go back to consider the validity of the arguments you have used. Another way is to attempt to derive the solution differently to see whether you get the same result. Where you used some generalized patterns, it may be good to substitute your answer into the relation you generated to see whether it is reasonable

Note: If after Step 4 you notice your answer was not right feel free to go back to any of the stages. You do not always have to start again from the first stage, although that is recommended.

Some techniques used in problem solving (word problems)

In solving problems one or more of the following techniques may be used:

- Look for patterns
- Try all possibilities.
- Create tables/organize data into tables.
- Dramatization = acting what the problem describes
- Making a diagram e.g. draw a sketch to help visualize spatial relationships.
- Guess and check (trial and error)
- Writing mathematical sentences.
- Always check if the answer is reasonable.

Objectives

At the end of the unit, participants should be able to:

- describe the characteristics of word problems in Mathematics.
- use various techniques of problem solving in Mathematics.
- solve word problems in Mathematics accurately.

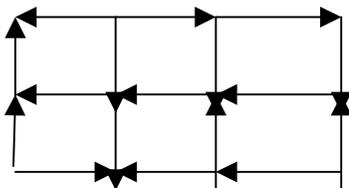
Suggested Resources

- Charts, problem cards, counters.
- Match sticks

Suggested Time: 1 hour

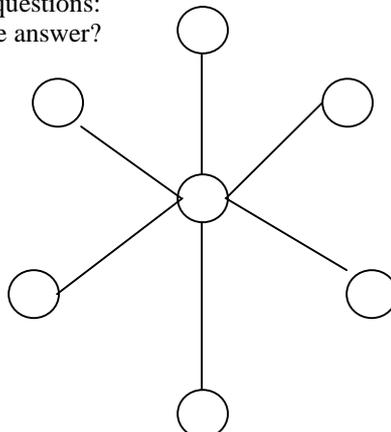
Activity 1 (15 minutes)

1. Divide participants into groups.
2. Distribute match sticks to each group
3. Use matchsticks to make this shape and answer the question that follows:



What is the minimum number of match sticks you would remove to remain with three squares of the same size?

4. Let participants place the numbers 1, 2, 3, 4, 5, 6 and 7 in the circles, one in each circle, so that the sum of three numbers in a straight line is always the same. Ask them to answer the following questions:
 - a. Is there more than one answer?



- b. Can you explain why only three different numbers can be placed in the middle circle?

5. Summarize as the groups report.

Activity 2

1. Organise participants into groups.
2. Give them a box of word problem cards to choose from.
3. Let each group choose 3 problems to solve.
 - a) What is the smallest number that gives a remainder of 3 when divided by 6 and when divided by 8?
 - b) A car goes 17 km on a litre of petrol. How many litres will be needed for a journey of 600 km?
 - c) An agent earns commission at rate of $7\frac{1}{2}\%$ from her sales. What were the goods worth if her commission amounted to K120.
 - d) The sum of two numbers is 26. One of them is 9. What is the other number?
 - e) A rectangle whose length is twice its width has a perimeter of 36 metres. Find its length and width.
 - f) One third of the children in a school come by bus or car, one-quarter cycle and the rest walk. What fraction of the children walk?
 - g) A lorry is carrying bags of maize whose total mass is 950 Kg. Each bag has a mass of 50 Kg. How many bags is the lorry carrying?
 - h) A circular pond with radius 6.3 m is surrounded by a rectangular lawn 30 m and 18 m. Find the area not covered by the lawn?
4. Let each group present their solution to the rest of the participants. They should explain the process followed to reach the solution.

Activity 3:

During plenary, let participants,

- a. study the problems presented in Activity 1
- b. identify the characteristics of the word problems in the activity
- c. discuss the process and techniques for problem solving in Mathematics.

Summary

Problem solving can be enjoyed by children if teachers understand and explain all the underlying concepts and the key words in the problems, It is often very gratifying when after several attempts a solution is finally reached.

Unit 2 Assessment

1. A car is travelling at a speed of 65km/h. How much time will it take to cover a distance of 260 km.
2. A class has 60 pupils. $\frac{1}{3}$ them are boys. How many girls are in the class?
3. When a certain number is halved and then 5 added, then the result is 10. Find the number.

Unit 3: Rate, Ratio and Proportion

Introduction

This unit seeks to draw the attention of participants to the definitions and the interrelationships between rate, ratio and proportion in real life situations. This unit explores a number of concepts related to rate, ratio and proportion. It also examines ways of using rate, ratio and proportion in solving our daily problems.

Background Information

Rate, ratio and proportion deal with relationships between one quantity and another. The relationships sometimes form a pattern, which help to solve problems involving these concepts. Rate, ratio and proportion can be expressed as fractions.

Rate: It is a many – to one correspondence or matching of two different quantities or sets. So quantities of different kinds may be connected in form of rate. The following are examples of rate:

- A man is paid K8.10 for hours. His rate of pay is 90t per hour.
- A cyclist travels 28Km in 2 hours. Her rate is 14 Km per hour. In this case the rate is called speed.
- A piece of metal has a volume of 20 cubic cm and a mass of 180 g. Its density is 9 g per cubic cm. The density of gases, liquid and solid is a rate giving mass per unit volume.
- A town of 32,000 people has an area of 40 sq km. The population density of the town is 800 people per square Km. Population density is a rate giving the average number of people per unit area.

Ratio: It is the relationship between quantities of the same kind. Ratio is often used when sharing things. Here are examples of ratio as a comparison between quantities of the same kind:

- A school has 200 boys and 300 girls. The ratio of boys to girls is 2:3. It is pupils in both cases.
- A father is 55 years old. His son is 11 years old. The ratio of the age of the father to that of the son is 5:1.
- Mary and Sam share 30 sweets in the ratio 3:2. It means for every 3 sweets that Mary gets Sam gets 2. Therefore Mary gets 18 sweets while Sam gets 12 sweets.

Proportion: It can be described as a mathematical sentence stating that two ratios are equal. For example:

$$\frac{1}{9} = \frac{2}{18} = \frac{3}{27} \text{ etc}$$

To understand this let's go back to rate:

A man earns K9 per week. It follows that in two weeks he will earn K18 and in 3 weeks, K27, etc. This can be expressed as 1 week is to K9 as 2 weeks is to K18. It can be expressed as ratio 1:9, 2:18. It can also be expressed as fraction $\frac{1}{9} = \frac{2}{18}$

It is this equation which is called **proportion**. In this case it is **direct proportion**. In reality it means if a man earns K9 in a week he will earn twice as much in two weeks, 3 times as much in 3 weeks etc. You can also see a one-to-one correspondence.

Another example: 10 men dig a hole in 6 days time. 2 men will take more time thus: $\frac{10}{2} \times 6 \text{ days} = 30 \text{ days}$

20 men will take less time. Thus $\frac{10}{20} \times 6 \text{ days} = 3 \text{ days}$

This can be expressed as 10 is to 6, as 2 is to 30. As ratio 10 : 6, 2 : 30. As fractions they become $\frac{10}{6}$ $\frac{2}{30}$.

Clearly these are not equivalent fractions

However we can notice something. When the numerator is reduced five times, the denominator is increased in the same proportion. Eg.

$\frac{20}{3}$, $\frac{10}{6}$ numerator decreased twice
denominator increased twice

$\frac{10}{6}$, $\frac{2}{30}$ numerator decreased five times
denominator increased five times

This can be expressed as 10 is to 6, as 2 is to 30. As ratio 10 : 6, 2 : 30. As fractions they become $\frac{10}{6}$ $\frac{2}{30}$. Clearly these are not equivalent fractions

However we can notice something. When the numerator is reduced five times, the denominator is increased in the same proportion. Eg.

$\frac{20}{3}$, $\frac{10}{6}$ numerator decreased twice
denominator increased twice

$\frac{10}{6}$, $\frac{2}{30}$ numerator decreased five times
denominator increased five times

This is called *inverse proportion*. In this example the number of days it takes to complete a piece of work *inversely* corresponds to the number of people involved. It means when one quantity increases, another decreases.

Proportions are mainly used to find one of the missing terms in one of the equal ratios eg: $\frac{2}{X} = \frac{10}{3}$

$$\frac{X}{4} = \frac{12}{8}$$

Direct proportion problems are best solved using the unitary method while inverse proportion problems are best solved using the ratio method.

Objectives

By the end of the unit, participants should be able to:

- define rate, ratio and proportion.
- show how rate, ratio and proportion are interrelated.
- express ratio of one quantity to another as fraction
- increase or decrease quantities in a given ratio
- solve problems involving rate, ratio and proportion.

Suggested Resources

- counters
- cards with word problems

Suggested Methods

- Pair work
- Group work
- Individual practice

Suggested time (3 hours)

Activity 1

1. Write sentences on the board and ask participants to explain their meanings, comment or other explanations
2. Give participants problems to solve in groups. (Determine number of groups)
 - a. If 10 ball-point pens cost K180.00, how much will one ball-point pen cost?
 - b. A car travels a distance of 160 Km in 2 hours. What is its speed?
 - c. A family has 60 litres of water, enough to last them for 4 days. How many litres does the family use per day?

- d. A business lady paid K18,000.00 for the 1000 Rand she used to buy goods from South Africa what was the exchange rate?
 - e. Chidzero town has a population of 6,000 people and an area of 20 sq km. What is its population density?
3. In plenary let participants share ideas on how they went about finding the solutions.
 4. Explain that in each example the participants were expressing a many-to-one correspondence. They were finding the number of things or quantities represented by a unit or one thing. Sometimes this is called *unitary method*. In all the examples the answers got are *rate*. Talk about rate using notes in the background information.

Activity 2

1. With participants, come up with sub-sets of the whole group attending this session, e.g.
 - a. Female and male participants
 - b. Those who are sciences, mathematics or languages.
 - c. Those whose mother tongue is Chichewa, Tumbuka or other.
2. Ask participants to discuss the relationship as ratio, for example, 3 women and 12 men, ratio is 3 to 12 or 1 to 4 which means for every 1 woman there are 4 men.
3. Give participants the following problems in their groups.
4. In groups, let participants do the following sums:-
 - a. Express K10 : K15 to its simplest ratio
 - b. Express 1 hour 15 minutes to its simplest ratio
 - c. Divide 350 mangoes between Funso and Yankho in the ratio 2 : 3
5. In the plenary ask participants present their solutions and let them explain what ratio is and how ratios are expressed.

Activity 3

1. Use rate and ratio to explain what proportion is showing interrelationships. (see background information for details).
1. In groups let participants work out the following problems:-
 - a. A cook is paid K900 for 10 days of work. Find his/her pay for (i) 3 days (ii) 24 days
 - b. 7 people dig a piece of ground in 10 days. How long would 5 people take to dig the same piece of ground? (use ratio method)
 - c. 24 soldiers drink 60 litres of milk. How many litres would 30 soldiers drink? (use unitary method)
 - d. A mother shared K7700 to her three children Chipiliro, Mwisonetha and Eranive so that Chipiliro gets twice as much as Mwisonetha and Mwisonetha gets twice as much as Eranive. How much did each one get.
 - e. John, Mary and Zione shared K68,000 so that for every K100 that Zione gets, Mary gets K200 and for every K300 that Mary gets John get K400.
 - f. Share 440 mangoes to three pupil, Charles, Jane and Chrissie so that Charles gets half as much as Jane and Chrissie gets half as much again as Charles. How much did each one get?

Summary

Rate, ratio and proportion are so interwoven that it is often difficult to talk about proportion without talking about rate and ratio. These basic concepts about rate, ratio and proportion help in solving other mathematical problems. Their application in a wide spectrum in Mathematics cannot be over-emphasized.

Unit 4: Angles

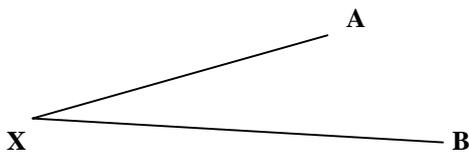
Introduction

Most of the objects and features in our environment depict angles. For example, angles can be identified in buildings, body parts, furniture and magazines. Virtually every aspect of our environment depicts angles. This unit explores ways of naming and measuring angles. It also extends to the nature of angles of a triangle.

Background Information

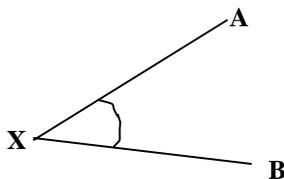
The term angle refers to the amount of turn. Angles are measured in degrees. A complete turn (revolution) is 360° . When two lines meet at a point they form an angle. This indicates the amount of turn that one line must move.

We can use letters to name angles. For example, if we have lines XA and XB that meet at a point X the angle formed is either AXB or BXA) e.g.:



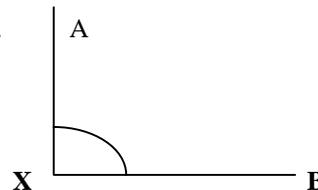
This shows that the letter in the middle of the set represents the position where the angle is. Lines XA and XB are the arms of the angles. We can also write the angles as AXB. When we keep turning one line while the other is fixed we can make different angles. For example:

Fig. 1.



The angle is less than 90° .
It is called an acute angle.

Fig. 2.



This angle is a quarter of a turn 90° . It is called a right angle. An angle greater than 90° but less than 180° is called obtuse angle as shown in Fig. 3 below.

Fig. 3.

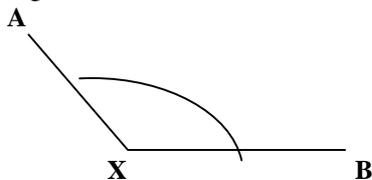
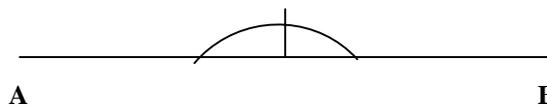


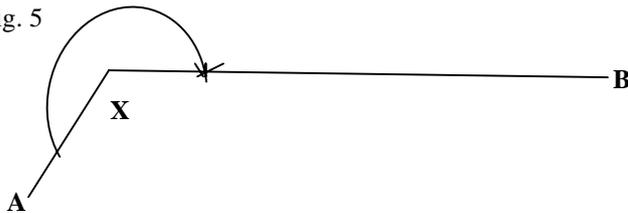
Fig. 4



A straight angle is 180° e.g. A straight

An angle greater than 180° is called a reflex angle as shown in Fig. 5 below.

Fig. 5



The sum of angles of a triangle is 180°

Objectives

By the end of this unit participants should be able to:

- Name angles
- Identify types of angles
- Show that angles of a triangle add up to 180°

Suggested resources

- Clock face
- Chart paper
- Pieces of thread
- Pair of scissors

Suggested methods

- Pair work
- Group work
- Individual practice

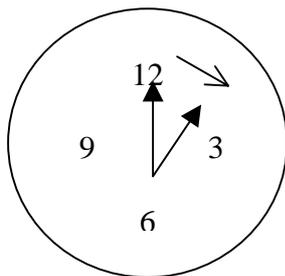
Suggested time (1 hour)

Activity 1

1. In pairs, ask participants to identify objects (letters, numerals, human bodies) that show two straight surfaces/faces meeting at a point to form a corner.
2. Let them draw a diagram to represent a corner of one of the objects identified.
3. Ask participants to state what is formed at the point where two lines meet.
4. Use two pieces of grass to form angles
5. Invite a volunteer to the front. Ask him/her to turn North, East, South, etc. The Facilitator should demonstrate how to turn clockwise and make angles.

Activity 2

1. Use a clock face to illustrate an angle using hour and minute hands



2. Let participants practise making turns using clock faces. Explain that the turns are measured in degrees e.g. – complete turn makes 360°

$\frac{1}{2}$ turn makes 180°

$\frac{1}{4}$ turn makes 90°

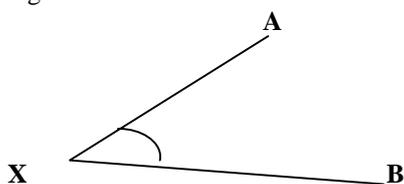
3. Ask participants to make turns your command as follows:

- Make a complete turn
- Make a half turn
- Make a quarter turn

Activity 3

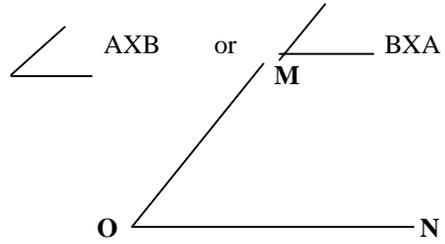
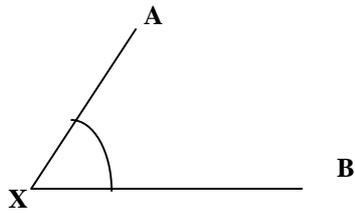
1. Let participants walk from point A going northwards to point X and ask them to turn going eastwards to point B.
2. Ask them to name the points of movement.
3. Let them draw an angle and label the lines.

e.g.



4. Ask participants to name the point where the angle has been formed.

5. Let them write down angles using symbols e.g. e.g.



6. Ask participants to name the following angles:

Fig. 1

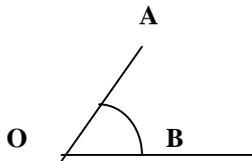


Fig. 2

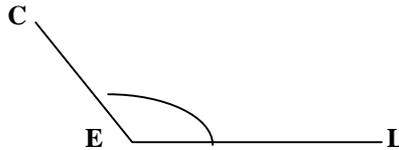
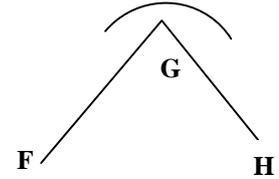


Fig. 3



Activity 4

1. In groups, let one member demonstrate how to make the following angles and then draw the angle:
 - i. Right angle - $\frac{1}{4}$ turn
 - ii. Straight angle - $\frac{1}{2}$ turn
 - iii. Complete turn

2. Let them also demonstrate and draw the following angles:
 - i. Acute angle - less than $\frac{1}{4}$ turn
 - ii. Obtuse angle - more than $\frac{1}{4}$ turn but less than straight angle
 - iii. Reflex angle - more than straight angle but less than a complete turn

3. Let each group make a presentation. Ask the presenters to give reasons for their answers.

4. Ask participants to identify and name the types of the following angles:

Fig. 1

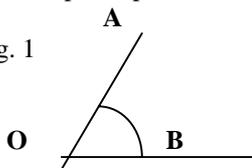


Fig. 3

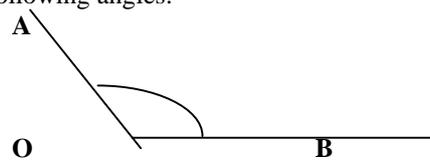


Fig. 2

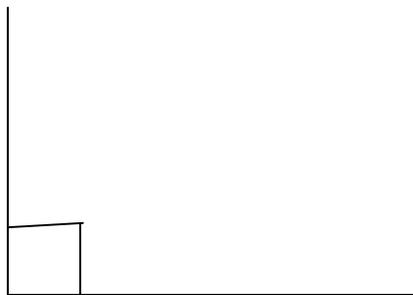


Fig. 4

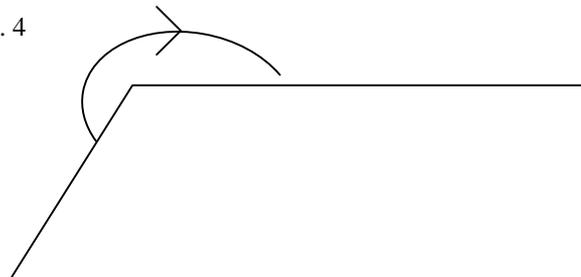
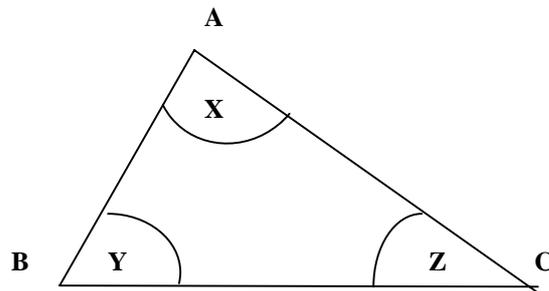


Fig. 5

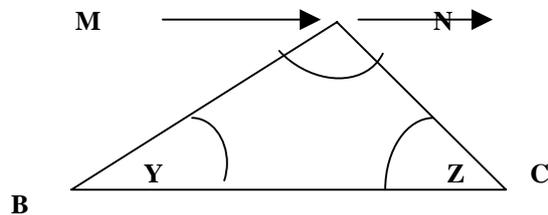


Activity 5

1. In groups, ask participants to draw a triangle and name the sides as shown below.

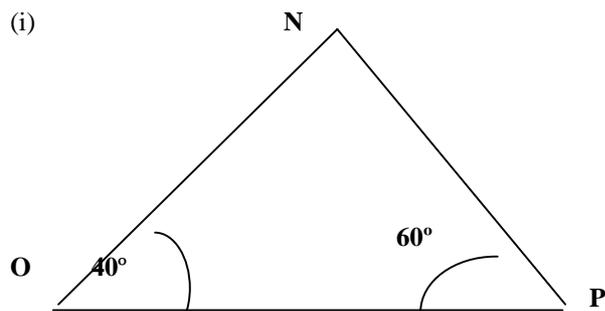


1. Let them mark the angles and draw a line at one of the corners that should be parallel to the line on the opposite side. e.g.

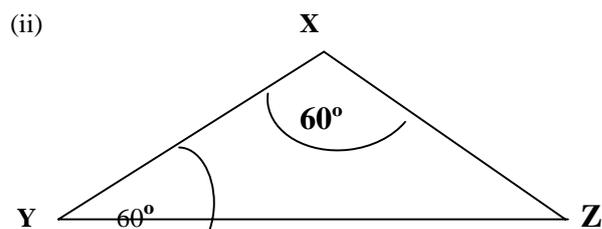


2. Using a pair of scissors, ask participants to separate the angles and fit them together at a point where the parallel line touches the triangle let them make the observations.
3. Ask participants to report their findings. Comment on their findings and conclude that angle sum of a triangle equals 180° .
4. Ask participants to do the following exercises:

Angles of a triangle:



Find angle ONP



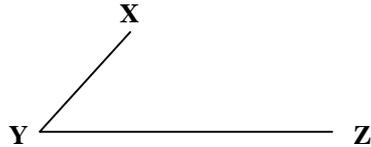
Find angle YZX

Summary

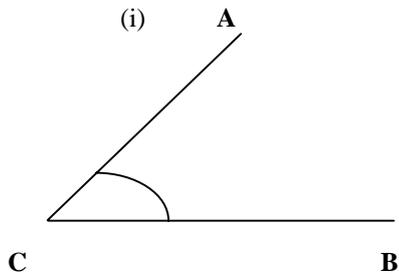
Angles are common features of our environment. They can be found in our classrooms, homes, body parts and local environment. Teachers need to know how angles are measured and named. For instance, angles are measured in degrees and are named following order of letters. There are several types of angles namely acute, obtuse, reflex and straight angles. Angle sum of a triangle is 180° .

Unit 4 Assessment

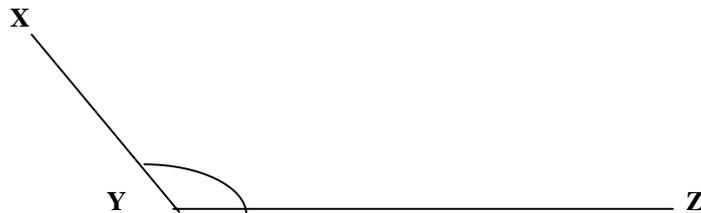
1. Name the angles shown below:



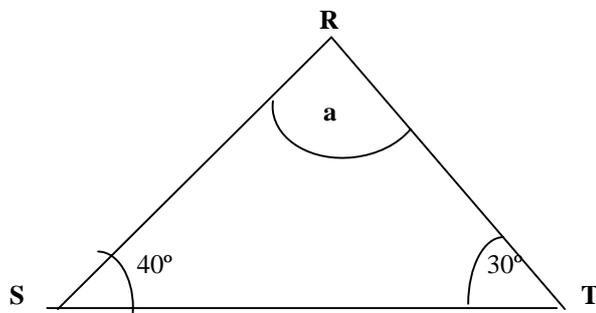
2. What type of angles are shown by the following figures?



- (ii)



3. Find angle SRT from the diagram below:



Unit 5: Parallel Lines

Introduction

Most of the objects/items that we use in everyday life depict parallel line but often we do not realize this. Have you ever thought of ladders, chairs and doors as having some characteristics that demonstrate parallel lines? This unit explores basic properties of parallel lines. It also examines the relationship that exists between parallel lines and angles.

Background information

Two lines that do not intersect within a plane are parallel. When parallel lines are crossed by a transversal they form angles. One common feature of parallel lines is that they don't meet even if we continue extending them.

Objectives

By the end of this unit, participants should be able to:

- Identify parallel lines
- Identify properties of parallel lines
- Name angles that are formed when parallel lines are intersected by a transversal
- Find the values of given angles using properties of parallel lines

Suggested resources

- Card board paper
- Books
- Chairs
- Tables

Suggested methods

- Pair work
- Group work
- Individual practice

Suggested time: 2 hours

Activity 1

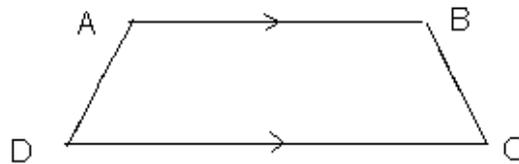


Figure 1

Figure 1 is a trapezium. Line AB is parallel to line DC.

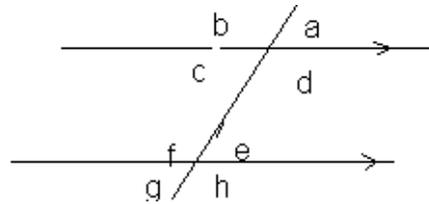
1. Let participants copy the figure and extend lines AB and DC. Then ask them to record their observations.
2. Ask participants to extend lines DA and CB and record their observation.
2. Ask participants to explain why the two sets of opposite lines are behaving that way.
3. Let them extend lines of each set to see if they are likely to meet at some point. Let them record their experiences.
4. Ask participants to report their experiences with the two sets of lines.

Activity 2

1. Using parallel lines, let participants in pairs identify characteristics of the two lines that are failing to meet at a point when extended e.g.
 - Each point of the one line is equidistant from the point on the other line
 - They are failing to meet
 - Discuss their experiences and state what parallel lines are (e.g., lines in a plane that do not intersect).

2. In groups, ask participants to identify objects in their immediate environment that depict parallel lines. Supply them with books, cardboards, magazines etc. for more examples. Let them report their findings to the other groups after the exercise.

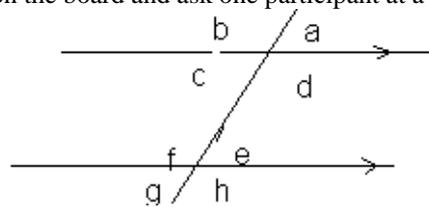
3. In groups, let participants draw parallel lines and then intersect them with a transversal. Let them label all the angles that are made by this process e.g.



4. Using pair of scissors, let them separate the angles and compare their size by putting one to top of the other.

5. Ask each group to report their findings. Make observations and comment.

6. Draw parallel lines on the board and ask one participant at a time to identify angles that are equal, e.g.



7. Let participants give reasons for their equality.

$c = e$ alt. Angles – on the same side of the lines

$d = f$ alt. Angles – on the same side of the lines

$a = e$ corresponding angles

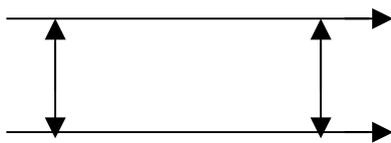
$d = h$ corresponding angles

$b = f$ corresponding angles

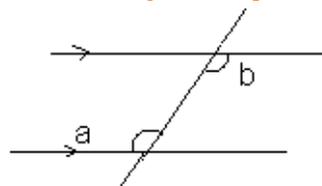
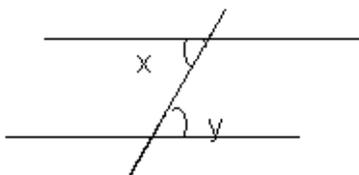
$g = c$ corresponding angles

8. Use a brainstorming session to summarize characteristics of a parallel line

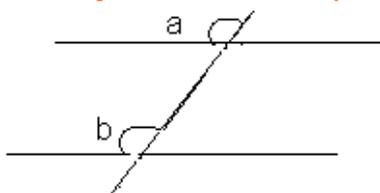
1. The distance between parallel lines is always the same



2. When parallel lines are cut by a transversal the alternative angles are equal, e.g.



3. When parallel lines are cut by a transversal the corresponding angles are equal, e.g.



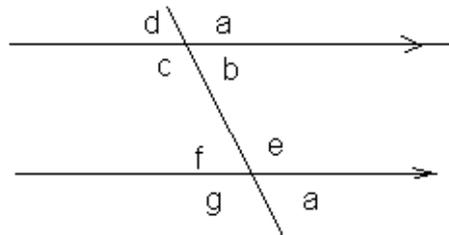
4. When parallel lines are cut by a transversal the sum of allied angles is 180°



Activity 3

1. In groups, let participants work out the following problems:

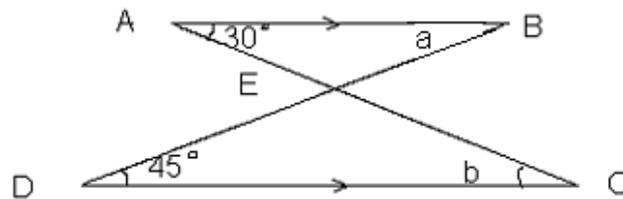
1.



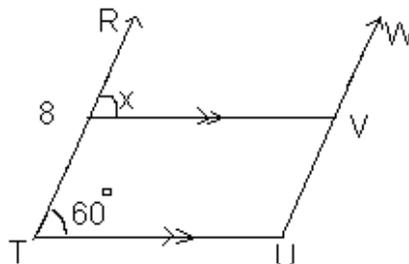
If $d = 40^\circ$, find b, f, e, c, a .

2. Find the sizes of the same angles indicated in the following figures:

(i)



(ii)



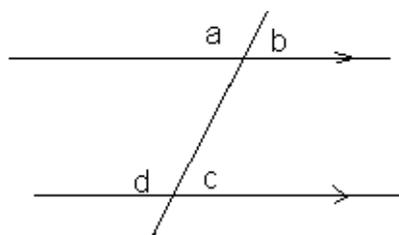
Summary

Parallel lines are contained in most of the items/features in our environment. However it is important that we know their characteristics. For example they are equidistant from each other and they never meet. When cut by a transversal they form angles such as alternate and corresponding angles.

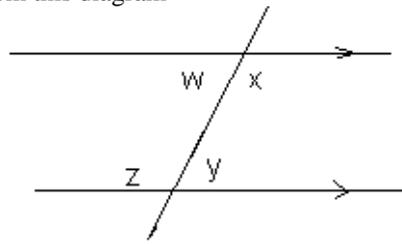
Unit 5 Assessment

1. Find corresponding angles from the following drawing

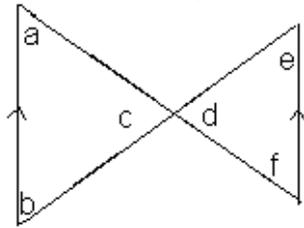
(i)



(ii) Find alternative angles from this diagram



(iii) Study the diagram below and answer the questions that follow.



a) If angle a is 40° , find f.

SECTION 3: SCIENCE

Electricity

Introduction

Electricity is a form of energy which is used in everyday life, such as for cooking, lighting, and driving of machines. There are two types of electricity. These are static and current.

Background Information

Although static electricity was discovered 200 years earlier than current electricity, it has not received adequate attention over the years because of its limited application in our day today life. However, most tall buildings are protected from lightning using lightning conductors which discharge thunder – clouds and carry negative charges to earth. Thunderclouds get charged through static electricity.

Current electricity has turned out to be a critical factor to development of societies over the years because of its direct application in our everyday life. Electricity can pass through metals and liquids through a path called *circuit*. In a liquid, electricity passes through it if there are positive (cations) and negative (anions) ions.

Metals conduct electricity through electrons. Turning a coil of wire surrounded by magnets can generate electricity. This arrangement is called dynamo. A turbine does the rotation of a coil in a dynamo. Using several ways such as water, wind or pedals rotates turbines.

Another source of electricity is a cell. Electricity in a cell is generated by a chemical reaction.

Objectives

By the end of this unit, participants should be able to:

- Explain how materials can be positively and negatively charged
- Describe the structure of an atom
- Demonstrate how static electricity is produced
- Explain how static electricity is used in everyday life
- Construct circuits
- Draw electric symbols representing a bulb, a switch, connecting wire, a cell and a fuse
- Draw circuits diagrams using electric symbols
- Classify materials into conductors and non-conductors of electricity
- Construct series and parallel circuits
- Investigate the effect of connecting series and parallel circuit on the amount of light produced
- Differentiate a series circuit from a parallel circuit
- State simple electrical faults.
- Fix a fuse in a three-pin plug.
- Connect wires in a three-pin plug correctly.
- State sources of electricity.
- Demonstrate how current electricity is generated.
- Explain the dangers of static electricity.
- Mention safety measures for static electricity

Suggested Resources

Plastic pens, papers, polyester shirts, plastic carpet, lead pencil, piece of wood, cellulose acetate, old radio motor, record disc, polythene rod, nail sand, water, salt solution, sugar solution, lemon fruit, pawpaw piece, birds feathers, magnetic substances

Suggested Methods

Demonstration, group discussion, experimentation

Suggested time: (6 hours)

Unit 1: Static Electricity (1 hour)

Activity 1

- Organize participants into groups.
- Distribute to each group the following materials:

Piece of paper	Plastic ball pen casing	Nails
Spoons	Combs	Broken door handles
- Ask each group to tear off 4 pieces of paper half the size of a fingernail each and place them on the desk.
- Ask one participant to hold the ball pen casing about 0.5 cm above one piece of paper. Ask participants to explain what happens to the piece of paper?
- Rub the pen casing on dry hair, or nylon cloth or birds feathers and repeat step 4. Observe what happens to the pieces of paper this time?
- Ask them to repeat steps 4 and 5 using a comb, old record disc.
- Let participants record their results in table 1

Table 1 Charging Materials

Materials	Attracts	Does not attract paper

- Ask participants to state what two conclusions they can draw from activity 1. Matter is made up of atoms. Demonstrate that matter is made up of small particles by breaking a piece of chalk into half. Then get one of the two pieces and break again into half. Repeat breaking one of the broken pieces of chalk until you get very small pieces of chalk. Explain to participants that these small particles consist of other smaller particles, e.g. electrons and protons.

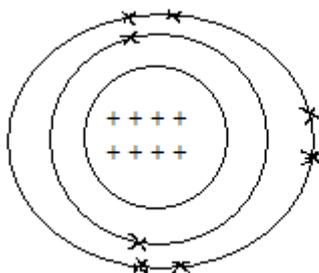
Explain to participants that when some non-conductors are rubbed they become either positively or negatively charged. The charge is acquired by gain or loss of electrons from atoms, which make up the substance. An atom is a smallest particle, which makes up a substance.

Introduce the diagram showing an atom with its shells to the participants. Let them study the diagram and answer the questions that follow:

An atom with its shells

Key

- + protons
x electrons



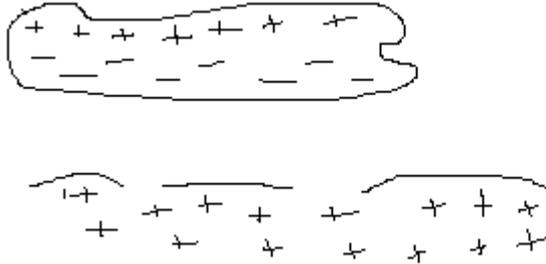
- How many electrons {x} are in the shells?
- How many protons {+} are in the nucleus?
- What is the charge of the atom?
- Explain what would happen if the atom loses some electrons to another atom?
- What would happen if an atom gains an electron?
- Which particles could be lost when a material is rubbed?

9. Let participants note that static electricity does not flow and is produced when you rub two objects, which are insulators.

10. With reference to the diagram below, ask participants to explain:

a. What happens on lightning?

Charged clouds



b. How can they protect themselves from lightning?

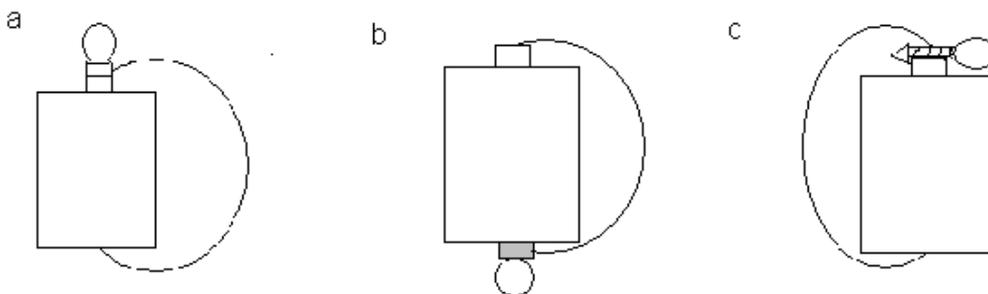
11. Ask participants to explain:

- The dangers of lightning
- Ways of avoiding dangers of lightning

Unit 2: Simple Circuits and Electrical Symbols (1 hour)

Activity 3

1. Organize participants into groups
2. Distribute to each group the following materials
 - Cell
 - Bulb
 - Piece of wire
 - Bulb holder
3. Let participants arrange the materials as shown in Figure 1. Ask them to answer the questions below the figure.



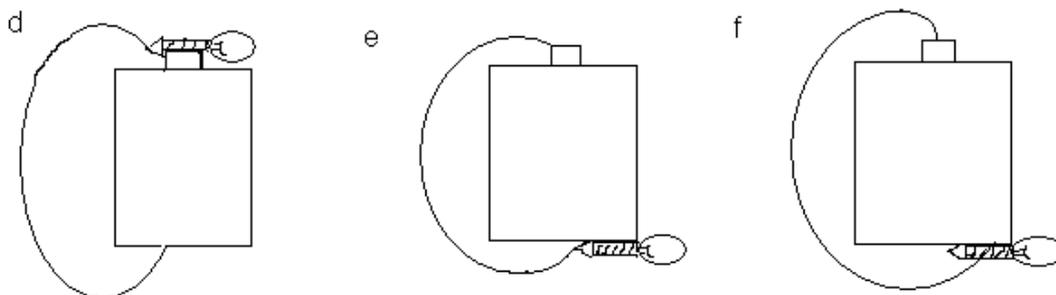


Figure 1

- What happens to the bulb in each of the arrangement in figure 1?
- What does your observation show?
- Can you examine the cell closely and locate the positive and negative terminals.
- Do you think these terminals took part in making the bulb light?

Electrical Symbols

The components of your circuit can be represented by symbols. The following are some of the common electrical symbols.

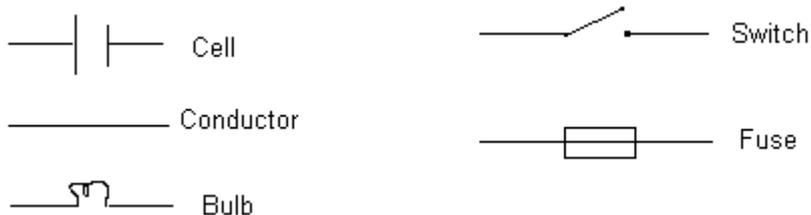


Figure 2.

- Ask participants to draw a circuit using symbols.
- Let participants note that :
 - Rate of flow of electrons is called an **electric current**.
 - The bulb only changes electrical energy to light and heat

Unit 3: Conductors and non-conductors of electricity (1 hour)

Activity 4

- Organize participants into groups
- Distribute to each group the following materials:
 - 2 cells
 - 2 bulbs
 - 1 bulb holder
 - 3 connecting wires
 - Container e.g. basin
 - Plastic materials, e.g. comb
 - Lemon or pine apple solution
 - Pieces of wood
 - Copper nail, nail, coin
 - Water
 - Sugar solution
 - Concentrated salt solution
 - Carbon rods
- Let participants construct the circuit in figure 3.

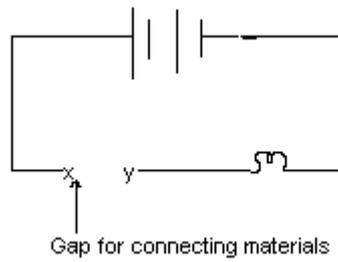


Figure 3

4. Ask them to connect one material at a time in the gap shown in figure 3, and record the results as illustrated in table 3.

Table 3. Conductors and non- conductors

Material connected	Does the bulb light up?

4. Explain to the participants that:
 - Findings in table three show that materials can be classified into conductors and non-conductors.
5. Let them:
 - Identify conductors and non-conductors from table 3. Indicate a tick for conductor and a cross (X) for non-conductor.
 - Explain the meaning of the terms: conductor and non-conductor.
 - Suggest special name given to solutions that conduct electricity.

Unit 4: Series and parallel circuits (1 hour)

Activity 5

1. Organize participants into groups
2. Distribute to each group the following materials
 - 2 cells
 - 2 identical bulbs
 - 2 bulb holders
 - 6 connecting wires
3. Using the materials provided ask participants to construct circuits in figure 4.

4. Let participants study fig 4 and answer questions i and ii

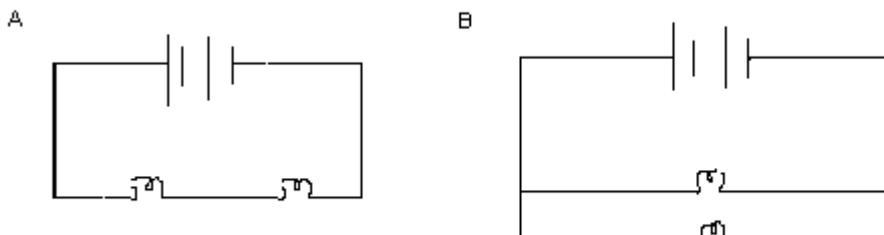


Figure 4

- f. Identify a series circuit and explain why you think it is a series circuit.
Why should the other be called a parallel circuit?
- g. In which circuit do the bulbs give more brightness?
Remove one bulb and take note of the amount of brightness of the bulbs in each circuit

Unit 5: Plug and electrical faults (1 hour)

Activity 6

1. Organize participants into groups
2. Distribute to each groups the following materials
 - Plug
 - Electric kettle or iron or fan or motor
 - Fuse
 - Cable with live, neutral and earth wire
 - Screw driver
 - Razor blade/knife
3. Ask participants to assemble the plug using materials provided.
4. Let participants identify general faults which occur in electrical appliances.
5. Let participants list causes of electrical accidents and suggest ways how each can be avoided/prevented.

Unit 6: Uses and sources of electricity (One hour)

Activity 2

1. Ask participants to use cells, bicycle dynamo or old radio motor hand driven generator to provide energy to some objects that use electricity.
2. Let the participants record their findings in a table as illustrated in table 2.

Table 2. Uses and Sources of Electricity

Object	Use	Source of electricity

3. From table 2, ask participants to classify objects, which use electricity produced by wind, water, heat and dynamos.
4. Let the participants go outside; look at a bicycle dynamo and demonstrate how it works by turning its pedals. Then ask them to answer the following questions:
 - a. What is making the bicycle bulb light?
 - b. Compare the brightness when you turn the pedals fast and when you turn the pedals slowly.
5. Name some Hydro-electric power stations in Malawi.

Summary

By rubbing against hair the plastic pen casing or comb acquired an electrical charge on the surface called static electricity. A rubbed surface can have a **positive charge (+)** or a **negative charge (-)**. Like charges repel while unlike charges attract when brought together.

Electrons (negative charges) are free to move in a specific direction when they are given energy from different sources. The cell provides the push while the wire (conductor) provides a path. Electrons flow from the negative to the positive terminal via the wire and the bulb, (**unlike charges attract each other**) when a complete circuit is made.

Materials can be classified as conductors and non-conductors of electricity. These could be solids or solutions. Solutions that conduct electricity are called electrolytes

Possible electrical faults in using a plug are; blown out fuse, loose connections, wrong connections, and bare wires in a cable of a plug.

Unit Assessment

1. How is current electricity different from static electricity?
2. Briefly explain how lightning is generated.
3. When would you have bright light, when cells are connected in parallel or bulbs connected in parallel?

4. Figure 5 shows an electric circuit

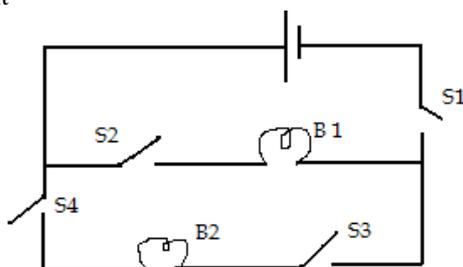


Fig. 5

If all the switches were closed, which bulb would not give light? Explain why?

5. Name the symbols labelled X and Y in Figure 6.

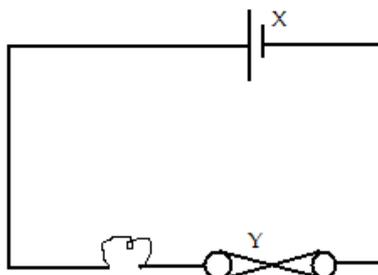


Fig. 6 – an electric circuit

APPENDIX 1: SUGGESTED ANSWERS

SECTION I: ENGLISH

Unit 1: The Verb and Personal Pronouns

Activity 1

Participants answer: "You are jumping" or "you are jumping," etc

Activity 2.

4. Possible answers: I am running; You are dancing; He/She is swimming; We are fishing; You are walking; They are singing.

Activity 3.

3. Possible answers: I have a coin; You have a comb; She/he has a cell; We have spoons; You have a bulb; They have a nail.

Activity 4.

1. Possible sentences with state of being verbs: I am happy; You are sad; He/she is well; We are sick; You are afraid; They are angry.

Unit 1 Assessment

1. First and second person singular: I am eating. You are eating.
2. Third person singular and first person plural: She/he has a book. We have a book.
3. Second and third person plural: You are humble. They are humble.

Unit 2: Subject-Verb Agreement

Activity 1

1. (Second person singular)

Your name is Gama. You want some shoes. Your feet get cold when you walk to school. And sometimes you cut them on stones. Your mother is going to Zomba next week. She intends to buy the shoes there.

3. (Third person singular)

His name is Gama. He wants some shoes. His feet get cold when he walks to school. And sometimes he cuts them on stones. His mother is going to Zomba next week. She intends to buy the shoes there.

4. (First person plural)

My name is Gama. This my sister. Her name is Brenda. We want some shoes. Our feet get cold when we walk to school. And sometimes we cut them on stones. Our mother is going to Zomba next week. She intends to buy the shoes there.

5. (Third person plural)

His name is Gama. This is his sister. Her name is Brenda. They want some shoes. Their feet get cold when they walk to school. And sometimes they cut them on stones. Their mother is going to Zomba next week. She intends to buy the shoes there.

Activity 2

1. Example of a possible response:

My name is Chimwemwe. I want a pencil. I need to write in my exercise book. My father intends to buy me some pencils.

2. My name is Chimwemwe. I want a pencil so I can write in my exercise book. My father is going to Blantyre next week. He will buy the pencils at the Shop-rite.

Her name is Chimwemwe. She wants a pencil so she can write in her exercise book. Her father is going to Blantyre next week. He will buy the pencils at the Shop-rite.

Activity 3

- a. Our offices stay open until 5:00pm.
- b. The witnesses (testifies, testify) tomorrow.
- c. Two ships (is, are) missing.
- d. The cause of most diseases (is, are) known.

Unit 2 Assessment

- a. (Plural Subject) The application and the cheque (plural verb) are in the mail.
- b. (Plural Subject) Men, women and children (plural verb) have a responsibility to the nation.
- c. (Singular Subject) Every man, woman and child (singular verb) has constitutional rights.
- d. (Singular Subject) Neither the desk nor the chair (singular verb) is what we ordered.
- e. (Plural Subject) Neither robots nor computers (plural verb) replace humans.

Unit: 3 Comprehension 1

Activity 2

Ways of helping children to understand meanings of difficult words:

- i. using context
- ii. miming or demonstrations
- iii. using real objects
- iv. using pictures
- v. using gestures

The teacher can also help pupils to guess meanings of difficult words by:

- h. using the form of words
- i. using the sound of the word
- j. using compound words for example, classroom, headteacher.

Unit 4: Punctuation

1. Mention some uses of a full stop end of a comma.
2. How is a semi-colon different from a colon?
3. Punctuate the following sentences:
 - f. "Now children," said the mother, "be very careful when you are crossing the road."
 - g. "I am afraid that the child will be hurt," said John.
 - h. Mary asked, "How will you know when it is time to leave?"
 - i. What a terrible storm we had last night!

- b. 10 ball-point pens cost K180
 \therefore 1 ball-point pen costs = $\frac{K180}{10}$
= K18
- c. 160 Km is covered in 2 hours
 \therefore Distance covered in 1 hour is $\frac{160 \text{ km}}{2 \text{ hrs}}$ (speed)
= 80 km/hr
- d. 60 litres of water is required for 4 days
 \therefore number of litres required for 1 day is $\frac{60 \text{ l}}{4 \text{ days}}$
= 15 litres
- d. Amount to be exchanged = K18000
and amount received = R 1000
 \therefore Exchange rate = $\frac{K18000}{R 1000}$
 \therefore K18 to R1 (one rand)
- e. 6000 people live in 20 sq km
 \therefore number of people staying in 1 sq km is $\frac{6000}{20}$
Population density = 300 people/sq km.

Activity 2

- a. Expressing the ratios to simplest form $\frac{K10}{K15} = \frac{2}{3}$
- b. $\frac{1 \text{ hour}}{15 \text{ min}} = \frac{60 \text{ min}}{15 \text{ min}} = \frac{4}{1}$
- c. 350 mangoes to be shared in the ratio 2:3
 \therefore Total ratio = 2 + 3
= 5
each share = $\frac{350 \text{ mangoes}}{5}$
= 70 mangoes
Funso's share = 70 x 2 = 140 mangoes
Yankho's share = 70 x 3 = 210 Mangoes

Activity 3

- a. 900 for 10 days
 \therefore Pay for 1 day is $\frac{K900}{10 \text{ day}} = K90$
and (i) 3 days pay is K90 x 3 = K270
(ii) 24 days pay is K90 x 24 = K2160
- b. 7 people dig in 10 days
 \therefore 5 people need more days
The required ratio =

7 people	10 days
5 people	more

$$= \frac{7 \text{ people}}{5 \text{ people}}$$

$$\text{Number of days required for 5 people} = \frac{7}{5} \times 10 = 14 \text{ days}$$

- b. 24 soldiers require 60 litres of milk
1 soldier would require $\frac{60}{24}$ litres of milk
= $\frac{5}{2} = 2\frac{1}{2}$ litres
 \therefore 30 soldiers would require $30 \times \frac{5}{2}$
= 75 litres
- c. Amount to be shared = K7700
The ratio to be shared to
Chipiliro Eravine Mwisonetha
2 = 1 1 1 + 1 +
1 1
2 x 3 1 x 3 3
 \therefore 6 3 1

$$\text{Total ratio} = 6 + 3 + 1 = 10$$

$$\text{Each share} = \frac{K7700}{10} = K770$$

$$\text{Chipiliro's share} = K770 \times 6 = K4620$$

$$\text{Mwisonetha's share} = K770 \times 3 = K2310$$

$$\text{Eravine share} = K770$$

- d. Amount share is K68000
Let the ratio be:-

Zione	Mary	John
K100	K200	
	K300	K400
1 x 3	2 x 3	
	3 x 2	4 x 2
\therefore 3	6	8

$$\therefore \text{Total ratio} = 3 + 6 + 8 = 17$$

$$\text{each shared} = \frac{K68000}{17} = K4000$$

$$\therefore \text{Zione's share} = K4000 \times 3 = K12000$$

$$\text{Mary's share} = K4000 \times 6 = K24000$$

$$\text{John's share} = K4000 \times 8 = K32000$$

- e. Mangoes to be shared is 440 mangoes

Let the ratios be:-

Charles	Jane	Chrissie
$1 + \frac{1}{2}$	1	$1 + \frac{1}{2} + \frac{1}{2}$
3	2	
1 X 3		2 x 3

\therefore Combined ratio

$$3 \quad 2 \quad 6$$

$$\text{Total ratio} = 3 + 2 + 6 = 11$$

$$\text{Each share} = \frac{440}{11}$$

$= 40$ mangoes
 \therefore Charles's share $= 40 \times 3 = 120$
 Jane's share $= 40 \times 2 = 80$ mangoes
 Chrissie's share $= 40 \times 6 = 240$ mangoes

SECTION 4: MATHEMATICS

Activity 1

Practical responses

Activity 2

Practical responses

Activity 3

Finding b , f , e , c and a , if $d = 40^\circ$

i.

In the diagram

$d = f$ – corresponding angles

$$\therefore f = 40^\circ$$

$d = b$ vertically opposite angles

$$\therefore b = 40^\circ$$

$$d + a = 180^\circ$$

$$40^\circ + a = 180^\circ$$

$$\therefore a = 140^\circ$$

$a = c$ vertically opposite angles

$$\therefore c = 140^\circ$$

$a = e$ corresponding angles

$$\therefore e = 140^\circ$$

ii.

Finding sizes of angles

Angle $BAE =$ angle ECD alternate angles

$$\therefore b = 30^\circ$$

Angle $EDC =$ angle DBA

$$\therefore \text{Angle } a = 45$$

iii.

Angle $STU =$ angle RSV alternate angles

$$\therefore \text{Angle } RSV = 60^\circ$$

Unit assessment

i.

Corresponding angles

b and c

a and d

ii.

Alternate angle

W and Y

Z and X

iii.

Finding angle f if angle $a = 40^\circ$

Angle $a = f$ alternate angles

$$\therefore f = 40^\circ$$

Activity 4

(i) Acute angle

(ii) (Right angle)

(iii)

Obtuse angle

(iv)

Reflex angle

(v)

Straight angle

Activity 5

(i)

Finding angle ONP

Angle NOP

$$= 40^\circ$$

Angle NPO

$$= 60^\circ$$

Angle $NOP + NPO + ONP$

$$= 180^\circ \text{ angle sum}$$

of a triangle

$$40^\circ + 60^\circ + ONP$$

$$= 180$$

$$100^\circ + ONP$$

$$= 180^\circ$$

$$\therefore ONP$$

$$= 180^\circ - 100$$

$$= 80^\circ$$

(ii)

$XYZ + YXZ + ZY$

$$= 180^\circ \text{ angle sum}$$

of a triangle

$$60^\circ + 60^\circ + XYZ$$

$=$

$$180^\circ$$

$=$

$$120^\circ + XZY$$

$=$

$$180^\circ$$

$$\therefore XZY = 60^\circ$$

(iii)

$XYZ + YXZ + ZY$

$$= 180^\circ \text{ angle sum}$$

of a triangle

$$60^\circ + 60^\circ + XYZ$$

$=$

$$180^\circ$$

$=$

$$120^\circ + XZY$$

$=$

$$180^\circ$$

$$\therefore XZY = 60^\circ$$

Unit Assessment

1. Angle XYZ

2. i. Acute angle

ii. Obtuse angle

$$3. \quad 40^\circ + 30 + a = 180^\circ$$

$$70^\circ + a = 180^\circ$$

$$\therefore a = 180^\circ - 70^\circ$$

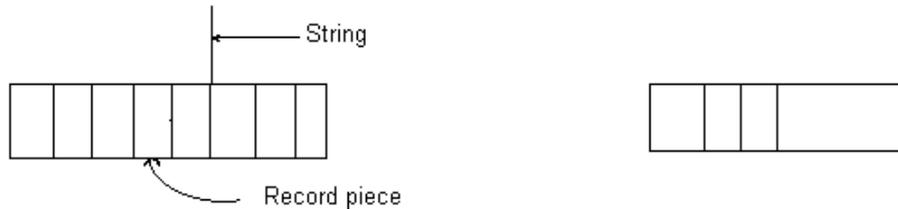
$$= 110^\circ$$

Section 3: Science

Suggested improvised materials for teaching electricity

1. Old Record Disc

To demonstrate how like charges repel each other using old record disc



Procedure

Cut pieces of record disc into rectangular shape. Hang to a thing so that it balances. Rub one side of the hung piece of record. Using the same material rub the other piece of record and bring it closed to the rubbed side of the hang piece.

Note: Instead of record disc, you can also use plastic transparent pen cases.

2. Inflated balloon

To demonstrate static electricity as an entertainment activity.

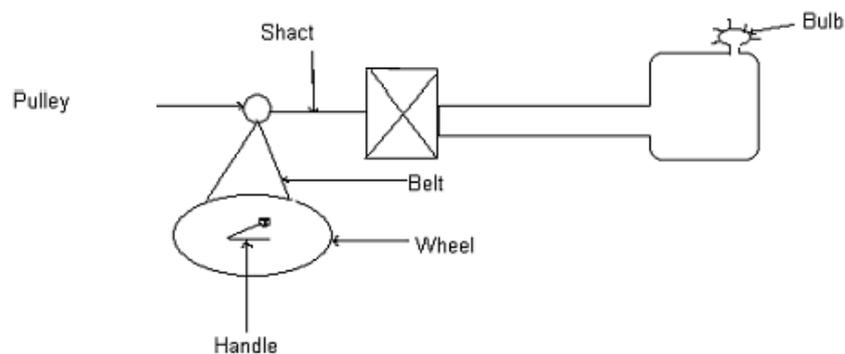


Procedure

Rub against a tied inflated balloon and release it towards the wall while holding the string.

3. Hand Driven Generator

To demonstrate how electricity can be generated.

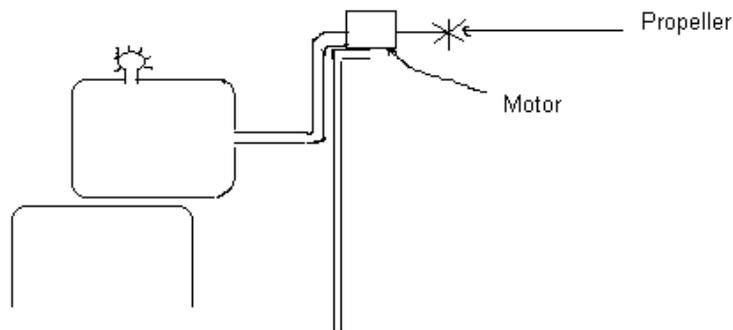


Procedure

This can be made by using a ready made motor which is fixed to a bulb using connecting wires. A propeller can be made of plastic bottles etc. Belts to be attached between propeller and motor to the wheel. Wheels could be made of either polish tins or wires or wood. Insert a handle on the wheel which will be used for turning the wheel.

4. Wind Generator

To demonstrate how electricity is generated by wind.

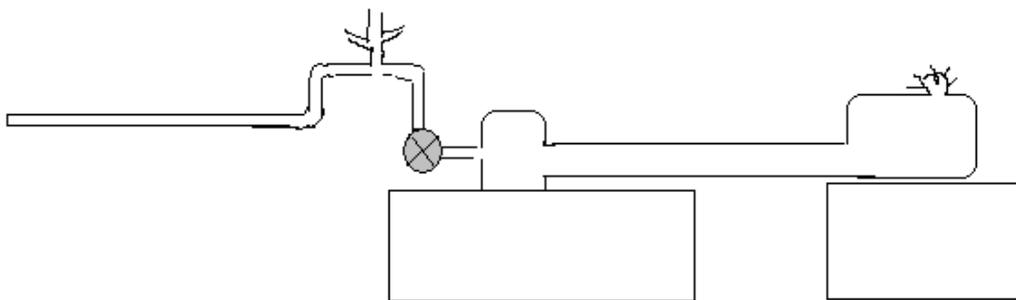


Procedure

Fix a motor with a propeller on top of a long pole about 3-4m long. Position it against the direction of the wind.

5. Hydro Electric Power

To demonstrate how electricity is generated by water

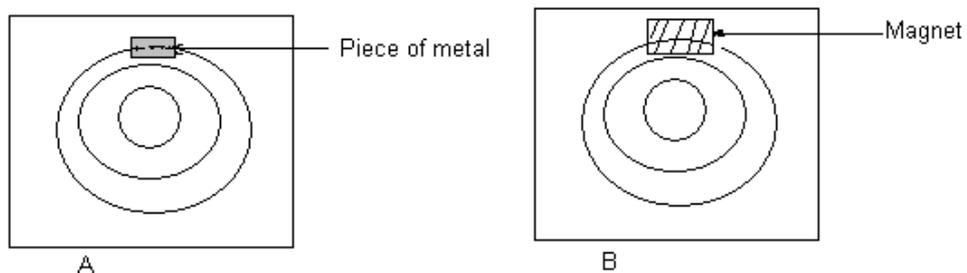


Procedure

Fix a motor with a propeller 20cm extending in the air. Have a fast jet of water splashing on the propeller from high up. May also use a hose pipe. Propellers can be made of metal tins and plastic but should have wide blades.

6. Structure of an atom

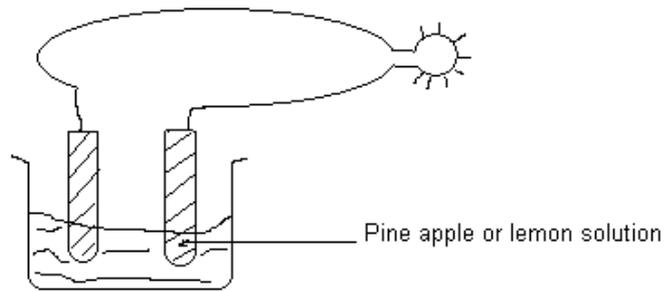
To illustrate charging of an atom



Procedure

Find two boards and fix wires in a circular form. Fix a metal on one wire to represent use of a magnet to attract the metal.

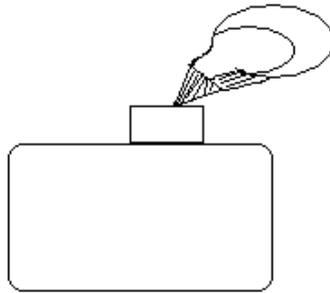
7. Improved Cell



Procedure

Collect lemon juice, pine apple juice, and pour the juice into a container. Dipp the electrodes on each side of the container to complete a circuit. Observe what happens.

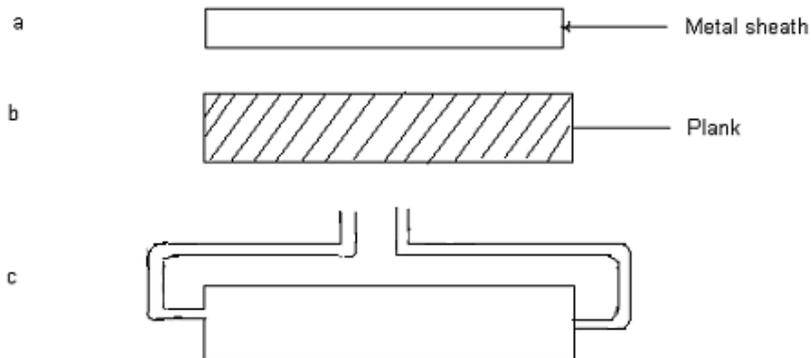
8. Connecting a cell to a bulb without a wire



Procedure

Connecting a bulb without using wires while connecting both the positive and negative terminals.

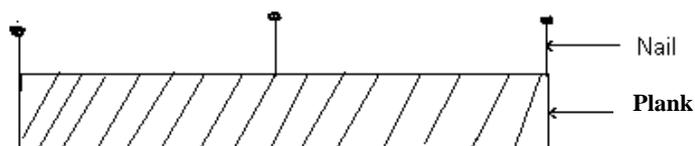
9. Production of improvised switches and bulb holders



Procedure

Collect thin metal casing and a plank. Cut the small metal casing. Use the metal casing (cut) to produce a bulb holder after nailing it to the plank or a small plank.

10. A cell holder



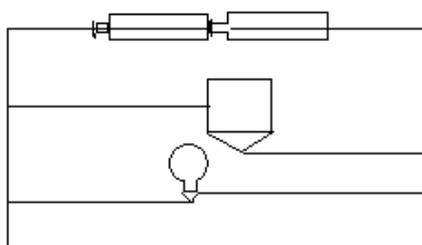
Procedure

Collect three nails and a small plank. Measure the plank to be equal to the size on the cell.

Note: You may also use bamboo or any plastic bottle or tubing to hold the cells. You may also wrap cells with hand paper. Tie around it using a rubber band or any rubber eg old bicycle tube.

11. Circuit board

To demonstrate series and parallel circuit.



Procedure

Make a circuit board equal to the size of A4 paper. Fix on nails as bulb holders. Arrange them in either series or parallel.

Suggested solutions to activities

Activity 1

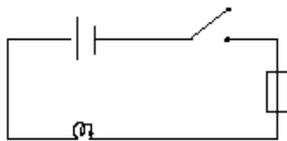
Materials	Attracts	Does not attract paper
Plastic ball pen casing	Yes	
Nails		No
Spoons		No
Plastic comb	Yes	
Broken door handles		No

- a. The charged (rubbed) plastic pen will manage to pick pieces of paper when brought on top.
 - b. The charged (rubbed) plastic pen will attract the water drops and change their direction of dripping.
8.
 - a. There are eight electrons in the shells.
 - b. There are eight protons in the nucleus
 - c. No charge (neutral)
 - d. If an atom loses some electrons it becomes positively charged
 - e. If an atom gains an electron it becomes negatively charged
 9.
 - a. Electrons
 - b. Clouds in rain days when moving rub over one another and become charged either positively or negatively as shown on the diagram. The charged clouds induce opposite charges on nearby clouds or the ground if the cloud is close to the ground. Attraction of opposite charges occurs and electrons jump from the cloud which is negatively charged to one which is positively charged or to the ground and thus lighting occur.

- c. Avoiding sittings/standings near walls, tall trees and metal poles. Also having a house with a lightning arrestor
- d. When you wear polyester cloth you rub over with your skin and the cloth becomes charged. When taking off the cloth electrons jump from the charged cloth to your body and sparks are seen.
- e. When you walk over plastic carpet barefoot you become charge because you rub your feet on the insulator (plastic carpet). When you shake hands with someone standing on the door way at end of the carpet electrons flow from or to the charged person to or from the uncharged and the two get a shock.
- f. Setting fires which can damage property can cause death, can damage vegetation
- g. See 9 (c)

Activity 2

- 3. a. Arrangements a, b, d and e give light
- b. Proper connections are important in circuits
- c. Yes



Activity 3

Material	Does the bulb light or not?
Lead pencil	Bulb light
Piece of wood	Bulb does not light
Piece of plastic	Bulb does not light
Nail	Bulb lights
Sand etc	Bulb does not light

- 5. A conductor is material that allows electricity pass through it while a non conductor does not.
- 6. electrolyte.

Activity 4

- f. A is a series circuit. Because components are connected one after another in a single line.

B is a parallel circuit. Because the path of electric current is branched and components are connected side by side.

- g. B (in parallel circuit)

Activity 5

- 3. Live (brown or red color)
Neutral (blue or black)
Earth (green and yellow)
- 4. Blown out fuse
Brown out bulb
Loose connections
Bare wires in a cable
Wrong connections

Activity 6

Object	Use	Source of electricity
Bulb	Lighting	Cells Wind Water Mechanical energy

3. Water, wind and cells
4. a. Bicycle dynamo
b. When you turn the pedals fast, the bulbs gives more light and vice versa
5. Tedzani, Nkula, Wovwe

Answers to Science Unit Assessment

1. Current electricity flows while static electricity does not flow.
2. Lightning is formed by clouds rubbing each other during rains. The clouds become either positively or negatively charged. The charged clouds induce opposite charges on nearby clouds. Attraction of opposite charges occurs and electrons jump from the cloud which is negatively charged to one which is positively charged or to the ground and thus lightning occurs.
3. When connected in parallel, we have more bright light.
4. B₁ would not give light because switch S₂ is made up of plastic which is not a conductor of electricity.
5. X is cell and Y is a fuse.

APPENDIX 2: Reference

Section 1: English

- Byfield, J.S. (1985). *Help with Business English*. Boston: Houghton Mifflin.
- Chilora, H. G., et al. (1994). *Activities with English Pupils' Books for Standard 3*. Domasi: MIE.
- Chilora, H. G., et al. (1994). *Activities with English, Pupils' Books for Standard 4*. Domasi: MIE.
- Chilora, H. G., et al. (1994). *Activities with English, Pupils' Books for Standard 5*. Domasi: MIE.
- Chilora, H.G, et al. (1996). *Activities with English Pupil's Book for Standard 7*. Domasi: MIE.
- Chilora, H. G., et al. (1994). *Activities with English Pupils' Books for Standard 8*. Domasi: MIE.
- Eckersley, J. M. (n.d.) *A Comprehensive English Grammar for Foreign Students*.
- Edriss, K. A. (1995). *English Grammar Information Book*. Blantyre: Dzuka.
- English in the National Curriculum, Key Stage Two Resource Pack*.
- Forest, R. (n.d.). *Revision English*.
- Iphani, M.J., et al. (1994). *Activities with English Pupils' Books for Standard 6*. Domasi: MIE.
- Legget, G. et al. (1985). *Handbook for Writers*. Englewood Cliffs, NJ: Prentice-Hall.
- Malawi Ministry of Education. (1991). *Malawi Primary School Teaching Syllabus: English Standards 1 – 8*. Domasi: MIE.
- Malawi Institute for Education. (n.d.) *Activities with English. Pupil's Book for Standard 8*. Domasi: MIE.
- Ministry of Education. (1991). *Primary English Syllabus*. Domasi: MIE.
- Shiach, D. (1995). *Basic punctuation*. London: John Murray.

Section 2: Mathematics

- Chirambo, E. Z., et al. (1998). *Malawi Primary Education Mathematics Pupils' for Standard 7*. Blantyre, Malawi: Macmillan.
- Chiwiywa, A.P.H. (1998). *Malawi Primary Education Mathematics Pupils' for Standard 8*
- Heddens, J.W (1980) *Today's Mathematics*, Chicago, Sciences Research Associates.
- Malawezi, F. (1989). *Secondary Mathematics Book 1*. Blantyre: Dzuka.
- McKillip, W. D. (1978). *Mathematics Instruction in the Elementary Grades*. Morristown, NJ: Silver Burdett.
- Paling D., Wardle, M.E (1980). *Comprehensive Mathematics*. Oxford: Oxford University Press.

Section 3: Science

- Gonthi, H.F., et al. (1997). *Science and Health, Teachers' Guide for Standard 8*. Domasi: MIE.
- Malawi Ministry of Education and Culture. (1992). *Malawi Primary School Teaching Syllabus, Science and Health Education, Standard 5-8*, Malawi Institute of Education.
- TDU. (n.d.) *Student Teachers' Handbook 3*. Domasi: Malawi Institute of Education.