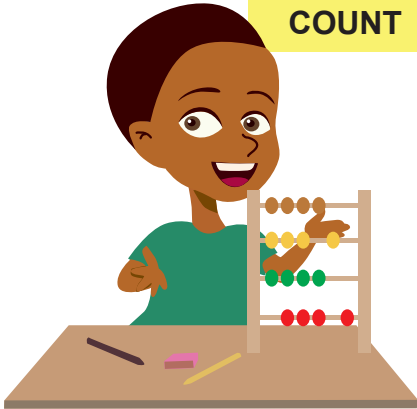


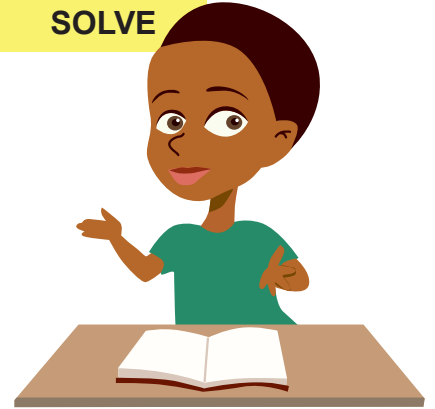


REPUBLIC OF ZAMBIA
MINISTRY OF EDUCATION

COUNT



SOLVE



NUMERACY

READ



WRITE



NUMERACY

Teacher's Guide **CATCH UP**

This Teachers' Guide is compiled for the Catch Up programme for teaching learners in grades 3 to 5 in Zambia who have not yet achieved the numeracy skills required in their grades. The Ministry of Education acknowledges the contribution made by Pratham, Zambia Education Sector Support Technical Assistance (ZESSTA), VVOB, TaRL Africa, UNICEF, USAID, LEGO Foundation, and Hempel Foundation to these materials. In addition, the Ministry acknowledges the work done by teachers and teacher trainers involved in adapting this guide and additional materials.

TABLE OF CONTENTS

| | |
|--|----|
| Background | 1 |
| The Placement Test | 3 |
| Difficulties Faced While Learning Mathematics | 7 |
| Lessons Process And Planning. | 8 |
| Number Recognition Activities | 9 |
| Mental Mathematics | 19 |
| Basic Mathematics Operations | 22 |
| Lesson Procedure | 42 |
| 7C's Framework of Learning through Play | 46 |
| Impact of Learning through Play on Fields of Development | 47 |

◆ **Background information - What is the Catch -Up programme/Teaching at the Right Level (TaRL) methodology?**

The Ministry of General Education has made great strides to improve access and equity among learners in primary schools. Efforts are now being put in place to ensure improvement in education quality by raising learner performance to acceptable levels by the end of primary school. This is being achieved by implementing the Zambia Education Curriculum Framework of 2013 through which learners will acquire Functional Literacy and Numeracy Skills. National Assessment results that are conducted once every two years for Grade 5 learners have shown that at present, the majority of learners fail to break through to literacy and/or numeracy. This is caused by many factors such as overcrowded classrooms that limit teacher's ability to attend to individual learners, especially those who are struggling to learn. The Catch Up programme has been designed so that teachers have the time to focus on these learners during remedial lessons. In line with the Zambia Education Curriculum Framework 2013, and the Revised School Curriculum, learners will learn to read, write, and become numerate in a familiar language through Catch Up activities. TaRL teaching methods will also ensure that learners are actively engaged.

◆ **The situation - Why is the Catch Up programme being implemented?**

The Catch Up programme was adapted for the learners who are in Grades 3, 4 and 5, who are not yet able to read, write or solve simple mathematical problems. The Ministry of General Education would like to acknowledge the Materials on which this adaptation is based: i.e. the manual compiled by Pratham in India which has then been harmonised with the ZESSTA materials developed in Zambia. The Ministry recognizes that it is essential to help learners improve by conducting remedial work in ways that actively involve learners, and help them enjoy their early Grades i.e. 3–5, before they enter junior secondary.

◆ **Intentions - What will the Catch Up programme/TaRL methodology achieve?**

The Catch Up programme will assist the learners to grasp numeracy and literacy concepts and skills through practice and discussions. Learners are challenged to solve problems by using different methods and are encouraged to try again and again until they succeed. This helps them to understand and build strong foundational skills, build their confidence, and develop interest in these key skills. Exposure to Mental and practical, based on number recognition and the basic mathematics operations, will improve their understanding of Number Sense. This will also help in building their basic competencies in Numeracy.

The Catch Up programme is based on learning through different hands-on activities and builds on learner's prior knowledge. The programme encourages learners to work individually and in groups to build associations between learner's experiences and their Numeracy development. Through interaction and sharing ideas, learners enjoy being with others. They also build deeper understanding and relationships. Once the learners have achieved the learning outcomes at each level, they should be promoted to the next level. There is a need to build in flexibility so that those who make progress can move on quickly. For example, once learners recognise numbers, they should move to basic mathematics operation. One should avoid holding learners back below their achievement levels.

◆ **The language and the teacher**

This Teacher's Guide is designed to help you, the teacher, to deliver Catch Up activities for all learners who are falling behind in Numeracy skills. It is written in English and many examples have also been written in English. However, you will have to teach this course in the learner's familiar language to help them understand the concepts. This means that you will also need to translate all the examples given into the familiar language.

This guide will be also be accompanied by an intensive teacher training course that will cover all the main skills you will need to develop as a Catch Up teacher. This includes training on how to translate from English into the language you will teach in. The course is based on a number of assumptions about the teacher. These assumptions include:

- You are a fluent speaker of the language of instruction (e.g. Cinyanja, Chitonga, Icibemba, Silozi, Kikaonde, Luvale, Lunda.)
- You have attended training on how to conduct Catch Up activities.
- You are a professional teacher who is imaginative, creative and well-motivated to help your learners learn through a variety of creative activities.

The three points above are essential criteria to teach Catch Up. After understanding and trying out the lessons given in the guide and after attending the training, you will be able to generate a range of similar lessons and activities. These lessons and activities will ensure learners learn to read and write quickly through active engagement.

Approach

- 1) For the purposes of teaching and learning, learners are grouped according to their current learning level rather than by grade. This will make the learning relevant and meaningful for learners.
- 2) Regardless of age or grade, the starting point for instruction is to establish the current numeracy level of the learner using a basic assessment tool administered on a one-on-one basis.
- 3) Set achievable goals which are clear and easy to understand by learners, parents and instructors.
- 4) We use a three group strategy. The Whole Group Approach (involving the whole class), Small Group Approach (smaller parts of the class) and the Individual Approach (self or supervised learning, particularly for reading, writing and interpretation.)
- 5) Combining a variety of activities is very effective for maximizing learning.

CATCH UP AND LEARNING THROUGH PLAY

Young learners often learn through play. When learners are provided with opportunities to play in their classes, they not only learn meaningfully but also become motivated and incentivised to learn. Learning through Play also helps learners build confidence and develop other essential socio-emotional skills.

In most school classes, learners only listen while the teacher keeps talking. Learners sit in rows facing the teacher and the chalkboard. Play is usually absent in such classes. However, a Catch Up class is very different. The Catch Up teacher uses a variety of activities to engage the learners and encourages teacher-learner and learner-learner interactions. These activities are based on the learner's current level of understanding and flow from simple to complex or from known to unknown.

Through play and games, children not only learn literacy and numeracy but also develop essential social, emotional, and physical skills. Learning through Play encourages participation, provides choice, generates involvement, and ensures the well-being of learners. The Catch Up teacher knows that play is not just for breaktime. It is an essential part of learning in the school.

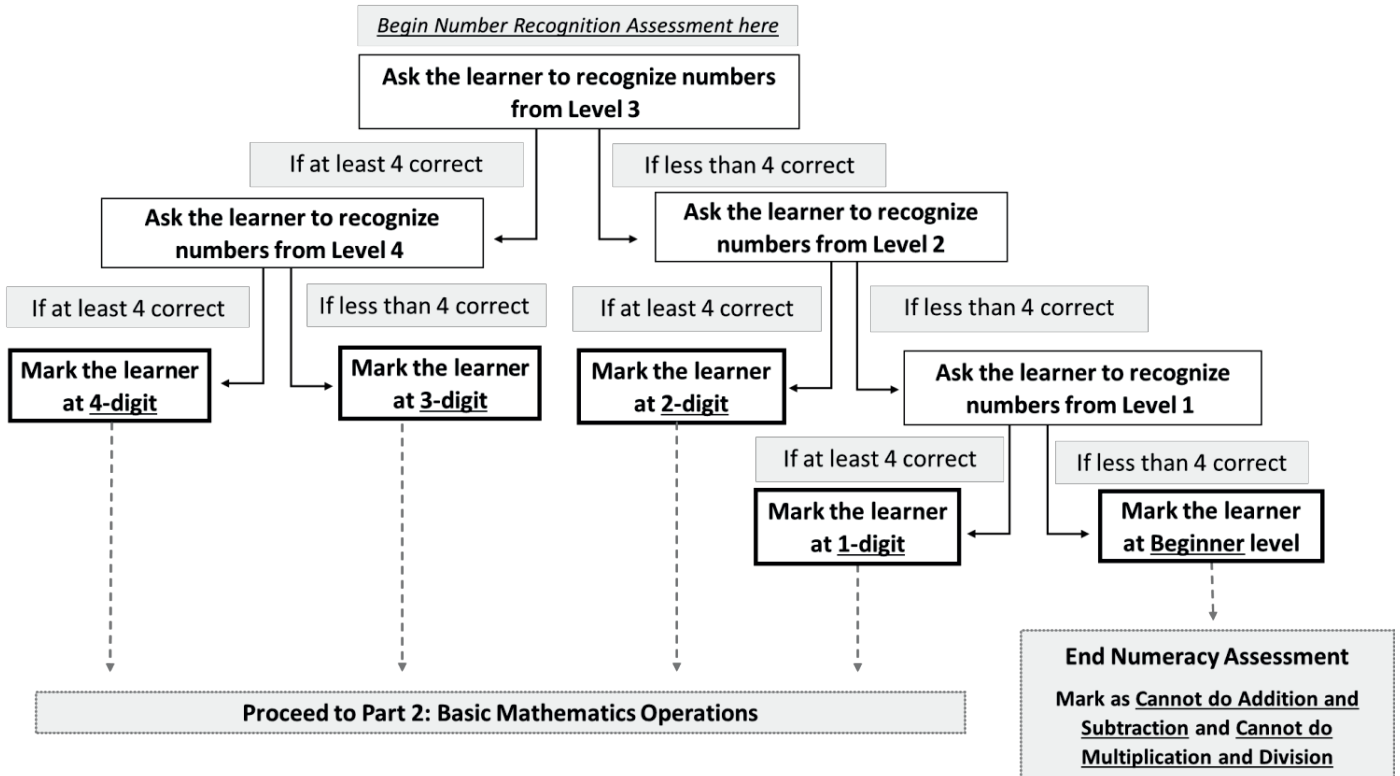
THE PLACEMENT TEST

Basic Numeracy Assessment Tool 1 Part 1: Number Recognition

| LEVEL 1 | | LEVEL 2 | |
|---------|---|---------|----|
| 4 | 8 | 30 | 53 |
| 1 | 7 | 61 | 96 |
| 3 | 5 | 47 | 12 |

| LEVEL 3 | | LEVEL 4 | |
|---------|-----|---------|-------|
| 402 | 971 | 3 522 | 8 045 |
| 541 | 884 | 1 002 | 6 660 |
| 609 | 920 | 4 147 | 5 402 |

Part 1: Instructions



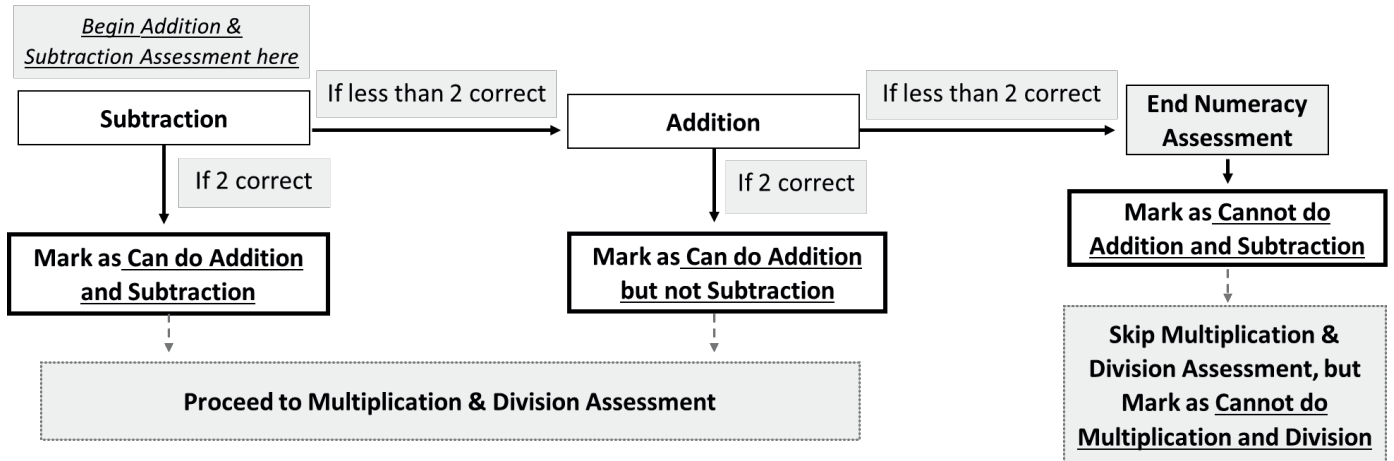
THE PLACEMENT TEST

Basic Numeracy Assessment Tool 1 Part 2: Basic Mathematics Operation

| ADDITION | |
|----------|--------|
| 17 | 36 |
| $+ 49$ | $+ 25$ |
| | |

| SUBTRACTION | |
|-------------|--------|
| 72 | 50 |
| $- 14$ | $- 32$ |
| | |

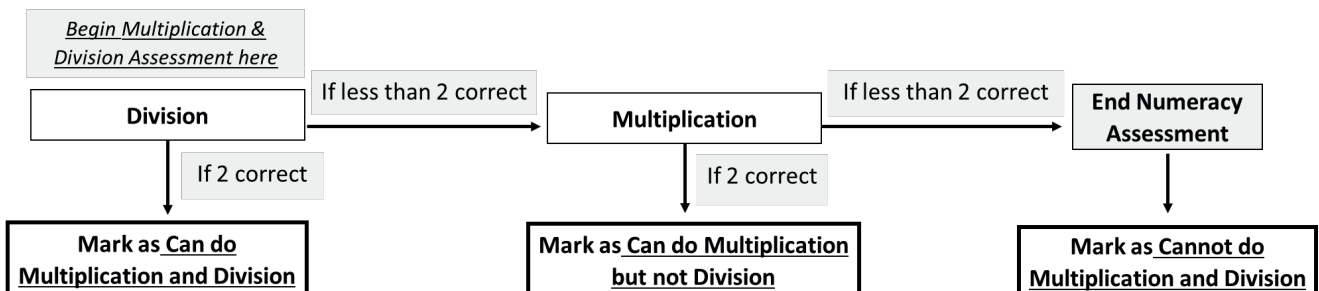
Instructions



| MULTIPLICATION | |
|----------------|------------|
| 26 | 68 |
| $\times 3$ | $\times 5$ |
| | |

| DIVISION | |
|--------------------|--------------------|
| $5 \overline{)67}$ | $3 \overline{)89}$ |
| | |

Instructions



THE PLACEMENT TEST

The levels are mentioned in the table below:

| | | |
|-----------------|--|-----------------------------------|
| BEGINNER | Beginner | Cannot recognize even one digit |
| LEVEL 1 | 1 -digit number recognition | Can recognize at least one digit |
| LEVEL 2 | 2 -digit number recognition | Can recognize two-digit numbers |
| LEVEL 3 | 3 digits - can recognize three-digit numbers | Can recognize three-digit numbers |
| LEVEL 4 | 4 digits - can recognize four digits numbers | Can recognize four-digit numbers |

Based on the aforementioned levels, the following three major groups will be formed for classroom teaching:

- **GROUP 1:** Level 1 and Beginner (1-Digit number recognition)
- **GROUP 2:** Level 2 and 3 (2-digit number recognition and 3-digit number recognition)
- **GROUP 3:** Level 4 (4-digit number recognition)

Homogeneous and Heterogeneous Grouping

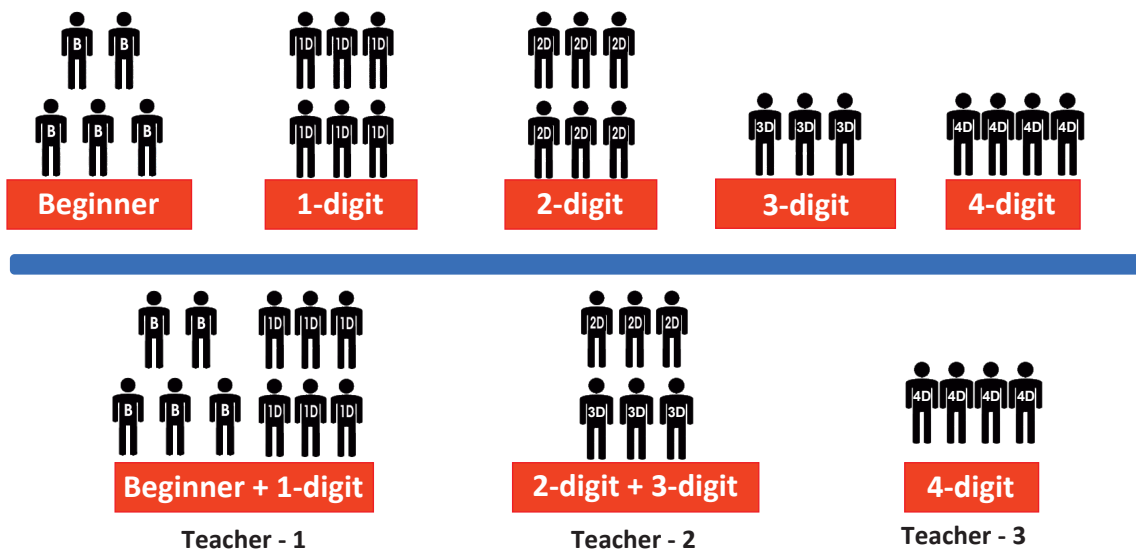
All level-wise groups need input on understanding numbers and/or operations with their application. The activities are designed in such a way that the teacher can conduct them with the whole class as well as with smaller groups. Hence, it is necessary to understand the importance of both whole class and small group procedures.

We recommend that learners be divided as above but depending on the pupil-teacher ratio, sitting space and classroom resources we can further classify the classroom setting either as a homogenous grouping or heterogeneous grouping of learners.

Homogeneous Grouping:

In homogeneous grouping the one teacher is in charge of learners at one or at least two level. For example, if there are 3 teachers, all learners at beginner and 1 digit level will be with teacher 1, all learners at 2 and 3 digits level will be with teacher 2 and all learners at 4 digits level will be with teacher 3.

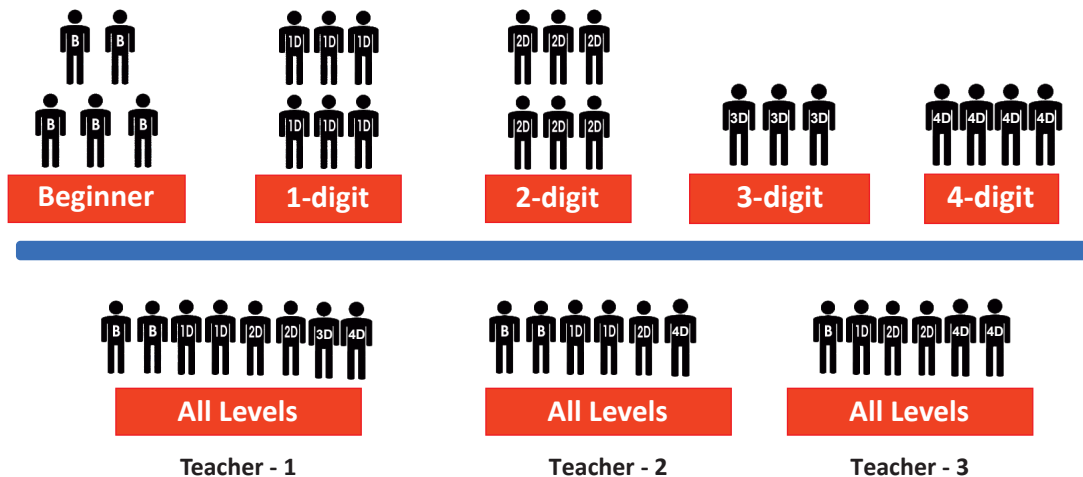
One teacher has only one group within a classroom (Mixed grades)-Grouping



Heterogeneous Grouping:

In heterogeneous grouping, one teacher is in charge of learners at all levels. The teacher will conduct whole class activities and then divide them into groups. For example, beginner and one-digit learners will sit in one group, 2 and 3 digits level learners will sit in another group and 4 digits learners will sit in one groups. All of them will sit in their groups in the same classroom and do activities allotted to them according to their learning levels.

Heterogeneous grouping - One teacher has all groups within a classroom



DIFFICULTIES FACED WHILE LEARNING MATHEMATICS

This section will help you anticipate the difficulties learners might face in order for you to address them in your lesson.

Number concepts

If there is lack of basic understanding of numbers, over a period of time the fear of mathematics increases.

Rote learning is a good strategy for remembering formulas and tables but explaining these concepts can be difficult. Concepts can be understood easily through practical knowledge, which helps learners to overcome problems with abstract presentation. Common problems with number concepts include the following:

- **Identifying** : Finding or writing numbers randomly is difficult.
- **Reversal** : Learners get confused while writing two or more than two-digit numbers. They don't understand place value.

For example, they might not know the difference between 23 and 32 or might write 23 when 32 is said.

Basic Mathematics operations

Learners are not clear about how to present the problem in mathematical form.

Basic mathematical terms:

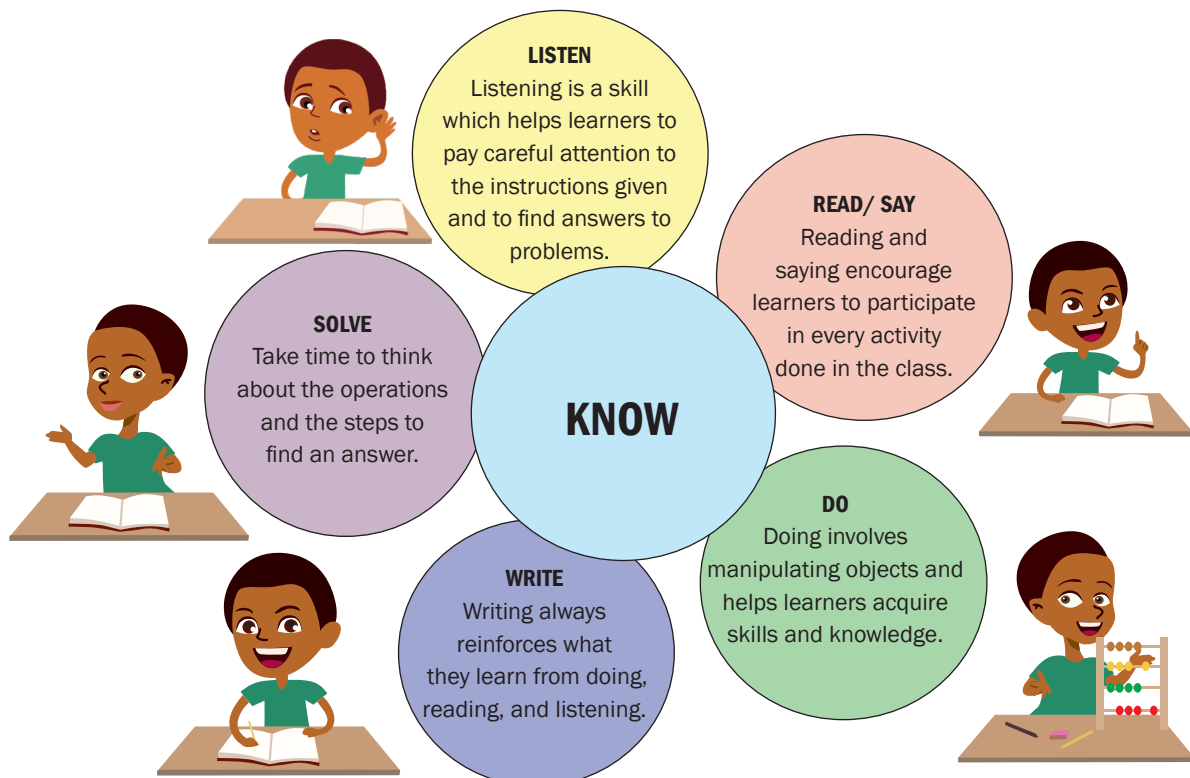
Sometimes learners get confused with mathematical terms and their meanings in everyday language.

- **Place value confusion means** that they have problems in deciding how to start addition and subtraction operations, where to write answers or where to borrow the numbers.

It is important that learners understand the concepts behind doing operations. They should also be able to connect these concepts with mathematical vocabulary. When this is done, they can do rote memorization to help with mental math skills.

LEARNING CAPABILITIES

Learning mathematics is a combination of listening, reading, saying, doing, writing, and solving.



LESSON PROCESS AND PLANNING

Introduction

In the initial days of teaching, conduct no more than one operation either in addition or subtraction or multiplication or division with oral word problems. When solving written word problems, again choose only one operation from addition, subtraction, multiplication, or division and conduct the activity. You can later conduct more than one activity orally but continue with one written operation for a longer time until you feel the learners are confident.

Activities related to other competencies should be conducted on alternate days. Homework could be given on days when activities related to different competencies are taken. Solved worksheets or numerical problems will be discussed on the next day.

Actively engage learners in games related to numbers, operations and other competencies as needed. The game should be related to the topic and activity that is being conducted.

Lesson procedures

Below is an outline of a lesson procedure. Some guidelines on timing are given in the annex on pages 42-45. As learners progress and master number recognition, the priorities in lesson timing and procedures will shift. For instance, from an emphasis on number recognition, emphasis will shift to operations.

1. Number recognition

- Whole class activity: number chart reading
- Group activity: number chart activity
- Individual: reading the number chart

2. Operations

- Whole class: 'Mental Maths'
- Whole class: introduction to an operation
- Whole class: word problem
- Group work: word problem in groups
- Individual work: word problems individually

Planning lessons across the groups

When planning your lesson and choosing activities to include in the lesson, consider the group and the needs of that particular group.

This teacher guide contains guiding frames that can be used to help create lesson plans. The frames suggest how long an activity may take in class and the number of days that a teacher may wish to conduct the activity before moving on to something different. The frames are purely suggestions; teachers should feel free to develop plans based on the levels of their groups and the progress that learners are making on a topic.

NUMBER RECOGNITION ACTIVITIES

1. CLAP AND SNAP

Outcome of this activity:

- To understand the concept of place value for ones, tens, and hundreds.

Materials:

- No material required

Instructions

- Teacher explains to learners that when he/she snaps the fingers, this action denotes ones. Clapping hands denotes tens and stamping feet denotes hundreds.

Whole class

Process:

- Teacher claps two times and snaps three times. She/he asks learners to say out the number, which is 23.
- Teacher to give another demonstration using a set of different numbers, but considering the point that this activity needs to start with the small number and motivate learners to recognize the number.
- After at least two demonstrations, the teacher asks a learner to demonstrate while others identify the number that has been clapped and snapped.
- Reverse the order to snap and clap, once the learners understands the game.
- Teacher can say the number and ask learners to do the action.

Small group practice

Process - 1

- Teacher will divide the class into small groups and ask them to practice, as demonstrated earlier. The group leader will facilitate the practice in small groups.

Process - 2

- Groups can compete with one another; one group can clap and snap, and the other group can say the number.

Points to Remember:

- Do not clap or snap very fast or very slow.
- Do this activity for 3-digit numbers by adding one more action like stamping feet on the floor or 'hundred'. (Stamp, clap and snap).

2. NUMBER WHEEL (NUMBER CIRCLE)

Outcome of this activity:

- To understand the concept of place value for ones, tens, hundreds, thousands, and ten thousands.

Materials:

- 9 stones & chalk

Whole Class

Process:

- Teacher draws two concentric circles on the ground/floor.
- Teacher labels the inner ring "ones," the outer ring "tens." These words are written on the inside of each ring.

NUMBER RECOGNITION ACTIVITIES

- Teacher shows the learners that she or he has nine stones.
- Teacher instructs learners to be on one side for safety reasons and proper visibility.
- Teacher throws the stones into the rings.
- Teacher says the rules:
 - If any stone lands on a line, we exclude it.
 - If any stone lands beyond the rings, we exclude it.
- Teacher groups the stones in each ring.
- Teacher draws a frame of tens and ones (and other place values depending on the number of circles being used) and writes in the number.
- Teacher gives the stones to a learner to try.

Small group practice

Process - 1

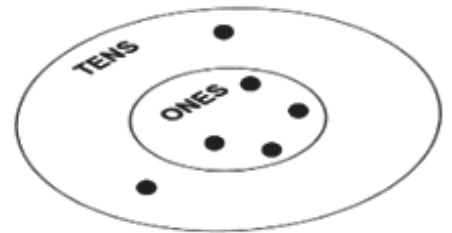
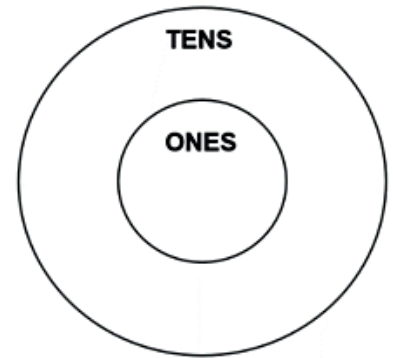
- The teacher will divide the class into small groups and ask them to practice, as demonstrated earlier. The group leader will facilitate the practice in small groups.

Process - 2

- Groups can compete with each other to make big numbers, numbers with zero in the middle (203).
- The teacher will follow a points-based system for this competition.

Points to Remember:

- Draw the circle as per the number of digits you want to teach the learners. E.g., for 3-digit, draw three circles – Hundreds, Tens, and Ones.
- Start with 2-digit numbers and then go to higher digits by adding a new circle.
- Be very careful when a learner is throwing stones.
- Do not pick the stones while counting. Let the stones be in the circle and then count. Once the stone is removed from the circle, it doesn't have any value, he/she will not pick it before writing the number. The value of the stone is only because of its position in the circle. If learners try to pick up and count, please explain the reason to them.



| TENS | ONES |
|------|------|
| 2 | 4 |

24

NUMBER RECOGNITION ACTIVITIES

3. NUMBER CHART READING

Outcome of this activity:

- Recognise, count, and read numbers from 1 to 100.
- Recognise number patterns.

Materials:

- 1-100 Number Chart (1 Big poster size & small A-4 size chart individual-wise)

Whole class

Process:

- Teachers will read the chart clearly. The learners will only listen. They will not repeat with or after the teacher.

Teacher will:

- Read some numbers from the number chart and read them two or three times.
- Distribute charts to learners (small number chart) and this time the learners will place a finger on the number chart.
- Give an opportunity to two to three individual learners to read numbers from the chart to follow the numbers being read.

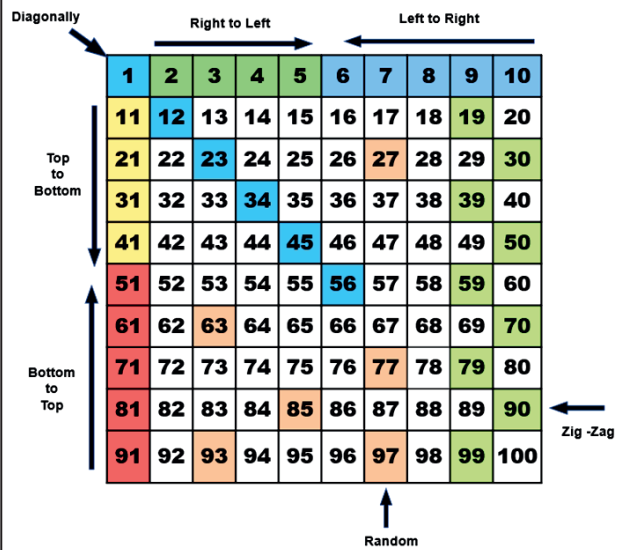
Note: Remember to alternate the learners and praise them for their effort once they have finished reading.

Small group practice & individual practice

- Divide learners into smaller groups of 5-6. Distribute a small number chart to each group and ask them to practice the activity, as mentioned earlier.
- After group practice, ask learners to practice the activity in pairs or individually.



| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |



Note :

- Conduct the number chart reading activity daily for 10 minutes, at the beginning of the lesson
- Ask learners to sit in groups and practice with the small chart.

NUMBER RECOGNITION ACTIVITIES

Points to Remember:

- Hang the chart in a way that it is visible to all learners and they can place a finger on it and read it.
- Place your pointer or finder under the number and say it loudly and clearly so that every learner can hear. Read the remaining numbers in the same manner.
- Read the chart by dividing numbers into consecutive groups to recognize numbers from 1 to 100: 1-20, 1-40, 1-60, 1-80, and 1-100.
- Read the number chart differently at different times. For example, top to bottom, bottom to top, right to left, left to right, diagonally, random, in a zigzag pattern and so on.
- When learners become familiar with one reading pattern, then introduce them to a new reading pattern.
- Connect this activity (abstract reading) with other number recognition activities using concrete objects. For example, numbers with bundle & sticks, and number wheel.
- Give learners a chance time and again and do not rush them. Initially, learners may find it difficult to read in different ways.
- Conduct the number chart reading activity daily for 10 minutes at the beginning of the class as this activity is more helpful for beginners and learners at the 1-digit level.
- Stop reading the chart daily once all learners start recognizing 2-digit numbers.

4. ACTIVITIES WITH STICKS

Outcome of this activity:

- Associate numbers with objects.

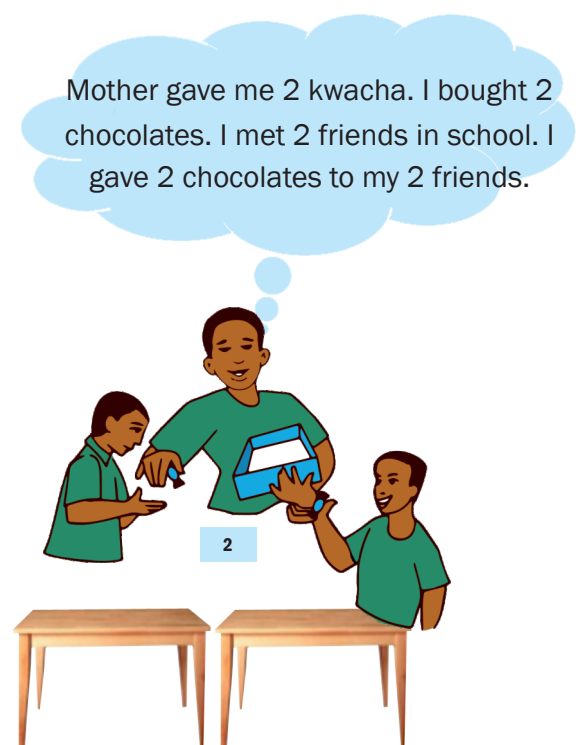
Materials:

- Sticks
- 1-100 number chart

Whole class

Process:

- Narrate a 4-line story about the number that is to be introduced.
- We heard a story of a particular number. Which things around us are as much as that number? For example, how many two things can be found here?
- Count as many sticks as the number we discussed.
- Ask 2-3 other learners to do this in a similar way.
- Use number card to recognize and build association with symbols related to the number.



NUMBER RECOGNITION ACTIVITIES

- Ask learners to read that number in the number chart.
- Write the number you read in your notebook.
- Introduce zero in the following way.
- Pick up 9 sticks. Ask learners how many sticks you have? After they answer, place all the sticks on the ground and discuss. How many sticks do I hold now? None. None means zero (0). Discuss the concept of zero with learners in the following manner.
- Ask about things that are not around you. For example, how many bicycles, animals are in the classroom? How many radios? Etc.
- Show the zero (0) number card and ask learners to write it in their notebook.
- Use the same method and activity to teach numbers from 1 to 9.



| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

5. BUNDLE AND STICKS ACTIVITY

Outcome of this activity:

- Interpret numbers using ten as a unit.
- Identify place values of digits in given numbers.
- Understand the concept of ones and place value.

Materials:

- Sticks, rubber band, chalk and 1-100 number chart.

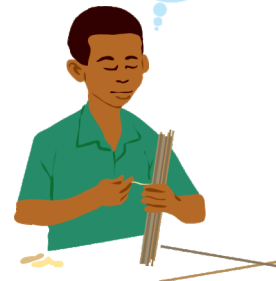
Whole class



Process:

The teacher will:

- Pick up a fistful of sticks in his/her hand and ask learners to guess the number of sticks in his/her hand.
- Count all the sticks one by one, and those who guessed correctly or near the number of sticks will be appreciated with claps.
- Ask a learner to show the number on the number chart.
- Repeat the process once or twice with the learner.
- Introduce a rule to the learners. Count 10 sticks, tie them with a rubber band, and make a bundle.
- Here the teacher will say, "We can make our rule that the 10 sticks make a bundle. This means one bundle has 10 sticks."
- Make a bundle out of the remaining sticks if possible. If a bundle can't be made, ask why.
- After bundles are made from the sticks that were picked up, ask how many bundles and how many sticks.

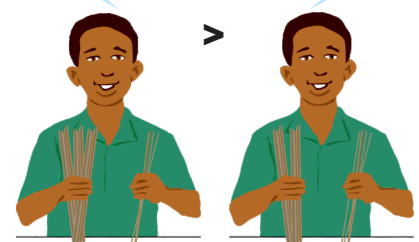
One, two, three



| BUNDLES | STICKS |
|---|---|
|  3 |  4 |
| 34 | |

34

25



NUMBER RECOGNITION ACTIVITIES

- Draw a frame for bundles and stick on the floor or on the ground.
- Place bundles in bundles column and sticks in stick column and write the number. The learners match the number in the box to the number on the bigger chart.

Comparison

- Invite two learners. Ask one to pick up for example 34 sticks and the other to pick 25 sticks. Ask each of them how many sticks they have.
- Ask both to use bundles and sticks and write their numbers next to one another.

Small group practice

Process - 1

- Teacher will divide the class into small groups and ask them to practice, as demonstrated earlier. The group leader will facilitate the practice in small groups.

Process - 2

- All groups will compete with one another. Each group will ask bundle & sticks questions to other groups.

Example:

- In 36, how many bundles and sticks are there?
- If we have 4 bundles and 3 sticks, then what is the number?

Note: The teacher should follow a points-based system for this competition.

Individual practice

- After group practice, ask learners to practice the activity in pairs or individually.

Points to Remember:

- Raise his/her hand while counting the sticks and avoid holding sticks in both hands.
- Keep all the sticks on the ground and pick them up one by one and add them to his/her hand while counting.
- Synchronize voice and hand movements.
- Use the bundle and stick activity for 2-digit numbers (10-99) only.
- Do this activity with learners of all levels as this activity is a prerequisite for teaching addition and subtraction concepts and recognizing 2-digit numbers.
- Keep sufficient sticks for the whole class demonstration and small group practice.
- Avoid using a big number for the demonstration. For example, if the Teacher takes 73 sticks, he/she will spend most of the time counting the sticks.
- Give oral practice of recognizing bundle and sticks to learners once they understand the concept of bundle and sticks, without actually using the sticks.
- Say any random number aloud and ask learners to use the bundle and sticks method to show the number. Or show any number using the bundle and sticks method and ask the learner to say the number. For example, 34.... a learner must say 3 bundles and 4 sticks, or if teacher says 5 bundles and 7 sticks, then learners must say 57.
- Explain that bundles are tens and sticks are ones, once the learners understand bundles.

NUMBER RECOGNITION ACTIVITIES

- Ask learners to point out the larger number and give a reason for it. Ask them about the logic behind their answer and discuss it. If the bundles are same in number, compare the number of sticks each one has.
- Introduce the concept of equal, greater than and less than ($=, >, <$).
- If both bundles and sticks are same in number, compare bundles with bundles and sticks with sticks. For example, 34 is greater than 25 or $34 > 25$.
- Use the same type and size of sticks. When counting, the teacher should hold the counted sticks in one hand.

6. EXPANSION CHART READING

Outcomes of this activity :

- Identify place value of digits in given numbers.
- Write numbers in expanded notation.

Materials:

- Board/ Chart paper
- Small Chart A4

Whole class

Process 1:

- The teacher will begin by writing the first line of the expansion chart on the board.
- Invite some learners and ask them to write the number in every column in a straight line.

Process 2:

- The teacher should begin by reading 1-90 numbers in a loud and clear voice.
- Give an opportunity to two to three individual learners to read numbers from the expansion chart.
- Teachers should place their fingers below the number being read and all learners should read the number together.
- Now ask every learner to read in the same manner one by one.
- When one learner is reading, ask others to follow along and help when that particular learner has challenges.

Expansion Chart

| Ten Thousands (TTh) | Thousands (Th) | Hundreds (H) | Tens (T) | Ones (O) |
|---------------------|----------------|--------------|----------|----------|
| 10,000 | 1000 | 100 | 10 | 1 |
| 20,000 | 2000 | 200 | 20 | 2 |
| 30,000 | 3000 | 300 | 30 | 3 |
| 40,000 | 4000 | 400 | 40 | 4 |
| 50,000 | 5000 | 500 | 50 | 5 |
| 60,000 | 6000 | 600 | 60 | 6 |
| 70,000 | 7000 | 700 | 70 | 7 |
| 80,000 | 8000 | 800 | 80 | 8 |
| 90,000 | 9000 | 900 | 90 | 9 |

NUMBER RECOGNITION ACTIVITIES

- **Choose a favourite number** – ask learners to choose their favourite number from the chart and discuss it.

For example, what is the number 6000? How many zeroes after 6? Where is the comma placed and how many?

Small group practice & individual practice

- Divide learners into smaller groups of 5-6. Distribute a small expansion chart to each group and ask them to practice the activity, as mentioned earlier.
- After group practice, ask learners to practice the activity in pairs or individually.

Points to Remember:

- Teach beginner and 1-digit level learners by hiding/folding the chart. For example, show 1-9 and 10-90 column in expansion chart and vice versa for other levels.
- Read the expansion chart in the following different ways:
 - Top to bottom: one, two... nine, ten, twenty... ninety.
 - Right to left: one, ten, hundred, thousand, ten thousand, hundred thousand.
 - one, one and one zero ten, one and two zeros one hundred, one and three zeros one thousand and so on.
 - Using times: ten one time is ten. Ten two times is twenty. Ten nine times is ninety. One thousand one time is one thousand. One thousand two times is two thousand. One thousand nine times is nine thousand.
 - In units, tens: one ten is ten; two tens is twenty; nine tens is ninety.

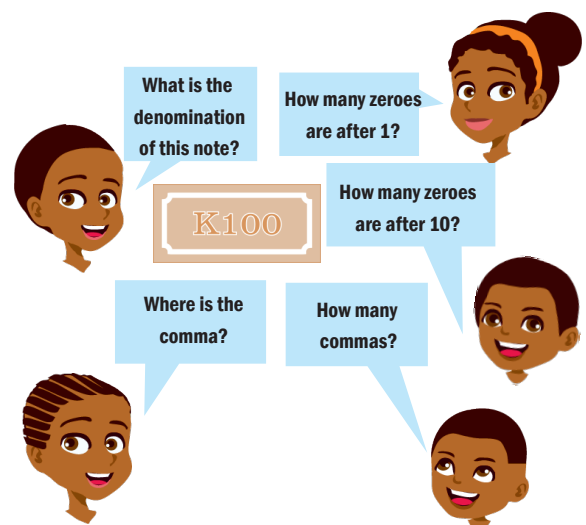
7. ACTIVITIES WITH PLAY MONEY

Outcome of this activity:

- To develop the concept of place value and number recognition.
- The play money used in Catch Up is just to help learners understand place value and conduct basic mathematics operations. It has no value in the real world and the denominations are different from actual Kwacha notes.

Materials:

- Play money sets (1-9, 10-90, 100-900, 1000-9000) and chalk



NUMBER RECOGNITION ACTIVITIES

Whole class

Process:

Introduction to play money and change

- With the whole class, the teacher will place a set of play money notes where the learner can see.
- The teacher will ask a few learners to pick each type of play money from the sample provided (1000s, 100s, 10s and 1s).
- The teacher will ask each learner to identify and read the value of the currency picked.
- Now divide learners into small groups of 5-6.
- Ask learners in all the groups to pick up one note of each type and render change for it.
- For example, if you pick a 1000 kwacha note, you have to render change in 100 kwacha denomination or 10-kwacha denomination.
- Use currency notes and teach ones, tens, and hundreds.




Activities with play money

- Ask learners to count and pick 427 kwacha.
- Now talk about the frame while simultaneously drawing it. Then write the number.
- Ask the learners, "What is the number you have?" Then ask, "4 notes of 100 kwacha make how many kwacha? After they answer, say, "But I cannot see 400 in 427. Let's solve it and find out."
- Now turn by turn, ask them the value of 427 and depict it with the use of an arrow in the picture. Talk about place value and expansion as well. Ask the learners to place the notes in that frame

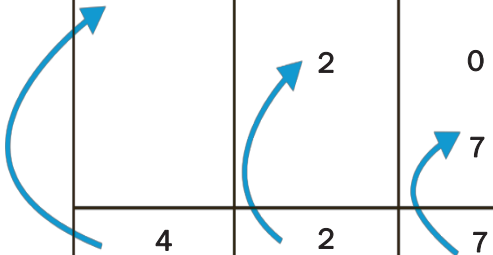
For example, the place value of 4 in $427 = 400$. The place value of 2 in $427 = 20$.

Small group practice

- Divide learners into small groups with 5-6 learners in each group and distribute a set of play money. Have a competition amongst groups to pick the same value of play money which is written on the board.

| HUNDREDS | TENS | ONES |
|--|---|---|
|  |  |  |
| | | |

| HUNDREDS | TENS | ONES |
|----------|------|------|
| 4 | 0 | 0 |
| | 2 | 0 |
| | | 7 |
| 4 | 2 | 7 |



Activities with play money

- Ask learners to count and pick 427 kwacha.
- What is the largest note?
- Match notes to the expansion chart.
- Write the amount on the note in figures and words.
- Use the notes to make some number patterns.
- Arrange notes in order.
- Flipping the play money.

NUMBER RECOGNITION ACTIVITIES

Points to Remember:

- While counting play money, be mindful of the following steps:
 - Raise your hand while counting the play money.
 - Avoid taking the play money in both hands.
 - Keep all play money on the ground and pick one by one and add it to those in your hand while counting.
 - Synchronize voice and demonstration of counting play money.
- Teach number recognition for higher digits as and when required.
- Conduct this activity with all level learners as this activity is a prerequisite for teaching addition and subtraction concepts and to practice 3-digit by 3-digit operations.
- Keep sufficient notes of each denomination during whole class demonstration and small group practice.

8. Numbers with Expansion Cards

Outcome of this activity:

- To identify place value of digits in given numbers and write numbers in expanded notation.

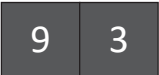
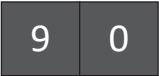

Materials:

- Expansion cards (1-9, 10-90, 100-900, 1000-9000) and chalk

Whole class

Process :

The Teacher will:

- Show one number using expansion cards. Example – 93.
- Ask learners what will be the expansion of the number or what are the different numbers inside this number. 
- Show the number in expanded form and explain the expansion of the number.
- After 2-3 demonstrations with different numbers in the whole class, spread all cards on the floor.
- Write any 3- or 4-digit number on the board and ask learners to read the number loudly. 
- Call one learner up front and ask him/her to make the number written on the board with the expansion cards. 
- Ask the learner to show the expanded form of the same number.

Small group practice

- Divide learners into small groups with 5-6 learners in one group and distribute a set of expansion cards. Have a competition amongst groups to find the expansion of numbers written on the board.

Points to Remember:

- Choose numbers as per the level of the class, for whole class demonstration.
- Provide sufficient number of expansion cards for group practice.

Outcome of this activity:

- Perform mental calculations quickly, especially calculations of one-digit by one-digit numbers.

Whole class**Process:**

- During the warm-up or opening of the operations section of every lesson, you will need to have conversations about mathematics with the learners. This activity will help learners memorize simple mathematical facts, which will soon become intuitive for them.

Example

- Number bonds ($3 + 4 = 7$ but no longer having to count on the fingers).
- Times tables ($3 \times 3 = 9$).
- Conduct mental math practice using the following methods:
 - Oral addition, subtraction, and multiplication chart activity.
 - Tossing the ball.
 - Mind Map.
- Recite the multiplication table daily either at the beginning or at the end of each lesson.
- Any one mental math game or activity should be conducted daily.
- You can make these mental maths activities a competition, or you can randomly select learners or go around the class.

Note: This activity should not be more than 5-10 minutes long.

- Never make learners feel like they have failed if they make a mistake.
- You will only do these sorts of activities and mathematical problems after the learners have begun to understand the concepts.

Example of how this could be integrated into a lesson:

- If we are going to do multiplication operations in the next lesson, the teacher could ask learners to recite multiplication tables or ask them to quickly find the answer to multiplication calculations of one-digit by one-digit number in their head.
- If the operation is addition, the teacher could ask learners to quickly find the answer to one-digit by one-digit number additions. This will help learners reinforce number bonds up to ten (or any other number pattern).

THREE DIFFERENT MENTAL MATH ACTIVITIES

1. ORAL CHART ACTIVITY

Materials:

- Chalk

Whole class

Process:

- The teacher will draw a blank oral addition/subtraction chart on the board.
- Ask learners to draw the same chart in their notebooks.
- Give 1-2 demonstrations to learners on how to fill up these charts.
- The teacher will invite two learners, divide the chart into two parts and ask them to fill up the chart as quickly as possible.
- Simultaneously, ask other learners to fill up the chart in their notebook.
- Encourage learners to finish the chart as soon as possible.
- Discuss the solution with both learners and ask the seated learners to verify the answers.

Small group practice

- Teacher will divide the class into small groups and ask them to practice, as demonstrated earlier. The group leader will facilitate the practice in small groups.

Points to Remember:

- Initially, divide the charts into parts like addition between 1 to 5 then 1-9. Similarly, for subtraction, 10-15, subtract from 1-5, then 10-18 subtract from 1-9.

2. MIND MAP

Whole class

Process:

- The teacher selects a number for the mind map. Example 12.
- The teacher says two numbers that add to 12 and writes them on the mind map as shown in image. Example: $6 + 6 = 12$.
- The teacher asks learner for a number pair which makes 12. Learner writes on their notebook.

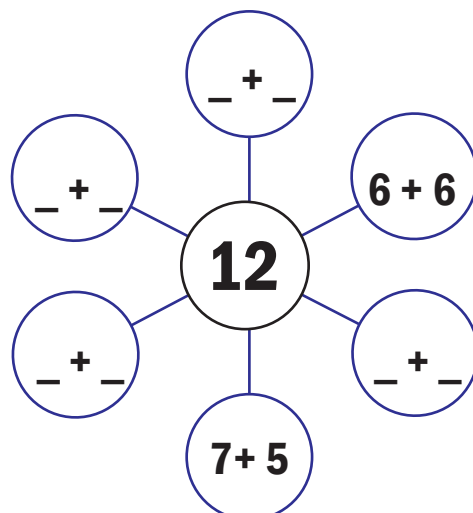
Example- $9+3, 4+8, 7+5$.

ORAL ADDITION

| + | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

ORAL SUBTRACTION

| - | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----|----|----|----|----|----|----|----|----|---|
| 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 |
| 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 |
| 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 |
| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 |
| 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 |



3. Tossing the Ball

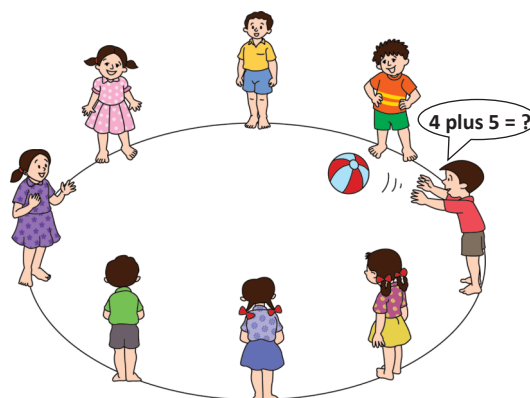
Outcome of this activity:

- To help learners develop speed and accuracy in solving maths problems.

Whole class

Process:

- The teacher will ask learners to stand in a circle.
- The teacher will throw a ball at a learner and give an addition question, such as "What is 5+9?" The learner will give the answer and throw the ball at another child. The learner will catch the ball and say the correct answer simultaneously. The learners/teacher will then give a new addition question to the learner who caught the ball.
- The teacher will demonstrate the activity and motivate the learners to ask the question and give the answer quickly.



Note:

- This is an important activity, and the teacher should do it with all levels.
- We should start this activity after giving learners practice in oral addition, subtraction, and multiplication charts.
- The content will differ when we are doing addition, subtraction, and multiplication operations.

Example

- Addition** (one digit by one digit).
 - ◆ $8 + 9, 7 + 5.$
- Subtraction** (one digit by one digit and two digits by one digit; Numbers between 10-18).
 - ◆ $5 - 3, 6 - 2.$
 - ◆ $18 - 9, 17 - 5.$
- Multiplication** (one digit by one digit).
 - ◆ $2 \times 9, 5 \times 5.$
- We can also do this activity without a ball.

Example

- The teacher asks learners to stand in a circle, points at a learner, and says a problem for that learner to respond to. This can be a quicker and a more ideal method for a larger group.

Points to Remember:

- Do it for all levels as this is an important activity.
- Start this activity after giving learners practice in oral addition, subtraction, and multiplication charts.
- Have no writing activity during tossing the ball activity.
- Use different content while doing addition, subtraction, and multiplication operations.

Example:

- Addition (one digit by one digit): 8 plus 9, 7 plus 5.
- Subtraction (one digit by one digit and two digit by one digit; numbers between 10-18)
 - 5 minus 3, 6 minus 2.
 - 18 minus 9, 17 minus 5
- Multiplication (one digit by one digit): 2 times 9, 5 times 5.

FINE WITH NINE

Outcome of this activity:

- To develop the concept of addition & subtraction using different keywords and concrete objects.

Materials:

- Sticks

Whole class

Process:

- Ask the learners to sit in pairs with 9 sticks.
- Ask each pair to count their sticks.
- Ask each pair to arrange all 9 sticks to create their own design/pattern on the floor.
- Ask one learner to collect and keep all 9 sticks with him/her.
- Instruct the learners to do the following task and not write anything. Just listen carefully to all instructions.
- Give them the following tasks and discuss them with the learners.
- Remove some sticks from the 9 that they were given. For example, ask them to remove 4 out of 9.
- Then ask learners, "How many sticks remain with you?"
- Now add 2 sticks. Ask, "How many sticks do you have altogether?"
- Now take away 6 sticks out of 7. Ask, "How many sticks are left with you?"
- Use random single-digit numbers to give learners enough practice of oral addition and subtraction using mathematical keywords. For example, in this activity, use the words "remove" and "take away" for subtraction and "altogether", "mix" and "combine" for addition.
- Help contextualize these words/terms that may be more appropriate in their language.

Small group practice

- Teacher will divide the class into small groups and ask them to practice, as demonstrated earlier. The group leader facilitate the practice in small groups.

Points to Remember:

- Each time, ask guided questions such as "How many sticks do you have altogether?"
- Initially, conduct this activity daily to enhance the concept of addition and subtraction mentally.
- Also conduct this without writing anything.
- After conducting this activity, will discuss the following questions with learners:
 - "What should we do when things increase?"
 - "When we add two or more things, what operation should we do?"
 - "Similarly, what should we do when things decrease in number?"
 - "What operation should we do when we remove something from a larger number of things?"

BASIC MATHEMATICS OPERATIONS

Solving Word Problems

In TaRL, basic operations are taught to learners using word problems which are related to our everyday experiences. Learners can easily relate to these problems. For example, Andrew bought books for 25 kwacha and a pen for 8 kwacha. How much money did Andrew spend in total? Before explaining operations using word problems, the teacher will discuss the concept of all operations. There are two methods to teach operations using word problems which will be common for all four operations.

Create word problems using the names of learners in front of the whole class. Example, the teacher will ask two learners to come forward. He/she will ask the learner 1 to pick some sticks. Now, the teacher will give them a scenario wherein learner 1 has 15 sticks and he wants to give 6 sticks to his/her friend, learner 2.

Now, the teacher can create a word problem and write it on the board and on the floor in front of the whole class.

Word problem: Ali has 15 sticks; he gave 6 sticks to Peter. How many sticks are left with Ali?

How to solve any word problem

Whole class

The Teacher will:

- Give instructions to learners saying, “I am writing a word problem. You have to listen carefully.”
- Write a word problem on the board and while writing he/she will simultaneously say the problem aloud.
- Read the problem again once it is written.
- Ask learners, “Who will read like me?” A learner will come to the front of the group and read.
- If needed, read the word problem once more. (This reading will be done by a learner or the teacher.)
- After reading, will discuss four questions with learners:
 - What information is given?
 - What is being asked?
 - What do I need to do?
 - Why?
- Draw the place value frame on the floor.
- After drawing the frame, fill up the frame by discussing the four questions and keep materials like sticks or play money as per the word problem ready.
- Solve the word problem step-by-step through discussion with the learners.
- After solving the word problem, write the answer in a full sentence and read it.

Small group practice & individual practice

- Divide learners into small groups with 5-6 learners in one group and give level-appropriate word problems to solve either with materials or without materials.
- Similarly, after group practice, ask learners to sit in pairs or individually to practice the activity.

BASIC MATHEMATICS OPERATIONS

1. ADDITION WITH BUNDLE & STICKS

Outcome of this activity:

- Identify place values of digits in given numbers.
- Add whole numbers with sums not exceeding 50, including carrying.
- Apply addition to real life up to 50.

Materials:

- Sticks, rubber band and chalk

Whole class

Teacher will:

- First, write the addition word problem clearly on the board and simultaneously read the word problem.
- Read the problem clearly again. The learners will only listen. They will not repeat after the teacher.
- Give individual learners an opportunity to read and appreciate their efforts once the learner has finished reading.
- Ask four guided questions.
 - What information is given in the problem?
 - What is being asked in the problem?
 - What will you do?
 - Why?

Teacher will:



- Draw a frame on the floor or ground. Involving two learners, demonstrate the solving of the word problem using bundles and sticks.
- Remind the learner with the rule of making a bundle of 10 sticks.
- Since Richard has 26 pineapples, he will pick 26 sticks.
- When using the blackboard, don't use sticks. (Learners will be doing abstract addition.)

Rule: Ask learners to remember the rule of making a bundle once they have ten sticks.

- Now discuss with the learners. How many bundles can be made with these sticks? Then place the bundles in the bundle column and sticks in the stick column.
- Similarly, take 15 sticks and ask Anne to make a bundle. Place bundles in the bundle column and sticks in the stick column.

Richard has 26 pineapples.
Anne gives him 15 more pineapples.
How many pineapples does Richard have now?







| BUNDLES | STICKS |
|---|---|
|  2 |  6 |
| + | |
| | |

Twenty-six

RICHARD







| BUNDLES | STICKS |
|---|---|
|  2 |  6 |
|  1 |  5 |
| + | |
| | |



RICHARD

ANNE

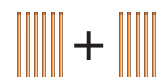


| BUNDLES | STICKS |
|---|---|
|  2 |  6 |
|  1 |  5 |
| + | |
| | |

Seven, Eight, Nine, Ten, Eleven

RICHARD

ANNE






BASIC MATHEMATICS OPERATIONS

Rule :

- As illustrated in figure, we start by placing the addition symbol on the left of the frame.
- We always add loose sticks first then move to bundles.

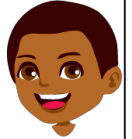
- After Anne gives all her sticks to Richard, 6 and 5 sticks will be added and it will make one bundle and one stick.
- Write 1 in the tens “carry forward” column. Place the stick in the sticks columns and write 1.
- Turn 2 bundles plus 1 bundle and 1 bundle in the “borrowed/carry forward” column when added make 4 bundles.
- So now Richard has 4 bundles and 1 stick. Ask learners, “4 bundles and 1 stick make how many?”
- Place your finger and read in the following way, “26 plus 15 is 41.” Use this answer to respond to the question. Answer in one sentence, "Now Richard has 41 pineapples."

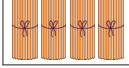
| | BUNDLES | STICKS |
|---|---------|--------|
|  | 1 | |
|  | 2 | 6 |
|  | 1 | 5 |
| | | 1 |

One bundle and one stick in eleven

RICHARD

ANNE



| | BUNDLES | STICKS |
|---|---------|--------|
| | 1 | |
| | 2 | 6 |
| | 1 | 5 |
|  | 4 | 1 |

Four bundles and one stick

RICHARD

ANNE



Small group practice & individual practice

- Teacher can demonstrate 3-5 examples in front of the whole class and then go for small group practice and individual practice

Points to Remember:

- Talk to learners during each step. Try to ensure that learners also talk about each step while they solve the problem.
- Always ensure that they have enough sticks when they are demonstrating the activity.
- Directly use readymade bundles if all learners know about bundle & sticks.
- In the beginning, create a word problem and do the above exercise with this word problem.
- Use bundle & sticks to teach addition up to 2-digit and ensure that the answer does not exceed 99.
- Always create enough number of word problems for the whole class, small group and individual practice.
- Create word problems using different keywords like add, mix, more, increase, altogether.
- Always start word problems using a carryover question.
- The number of digits can vary as per the level of the class. It is important for the teacher to give practice without materials once the learner has understood the process.

2. ADDITION WITH PLAY MONEY

Outcome of this activity:

- Add whole numbers vertically including carrying.
- Carry out addition of quantities in real life situations.

Materials:

- Play money and chalk

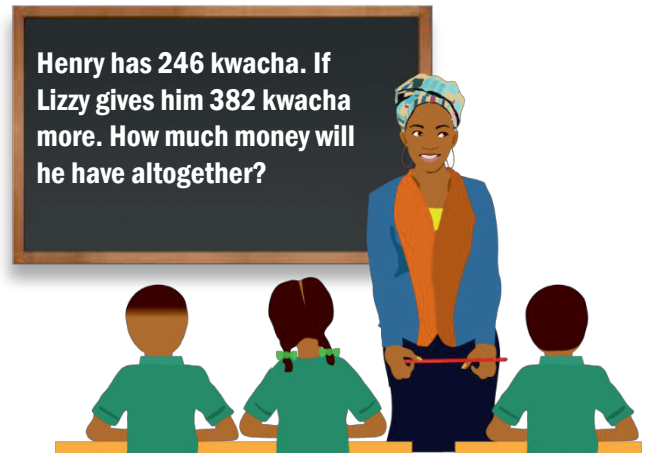
Whole class




Teacher will:






- First, write the addition word problem clearly on the board and simultaneously read the word problem.
- Read the problem clearly again. The learners will only listen. They will not repeat after the teacher.
- Give individual learners an opportunity to read and appreciate their efforts once the learner has finished reading.
- Ask four guided questions.
 - What information is given in the problem?
 - What is being asked in the problem?
 - What will you do?
 - Why?





Teacher will:

- Draw a frame on the floor or ground. Involving two learners, demonstrate the solving of the word problem using play money.
- Since Henry has 246 kwacha, count those many notes and write them in the frame. Lizzy has 382 kwacha. Count and write it in the frame.
- Teacher will remind learners of the addition rule that we will always first add one's place. We start doing addition and introduce the addition symbol.
- Now if Lizzy gives 2 notes of 1 kwacha to Henry, Henry will have eight notes of 1 kwacha. Similarly, if Lizzy gives 8 notes of 10 kwacha to Henry, he will have 12 notes of 10 kwacha. So, we will have 1 note of 100 kwacha which will be placed in the hundred's column. Then, we place 2 notes of 10 kwacha in the tens column and write the number.
- Now Lizzy will give 3 notes of 100 kwacha to Henry and he will then have 6 notes of 100 kwacha so we will write 6 in the hundred's column.
- Now Henry will count all the notes he has. He has 6 notes of 100 kwacha, 2 notes of 10 kwacha, and 8 notes of 1 kwacha. So, Henry will have 628 kwacha with him.



| HUNDREDS | TENS | ONES | |
|---|--|--|-------|
| | | | |
|  2 |  4 |  6 | HENRY |
| | | | |

| HUNDREDS | TENS | ONES | |
|--|---|---|-------|
| | | | |
|  2 |  4 |  6 | HENRY |
|  3 |  8 |  2 | LIZZY |
| | | | |

| HUNDREDS | TENS | ONES | |
|--|---|---|-------|
|  1 | | | |
|  2 | 4 | 6 | HENRY |
|  3 | 8 | 2 | LIZZY |
| |  2 |  8 | |

BASIC MATHEMATICS OPERATIONS




- Once the sum is solved the teacher will place her finger and read in the following manner, "When 246 and 382 are added together, we get 628."
- Thus, Henry will have 628 kwacha which needs to be written in a full sentence on the board.

Small group practice

- Teacher can demonstrate 3-5 examples in front of the whole class and then can go for small group and individual level practice.

Points to Remember:

- Before starting this activity, ensure all learners are familiar with play money and the denominations.
- Always ensure that they have enough play money when demonstrating the activity.
- Give an understating of the word problem using process-1 in addition with bundle & sticks. Here focus on process-2 and directly use an already created word problem.
- After understanding the concept, give learners practice without using any materials.

| HUNDREDS | TENS | ONES | |
|---|---|---|-------|
| 1 | | | |
| 2 | 4 | 6 | HENRY |
| 3 | 8 | 2 | LIZZY |
|  6 |  2 |  8 | |

3. SUBTRACTION WITH BUNDLE & STICKS

Outcome of this activity:

- Subtract whole numbers vertically up to 50.
- Apply subtraction to real life up to 50.

Materials:

- Play money and chalk



Whole class

The Teacher will:

- First, write the subtraction word problem clearly on the board and simultaneously read the word problem.
- Read the problem clearly again. The learners will only listen. They will not repeat after the teacher.
- Give individual learners an opportunity to read and appreciate their efforts once the learner has finished reading.
 - Ask four guided questions.
 - What information is given in the problem?
 - What is being asked in the problem?
 - What will you do?
 - Why?

Samuel has 32 balloons.
If he gives Nella 13 balloons, how many balloons does Samuel remain with?



| BUNDLES | STICKS | |
|---|---|--|
|  3 |  2 | |
| | | |

Thirty-Two

SAMUEL





BASIC MATHEMATICS OPERATIONS

- Draw a frame on the floor or ground. Involving two learners, demonstrate the solving of the word problem using bundles and sticks.
- Remind the learners of the rule of making a bundle of 10 sticks.
- As Samuel has 32 balloons, he will pick 32 sticks. Ask learners if you can make bundles out of 32 sticks. Then ask them to place bundles in the bundle column and sticks in the sticks column and write the number.
- Nella has to take 13 sticks from Samuel. So how many bundles and sticks can be made with 13? Write that number in bundle and sticks columns.
- As Samuel has 32 balloons, he will pick 32 sticks. Ask learners if you can make bundles out of 32 sticks. Then ask them to place bundles in the bundle column and sticks in the sticks column and write the number.
- Nella has to take 13 sticks from Samuel. So how many bundles and sticks can be made with 13? Write that number in bundle and sticks columns.

Rule: We start by placing the subtraction symbol on the left of the frame. Then we subtract loose sticks. Say, "This is our subtraction rule. Start subtracting the sticks."

Rule: When a bundle is placed in the stick column, it is unbundled to sticks.


- First, we need to subtract 3 sticks from 2 sticks. We cannot subtract 3 sticks from 2. So, we borrow 1 bundle from the bundle column and when the bundle is placed in the stick column it should be unbundled. Also, when 1 bundle is picked out of 3 bundles, 2 bundles remain in the bundle column.
- If 3 sticks are subtracted from 12 sticks, 9 sticks remain in the sticks column. 1 bundle is subtracted from the bundle's column. This means that only 1 bundle remains in the bundle column. So, in total, Samuel has 1 bundle and 9 sticks.
- Place your finger and read in the following manner, 'When 13 is subtracted from 32, we get 19.' Use the difference (19) to answer the word problem and write in a sentence form, "Now Samuel has 19 balloons left with him."



| BUNDLES | STICKS |
|--|---|
| | |
|  3 |  2 |
| - | |
| | |

Thirteen

SAMUEL

NELLA






| BUNDLES | STICKS |
|--|---|
| | |
|  3 |  2 |
| - | |
| | |

Can Samuel give 3 sticks to Nella?

SAMUEL

NELLA






| BUNDLES | STICKS |
|--|--|
|  2 |  12 |
| 3 | 2 |
| 1 | 3 |
| - | |
| | |

Convert one of the three bundles to sticks.

SAMUEL

NELLA






| BUNDLES | STICKS |
|--|---|
|  2 | 12 |
| 3 | 2 |
| 1 | 3 |
| - | |
| |  9 |

Nine

SAMUEL

NELLA




| BUNDLES | STICKS |
|---|---|
| 2 | 12 |
| 3 | 2 |
| 1 | 3 |
| - | |
|  1 |  9 |

Nineteen

SAMUEL

NELLA



BASIC MATHEMATICS OPERATIONS

NOTE:

- For every step while solving the problem, the teacher has to engage the learners and ensure that learners participate. After the demonstration, the teacher divides the learners into small groups. Finally, the teacher gives the learners a level-appropriate word problem.

Small group practice

- The teacher can demonstrate 3-5 examples in front of the whole class and then do small group and individual level practice.

Points to Remember:

- Create word problems using different keywords like remove, take away, reduce, less and left.
- It is important for the teacher to give practice without materials once the learners have understood the process.

4. SUBTRACTION WITH PLAY MONEY

Outcome of this activity:

- Subtract whole numbers vertically with regrouping.
- Carry out subtraction in real life.

Materials:

- Play money and chalk

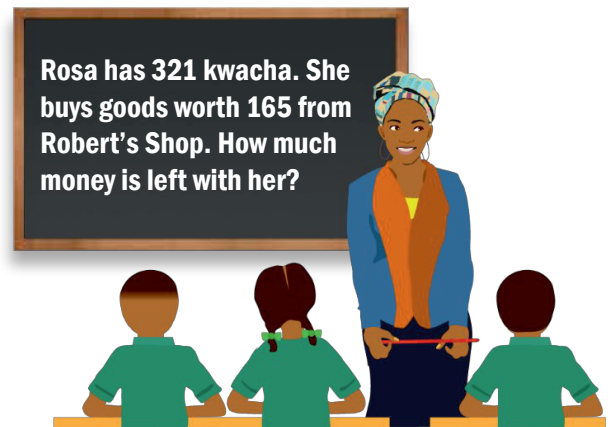
Whole class

The Teacher will:

- First, write the subtraction word problem clearly on the board and simultaneously read the word problem.
- Read the problem clearly again. The learners will only listen. They will not repeat after the teacher.
- Give individual learners an opportunity to read and appreciate their efforts once the learner has finished reading.
- Ask four guided questions.
 - What information is given in the problem?
 - What is being asked in the problem?
 - What will you do?
 - Why?

Teacher will:

- Draw hundreds, tens and ones frame on the floor or ground. Involving two learners, demonstrate the solving of the word problem using play money.
- Rosa has 321 kwacha. She has to give 165 kwacha to Robert. We have to subtract 165 from 321 kwacha.
- Rosa should take 321 kwacha and write the appropriate number in the hundreds, tens, and ones column. Now, Rosa has to subtract 165 from 321. So, we have to start solving the mathematical problem from the ones column.



| HUNDREDS | TENS | ONES | |
|----------|------|------|------|
| 3 | 2 | 1 | ROSA |
| - | 1 | 6 | 5 |
| | | | |

| HUNDREDS | TENS | ONES | |
|----------|------|--------------|--------------|
| 3 | 1 | 11 | ROSA |
| - | 1 | 2 | 1 |
| | 6 | 5 | ROBERT |
| | | | |

BASIC MATHEMATICS OPERATIONS

- Rosa cannot give Robert 5 kwacha from the one note of 1 kwacha she has. So, she gets 1 note of 10 kwacha and changes it to 10 notes of 1 kwacha. Now she has 11 notes of 1 kwacha. She gives 5 notes of 1 kwacha to Robert. She has 6 notes of 1 kwacha left with her. When 1 note of 10 kwacha is picked out of 2 notes of 10 kwacha, 1 note of 10 kwacha remains in the tens column.
- Again, Rosa cannot give 6 notes to Robert from 1 note of 10 kwacha. So, she gets 1 note of 100 kwacha and changes it to 10 notes of 10 kwacha. Now she has 11 notes of 10 kwacha. When 1 note of 100 kwacha is picked out of 3 notes of 100 kwacha, 2 notes of 100 kwacha remain in the hundreds column.
- Now she gives 6 notes of 10 kwacha to Robert. Then she has 5 notes of 10 kwacha remaining with her.
- In the end, she gave 1 note of 100 kwacha from 2 notes of 100 kwacha to Robert. So, 1 note of 100 kwacha was left with her.
- She counted all the notes again. 1 note of 100 kwacha, 5 notes of 10 kwacha, 6 notes of one kwacha. The total is 156 kwacha.
- 156 remain when the sum is solved. So, Rosa has 156 kwacha left with her.

Small group practice & individual practice

- Teacher can demonstrate 3-5 examples in front of whole class and then conduct small group and individual level practice.

Note : It is important for the teacher to give practice without materials once the learners have understood the process.

| HUNDREDS | TENS | ONES | |
|----------|--------------|--------------|--------|
| | 11 | 11 | |
| 3 | 2 | 1 | ROSA |
| - | 1 | 6 | ROBERT |
| | | 6 | |

| HUNDREDS | TENS | ONES | |
|----------|--------------|--------------|--------|
| | 11 | 11 | |
| 2 | 2 | 1 | ROSA |
| - | 1 | 6 | ROBERT |
| | 5 | 6 | |

| HUNDREDS | TENS | ONES | |
|--------------|--------------|--------------|--------|
| 2 | 11 | 11 | |
| 3 | 2 | 1 | ROSA |
| - | 1 | 6 | ROBERT |
| 1 | 5 | 6 | |

BASIC MATHEMATICS OPERATIONS

CONCEPT OF MULTIPLICATION

Multiplication is the number of equal groups times the number of objects in each group. It is simply a mathematical operation involving a pair of numbers, a multiplier, and a multiplicand, to drive to a third number called a product. It consists of adding a number to itself a specified number of times. Therefore, multiplication can be expressed as repeated addition.

At the basic level, we first introduce multiplication as repeated addition. As we progress, we enhance the mental capacity of learners so that they can recall that numbers, when multiplied, give a particular product.

Outcome of this activity:

- Express multiplication as repeated addition.
- Multiply single-digit numbers.
- Use multiplication vocabulary correctly.
- Apply the properties of zero in multiplication.

1. MULTIPLICATION USING STICKS

Materials: Pros

- Sticks and chalk

Process:

- Divide learners into small groups of 4-5 learners.
- Give 12 sticks to each group.
- The learners have to assemble those sticks in a formation. That may be grouped in 2s, 6s, 3s, or 4s.
- How many groups of sticks are in each formation?
- How many sticks are in each group?
- How many formations were made?
- Explain that, when a number is added to itself a certain number of times, that relation is denoted by the multiplication (x) sign.

For example:

- 3 times 4.
- 4 times 3.
- 6 times 2.
- 2 times 6.

In a multiplication problem, the first number represents the number of groups and the second number represents the number of elements (items) in each group. All the elements in all the groups give the total number of elements.

Thus:

Number of groups X number of elements = total number of elements (GET)

MATHEMATICAL VOCABULARY

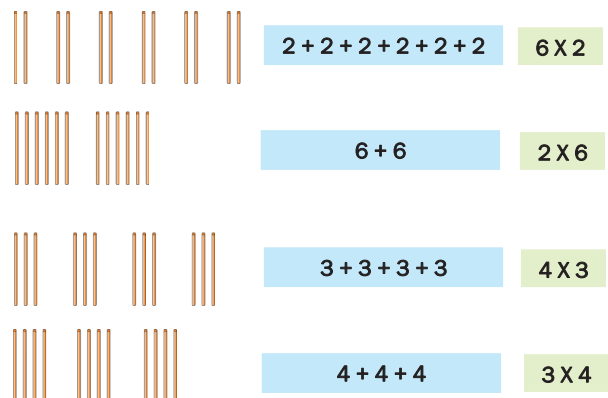
In this example, $4 \times 3 = 12$,

4 is the multiplier.

3 is the multiplicand.

12 is the product.

Hence: multiplier x multiplicand = product.



Take many examples that have 0 and ask them to see a pattern in it or draw an inference:

- When you multiply a number with 0 you multiply all numbers other than the zero. Then you write the answer and count all zeros and add them to the right of the answer.
- For example: $20 \times 3 = 60$
 $340 \times 20 = 6800$

BASIC MATHEMATICS OPERATIONS

2. LEARNING TABLES USING THE LADDER METHOD

Outcome of this activity:

- To develop the pre-multiplication concept by using concrete objects.

Materials:

- Chalk

Whole class

Process:

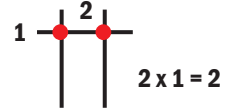
- The teacher will discuss the multiplication table with all learners.
- Demonstrate the ladder method for table of 2.
- Demonstrate 2-3 additional examples to learners.
- Divide learners into small groups and ask them to create multiplication tables of any number which they like.
- Similarly, after group practice, ask learners to be in a pair or work individually to practice the activity.

Draw two vertical lines.



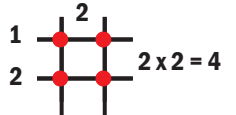
Draw two horizontal lines.

Count the point where the lines intersect.



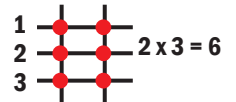
Draw two horizontal lines.

Count the point where the lines intersect.



Draw two horizontal lines

Count the point where the lines intersect.



3. READING THE TABLE CHART

Materials:

- Multiplication chart
- Below is a chart with multiplication tables from 2 - 10.
- Place your pointer on any one table and read it loudly and clearly.
- E.g. 3 times 4 then 3 (rows) x 4 (columns).
- Show the learners the rows and the columns. Where the row and the column intersect is the product.
- Give learners an opportunity to read.
- Divide the learners into small groups and ask each group to read in the above-mentioned manner.

NOTE:

- The reading of the multiplication can also be done in patterns.

Points to Remember:

Use sticks and ladder method for a better understanding of multiplication with zero.

- While using sticks,
 - 0 groups of 2 sticks - 0 times 2 sticks - 0×2
 - 2 groups of 0 sticks - 2 times 0 sticks - 2×0
- With the ladder method,
 - Draw two vertical lines and zero horizontal lines then show that there are no points where the line cuts, thus $2 \times 0 = 0$
 - Explain when we multiply with 1, we get the same number and when we multiply with 0 then we get the answer as zero.
- Conduct the Multiplication table reading activity daily for 10 minutes at the beginning of the class.
- Practice oral multiplication using MIND MAP.

MULTIPLICATION CHART

| | | | | |
|-------------|-------------|-------------|-------------|-------------|
| 2 X 1 = 2 | 3 X 1 = 3 | 4 X 1 = 4 | 5 X 1 = 5 | 6 X 1 = 6 |
| 2 X 2 = 4 | 3 X 2 = 6 | 4 X 2 = 8 | 5 X 2 = 10 | 6 X 2 = 12 |
| 2 X 3 = 6 | 3 X 3 = 9 | 4 X 3 = 12 | 5 X 3 = 15 | 6 X 3 = 18 |
| 2 X 4 = 8 | 3 X 4 = 12 | 4 X 4 = 16 | 5 X 4 = 20 | 6 X 4 = 24 |
| 2 X 5 = 10 | 3 X 5 = 15 | 4 X 5 = 20 | 5 X 5 = 25 | 6 X 5 = 30 |
| 2 X 6 = 12 | 3 X 6 = 18 | 4 X 6 = 24 | 5 X 6 = 30 | 6 X 6 = 36 |
| 2 X 7 = 14 | 3 X 7 = 21 | 4 X 7 = 28 | 5 X 7 = 35 | 6 X 7 = 42 |
| 2 X 8 = 16 | 3 X 8 = 24 | 4 X 8 = 32 | 5 X 8 = 40 | 6 X 8 = 48 |
| 2 X 9 = 18 | 3 X 9 = 27 | 4 X 9 = 36 | 5 X 9 = 45 | 6 X 9 = 54 |
| 2 X 10 = 20 | 3 X 10 = 30 | 4 X 10 = 40 | 5 X 10 = 50 | 6 X 10 = 60 |

| | | | |
|-------------|-------------|-------------|---------------|
| 7 X 1 = 7 | 8 X 1 = 8 | 9 X 1 = 9 | 10 X 1 = 10 |
| 7 X 2 = 14 | 8 X 2 = 16 | 9 X 2 = 18 | 10 X 2 = 20 |
| 7 X 3 = 21 | 8 X 3 = 24 | 9 X 3 = 27 | 10 X 3 = 30 |
| 7 X 4 = 28 | 8 X 4 = 32 | 9 X 4 = 36 | 10 X 4 = 40 |
| 7 X 5 = 35 | 8 X 5 = 40 | 9 X 5 = 45 | 10 X 5 = 50 |
| 7 X 6 = 42 | 8 X 6 = 48 | 9 X 6 = 54 | 10 X 6 = 60 |
| 7 X 7 = 49 | 8 X 7 = 56 | 9 X 7 = 63 | 10 X 7 = 70 |
| 7 X 8 = 56 | 8 X 8 = 64 | 9 X 8 = 72 | 10 X 8 = 80 |
| 7 X 9 = 63 | 8 X 9 = 72 | 9 X 9 = 81 | 10 X 9 = 90 |
| 7 X 10 = 70 | 8 X 10 = 80 | 9 X 10 = 90 | 10 X 10 = 100 |

PRACTISE WITH MULTIPLICATION TABLE

Steps

- Say times table from the beginning



Three ones is three.
Three twos is six.

- Start in the middle

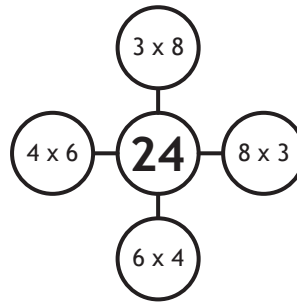


Five fours is twenty.
Five fives is twenty-five.
Five sixes is thirty.

- Random



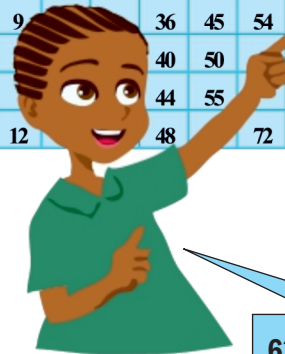
Five fours is twenty.
Five fives is twenty-five.
Five sixes is thirty.



$6 \times 6 = 36$ then
 $3 \times 9 = ?$

Times Table 12x12

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 2 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| 3 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 |
| 4 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 |
| 5 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| 6 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
| 7 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 |
| 8 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 |
| 9 | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 108 |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 |
| 11 | 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 | 121 | 132 |
| 12 | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 |



63 means 9 times 7.
 $9 \times 7 = 63$

BASIC MATHEMATICS OPERATIONS

MULTIPLICATION OF 2-DIGIT NUMBERS (OR GREATER) BY 1-DIGIT NUMBERS (OR GREATER)

Outcome of this activity:

- Apply multiplication to real life situations.
- Multiply, two-digit and three-digit numbers vertically.
- Solve problems using multiplication box and the frame.
- Multiply numbers by 10, 100, 1000, etc.

Whole class

Process:

- Initially, the teacher will talk about the concept of multiplication. Now write the multiplication problem and discuss it and solve it in the following way.
- Just like addition and subtraction, write the multiplication word problem on the board and read it simultaneously.
- Discuss the following four questions.
 - What information is given in the problem?
 - What is being asked in the problem?
 - What will you do?
 - Why?
- As the teacher discusses the mathematical problem, she will simultaneously draw a frame on the floor or the blackboard. Ask learners, "How many tens and ones are there in 24?"
- Write 3 under 24 in the frame and introduce the multiplication (x) sign.
- Now 4 multiplied by 3 is 12.
- 12 has 1 ten and 2 ones. So, let's write 2 in the ones column and 1 in the tens column.
- Now let us multiply 2 tens, which is 20, by 3. 20 multiplied by 3 is 60 which has 6 tens and 0 ones. Now write 0 in ones column and 6 in the tens column.
- Now add ones with ones and tens with tens. 2 ones added to 0 ones is 2 so let's write 2 in the ones column. 1 ten plus 6 tens are 7 tens so we can write 7 in the tens column below. 7 tens and 2 ones make 72.
- Therefore, 24 multiplied by 3 is 72.
- Now the teacher can write the answer. Also say it in the following way, "Susan will pay 72 kwacha to the shopkeeper."

One ball costs 24 kwacha.
Susan has to buy 3 balls.
How much money will
Susan pay to the
shopkeeper?



| TENS | ONES |
|------|------|
| 2 | 4 |
| | |
| | |
| | |

Two tens and
four ones



| TENS | ONES |
|------|------|
| 2 | 4 |
| | 3 |
| | |
| | |

×

Let's write 3 and
the multiplication
sign (x)



| TENS | ONES |
|------|------|
| 2 | 4 |
| | 3 |
| 1 | 2 |
| | |
| | |

×

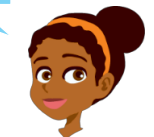
Twelve



| TENS | ONES |
|------|------|
| 2 | 4 |
| | 3 |
| 1 | 2 |
| 6 | 0 |
| | |

×

Six tens and
zero ones



| TENS | ONES |
|------|------|
| 2 | 4 |
| | 3 |
| 1 | 2 |
| 6 | 0 |
| 7 | 2 |

×

+

Seventy-two

→ $4 \times 3 = 12$

→ $20 \times 3 = 60$



BASIC MATHEMATICS OPERATIONS

Small group practice & individual practice

- Teacher can demonstrate 3-5 examples in front of the can whole class and then conduct small group and individual level practice.

Points to Remember:

- Before conducting this activity ensure all learners know the expansion of numbers and give them practice of multiplication with 1, 10, 100 and 1000.
- For example:
 - $2 \times 3 = 6$
 - $20 \times 3 = 60$
 - $200 \times 3 = 600$
 - $2000 \times 3 = 6000$
 - $2 \times 30 = 60$
 - $20 \times 30 = 600$
- Always start with 2-digit by 1-digit multiplication.

MULTIPLICATION PATTERNS

- Once learners understand the meaning of multiplication with the ladder system and sticks, give them practice in finding patterns in different multiplication problems.

- $4 \times 3 = 12$
- $40 \times 3 = 120$
- $400 \times 3 = 1200$

- $4 \times 3 = 12$
- $4 \times 30 = 120$
- $4 \times 300 = 1200$

- $4 \times 3 = 12$
- $40 \times 30 = 1200$
- $400 \times 300 = 120000$

- Ask learners to observe these problems and what pattern they could find in them. Give them practice in solving mentally because, here, the learners will have to multiply the numbers and just add the total number of zeroes at the end. Like 40×30 means 4 times 3 is 12 and just add two zeroes after 12. It is easy to do multiplication of 4 and 3 rather than 40 and 30.
- Once learners get sufficient practice by solving such problems then they will also understand the pattern. Then give them practice of solving multiplication.

BASIC MATHEMATICS OPERATIONS

MULTIPLICATION BOX

The multiplication box is a strategy designed to enhance the skill of multiplication. There is a variety of multiplication boxes depending on the purpose. The content below shows multiplication boxes to enhance the multiplication of 2-digit numbers, helping the learners with place values.

See the following method of solving multiplication in the box. Explain this to learners and ask them to practice. This method helps learners to understand the concept of multiplication easily.

Materials:

- Chalk

Solved problem by using
multiplication box:

$24 \times 30 = ?$

| | | | |
|----|----------------------|---------------------|---------|
| | 20 | 4 | |
| 30 | $20 \times 30 = 600$ | $4 \times 30 = 120$ | 720 (1) |
| 0 | $0 \times 20 = 0$ | $0 \times 4 = 0$ | + 0 (2) |
| | | | 720 |

Solved problem by using
multiplication box:

| | | | |
|---|----|----|----|
| | H. | T. | O. |
| × | | 2 | 4 |
| | | 3 | 0 |
| | | | 0 |
| + | 1 | 2 | 0 |
| | 6 | 0 | 0 |
| | 7 | 2 | 0 |

- Such as $24 \times 30 = ?$ How will you explain it?
 These are big numbers. So, we split them into tens and ones.
 24 means 20 and 4 (2 tens and 4 ones).
 30 means 30 and 0 (3 tens and 0 ones).
 1) Multiply 0 by 4 = 0 (4 times 0).
 2) Multiply 0 by 20 = 0 (20 times 0).
 3) Multiply 30 by 4 = 120 (30 taken 4 times).
 4) Multiply 30 by 20 = 600 (30 taken 20 times).

Note: Therefore, as shown in Activities 1 and 2, when 0 is either a multiplier or a multiplicand, the product will be 0.

Reminder: When you multiply numbers with zeroes at the end, multiply whole numbers only other than 0. Write the answer, count all the zeroes, and add them to the right-hand side of the answer.

CONCEPT OF DIVISION

Division is a mathematical operation between two numbers, dividend and divisor, for calculating the number of times one number is contained within the other (quotient). In order to solve division problems efficiently, learners need to understand the concept of division and have a good mental model of the problem. Division can be introduced through the concepts of repeated subtraction and sharing.

Outcome of this activity:

- Express division as repeated subtraction or sharing.
- Use division vocabulary correctly.

USING STICKS

Process - 1

- The teacher should invite one learner and ask him/her to pick 12 sticks.
- Ask the learner to invite his/her two friends to the front of the whole class.
- Ask the learner to distribute the 12 sticks among the two friends equally.
- Now the teacher should discuss the following questions with all learners.
 - 1) How many sticks are there in total?
 - 2) Between how many friends did we distribute them?
 - 3) How many did each friend receive?
 - 4) How many sticks were distributed in total?
 - 5) How many sticks remain with the learner?
- Collect all the sticks and ask the learner to add some friends and the teacher should show them the different examples of equal distribution.
- Once learners understand the concept of division, the Teacher can give some more practice using play money and different example with remainder and without remainder.

BASIC MATHEMATICS OPERATIONS

Process - 2

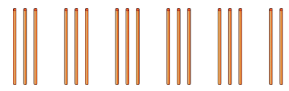
- Divide the learners into small groups and distribute an equal number of sticks to each group, e.g. 18 sticks.
- Instruct every group to distribute the sticks equally among a few learners.
- Ask how many learners were given sticks. Ask how many sticks each learner received. Explain that the process of equal distribution of sticks is denoted by the division symbol (\div).

Forexample:

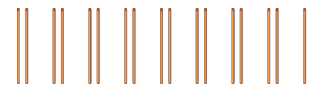
- Divide 18 equally among 3. $18 \div 3 = 6$.
 - Divide 18 equally among 2. $18 \div 2 = 9$.
 - Divide 18 equally among 6. $18 \div 6 = 3$.
 - Divide 18 equally among 9. $18 \div 9 = 2$.
- $18 \div 3 = 6$. 18 is the dividend; 3 is the divisor and 6 is the quotient.



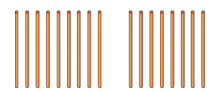
If they are divided among 3, each one will get 6 sticks



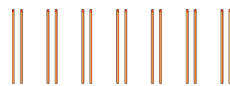
If they are divided among 6, each one will get 3 sticks



If they are divided among 9, each one will get 2 sticks



If they are divided among 2, each one will get 9 sticks



Note : Use examples that will also have a remainder. For example, when 18 is divided by 7, everyone gets 2 and 4 will remain.

If they are divided among 7, each one will get 2 sticks and 4 will remain.



| TOTAL NO. OF STICKS TO DIVIDE | DISTRIBUTED AMONG NO. OF LEARNERS | TOTAL NO. STICKS EACH LEARNER GETS | TOTAL NO. OF STICKS DISTRIBUTED AMONG ALL | REMAINING STICKS | SYMBOL - 1 | SYMBOL - 2 |
|-------------------------------|-----------------------------------|------------------------------------|---|------------------|-----------------|--|
| 18 | 3 | 6 | 18 | 0 | $18 \div 3 = 6$ | $\begin{array}{r} 6 \\ 3 \overline{) 18} \\ \underline{-18} \\ 00 \end{array}$ |
| 18 | 2 | 9 | 18 | 0 | | $\overline{\hspace{2cm}}$ |
| 18 | 5 | 3 | 15 | 3 | | $\overline{\hspace{2cm}}$ |

- After explaining all the examples, introduce the division sign to the learner and show them where to put the dividend, divisor, quotient and remainder without taking their name.

Small group practice & Individual practice

- Teacher can demonstrate 3-5 examples in front of the whole class and then can conduct small group and individual level practice.

BASIC MATHEMATICS OPERATIONS

Division with Play Money

Outcome of this activity:

- To give an understanding of how to solve division with word problems.

Materials:

- Play money and chalk

Whole class

Process :

- Talk about the concept of division, discuss it and solve it just like addition and subtraction by writing the division word problem on the board and reading it simultaneously.
- Discuss based on the following questions:
 - What information is given in the problem?
 - What is being asked in the problem?
 - What will you do?
 - Why?
- Draw the frame on the floor. Say, "The amount which we have to distribute will be written inside the frame - 416 which has 4 hundreds, 1 ten and 6 ones."
- Say, "416 kwacha need to be distributed among 4 learners, so write it in the frame. Now let us divide 416 by 4."
- Discuss the division rule with learners: "Always start division from the higher place value."
- Distribute the hundred's notes first. 4 notes of hundred will be distributed among four friends equally and everyone will get 1 note of 100 kwacha.
- Say, "We have distributed 4 notes of 100 kwacha so we will subtract 4 minus 4 and we will get zero."
- Say, "Each friend will receive 1 note of 100 kwacha then we will write it 1 at hundred's place value."
- Say, "Now we will distribute the tens. We tried to distribute 1 note of 10 kwacha equally among 4 friends and we cannot distribute it so everyone will get 0 notes and we will still have 1 note of 10 kwacha."
- Say, "We have distributed 0 notes of 10 kwacha so we will subtract 1 minus 0 and we will get one. No one will receive any money thus we will write 0 in the ten's place above."

Umar has 416 kwacha. He divides all his money equally among 4 friends. How many kwacha did Umar give to each of his friends?



| | H | T | O |
|-----|---|---|---|
| 4) | 4 | 1 | 6 |

| |
|-------------|
| 4 X 1 = 4 |
| 4 X 2 = 8 |
| 4 X 3 = 12 |
| 4 X 4 = 16 |
| 4 X 5 = 20 |
| 4 X 6 = 24 |
| 4 X 7 = 28 |
| 4 X 8 = 32 |
| 4 X 9 = 36 |
| 4 X 10 = 40 |

| | H | T | O |
|-----|---|---|---|
| 4) | 1 | | |
| | 4 | 1 | 6 |
| - | 4 | | |
| | 0 | | |

| |
|-------------|
| 4 X 1 = 4 |
| 4 X 2 = 8 |
| 4 X 3 = 12 |
| 4 X 4 = 16 |
| 4 X 5 = 20 |
| 4 X 6 = 24 |
| 4 X 7 = 28 |
| 4 X 8 = 32 |
| 4 X 9 = 36 |
| 4 X 10 = 40 |

| | H | T | O |
|-----|---|---|---|
| 4) | 1 | 0 | |
| | 4 | 1 | 6 |
| - | 4 | | |
| | 0 | 1 | |
| | | 0 | |
| | | | 1 |

| |
|-------------|
| 4 X 1 = 4 |
| 4 X 2 = 8 |
| 4 X 3 = 12 |
| 4 X 4 = 16 |
| 4 X 5 = 20 |
| 4 X 6 = 24 |
| 4 X 7 = 28 |
| 4 X 8 = 32 |
| 4 X 9 = 36 |
| 4 X 10 = 40 |

| | H | T | O |
|-----|---|---|---|
| 4) | 1 | 0 | |
| | 4 | 1 | 6 |
| - | 4 | | |
| | 0 | 1 | |
| | | 0 | |
| | | | 1 |
| | | | 6 |

| |
|-------------|
| 4 X 1 = 4 |
| 4 X 2 = 8 |
| 4 X 3 = 12 |
| 4 X 4 = 16 |
| 4 X 5 = 20 |
| 4 X 6 = 24 |
| 4 X 7 = 28 |
| 4 X 8 = 32 |
| 4 X 9 = 36 |
| 4 X 10 = 40 |

| | H | T | O |
|-----|---|---|---|
| 4) | 1 | 0 | |
| | 4 | 1 | 6 |
| - | 4 | | |
| | 0 | 1 | |
| | | 0 | |
| | | | 1 |
| | | | 6 |



BASIC MATHEMATICS OPERATIONS

- Say, "Before we had 1 note of 10 kwacha which we need to change into 1 kwacha notes. 1 note of 10 kwacha has 10 notes of 1 kwacha thus we will have 16 notes of 1 kwacha."
- Say, "Now we will distribute 16 notes of 1 kwacha equally among four friends with each one getting 4 notes of 1 kwacha."
- Say, "We have distributed 16 notes of 1 kwacha, so we will subtract 16 minus 16 and we will get zero. Each friend will receive 4 notes of 1 kwacha, then we will write 4 in the one's place above."
- Write the answer.
Each friend will get 104 kwacha.
- Ask all four learners to count their notes and confirm that each learner has received 104 kwacha.

| |
|--------------------|
| $4 \times 1 = 4$ |
| $4 \times 2 = 8$ |
| $4 \times 3 = 12$ |
| $4 \times 4 = 16$ |
| $4 \times 5 = 20$ |
| $4 \times 6 = 24$ |
| $4 \times 7 = 28$ |
| $4 \times 8 = 32$ |
| $4 \times 9 = 36$ |
| $4 \times 10 = 40$ |

| | | | | |
|---|---|---|---|--|
| | H | T | O | |
| | 1 | 0 | 4 | |
| 4 | 4 | 1 | 6 | |
| - | 4 | ↓ | ↓ | |
| | 0 | 1 | 6 | |
| | - | 0 | ↓ | |
| | | 1 | 6 | |
| | | - | 1 | |
| | | 0 | 0 | |



Small group practice & individual practice

- Teacher can demonstrate 3-5 examples in front of the whole class and then conduct small group and individual level practice.

DIVISION USING MULTIPLICATION

Outcome of this activity:

- Follow the regular process of division in using the multiplication table.
- Follow guidelines to solve word problems.

Process:

- Discuss the steps.
- Write a division word problem of 2-digit by 1 digit. For example, Alex distributed 72 mangoes among his 3 brothers, how many mangoes does each brother get?
- Ensure at this stage that learners know that division always starts from the bigger number or place value. In the number 72, first divide the number 7 by 3.
- Write the multiplication table of 3. Explain to learners that we will read the table of 3 till we get 7 or less than 7.
- Say, "3 times 2 is 6 and 3 times 3 is 9 so we will go with 3 times 2."
- Write the number 2 above the number 7.

Alex distributed 72 mangoes among his 3 brothers, how many mangoes does each brother get?



| | | |
|---|------|------|
| | TENS | ONES |
| 3 | 7 | 2 |

| | | |
|---|---|---|
| | 2 | |
| 3 | 7 | 2 |
| - | 6 | |
| | 1 | |

$3 \times 1 = 3$
 $3 \times 2 = 6$

BASIC MATHEMATICS OPERATIONS

- Write the number 6 below the number 7.
- Subtract 6 from 7 and 1 will remain.
- Say, "Now, we will divide the ones place. We have 1 ten remaining and 2 ones. So, we need to divide 12 by 3." (please check this line for meaning)
- Again, read the table of 3 till we get 12 or less than 12.
- 3 times 4 is 12. Subtract 12 from 12 and you will get 0.
- The remainder will be 0.
- Teacher will discuss the answer that each brother receives 24 mangoes.

Small group practice & individual practice

- The Teacher can demonstrate 3-5 examples in front of the whole class and then conduct small group and individual level practice.

Points to Remember:

- Always start with 2-digit by 1-digit division.
- Ensure all learners recite 2-10 multiplication tables when they are doing the division activity. Therefore, from day 1, Teacher will ask learner to recite multiplication tables.
- Give practice of equal distribution first then you can move to remainder problems.

$$\begin{array}{r|l} 2 & \\ \hline 3 \overline{) 7} & 2 \\ - 6 & \downarrow \\ \hline 1 & 2 \end{array}$$

$$\begin{array}{r|l} 2 & 4 \\ \hline 3 \overline{) 7} & 2 \\ - 6 & \downarrow \\ \hline 1 & 2 \\ - 1 & 2 \\ \hline 0 & 0 \end{array}$$

$3 \times 1 = 3$
 $3 \times 2 = 6$
 $3 \times 3 = 9$
 $3 \times 4 = 12$

$$\begin{array}{r|l} 2 & 4 \\ \hline 3 \overline{) 7} & 2 \\ - 6 & \downarrow \\ \hline 1 & 2 \\ - 1 & 2 \\ \hline 0 & 0 \end{array}$$

LESSON PROCEDURE

HOW TO PREPARE LESSON PLAN - NUMERACY

- Define the learning goals as your level wise group.

| Activities | Beg + 1 digit Level group | 2- and 3-digits Level group | 4 digits Level group | Remark |
|-----------------------------------|---------------------------|-----------------------------|----------------------|--------|
| Weekly / Bi Weekly/Monthly | | | | |

- Decide the expected outcomes for the end of each week. Based on the outcomes, list the activities to be conducted in the class.
- Divide each lesson into two parts: Number Recognition and Basic Mathematics operation activities.

| Activities | Beg + 1 digit Level group | 2- and 3-digits Level group | 4 digits Level group | Remark |
|-----------------|--|--|--|--------|
| Weekly-1 | <ul style="list-style-type: none"> ● Number Recognition- ● Mental Maths - ● Basic Operation - | <ul style="list-style-type: none"> ● Number Recognition- ● Mental Maths - ● Basic Operation - | <ul style="list-style-type: none"> ● Number Recognition- ● Mental Maths - ● Basic Operation - | |

- Follow each activity with the process of demonstration in the whole class, practice in small groups and individual practice.

| Week | Beg + 1 digits/ 2+3 digits/ 4digits (No of activities) | Whole (Time) | Small (Time) | Individual (Time) |
|--------------|---|--------------|--------------|-------------------|
| Day-1 | <ul style="list-style-type: none"> ● Number Recognition (1-2 Activities) | | | |
| | <ul style="list-style-type: none"> ● Mental Math (1 Activity) | | | |
| | <ul style="list-style-type: none"> ● Basic operation (1 Activity) | | | |

- Ensure availability of enough material depending on the classroom size
- Prepare the lesson plan based on Math grouping:
 - Beginner and 1-digit
 - 2 and 3 digits
 - 4 digits

Sample Lesson Plan:

1) Spend more time to build number knowledge of learners at the beginner and 1-digit level along with operational activities.

Make strategic plans as given below:

| Activities | Time |
|--|---------------|
| Choose any one number knowledge activity <ul style="list-style-type: none"> ● Number with bundle & sticks/ Number wheel/ Clap snap ● Number chart Reading (5-10 mins daily) | 30-40 minutes |
| Choose mental math activity <ul style="list-style-type: none"> ● Oral addition, subtraction & multiplication ● Recitation of multiplication table on every day | 5-10 minutes |
| Choose any operation activity <ul style="list-style-type: none"> ● Fine with nine ● Practice of basic operations using word problem. | 10-15 minutes |

LESSON PROCEDURE

Important points:

- The challenge with beginners and level 1 is recognizing and reading numbers. This implies that their lessons should focus more on number recognition activities. However, this does not mean ignoring basic operations.
- It is very important that the teacher carefully selects activities that would help learners recognize numbers and numerate.
- It is also important for the teacher to carefully decide how much time should be allocated for number recognition and basic operations. For the beginners, it would be good to provide more time for number recognition than basic operations so that they improve.
- Once they are comfortable with numbers then more time can be allocated to mathematics operations.
- Following points keep in mind when do basic operations.
 - Start with 1-digit by 1-digit addition with carrying and subtracting 2-digit by 1-digit for carry over and take away (borrow) and later you can increase the number of digits (within 15-20 days).
 - After 15-20 lessons, start with 1-digit by 1-digit multiplication and division. Later you can increase the number of digits.
 - After teaching concepts in all the operations, keep alternating between all the four operations every month as per progress of the learners.

2) Learners who are comfortable with numbers like 2-digits, 3-digits and 4-digits level. Give them more time for mathematics operations activities compare to number recognition.

| Activities | Time |
|--|---------------|
| Choose any one number knowledge activity <ul style="list-style-type: none"> ● Number with bundle & sticks/ Number wheel/ Clap snap ● Number chart Reading (5-10 mins daily) | 10-15 minutes |
| Choose mental math activity <ul style="list-style-type: none"> ● Oral addition, subtraction & multiplication ● Recitation of multiplication table on every day | 5-10 minutes |
| Choose any operation activity <ul style="list-style-type: none"> ● Fine with nine ● Practice of basic operations using word problem. | 30-40 minutes |

Important points:

- Choose those number recognition activities which help learners to build their number knowledge first and then higher number digits recognition.
- Numbers with Bundles & Sticks will help to build concept of place value and later on activities like Numbers with play money, Number wheel, expansion chart will help to recognize higher digits, place value and expansion of numbers.
- Keep the following points in mind when doing basic operations
 - Start with 2-digit by 2-digit addition with carrying and subtraction of 2-digit by 2-digit with taking away (borrowing) and later you can increase the number of digits (within 15-20 days).
 - After 15-20 lessons start with 2-digit by 1-digit multiplication and division and later you can increase the number of digits.
 - After giving concepts in all the operations, keep alternating all the four operations every month as per progress of the learners.

Lesson Planning for Numeracy

Points we need to keep in mind while dealing with specific group

Conducting Activities in a Homogeneous Classroom:

In a homogeneous classroom, learners who are of similar levels sit together. It is very important to understand how to conduct one activity for the whole class and then ask learners to practice in small groups by giving all the groups similar examples

Example 1: Number with Bundle Sticks in a homogeneous Classroom



The Number with Bundle & Sticks activity will be demonstrated in whole class

Divide the learners into small groups and give them similar task to repeat

Example 2: Addition with bundle & sticks activity in a homogeneous Classroom



Addition with Bundle & Sticks activity will be demonstrated in Whole class

Divide the learners into small groups and give them similar task to repeat

Conducting activities in a Heterogenous Classroom (Mixed Group):

In a heterogenous classroom, learners who are at different levels sit together. It is very important to understand how to conduct one activity for the whole class (with all learners) and then ask learners to practice in small groups as per their learning levels.

Example 1: Number with Bundle Sticks in a heterogenous Classroom



The Number with Bundle & Sticks activity will be demonstrated in whole class (with all level learners)

Divide the learners into small groups according to the learning levels like this



(Beg +1-digit)

Give them some sticks so that they can practice numbers up to 20.



(2-digits & 3 digits)

Give them some sticks so that they can practice numbers up to 99.



(4 digits)

Give them some sticks so that they can practice numbers up to 999.

Lesson Planning for Numeracy

Example 2: Addition with bundle & sticks activity in a heterogenous Classroom.



Addition with Bundle & Sticks activity will be demonstrated in Whole class (with all level learners).

Divide the learners into small groups according to the learning levels like this



(Beg +1-digit)

Give only 1-digit by 1-digit word problems at the beginning. Once they get enough practice, give them 2-digit problems.



(2-digits & 3 digits)

Give them 2-digit by 2-digit addition word problems for practice.



(4 digits)

Give them 2-digit by 2-digit addition word problems for practice.

Note:

- This sample plan will help you understand how to conduct activities in both classes.
- In Zambia, we normally create a homogeneous group for the CU lesson. We suggest heterogeneous grouping in some schools due to low enrollment or insufficient teachers. Therefore, The teacher should plan their lesson as per grouping.



CONCRETE

Learning through Play activities provide learners with the opportunity to actively engage with, manipulate and transform materials. Through hands-on experience, learners are absorbed in the activity.



CAPTIVATING

Learning through Play attracts and holds learners' interest. It gives learners choices, big or small, about the learning content or the processes.




CONNECTED

Learning through Play relates to something already known by learners. It builds upon their existing knowledge, their needs, and their interests. Learning through Play activities therefore connects or links with the inner world and/or social environment of learners.

7 CHARACTERISTICS OF LEARNING THROUGH PLAY

7CS FRAMEWORK



CHALLENGING

In the pursuit of solving problems, Learning through Play appeals to learners' creativity and imagination. Rather than being provided with solutions, learners are challenged to discover for themselves, to try and fail, try again, and make connections, whether alone or in a group, pushing their limits.



COLLABORATIVE

Learning through Play does not occur in isolation. Instead, learners interact, exchange, and collaborate with peers and/or knowledgeable others, including the teacher. Through collaboration, they learn from each other and build relationships.



CREATIVE

Learning through Play provides learners with the opportunity to develop new and imaginative ideas and gives them the freedom to express themselves in a variety of ways, voicing and/or processing their feelings and emotions.



CHEERFUL

Joy is at the heart of play, both enjoying a task for its own sake and the momentary thrill of surprise, insight, or success after overcoming challenges.

IMPACT OF LEARNING THROUGH PLAY ON FIELDS OF DEVELOPMENT

| Connection to benefits identified by the LEGO Foundation | Domain | Sub-domain | Specific Benefits |
|--|-------------------------------------|--|--|
| Cognitive skills | Cognitive Development | <ul style="list-style-type: none"> • Logical and analytical thinking • Cognitive processes • Numeracy • Language, literacy | <ul style="list-style-type: none"> • Reasoning • Abstract thinking |
| Social skills | Social-emotional Development | <ul style="list-style-type: none"> • Emotional development • Social development • Moral development | <ul style="list-style-type: none"> • Self-concept • Self-regulation • Self-awareness and expression • Socio-emotional wellbeing • Interpersonal skills • Social competence • Values |
| Emotional skills | | | |
| Physical skills | Physical Development | <ul style="list-style-type: none"> • Motor development • Visual-motor integration skills | <ul style="list-style-type: none"> • Physical wellbeing • Gross motor development • Fine motor development • Hand-eye coordination |
| Creative skills | Learning to learn | <ul style="list-style-type: none"> • Inquiry • Observation • Exploration | <ul style="list-style-type: none"> • Exploration and experimentation • Curiosity and interest • Persistence • Imitation and emulation • Creativity |

Recommended for use in Zambian schools by the Curriculum Development Centre.



REPUBLIC OF ZAMBIA

MINISTRY OF EDUCATION

Produced by the Ministry of Education with support from:



USAID
FROM THE AMERICAN PEOPLE



The **LEGO** Foundation 



Belgium
partner in development

