MALAWI TEACHER TRAINING ACTIVITY (MTTA)

In collaboration with

MALAWI EDUCATION SUPPORT ACTIVITY (MESA)

FIRST CYCLE TRAINING HANDBOOK

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American Institutes for Research (AIR)

In Consortium with

Malawi Institute of Education (MIE)

Miske Witt & Associates

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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

MESA/MTTA Performance and Monitoring.

MESA assesses pupil performance by collecting the pupil grade at the beginning of the school year (February) and towards the end of the school year (October). As shown below, the difference between the two grades shows how much pupils gained by the end of the year for standards 3 and 6. MESA also observes teaches teaching Mathematics and English. Below are the results of the study conducted above.

Table 1: Levels of Mastery in English for the school year 2004

Sex	Levels of Mastery	Standard 3						Standard 6					
		Reading		Compre-hension		Most used words		Reading		Compre-hension		Most used words	
		Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct
Girls	Full (80-100%)	0.3	5.7	0	0.7	0.3	9.2	46.8	74.5	1.6	6.2	1.1	13.5
	Partial (31-79%)	2.5	11.7	0	1.5	0	17.9	36.6	16.6	16.5	39.5	33.8	52.2
	Non (0-30%)	97.2	82.6	99.9	97.7	99.7	72.9	16.6	8.9	81.9	54.3	65.1	34.3
Boys	Full (80-100%)	0	5.1	0	1.0	0.4	8.2	45.4	74.1	2.2	8.0	2.8	19.9
	Partial (31-79%)	1.5	10.4	0.1	1.6	0	17.7	38.9	18.6	17.5	38.8	39.6	48.5
	Non (0-30%)	98.5	84.4	99.9	97.4	99.4	74.0	15.7	7.3	80.5	53.2	57.6	31.6

Table 2: Levels of Mastery in Mathematics overall for the school year 2004

		Standard 3		Standard 6	
Sex	Levels of mastery	February 2004	October 2004	February 2004	October 2004
Boys	Full Mastery	0.4	5.6	0	0.6
	Partial Mastery	71.0	81.7	1.7	11.9
	Non Mastery	28.6	12.8	98.3	87.9
Girls	Full Mastery	0.3	4.4	0	0
	Partial Mastery	69.2	79.7	1.1	8.1
	Non Mastery	30.6	15.8	98.9	81.9

How to use tables: *For example, in Table 1 under the Standard 3 and Reading columns, you get the February and October 2004 percentages like 0.3 and 5.7% for Full mastery. The difference between the two (5.7% – 0.3%) is 5.4%. This shows that there was a gain of 5.4% in the full mastery level in the school year 2004 in English reading in Standard 3. The percentage may not sound big enough but indicates that some good work was done, hence the gain. So more work for big gains!*

In order to complement the efforts of MESA, MTTA has started by assessing the proficiency levels of teachers in English, Mathematics and Science. As such it became necessary to observe the Science lessons as well. During the baseline, teachers were also asked to state topics they felt were easy to teach, easily understood by pupils, topics difficult to teach, topics not easily understood by pupils, topics which teachers needed more support on to teach more effectively and topics they would change if they were able to and the reasons for doing so.

SECTION I: ENGLISH

UNIT 1 PARTS OF SPEECH

Introduction
This section begins with a lesson on identifying parts of speech. It is important to know the part of speech to which a word belongs in order to make sense of the phrase, sentence and the passage being read or spoken. Knowing parts of speech also helps one to compose meaningful sentences and passages. In this unit you will identify parts of speech used in everyday language.

Objectives
By the end of this session participants should be able to:
Use English language for effective communication through the use of correct grammatical structures
Identify parts of speech

Materials needed
Teachers' Guides and Pupils' Books for primary schools
Notes in MTTA folder for Liwonde workshop
Suggested methods
Pair work
Group work
Plenary
Suggested time: 1 hour

Activity 1:
In plenary, let participants brainstorm the meaning of the term "speech". As a whole group identify the key words or phrases in the different definitions.
What is speech?

Activity 2
In plenary, ask participants to identify the parts of speech that have not been completed below.
Parts of speech
Adverb
A…
C…
I…
N…
P…
P…
Verb

Activity 3
In groups, ask participants to give a definition of each of one of the parts of speech stated above.

Activity 4

Ask participants to work in pairs to write sentences in which each part of speech has been used.
Ask participants to display their work for discussion in plenary.

Activity 5
Ask participants to work in groups and do the following:
Write sentences using “one”, “fast”, “work” and “both”.
Identify the part of speech for each of the words listed above.

Activity 6
In groups, identify parts of speech for the following words:
One
Work
Fast
Both

Assessment/Reflection
Write down two main ideas that you have learnt about parts of speech.

Summary
In this unit you have learnt about parts of speech. These are nouns, verbs, adverbs, adjectives, prepositions, pronouns, conjunctions and interjections. Each word belongs to a part of speech. There are some words, however, that belong to more than one part of speech depending on how they are used.

It is important to note that it is impossible to tell what part of speech a word belongs to unless it is used in a sentence.

UNIT 2 NOUNS

Introduction
One of the most commonly used parts of speech in the English language is the noun. As it has been observed in the previous unit, a noun is a word that names a person, place or thing. In this unit you will learn more about nouns, in terms of their functions and how they can be changed from singular to plural.

Objectives

By the end of the unit, participants should be able to:
Identify parts of speech in a passage
Identify nouns in sentences
State some of the functions of nouns in sentences and passages
Change nouns from singular to plural forms

Materials needed
Pupils books and Teachers' Guides on activities with English
Ready-made passages on a flip chart/chalkboard/ or textbook
Notes in MTTA folder for Liwonde workshop

Suggested methods
Pair work
Group work
Plenary

Suggested time: 1 hour
Activity 1
Identify parts of speech in the following sentence:
Jane went to school yesterday to study for her final and important examinations.
We will all miss him because he was a good fellow.
Machines make work easier.

Activity 2
Organize participants into groups to identify parts of speech from a passage of your choice. The groups may be arranged as follows:

Group 1 – nouns and conjunctions
Group 2 - adverbs and preposition
Group 3 - adjectives and interjections
Group 4 – verbs and pronouns

Activity 3
In pairs, underline the nouns in these sentences and state their functions.
Mary is our teacher.
Soldiers kill our enemies.
Susan wrote Jon a beautiful letter.
Martha is a clever girl.
Children eat a lot of mangoes.

Activity 4
In groups, make all the nouns in the following sentences plural.
A girl has fallen down.
That green shirt looks good.
I have seen a red book in the corner.
Mary went to church yesterday.
A fox killed my hen.

Activity 5
Make sentences with the following nouns: brush, watch, box, house, fox, and gas in:
Singular sentences
Plural sentences

Summary
Most nouns are changed into plural by adding “s” to their singular form. Some nouns that end in “o” form their plurals by adding “es”. In this unit we have focused on identifying nouns and other parts of speech in a passage. We have also practised how to turn some nouns from singular to plural forms. Although rules are important for changing singular forms into plural, it is important to note that practice is the best way to master the skill of changing singular forms to plural.

UNIT 3 COMPOSITION WRITING

Introduction
Composition writing is one of the important skills that teachers need to teach pupils. Primary school pupils should be introduced to composition writing at an early age in order to train them to express themselves fully and meaningfully. The purpose of this unit is to equip teachers with knowledge and skills necessary for teaching pupils how to express themselves through composition writing. The unit has been broken into two lessons.

Objectives
By the end of the unit, the participants should be able to:
Write a two or three paragraph composition
Identify the four types of compositions
Discuss how the four types of compositions differ from each other
Explain the importance of experience in composition writing
Discuss what influences the writer to choose to write one type of composition and not the other

Materials needed
Pupils books and Teachers' Guides on activities with English
Ready-made extracts on guided compositions, e.g. Simple (gap filling) cloze passage, joining sentences, picture composition
Notes in MTTA folder for Liwonde workshop

Suggested Methods
Pair work
Group work
Plenary

Suggested time: 2 hours

<u>Session 1 (1 hour)</u>

Activity 1
Explain to participants the relationship between the four skills in English i.e. what pupils listen to they will speak it, then read about it and finally write it. Then let participants brainstorm in what standard they think composition writing should begin and why.

Activity 2
Ask participants, in groups, to list the types of guided compositions at sentence level. For example, blank filling, joining sentences, describing a picture and so on. Ask the group to display their work and explain it.

Activity 3
In groups again, ask participants to choose one of the compositions mentioned in Activity 2 above and write it showing how pupils are being guided. Then they report back.

Activity 4
In pairs, let participants brainstorm titles of compositions pupils could write about more freely. These titles should include pupils' immediate environment such as the classroom, the

outside environment and then the others that allow pupils to write creatively. The presenter should emphasize the need for preparing the pupils orally by going over the title through discussions (to generate ideas before writing the composition.

Summary
In this unit we have noted that the skill of writing composition builds on other skills of listening, speaking and reading. Therefore, before giving children a written composition assignment, the children should be prepared orally. One way to prepare pupils for writing a composition is to go over the title through class discussion in order to go over ideas before writing the composition.

Session 2 (1 hour)

Activity 1
Give an outline of what will be covered in the course:
Types of compositions
How the compositions differ
Types of audiences for composition/writing
Sources of information for composition writing

Activity 2
Ask participants in groups to brainstorm and generate areas and vocabulary in preparation for writing a composition titled “the fight”.

Ask participants to decide on paragraph content using the areas generated.

Activity 3
Individually in smaller groups, let participants write a two or three paragraph composition using the ideas and vocabulary that have been generated.

Activity 4
In plenary,
Let participants display and read their compositions
Discuss how each composition is different from the others
Discuss how each of composition is similar to the others
Identify compositions that are narratives (telling a story), descriptive (describing something), expository (informing us about someone) and argumentative (giving opinion)
Discuss what makes the compositions different even though the title is the same
Discuss the possible audience of the compositions
Note: for types that have not been exposed create something to expose such types as well.

Activity 5
In pairs, let participants discuss where we get the information or experience that we bring to the compositions we write.

Activity 6
Discuss:
What influences choice of words in a composition
The importance of providing a topic in the writing of a composition

Importance of deciding the approach to what you will write before you start writing

Summary

In this unit we have noted that the following ideas are important for writing a composition: a careful selection of the topic, appropriate choice of words and the need to decide on an approach to use for writing a composition before the writing activity.

Reflection

List as many sources as possible one uses to write a composition

Both argumentative and descriptive compositions use persuasive language. State what makes them different?

What determines the type of composition to write?

UNIT 4 CLASSROOM LANGUAGE

Introduction
Pupils learn different lessons in a day. Each lesson demands that they perform specific tasks and/or activities. It is the role of the teacher to see to it that the pupils know and understand what to do and how to do it. To achieve this, there is need to establish a proper way of communicating and to build a relationship which will ensure that both the pupils and the teacher know and understand what is happening in the classroom at any given time. A classroom language has to be established to get the class working.

Aim
To enable teachers and pupils communicate effectively in a classroom situation and develop an efficient working relationship.

Objectives
By the end of this unit, teachers will be able to:
Use controlled language in a lesson and classroom situation
Enlist other examples of classroom language

Suggested resources
Activities with English Teachers' Guides Standards 1 to 8
Primary Mathematics Teachers' Guides Standards 1 to 8
Primary science Teachers' Guides
Student Teachers' Handbook – (Teacher Development Unit)

Suggested methods
Discussion
Question and answer
Role play
Demonstration

Suggested time: 1 hour

Activity 1
Brainstorm what can be observed in a disorganized classroom.

Activity 2
In pairs, teachers discuss what could be observed in a successful lesson delivery.

Activity 3
In groups, teachers discuss and report of classroom language that they could use in:
Giving instructions for different activities
Organizing pair or group work
Asking questions
Giving demonstration
Praising
Maintaining discipline
Organizing reading activity
Requesting an oral response
Introducing and concluding a stage in a lesson

Activity 4
Using Activities with English Teachers' Guides Book 1 to 8 and Teachers Guides for Mathematics and Science and other subjects, let the teachers find more classroom language examples in groups. Let them report on their findings.

Activity 5
Let teachers demonstrate how to use classroom language in the following examples (not what has already been discussed):
Organizing group work/ pair work
Repeating instructions that were not very clear
Asking pupils to perform an experiment after the teacher's demonstration

Activity 6
Ask the teachers to write two examples of the classroom language they would use in the following situations (not what has already been discussed):
Introducing and concluding a lesson
Organizing a reading activity
Giving instructions
Asking questions

Unit assessment
What would you say in the following situations?
A pupil in standard 8 fails to answer a question correctly. She/he is feeling very depressed about it.
You want to demonstrate something in science. What do you say to draw pupils' attention so that they observe attentively?
Limbani, a pupil in standard 1 is disturbing others during the lesson. What do you say to stop him/her and draw her/him back into the lesson without intimidating her/him?

Summary
The unit covered work on classroom language used in different subjects and subject areas. For effective communication to take place in a classroom, it is important that the teacher uses appropriate language for the particular class level. This creates trust and builds a close relationship between the pupils and the teacher. This enables the pupils to participate in the lesson and for the teacher to know how the pupils are performing.

REFLECTION

1. Write down two or three ideas you have obtained from unit 1: Parts of speech.
2. Write down two factors that influence the writing of compositions.
3. Write down ways in which classroom language affects the teaching and learning process?

SECTION II: MATHEMATICS

Unit 1 FACTORS AND MULTIPLES

Introduction
Children in primary schools need to develop an understanding of factors and multiples so that they can develop their mathematical knowledge and skills.

Therefore this topic aims at equipping teachers with basic knowledge and skills on factors and multiples which they will use when teaching primary school children.

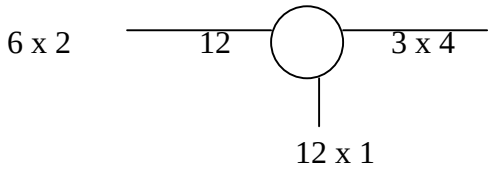
Objectives
Participants should be able to:
Identify ways of helping teachers achieve academic mastery of factors and multiples
Identify creative ways of introducing factors and multiples to primary school pupils

Suggested resources
Primary Mathematics Teachers Guides
Primary mathematics Pupils Books
Chart paper
Pental marker
Cards

Background Information (content)
This topic is intended to help teachers conceptualize factors and multiples in relation to requirements of the primary school curriculum. To do this, work on concepts such as prime numbers, composite numbers and test for divisibility has been explored to ensure that teachers understand factors and multiples fully. Exercises have been included for the participants to practice what they are learning. The session has also included work on how teachers can introduce the topics to primary school pupils using creative methods.

Suggested methods
Group discussion
Pair work
Use of games
Role play
Brainstorming

Factors and multiples
Activity 1
Meaning of the term factor (15) minutes
Flash a number card and ask participants in pairs to write two numbers which when multiplied will give the number on the card as their product eg 12 = 6 x 2, 4 x 3.
Ask pairs to read out their responses and then write the answers on the board eg



Use the responses to let participants give the meaning of the term factor eg explain that in 12 = 4 x 3, 12 is the product, 3 is a factor and 4 is also a factor. Ask individuals to give the meaning of the term factor eg a number that is multiplied to give a product.
Participants give examples of factors of given numbers eg factor of 24, 36, 105.
Use games to consolidated the process of expressing numbers as products of their factors eg the donkeys tail.

Activity 2
Prime and composite numbers (15 min)
Write two numbers on the board – one which has 1 and itself as factors and another that has other factors eg 1 and 16. Ask participants to express each number in as many ways as possible as a product of other numbers eg
7 = 1 x 7
16 = 4 x 4
= 1 x 16
= 2 x 8

Individually let participants write their answers on the board. Explain that 7 is a prime number because it has only 1 and itself as factors and 16 is a composite number because it has several sets of fats.
Ask participants to give examples of prime numbers eg 2, 3, 5, 7, 11, 13 … and then composite numbers eg 12, 15, 15, 24, 36……

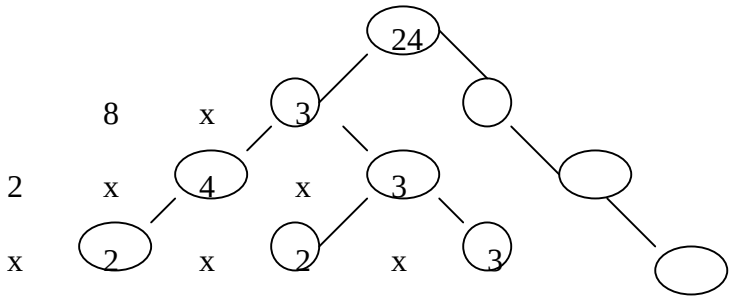
Activity 3
Prime Factor (30 min)
Individually let participants write a factor of a given number which is itself a prime number eg
18 – 2, and 3
27 – 3,
Ask some participants to write their responses on the board eg
18 – 2, and 3
27 – 3
Explain that in 18 = 3 x 6, 3 is a prime number but also a factor of 18. using this information ask participants to write down the meaning of the term prime factor eg a factor that has only 1 and itself as factors.
Ask one participant to demonstrate how to express a number as a product of its prime factors.
Comment and show that the process can be done through
Discussion
Factorization, then demonstrate the two methods

Discussion

2	24
12	
6	
3	
1	

2 x

Factorisation (using factor tree)



24 = 2 x 2 x 2 x 3

In pairs let participants practice expressing numbers as products of their prime factors using division and factorization (factor tree)
Demonstrate how to multiply numbers using prime factors eg
= 154 x 15 x 5
= (154 x 3) x 5
= 462 x 5
= 2310

In groups, participants do the following
Express numbers as products of their prime factors using i) division ii) factor tree eg 420
Multiply 87 by 54 using prime factors

Activity 4
Test for divisibility (15 min)
Show participants a number on card eg 1449 and ask them to give possible divisors of this number
Discuss with participants the easiest way of finding out whether this number (1449) is divisible by the numbers they have given eg 3, 9 eg
3 – if sum of the digits is a multiple of 3 eg
9 – if sum of the digits is a multiple of 9
In pairs/fours let participants explore how they would know if a number is divisible by 2, 4, 5, 11, 10
Let participants share their ideas with other members. Explore the test for divisibility using 2, 3, 5, 11, 10, 9. Explain test for divisibility for these numbers
Using a divisibility test chart, ask participants in groups to indicate whether a number is divisible by a given number or not eg

Number	Divisible by 2	Divisible by 3	Divisible by 11	Divisible by 5	Divisible by 4	Divisible by 9
1968						
45666						
17567						
254751						
128295						
308460						

Activity 5
Multiple (15 min)
Write a number on the board/chart paper and ask participants to give numbers that can be multiplied to give the sad number as a product eg 72 = 12 x 6
Use responses from participants to state what a multiple is eg
72 = 12 x 6
factor x factor
72 is a multiple
Explain why 72 is a multiple of 12 or 6 – each of the two numbers can divide it without any remainder

Let participants give multiples of given numbers
- 2
- 3
- 5

Ask participants to write down multiples of given numbers eg 6, 8, 9. Give limits to the number of multiples that participants should write for each nu

REFLECTION

1 a) Express 640 as a product of its prime factors
b) What are the multiples of 4 between 20 and 50

2 a) Find the LCM of 20, 24 and 30
b) Find the HCF 120 and 105

3 A fence around a garden is 53 m 3 cm long. If the poles around the fence are 1 m 3 dm apart, how many poles are there altogether. Give your answer to the nearest whole number

UNIT 2 HIGHEST COMMON FACTOR (HCF) AND LOWEST COMMON MULTIPLE (LCM)

Introduction
After going through the ideas of factors and multiples of numbers, it is also necessary to have some knowledge that different numbers may be related, hence it is possible to express the value of one number in terms of several other numbers. This presentation focuses on Highest Common Factors and Lowest Common Multiple.

The ideas of Highest Common Factors and Lowest Common Multiples are very essential because will help learners understand how numbers are related.
For example, LCM – to work out common denominators when dealing with fractions and HCF when dealing with equivalence of factors

Objectives
Participants should be able to:
Find common factors of given numbers
Demonstrate how to find the Highest Common Factors of the given numbers
Find some common multiples of given numbers
Demonstrate how to find the Lowest Common Multiple of the given numbers
Work out word problems on Highest Common Factors and Lowest Common Multiples

Suggested resources
Number counters
Human resources
Talular Multiplication Calculator
Markers
Chairs

Suggested Methods
Pair work
Group work
Demonstration
Discussion
Practice
Problem solving

Suggested time: 1 hour

Background Information
Highest Common Factor (HCF)
If two or more numbers all possess the same factor, the factor is called a common factor.
For example, 3 is a common factor of 12, 21 and 33, because these numbers are all divisible by 3.
There may be more that one common factor for a given set of numbers. For example 2,3, and 4 are common factors of 12, 24, 36 and 48.

Activity 1
In groups, using the number chart, find the common factors of 36 and 48 as follows:
Circle all factors of 36
Mark with a square all factors of 48
Identify numbers which have double marks
The double marked numbers are common factors of 36 and 48

In groups, find the common factors of 16 and 24 as follows:
Write down factors of each number against it from the smallest to the largest
Circle factors that apply to both numbers
The factors that apply to both numbers are the common factors of 16 and 24

The largest number is a common factor of two or more numbers and is called their Highest Common Factor (abbreviated to HCF). In groups, identify and write down the HCF of (a) and (b) above.

Activity 2 (15 min)
In groups find the Highest Common Factor of 72, 48 and 60 using the prime factors.
First find the prime factors of 72
Second find the prime factors of 48
Lastly find the prime factors of 60
Group the common prime factors of 72, 48 and 60
Multiply the common prime factors to get the HCF of 72, 48 and 60.

After the full mastery by pupils to calculate the HCF of whole numbers up to 3 terms then introduce the calculation of HCF of numbers up to 4 terms.

Activity 3 (10 min)
Using the method of continued division, find the HCF of:
403 and 832
663, 561 and 2431

Divide the smaller number into the larger
Then divide each remainder into the previous divisor
When there is no remainder, the last divisor is the HCF
For the HCF of three numbers, the HCF two of them should be found, after which the HCF of this result and the third number may be found

Activity 4 (10 min)
Find the greatest number which when divided into 45, 87 and 56 will leave a remainder of 3 in each case.
First subtract 3 from each of the numbers
Then find the HCF of the numbers obtained after the subtraction.

Lowest Common Multiple

It is important that pupils should fully understand the ideas about the common multiple before introducing the Lowest Common Multiple

Activity 1 (15 min)
In pairs write two sets of multiples of 2 and 3 using numbers between 1 and 30
Look at the multiples carefully and discuss what you notice.
Draw loops around these pairs.

Activity 2 (20 min)
In groups, draw three separate rectangles
In rectangle 1, write in it all the whole numbers from 1 to 20
Draw a loop inside rectangle 2 and write in the loop all multiples of 2 from numbers 1 to 20.
Draw a loop inside rectangle 3 and write in the loop all multiples of 3 from numbers 1 to 20
Discuss ways of showing both the multiples of 2 and the multiples of 3 in the same diagram. (Venn diagram)

In both activities, the numbers that are multiples of both 2 and 3 are common multiples of 2 and 3.

The smallest of these common multiples is the Lowest Common Multiple of 2 and 3.

Activity 3
Using the prime factors find the LCM of 36, 24 and 18.
Write all prime factors of 36, 24 and 18
Identify the common prime factors and group them together
Multiply the factors to get the

Activity 4
In groups, solve the following problems involving the Lowest Common Multiple.
Form bells ring at intervals of 8 seconds, 15 seconds, 12 seconds and 9 seconds respectively. If they start together, how long will it take before they next ring together?
Find the smallest number of sweets such that when they are put into bags which all contain 12 sweets or 18 or 21 or 28 there are 3 sweets left over each time.

Unit 3 LENGTHS

Introduction

The standard measure of length is based on the circumference of the earth. It was $\frac{1}{10,000,000}$ (ten millionth or 0.00000001) of the distance from the equator to the North Pole and this was called a metre (m).
The other units of length are in decimal multiples of a metre, and we use prefixes to designate these units.

Aim
This session attempts to broaden the understanding of participants in the use of units of measurements in length, the relationships between units and hints for effective teaching of length.

Objectives
By the end of this section participants should be able to:
Convert one unit to another in metric system
Multiply the length
Divide length
Solve word problems related to length
Employ effective teaching on length

Suggested resources
Pieces of strings
A chart showing the relationship between the units
Rulers
Tables
Pencils
Markers
Sticks
A4 paper
Chart paper

Suggested methods

Group work	Pair work
Problem solving	Practical work

Suggested time: 1 hour

Background Information (Content) and Activities

Estimation and verifications in measurement.
One activity that participants should be encouraged to do through out the learning of linear measurement is to estimate and verify their measurements in both non-standard and standards units.
In this exercise participants should write down their estimates and then do the actual measurement. This becomes a good learning game.

Activity 1 (10mins)

Ask participants, in groups to estimate the length of a table at which they are sitting
Ask the question: what is the length of the table in terms of pencils as units of measurement
Rulers as units of measurement
Take down their estimates on a chart as shown below
Ask participants to verify their estimates by measuring

Unit of measure	Group		Estimate measure	Actual measurement
Pencil	1	A		
		B		
		C		
		D		
Ruler	2	A		
		B		
		C		
		D		

Activity 2 (10mins)
Discuss the importance of estimation and the need for the use of standard units of measurement.
Ask participants to estimate the width of an A4 paper in cm and repeat the process as in activity 1

Activity 3 (10mins)
Ask participants what a standard unit is, in measurement of linear length in the metric system.
Discuss the origin of the metre as a standard unit
Ask participants to name the other units and their relation to a metre.

From the above activity it is evident that the metric system is based on powers of 10 and that each unit is ten times the unit on its right.

For example: a) Express 15 km in metres (m)
Since 1 km = 1,000 m
Then 15 km =? More
= 15 x 1,000m
<u>= 15, 000m</u>

Activity 4 (25mins)
Ask participants in groups to convert the following

24 cm to mm give your answer to the nearest hundred.
12 cm to Dam give your answer to one significant figure.
16.9 dm to Hm give your answer to three decimal places.
6.7 mm to m give your answer to the nearest hundredth.
7.49 Hm to cm give your answer to two significant figures.

Ask one participant to demonstrate how to work out one of the problems.
Discuss the answers with the whole group.

Ask participants in their groups to come up with a generalization of converting a unit of linear measurement from one to another.

Sometimes it is easy to work with denominate numbers (quantities expressed with a numeral and a unit of measure) in metric system. In other words we can always write a metric system number in terms of one unit.

For example:
3 m 4 dm 9 cm can also be written in m only as follows:
Since 10 dm make 1 m
Then 4 dm = 4 m/10
= 0 .4 dm
And since 100cm make 1 m
Then 9cm = 9 m/100
=0.09m
Adding: 3 m + 0.4 m + 0.09m
= <u>3.49 m</u>

Activity 5 (20mins)
Write the following numbers in terms of metres (m)
a. 3 m 42 cm
b. 4 Dam 6 dm 3 cm
c. 2 Km 3 Hm 2 Dam 4 m 3 dm 2 cm
A skirt requires 2 m 75 cm of material at K300 per metre. Calculate the total cost of the material

People meet practical problem related to length in everyday life. Tailoring, carpentry, and building are some activities where length is applied.

Activity 6 (20mins)
In groups ask participants to work out the following problems:
A piece of cloth 8 m 05 cm long was to be divided equally amongst 7 pupils for needlecraft. How much cloth did each pupil receive?
Four pieces of word are joined together to form a bench. Each piece of wood is 1 m 64 cm 08 mm long. Calculate the total length of the bench.
Discuss the problems with the whole group.

Summary
The metric system is easy to work with because it is a decimal system. In other words, it is a base 10 and this makes computations easy. Teachers and pupils should understand the conversions fully first before moving into operations. The idea of estimation should not be taken lightly since in everyday life we are often confronted with situations where estimate or guess is inevitable. In such situations, accurate estimations largely depend on practice or experience. Hence it is important for teachers to take this into consideration.

REFLECTION

1. Write down two methods of finding common factors. Which one do you prefer and why.

2. Write down ways of finding the Lowest Common Multiple (LCM) and the Highest Common Factor (HCF). Give an example in each case.

3. Write down the importance of estimating measurements and using standard units of measurement.

SECTION III: SCIENCE

Unit 1 MACHINES

Session 1 (1 hr)

Introduction
Machines cannot be separated from our everyday life because we rely on them to simplify our daily tasks. For example, stones were used to chop meat in ancient times; bicycles are used today to ease movements.

The topic will focus on examples of commonly used simple machines and how they work to support everyday life. The approach used is intended to offer hands on experience to participants while building an understanding of how the machines operate to make work easier. Calculations are included to improve the mathematical competence of the participants.

Objectives
By the end of this unit, participants should be able to:
Define a machine
List examples of machines used in everyday life
State the differences among the following simple machines: levers, inclined planes and pulleys
Calculate mechanical advantage of machines
Explain the application of machines in everyday life
Teach the topic on machines

Suggested resources

Wheelbarrows	Bottle openers	Pair of scissors	
Pulleys (grooved wheels with holes)	Thin nylon string	Knives	
Spring balances	2 meter smooth planks		Wedges
Unopened Fanta bottles	Clamps and clamp stands		Hoes
Screws and bolts	A4 plain paper		Razor blades
Axes	Flip chart paper	markers	
Crowbars	Fishing rod with string		rollers
Claw harmers	Pair of pliers	Screw drivers	
Pieces of wood	Hangers with rollers	Metre rulers	
Toothpicks	Masses (weights)		Beam balances

Suggested methods
Group work
Experimentation
Question and answer
Field visit

Suggested time: 1 hour

Background information and activities

Activity 1

1. Organize participants into groups.

2. Distribute to each group the following materials:

Pulleys	Axes	Screws	Screw driver
Bottle opener	Rollers	Planks	Pliers
Hanger with a roller	Wheelbarrow	Crowbar	Wedge
Fishing rod with string	Pair of scissors	Knives	Hoes
Claw hammer			

3. Ask participants to classify the materials into levers, inclined planes and pulleys.

Levers	Inclined plane	Pulleys

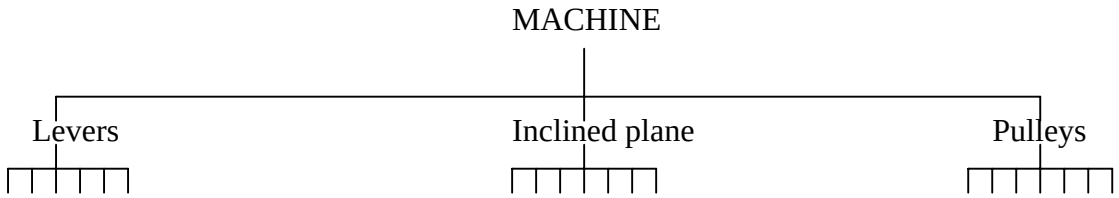
Show participants a bottle of Fanta with a lid on.

5. Ask one person to come in front and try to open the bottle using bare hands.
What is needed to open the bottle more easily?

6. Show participants a piece of wood into which a nail has been fixed.
Ask participants to try and extract the nail with their bare hands.
What is needed to extract the nail from the piece of wood more easily?
What term is used to describe anything that makes work easier to do than without it?

7. Ask participants to list more examples of machines that are used in everyday life.

Summary



A machine is a device that makes work easier to do than without it. Some machines are simple, e.g., levers (scissors, bottle opener), pulleys and inclined planes while other machines are compounded, e.g., bicycle, and car.

Machines make work easier by:
Multiplying less force
Changing direction of force
Making things go faster

Session 2 (1 hr)

Activity 2
Ask participants to study the devices that were classified as levers in activity 1.

Ask participants to discuss the meaning of a ‘lever’.

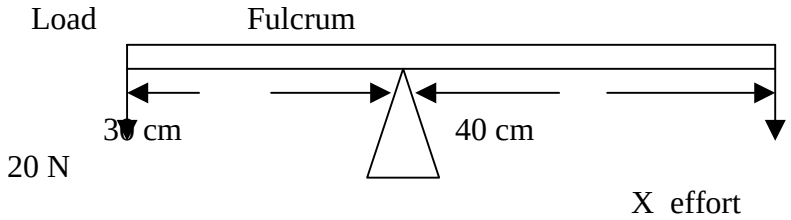
Let participants list down common features that levers have. Encourage them to use each device to determine the common features.

Let participants describe the position of the fulcrum in relation to the load and effort in the following levers (simple machines):
Claw hammer
The human arm
Wheelbarrow
Crowbar
Pair of scissors
See-saw
Pair of pliers
Wheel spanner
Fishing rod
Bottle opener

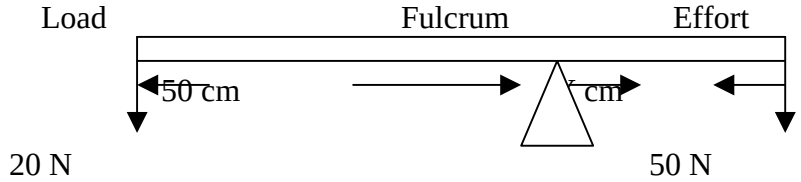
Ask participants to classify the levers in Step 4 into the three classes of levers, namely, first class levers, second-class levers and third class levers.

The law of levers says distance x load on one side of the fulcrum = distance x effort on the other side of the fulcrum. Use the law of levers to work out the values of X, Y and Z in the following levers:

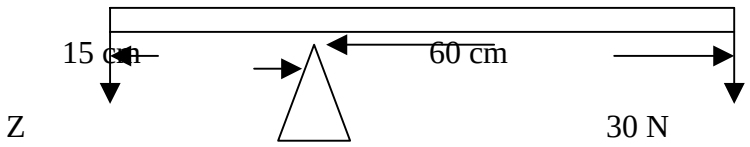
a.



b.

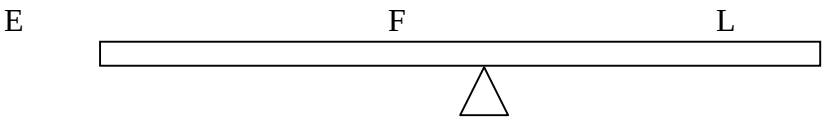


c. Load Fulcrum Effort

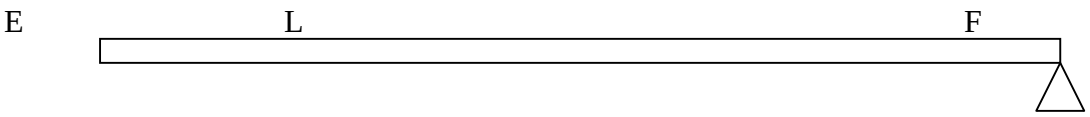


Summary
A lever is a rigid bar that is free to move or turn about a fixed point.
There are three classes of levers:
First class levers
Second class levers
Third class levers

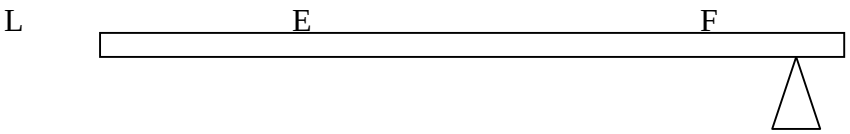
c. A first class lever has fulcrum between load and effort:



A second-class lever has load between fulcrum and effort:



A third class lever has effort between load and fulcrum:



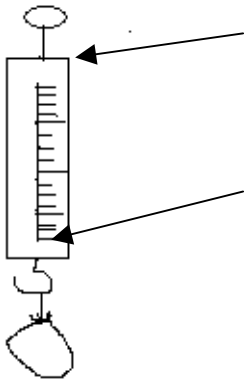
Session 3 (1 hr)
Activity 3
Ask participants to form groups of 5 members.

Facilitator brings a load attached to a spring balance to every group.

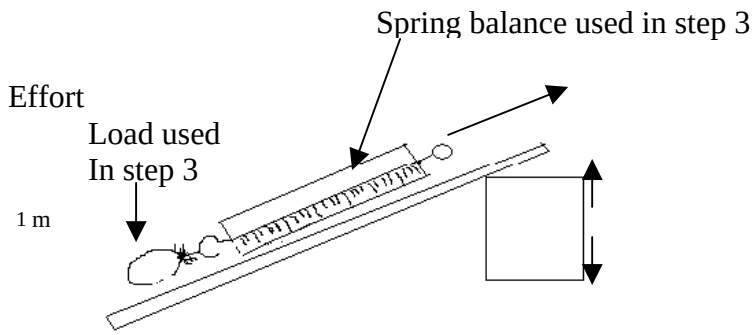
Ask participants to lift the load to a height of about 1 m and take a reading.

Spring balance

Load



Bring a smooth plank and set it as in the diagram below:



5. Ask participants to drag the load in Step 5 through the smooth plank to the height of 1 m and record the reading.

6. Ask participants to compare the values of the effort applied in Steps 3 and 5.

7. Ask participants to reduce or increase the slope of the plank and repeat step 5 above.

8. Ask the following questions:
What is the relationship between the effort applied and the slope of the plank?
Apart from increasing or reducing the slope of the plank, what other factors can affect the amount of effort to be applied?
What name is given to the type of machine that was used in Steps 5 – 7?

Ask participants to give more examples of inclined planes used in everyday life.

10. Ask the following questions:
What scientific skills and attitudes did you use in Activity 3?
What scientific knowledge have you learnt from Activity 3?

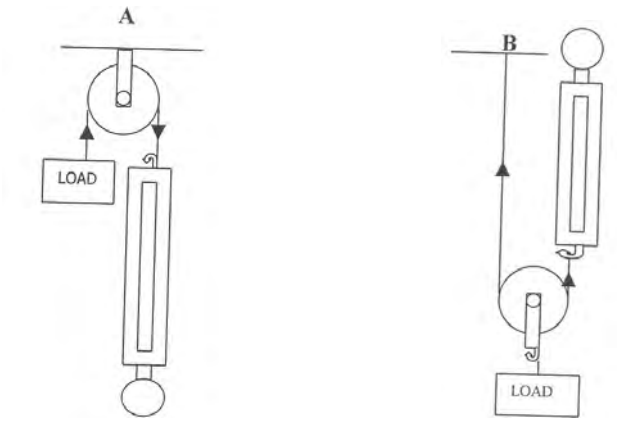
Summary

An inclined plane is a straight surface, which is set at an angle to the ground. It can be used in lifting loads to higher grounds with less effort as compared to lifting without it. The longer the inclined plane the less the effort required. The smoother the plank the easier it is to drag the load along it, which means using less effort. Examples of inclined planes are wedges, screws, knives, razor blades, a needle, axes, hoes and toothpicks.

Session 4 (1 hr)

Activity 4
Ask participants to lift a load that is hooked to a spring balance and take the reading.

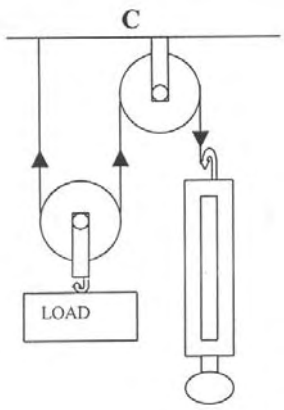
Ask participants to lift the same load as in Step 1 using a pulley set as in A and B and take readings.



3. Ask participants to compare the three readings in Steps 1 and 2.

4. Ask the following questions:
In which case was greatest effort applied?
Explain the difference between the effort applied in A and B in Step 2.

5. Facilitator sets up two pulleys as shown in the diagram bellow to lift the same load as in Steps 1 and 2 and take the reading.



6. Ask participants to lift the load using the set up in Step 5 and take a reading. Ask the following questions:
How does the new reading compare with those in Steps 1 and 2?

Explain why it is easier to lift a load in C as compared to A.
What is the name of the machine that was used in Steps 2 and 5?
What are the advantages of using pulleys over the use of an inclined plane when lifting a load?
Explain why pulleys are machines.

7. Ask the following questions:
What scientific skills and attitudes did you use in Activity 4?
What scientific knowledge have you learnt from Activity 4?

Summary

Pulleys are machines, which can be used to lift a load. In some pulley systems the weight of the load is shared in the strings and thus reducing the effort required in lifting the load. It is easier to lift a load by pulling down as compared to pulling up since gravitational force would be acting against the effort.

Session 5 (1 hr)

Activity 5
Ask participants to explain what they understand by the term mechanical advantage in connection with machines.

Ask participants how they would calculate the mechanical advantage of a machine.

3. Ask participants to calculate the mechanical advantage in each of the follow cases:
A load of 40 N is lifted using first class lever (plank) with an effort of 20 N.
An effort of 30 N is applied on a load of 75 N.
Mechanical advantage of pulleys in Step 5 of Activity 4.

Summary
A machine is said to have mechanical advantage if the effort required is less than the load.

$$\text{Mechanical advantage of a machine} = \frac{\text{Load}}{\text{Effort}}$$

Activity 6

Ask participants to discuss in groups how teachers would prepare and teach the topic on machines effectively.

2. Representatives from each group report their findings in plenary for discussion.
Findings could include the following:
Thorough preparation by the teachers
Collection of materials
Use of participatory methods
Use of continuous assessment

Assessment
1 a) Give three examples of inclined planes used in everyday life.

b) Imagine you have two inclined planes titled at the same angle and of the same length. One plank has rollers fixed on it while the other has a smooth surface. Which inclined plane would require less effort in dragging the same load? Explain your answer.

2 Screws are a form of wedges with winding lines.
Which screw would require less effort, one with less threads or one with more threads when screwing into a plank.
Give reasons for your answer. Explain your answer

3. An effort of 50 N is applied on a fishing rod, which has a mechanical advantage of two. What is the weight of the load?

4. How would you increase the mechanical advantage of?
an inclined plane?
a pulley

5. Give three examples of where pulleys are used in everyday life.

REFLECTION

1. Name classes of levers and give an example of each.

2. Give three ways you can reduce effort when pushing or pulling a load on an inclined plane.

3. Briefly explain how you can increase mechanical advantage when lifting a load using pulleys.

APPENDIX 1: SUGGESTED ANSWERS

SECTION 1 ENGLISH

Unit 1: Activity 1

Long talking
Utterances that make sense
Something to communicate
Message carrier
Articulated sounds

Activity 2

1. Adverb
2. Adjective
3. Conjunction
4. Interjection
5. Noun
6. Pronoun
7. Preposition
8. Verb

Activity 3

Adjective
- Qualifies or describes a noun and/or a pronoun

Adverb
– Modifies (talks more about) a verb, adverb and/or adjective

Conjunction
– Joins words or word groups

Interjection
– Reveals the mood or feeling of the speaker (words that show feelings)

Noun
– A word that names a person, thing or place
- A word that acts as subject or object of the verb in a sentence

Pronoun
- Stands for the name of a person, place or thing

Verb
- Expresses a state of being
- Actions expressed or done in a sentence
A verb is an action word or a word that express feelings.

Preposition
- Shows the position of nouns or pronouns

Activity 4

Pronoun
I will not go to the football match

Verb
I played netball yesterday
I like fish

Adverbs
The rain fell heavily this morning
The dog was very big

Noun
I have an idea
Mosquitoes are dangerous

Preposition
The bottle is on the table

Adjectives
Madalitso is a short boy
It was a rainy day

Conjunctions
Pupils and their teachers are happy
Do you want a Fanta or a Coke?

Interjection
Wow! How beautiful
Sh! The teacher is coming

Activity 5

Work
Work hard. (Verb)
This is difficult work. (Noun)
We have no work books. (Adjective)

Both
Both are my sisters. (Pronoun)
He broke both legs. (Adjective)
I will pick both books. (Adjective)
I will pick both. (Pronoun)
Both of them are sick. (Pronoun)

One
I have one book. (Adjective)
One wonders why the bridge has not been repaired. (Pronoun)

One
One boy should come here (adjective)
There are three students, one is a prefect (pronoun)

Fast
We broke our fast. (Noun)
Run fast. (Adverb)
It was a fast car. (Adjective)

Activity 6
It is difficult.
I can't.
The word could be different parts of speech.

Words have to be in sentences in order to identify their part of speech.

Unit 2: Activity 1

Brush
The brush is green. (Singular)
The brushes are green. (Plural)

Gas
Gas expands when heated. (Singular)
Gases expand when heated. (Plural)

Watch
The watch is on the table. (Singular)
The watches are on the table. (Plural)

House
The house is on fire. (Singular)
The houses are on fire. (Plural)

Box
I want to use that box. (Singular)
I want to use those boxes. (Plural)

Fox
The fox runs away when the farmer comes. (Singular)
The foxes run away when the farmer comes. (Plural)

Activity 2: Nouns
Sieving is a method of separating solid mixtures. Smaller particles pass through the sieve and bigger particles remain in the sieve.

You can also use a cloth to sieve mixtures of solids and liquids. The solids remain on the cloth while the liquid passes through the cloth.

Winnowing is a method of separating solid mixtures. The lighter solids are carried away from the winnowing basket.

Sieving and winnowing are carried out in homes and industries.

Adverbs and prepositions
Sieving is a method of separating solid mixtures. Smaller particles pass through the sieve and bigger particles remain in the sieve.

You can also use a cloth to sieve mixtures of solids and liquids. The solids remain on the cloth while the liquid passes through the cloth.
Winnowing is a method of separating solid mixtures. The lighter solids are carried away from the winnowing basket.

Sieving and winnowing are (carried out) done in homes and industries.

Adjectives and Interjections
Sieving is a method of separating solid mixtures. Smaller particles pass through the sieve, and bigger particles remain in the sieve.

You can also use a cloth to sieve mixtures of solids and liquids. The solids remain on the cloth while the liquid passes through the cloth.
Winnowing is a method of separating solid mixtures. The lighter solids are carried away from the winnowing basket.

Sieving and winnowing are carried out in homes and industries.

Verbs and Pronouns
Sieving is a method of separating solid mixtures. Smaller particles pass through the sieve, and bigger particles remain in the sieve.

You can also use a cloth to sieve mixtures of solids and liquids. The solids remain on the cloth while the liquid passes through the cloth.

Winnowing is a method of separating solid mixtures. The lighter solids are carried away from the winnowing basket.

Sieving and winnowing are carried out (done) in homes and industries.

Activity 3
Mary – noun, subject of the sentence; teacher – complement
Soldiers – noun, subject of the sentence; enemies – object
Susan – noun, subject of the sentence; John – indirect object; letter – direct object
Martha – noun, subject of the sentence; girl – complement
Children – noun, subject; mangoes – direct object

Activity 4
The girls have fallen down.
I have seen red books in the corners.
Mary went to churches yesterday.
Foxes killed my hens.
Those green shirts look good.

Activity 5
John (noun) went (verb) to (preposition) school (noun) yesterday (adverb) to (preposition) study (verb) for (preposition) his (pronoun) final (adjective) and (conjunction) important (adjective) examinations (noun).

Unit 3
Activity 2

Questions
Who started the fight?
When was the fight?
What happened during the fight?
Were any people injured during the fight?
Why were the people fighting?
What happened after the fight
Who was fighting?
Where was the fight?
Who stopped the fight?
Was any property damaged during the fight?
What caused the fight?

Vocabulary

punch	angry	injured
apologize	bleed	break

Unit 4
Activity 1
Noise
Activities which are not well coordinated

Some pupils are permanently off task
Pupils failing to perform assigned tasks
Frequent display of wrong skills manipulation

Activity 2
All pupils occupied on the correct lesson activity
Pupils involved in the same lesson at any given time though stages may differ
Pupils discussing issues without disturbing each other
Close semblance of responses given
Teacher able to gauge/map out a process indicator to assess work being done by pupils
Marked stages of "pupils listening" and "pupils working on some activity"

Activity 3

Giving instructions
Take these books and give them to your friends.
Go back to your places.
Do exercise A in your notebooks.

Organizing pair or group work
Get into your pairs
Group leaders begin
Do the same in your pair

Maintaining discipline
Silence please
Stop that
Leave the classroom quietly
Where is your pencil, Emmanuel
Pay attention

Organizing reading lesson
Open your books to page …
Look at the picture carefully
Listen! Watch and listen

Showing disapproval
No
That's not right
Try again
Not as good/ not really

Organizing demonstration
Class watch and listen
Stand up/ sit down
Speak louder and clearly
Class look here and listen
Group leaders come here

Introducing and concluding a lesson
Now close your books and put them way
Yesterday we were learning about… what did we learn about…
Stop

Requesting oral response
Say after me
Do it again
Louder please
Long answer please

Praising
Good
Well done Jesse
Yes, that's right

SECTION 2 MATHEMATICS

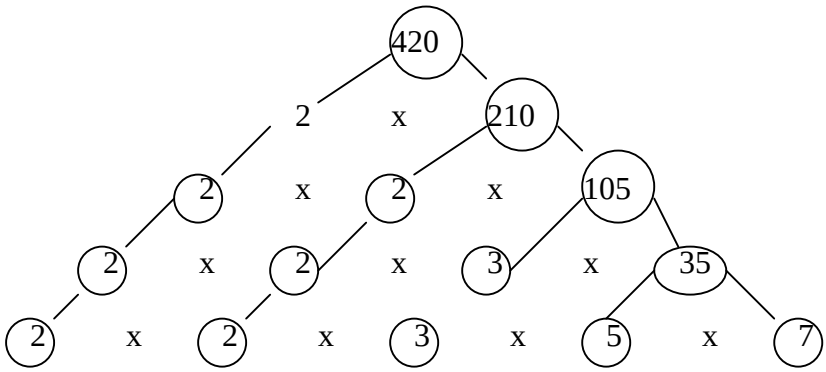
Possible Responses to activities for unit 1

Division

2	420
2	210
3	105
5	35
7	7
	1

420 = 2x2x3x5x7

factor tale



Activity 3

milli = $\frac{1}{1000}$ deci = $\frac{1}{10}$ hecto = 100

centi = $\frac{1}{100}$ deca = 10 kilo = 1000

or

10 millimetres (mm) = 1 centimetre

10 centimetres (cm) = 1 decimetre

10 decimetres (dm) = 1 metre

10 metres (m) = 1 decametre

10 decametres (Dam) = 1 hectometre

10 hectometres (Hm) = 1 kilometre (Km)

Activity 4

240 mm	≈	200 mm	to the nearest hundred
0.012 dam	≈	0.01 dam	to one significant figure
0.0169 hm	≈	0.017 hm	to three decimal places
0.0067 m	≈	0.01 m	to nearest hundredths
74900 cm	≈	75 000 cm	to two significant figures

When converting one unit to another, basically it involves the shifting of a decimal point. There is a simple way to remember the correct number of places to move the decimal.

First write down the units in order as follows:

Km	Hm	Dam	m	dm	cm	mm

In converting say, km to cm, count the number of units in going from kilometres to centimetres. We see that we move 5 units. Thus to change km to cm we move the decimal point 5 places to the right.

For example:
3 Km = 300,000 cm. To convert dm to Hm, we move 3 units to the left. In other words we move the decimal point 3 places to the left .For example: 3 dm= .003 Hm

Activity 5

1.a) 3.42 m b) 40.63 m c) 2,324.32 m

2. You might see that this problem requires first to write 2 m 75 cm in m only
This becomes 2.75 m
Since the cost is K300 per m
∴ 2.75 m would cost more

= 2.75 x K300

= K2.75 x 300

= K875

Activity 6

m	cm
1	15
7)8	5
7	100
1	105
100	
100	

m	cm	mm
1	64	08
X		4
6	59	02

Section 3 - Science

No suggested answers for Science activities.

Appendix 2: References

Section 1 - English

Malawi Institute of Education, (1991), *Activities with English*, A Course for Primary Schools Teachers' Guide for Standards 1 to 8

Malawi Institute of Education, (1991), *Activities with English*, A Course for Primary Schools Pupils' Books for Standards 1 to 8

Section 2 – Mathematics

Malawi Institute of Education: Primary Mathematics Teachers Guide for Std 5

Malawi Institute of Education: Primary Mathematics Guide for Std 7

Paling D (1997) Teaching Mathematics in Primary School (Oxford) University Press

Symon A. and Willikin G.W. Arithmetic. A Three Years' course: (Glassgow) Robert Gibson and Sons.

Treff, A.V. and Kacobs D.H. (1991) Basis Mathematics Skills (USA) America Guidance Service

Heddens, James (1984) *Today's Mathematics*, 5th Edition, and Science Research Associates.

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Malawi Institute of Education, (1995) Malawi Primary Education Mathematics Teachers Guide for Standards 5-7 Domasi, MIE

Malawi Institute of Education, (1991) Malawi Primary School Teaching Syllabus Primary Mathematics, Domasi, MIE

Section 3 - Primary Science

Asher and Parker, Introduction to Physical Science

Abott, O-Level Physics

MIITEP Handbooks

Primary Science Teachers' Guides and Pupils' Books