

# Teaching Early Grade Mathematics through the Error Analysis Approach

A Guide for Early Years' Teachers  
(Grades 1–3)

2026





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## Abbreviations and Acronyms

|                     |                                                                            |
|---------------------|----------------------------------------------------------------------------|
| <b>CBOs</b>         | - Community-Based Organisations                                            |
| <b>CEMASTEa</b>     | - Centre for Mathematics, Science and Technology Education in Africa       |
| <b>CPD</b>          | - Continuous Professional Development                                      |
| <b>CPA</b>          | - Concrete-Pictorial-Abstract                                              |
| <b>CSOs</b>         | - Curriculum Support Officers                                              |
| <b>MoE</b>          | - Ministry of Education                                                    |
| <b>SMASE-Africa</b> | - Strengthening Mathematics and Science Education in Africa (SMASE-Africa) |
| <b>STEM</b>         | - Science, Technology, Engineering, and Mathematics                        |
| <b>ZAF</b>          | - Zizi Afrique Foundation                                                  |



## Executive Summary

This *Error Analysis Manual* is a joint product of the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEА) and the Zizi Afrique Foundation (ZAF). It provides practical guidance for teachers of Grades 1–3 on how to use error analysis (EA) as a strategy for improving the teaching and learning of early-grade mathematics.

Grounded in Kenya's Competency-Based Curriculum (CBC), the manual seeks to strengthen teachers' ability to understand how learners think, identify where learning breaks down, and apply simple, evidence-based approaches to address these challenges. It builds upon collaborative research conducted in Bungoma West Sub-County, where classroom-based assessments revealed that many learners struggle with basic numeracy skills, particularly in addition and subtraction, due to recurring factual, procedural, and conceptual errors.

Through clear, step-by-step guidance, the manual introduces teachers to the Error Analysis approach, which emphasises diagnosing learners' mistakes, understanding their causes, and designing responsive teaching interventions. This approach moves beyond marking right or wrong answers to exploring *why* errors occur and how teachers can support learners in developing accurate mathematical understanding.

The manual is organised into three major units:

1. **Introduction to Error Analysis** – Explains the purpose, benefits, and alignment of EA with the CBC, highlighting how it promotes learner-centred and reflective teaching practices.
2. **Error Analysis in Practice** – Presents findings from classroom studies, outlines the main types of learner errors (factual, procedural, conceptual), and provides practical strategies and examples for addressing them.
3. **Explicit Instruction in Numeracy** – Demonstrates how teachers can apply EA principles through explicit, structured teaching, supported by hands-on activities, modelling, guided practice, and reflection.

Additional sections elaborate on key numeracy concepts, such as counting, place value, addition, and subtraction, accompanied by ready-to-use classroom strategies, practical demonstrations, and reflective questions that deepen teachers' understanding.

By applying this manual, teachers will be able to:

- Diagnose and interpret learners' errors with precision.
- Plan targeted lessons that address underlying misconceptions.
- Apply Concrete–Pictorial–Abstract (CPA) approaches to strengthen understanding.
- Foster learner confidence and numeracy fluency through supportive feedback and differentiated instruction.

Ultimately, this manual serves as a practical training and reference tool for teachers, instructional leaders, and education partners committed to enhancing foundational learning outcomes. It reflects a shared vision between CEMASTEА and ZAF to ensure every child acquires strong numeracy skills through evidence-informed, innovative, and contextually relevant teaching practices.

## Acknowledgement

This module reflects the shared vision, dedication, and collaboration of stakeholders committed to strengthening foundational numeracy across Africa. It is the outcome of a strategic partnership between the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEА), represented by **Mr. Joseph Kuria** and **Ms. Clotilda Nyongesa**, and Mizizi Elimu Afrika (formerly Zizi Afrique Foundation), represented by **Ms. Virginia Ngindiru**, **Mr. Vollaп O. Ochieng**, and **Mr. James M. Mburu**. Their joint leadership and technical expertise were instrumental in guiding the development, review, and refinement of this module.

We sincerely thank the Ministry of Education, Kenya, the Teachers Service Commission (TSC), and the teachers of Bungoma County for their continued guidance, collaboration, and invaluable classroom experiences, which ensured the relevance and practical applicability of this resource.

We acknowledge the valuable contributions of the Daara Learning Partnership, including The Education Partnership Centre (Nigeria), Funda Wande (South Africa), and eBASE Africa (Cameroon), whose shared learning, technical expertise, and cross-country collaboration enriched this module. We further appreciate the Daara Development Academy, the Daara Innovation Fund through which this work was supported, the Gates Foundation support structure, and eBASE Africa for conceptualizing and conducting the evaluation. The broader collaborative architecture, technical contributions, and Innovation Fund learning and reporting products also informed the synthesis and interpretation reflected in this publication.

Special appreciation goes to **Dr. John Mugo** and **Dr. Maurice Mutisya** for their strategic advisory support in packaging this product, the procurement team for procurement and logistical support, as well as the communications team for facilitating design, editing, and the product's documentation that enhanced the quality and accessibility of this publication.

Finally, we extend our heartfelt gratitude to the learners who participated in the pilot activities and classroom trials. Their enthusiasm, resilience, and feedback inspired continuous improvement and remain central to our shared commitment to ensuring that every child acquires strong foundational numeracy skills.

To all institutions, partners, educators, technical experts, support teams, and learners who contributed to this work, we express our sincere appreciation. This module stands as a testament to the power of collaboration, evidence-informed practice, and a shared commitment to advancing quality foundational learning across Africa.





## About the Centre for Mathematics, Science, and Technology Education in Africa

The Centre for Mathematics, Science, and Technology Education in Africa (CEMASTEА) is a government agency under the Ministry of Education, Science, and Technology (State Department of Early Learning and Basic Education). Its main goal is to improve the teaching of Mathematics and Science by training teachers in Kenya and other African countries.

Since its establishment in 2003, CEMASTEА has become a leading centre for training teachers, offering programmes for primary and secondary school educators. It also provides special courses for teachers in other African countries, focusing on Science, Technology, Engineering, and Mathematics (STEM).

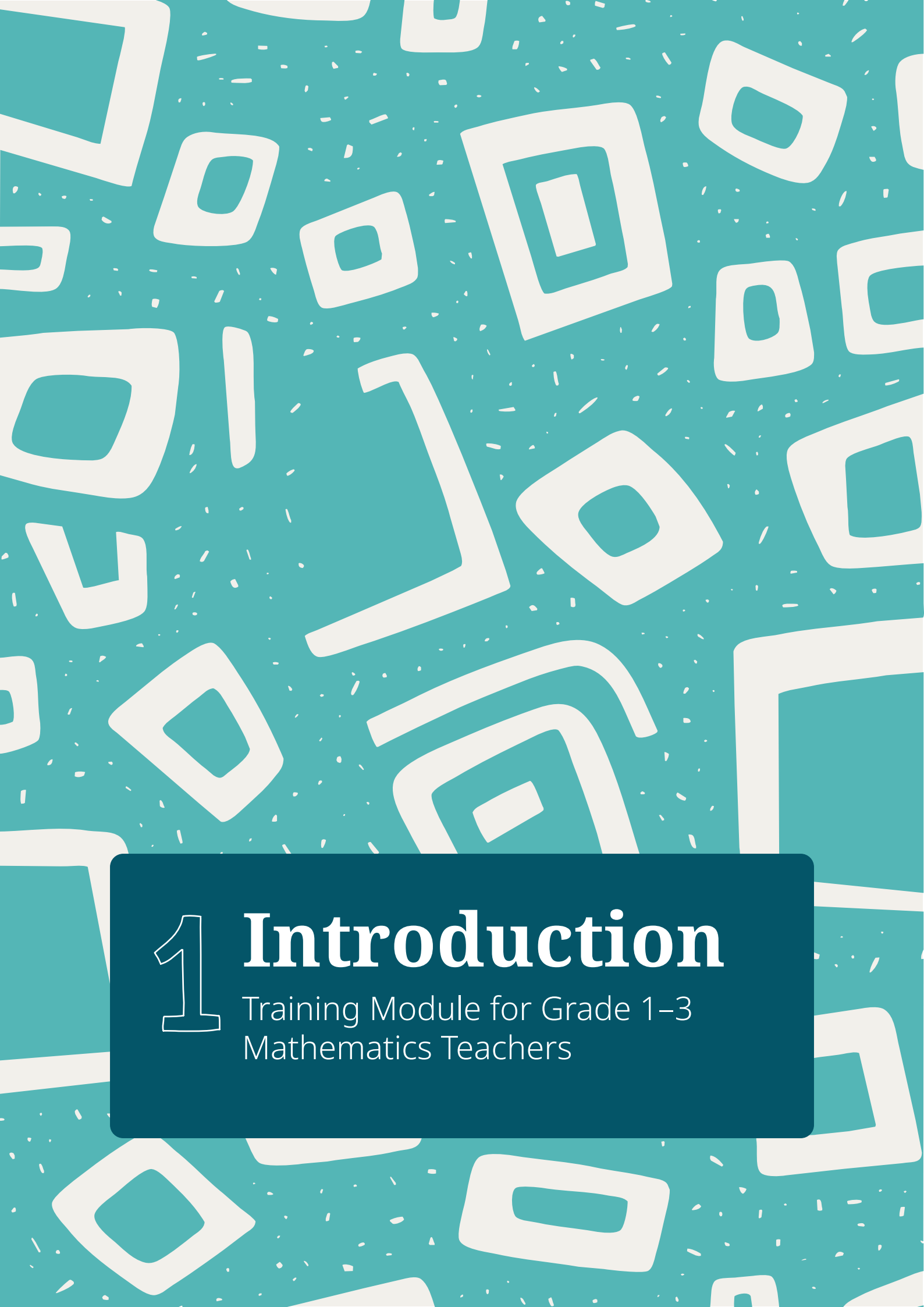
CEMASTEА works closely with the Ministry of Education, the Teachers Service Commission, and international partners, like the World Bank. It undertakes research, promotes the use of technology in learning, and supports STEM education. As the secretariat for Strengthening Mathematics and Science Education in Africa (SMASE-Africa), CEMASTEА helps improve the teaching of Mathematics and Science across the continent by training teachers in modern and effective teaching methods.



## About Mizizi Elimu Afrika

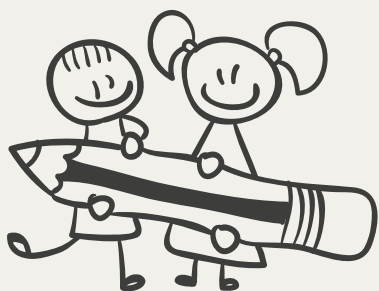
Mizizi Elimu Afrika is a non-profit organisation focused on helping children and youth who struggle with learning. It uses research to improve the education system and ensure that every child gains strong learning skills and every young person transitions smoothly into work and life.

Established in 2018, Mizizi works closely with government agencies to improve how children learn basic skills like reading and math. To discover why some children struggle with math, Mizizi has partnered with CEMASTEА to study common mistakes made in early-grade classrooms. The findings will help teachers, school leaders, and policymakers make better decisions to improve learning outcomes.

The background is a teal color with a pattern of white geometric shapes, including squares, rectangles, and L-shapes, some of which are nested. There are also small white speckles scattered across the teal background.

# 1 Introduction

Training Module for Grade 1–3  
Mathematics Teachers



This module is designed to train mathematics teachers for Grades 1 to 3 in Early Years Education.

Developed by Zizi Afrique in partnership with CEMASTEA, the module aims to strengthen teachers' skills and knowledge in teaching numeracy using the error analysis (EA) approach. It includes a training theme, learning outcomes, and suggested content for teachers. Each unit outlines what teachers will learn and how they can apply it in their classrooms.

## 1.1 What Is Error Analysis (EA)?

**Error analysis** is the process of identifying and understanding mistakes that learners make in mathematics. Instead of only marking answers as right or wrong, teachers review the errors to find out *why* they occurred.



## 1.2 How Is EA Applied?

Teachers use error analysis by:

1

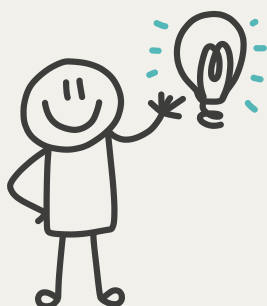
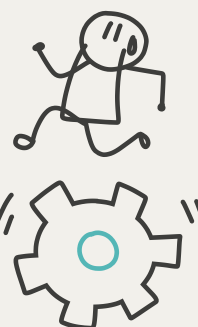
**Observing learners'** mistakes in their work.

2

**Identifying patterns** in the errors—are they forgetting steps, misunderstanding concepts, or making simple calculation mistakes?

3

**Helping learners** correct these mistakes by explaining and practicing the right methods.



## 1.3 Why Is EA Useful?

Error analysis is useful in teaching and learning for the following reasons:

- Error analysis helps teachers understand where learners struggle and how to support them.
- Error analysis encourages learners to think critically about their mistakes and improve.
- Error analysis builds stronger numeracy skills, as learners correct errors and avoid repeating them.

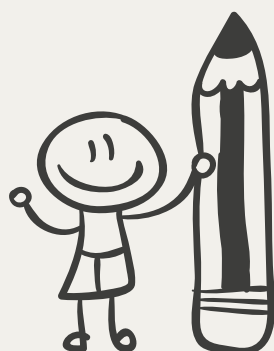
## 1.4 Why Is EA Important in Math Teaching?

Error analysis helps teachers teach better by focusing on areas where learners need the most help. It also boosts learners' confidence because they learn *why* they made mistakes and how to fix them. This way, they develop a deeper understanding of math instead of only memorising answers.

Math teaching today focuses on understanding concepts rather than memorising facts. Instead of just recalling answers, learners need to think, solve problems, and apply what they have learnt.



## 1.5 Why Is training on EA Important?



This training is based on the Competency-Based Curriculum (CBC), which encourages a deep understanding of numeracy. When children develop a strong grasp of basic math facts, they become faster and more confident in solving problems.

Fluency in math means a learner can quickly and accurately solve problems without struggling to recall steps. It is the key to success in mathematics.

Through this training, teachers will learn simple, practical methods to help **Grade 1–3 learners** understand numbers, correct their mistakes, and build strong math skills.



## 1.6 Training Theme

The theme of this manual is *to build teachers' knowledge and skills to help learners develop strong numeracy foundations.*

## 1.7 Training Goals

By the end of the training, teachers will be able to:

1. Understand how to analyse errors made by learners in numeracy.
2. Identify different types of errors: factual, conceptual, and procedural.
3. Learn simple and practical ways to help learners correct these errors.
4. Plan an engaging numeracy lesson using these strategies.
5. Appreciate the importance of using practical methods to strengthen numeracy skills.

## 1.8 Training Outcomes

The following are the expected training outcomes:

1. Easy-to-use strategies for improving numeracy skills.
2. Lesson plans that apply these strategies in the classroom.

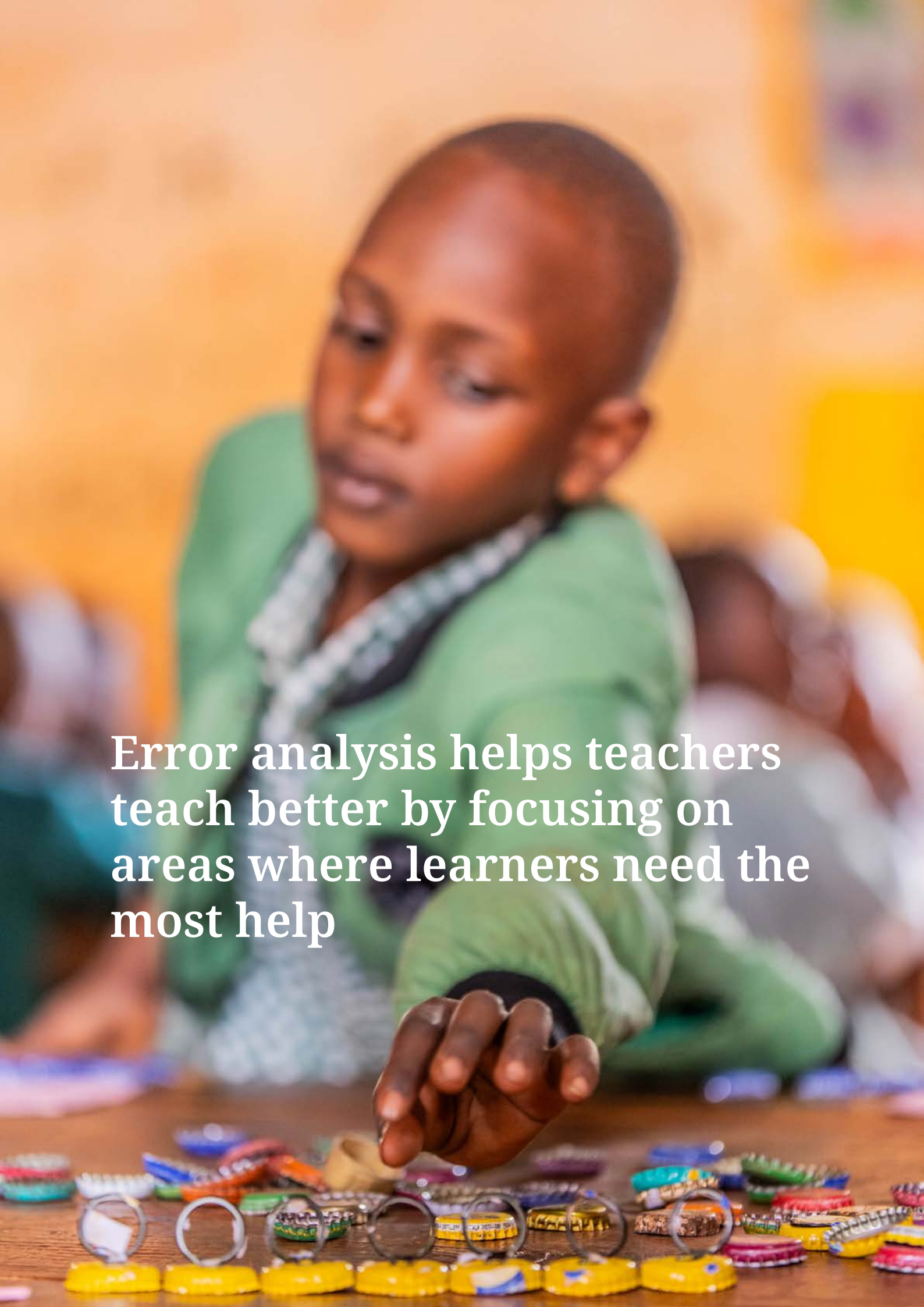


## 1.9 Why Is this Training Manual on Error Analysis Important?

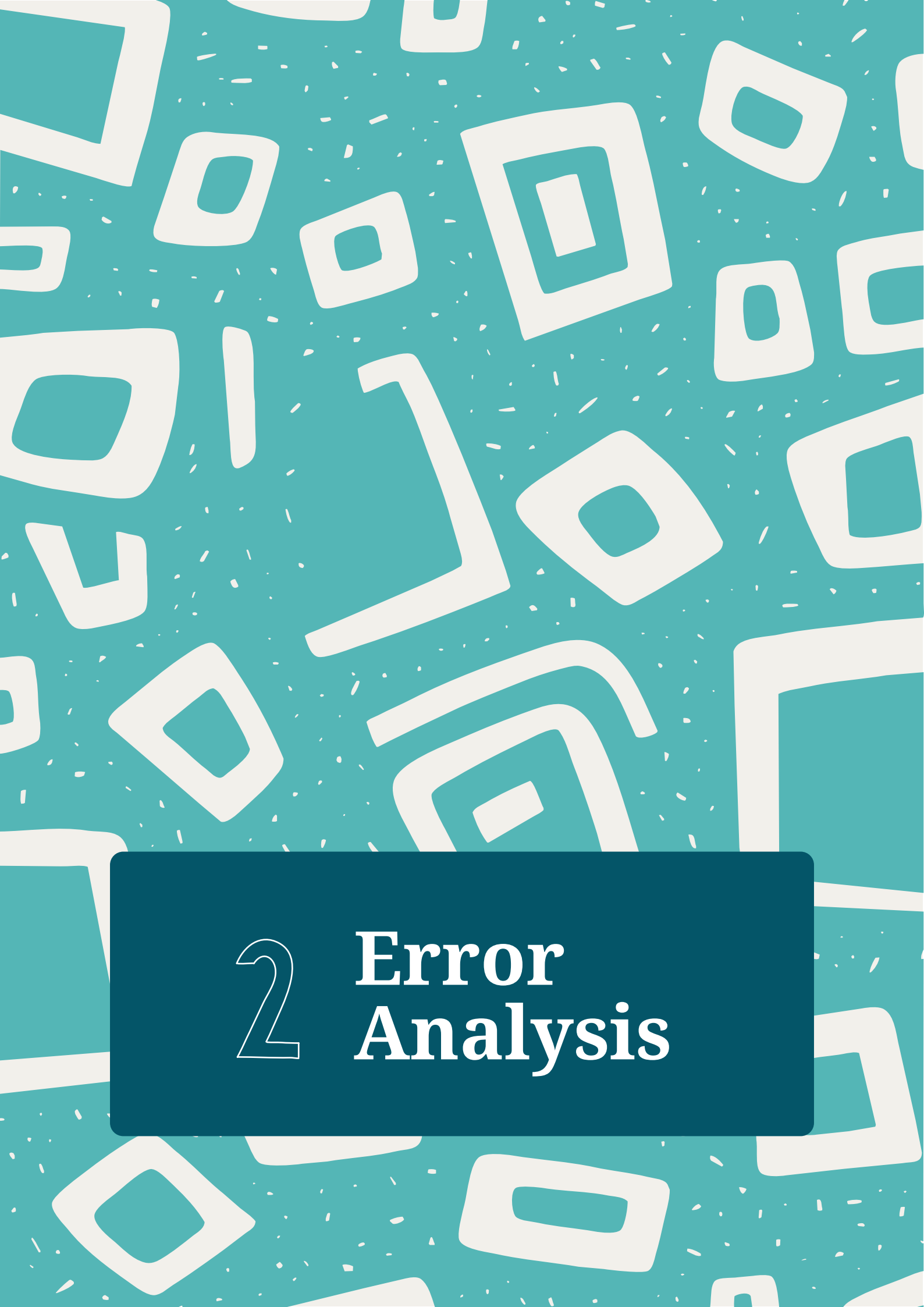
In today's classrooms, teaching mathematics is no longer only about memorising facts or following steps. Instead, the focus has shifted to helping learners truly understand what they are doing. This means supporting children to understand math facts (factual understanding), how and why math works (conceptual understanding), and how to carry out the steps (procedural understanding).

In the Competency-Based Curriculum (CBC) used in Kenya, mathematics aims to help learners think clearly, solve problems, and apply what they learn in real life. When learners understand the facts, steps, and ideas behind math, they become fluent. **Fluency** means being able to give the correct answer quickly and correctly—without needing to pause and think through every step. This signifies that the learner has fully mastered the concept.

This training is designed to help teachers in Grades 1, 2, and 3 use practical methods that support learners in developing this deep understanding. When learners understand math in a complete way, they are more likely to become fluent and successful in their numeracy learning.

A young child with dark skin and short hair, wearing a green long-sleeved shirt with a white and black patterned collar, is sitting on a wooden floor. The child is looking down at a collection of colorful bottle caps scattered on the floor. The child's right hand is reaching out towards the caps. The background is blurred, showing other people and a warm, orange-toned wall.

Error analysis helps teachers  
teach better by focusing on  
areas where learners need the  
most help

The background is a teal color with a pattern of white, hand-drawn geometric shapes, including squares, rectangles, and L-shaped brackets. A dark teal rectangular box is positioned in the lower half of the image, containing the text '2 Error Analysis' in white.

## 2 Error Analysis



## 2.1 Unit Outcomes

The following are the outcomes of this unit:

- a) Explain what error analysis in numeracy means.
- b) Share key findings from the error analysis conducted in Bungoma West Sub-County.
- c) Develop practical strategies to help address common types of errors in numeracy.
- d) Understand and value the role of error analysis in improving the teaching and learning of mathematics.

## 2.2 Error Analysis in Mathematics

### Understanding Mistakes, Errors, and Misconceptions in Numeracy

In a math classroom, learners may give wrong answers for different reasons. It is important for teachers to understand the difference between **mistakes**, **errors**, and **misconceptions**, because each needs a different kind of support.

A **misconception** occurs when a learner has an incorrect or incomplete understanding of a math idea. For example, a learner might believe that subtraction always makes numbers bigger. This shows they have a wrong belief about how subtraction works. Misconceptions often come from wrong information or poor understanding from earlier learning. They tend to repeat over time unless corrected.

A **mistake** is a one-time slip, like writing the wrong number or forgetting a step, even though the learner understands the concept. Mistakes often happen due to carelessness, lack of attention, or rushing. They are usually easy for learners to notice and fix on their own.

An **error** is a repeated wrong way of doing something, often caused by a misunderstanding of the concept or steps. Errors show that the learner may not fully understand what they are trying to do or has developed a wrong habit in solving problems.

Learners often make errors because their thinking is based on incorrect ideas (misconceptions). That's why teachers need to check their learners' work keenly, to understand where their thinking went wrong. Teachers should use simple tests or classroom activities to find out what learners know, explain the results clearly to learners and parents, and use that information to plan lessons that help close learning gaps.

**Error analysis** means looking closely at the mistakes learners make in their work to try and understand why they made them. It is not just about finding wrong answers but also checking what the learner did right and what was partly right.

This helps the teacher understand the learner's thought process. It also helps in finding better ways to support the learner.

Error analysis is a helpful way for teachers to:

- i. Check if a learner is making the same kind of mistake again and again.
- ii. Check if the same error keeps happening; it may show that the learner has a misunderstanding or is missing a skill. Once the teacher sees this pattern, they can plan lessons or give extra help to meet the learner's specific needs.

In short, error analysis helps teachers know exactly where a learner is struggling and how to help them improve.

## 2.3 Why Error Analysis Is Helpful to Teachers (i.e., Early Grade Teachers)

Error analysis is a useful tool that helps teachers understand how learners think and where they need help. Instead of only marking answers as right or wrong, error analysis gives a deeper understanding of the learner's thinking.

It helps teachers to:

- i. See what the learner is doing well – by looking at the steps the learner has done correctly, not just the final answer.
- ii. Find out what kind of mistakes the learner is making – for example, whether they are adding instead of subtracting or writing numbers backwards.
- iii. Tell if the mistake is just a slip or a deeper problem – some mistakes happen by accident, while others keep happening because the learner does not fully understand the concept.
- iv. Choose the best way to help the learner – once the teacher knows the problem, they can plan the right lesson or activity to fix the misunderstanding.

In short, error analysis helps teachers give the right support so learners can improve and succeed in math.

## 2.4 Steps for Doing Error Analysis in Numeracy

Error analysis helps teachers find out why learners are making mistakes in math and how to help them. Here are the steps to follow:

### Step I

#### Collect learner work

Give the learner 3 to 5 questions of the same type—for example, addition or subtraction problems.

### Step II

#### Look for patterns

Check the learner's answers and see if the same type of mistake is happening more than once.

### Step III

#### Think about the cause

Try to understand why the learner is making these mistakes. Is it because they do not know math facts, forgot a step, or do not understand the idea?

### Step IV

#### Plan how to help

Use the information to choose the best way to teach the learner again. Focus on fixing the mistake and building a better understanding.

## 2.5 Types of Errors Learners Make

1. **Factual errors** – These happen when a learner does not know basic facts. For example, not knowing number names, place values, or digits.
2. **Procedural errors** – These are mistakes in doing the steps, like forgetting to carry over in addition or placing a decimal in the wrong spot.
3. **Conceptual errors** – These happen when a learner does not fully understand the math idea, like not knowing how numbers relate or the properties of shapes.

## Case Study: The Findings from the Kenyan Error Analysis Study

### What We Found from the Error Analysis Study for Early Grades

Data were collected from five schools in Lwandanyi zone, Bungoma West Sub-County. The tools used included: October 2024,

- Interviews with head teachers and teachers
- Questionnaires for teachers
- Focus Group Discussions (FGDs) with learners
- A short assessment for learners, with three addition and three subtraction questions

The learners were timed as they completed the questions. After collecting their work, the answers were carefully checked to find common errors. Then, ways to help correct those errors were suggested.

### What the Findings Showed



#### Number of Learners Assessed:

**405 learners** took part, 219 girls (54%) and 186 boys (46%).

#### Grade 2:

194 learners (48%)

#### Grade 3:

211 learners (52%)

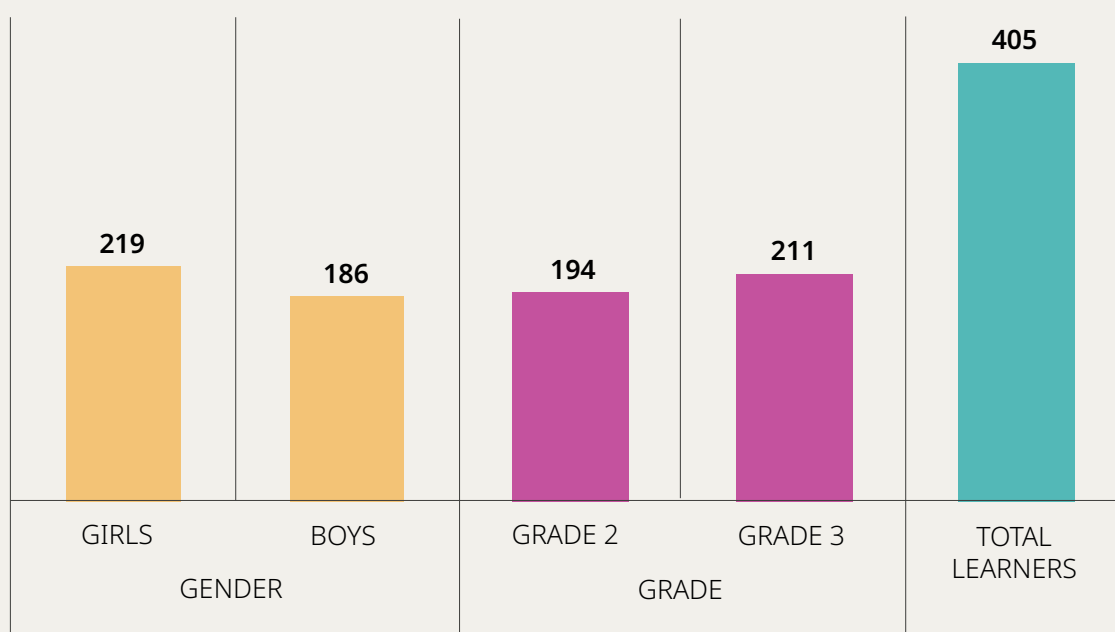


Figure 1: Learners Assessed by Gender and Grade

### Comparison Between Grades:

- **Factual Errors:** Grade 2 made more factual errors (91%) than Grade 3 (75%).
- **Procedural Errors:** Grade 3 made more procedural errors (17%) than Grade 2 (7%).
- **Conceptual Errors:** Grade 3 also made more conceptual errors (8%) than Grade 2 (25%).

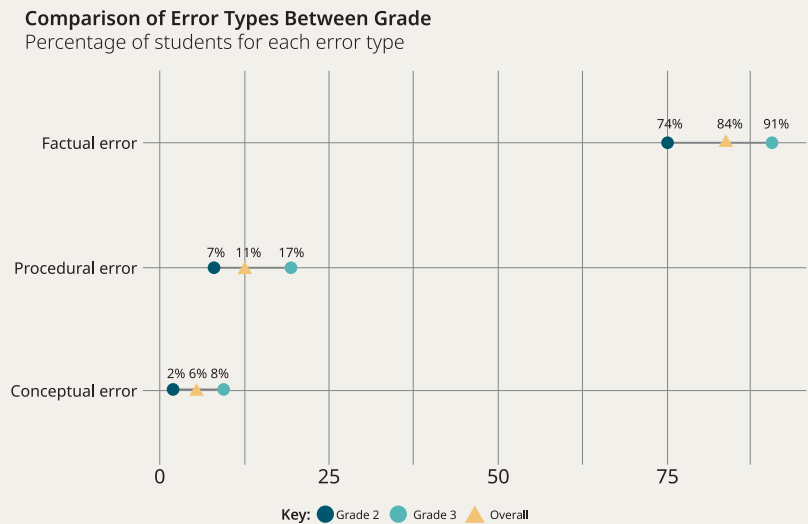


Figure 2: Comparison of Error Types by Grade

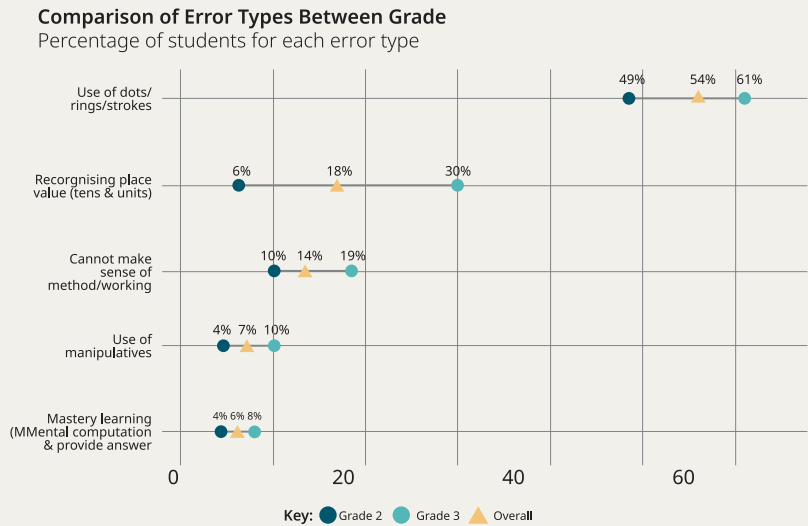


Figure 3: Common Methods by Grades

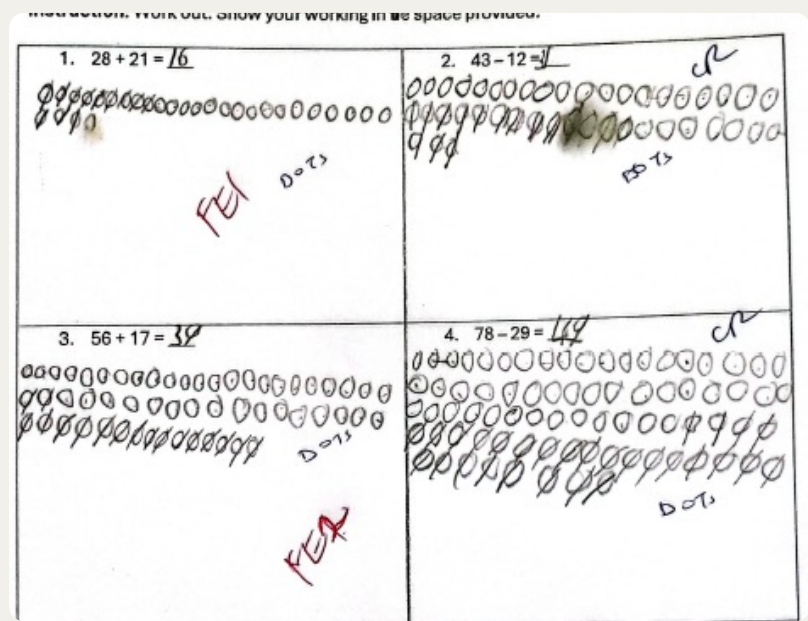


Figure 4: Sample Learner Script/Working

**Common Methods Used by Learners:**

Most learners in both grades used strokes or dots to solve problems:

- **61% in Grade 2**
- **49% in Grade 3**

More learners in Grade 3 (30%) could recognise place value compared to only 6% in Grade 2.

**Overall Performance:**

Most learners in both grades used strokes or dots to solve problems:

**Only 3% of learners got all addition and subtraction questions correct.**

**17% solved all addition problems correctly.**

**Only 7% solved subtraction problems correctly.**

This shows that many learners may have weak basic numeracy skills and need more support in mastering foundational concepts.



## 2.6 Conceptual and Procedural Fluency

To help children learn math well, they need two important types of understanding: conceptual knowledge and procedural fluency.

Conceptual knowledge means that a learner *understands the idea behind the math*. For example, they know what addition means, why numbers work the way they do, and how different math ideas connect.

Procedural fluency means a learner can *use math steps correctly, quickly, and in different ways*. For example, they can add or subtract using methods that make sense to them, and they can choose the best method for the problem.

These two types of learning:

- Grow as the child develops, step by step.
- Support each other — understanding the idea helps children use the steps better, and practising the steps helps them understand the idea more deeply.
- Are part of the same learning journey, not separate skills.

It is also important to note that:

- They are not just about memorising rules or steps.
- They are not skills learnt in isolation — children need both together to truly understand math.

In many classrooms, teaching often focuses only on showing the *steps* (procedures), such as how to add or subtract, without helping children understand the *idea* behind the steps. This can make it seem like children are doing well, but when they face a new or different problem, they may struggle because they do not fully understand the concept.

For children to apply math confidently, especially when solving new problems, they need both conceptual understanding and procedural fluency. When teachers help learners build both, children become flexible thinkers who can understand, choose, and use different strategies effectively.

### In simple terms:

Children learn math best when they know what they are doing, why they are doing it, and how to do it well.

## 2.7 Errors and Strategies

The table below provides a summary of common errors made by learners and the practical strategies to address them at the foundational learning levels:

Table 1: Common Errors in Numeracy and Practical Strategies to Address Them

| Type of Error     | Specific Error Observed                                                                                                                                                                                                                                                                                             | Practical Strategies to Address the Errors                                                                                                                                                                                                                                                      |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Factual Errors    | <b>Number recognition errors</b> <ul style="list-style-type: none"> <li>• Mirror writing</li> <li>• Failure to :               <ul style="list-style-type: none"> <li>◦ Recognise number names</li> <li>◦ Recognise number symbols</li> <li>◦ Match number names and symbols to real objects</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Use of counters, flash cards, number cards, and number lines.</li> <li>• Tracing, shading, and completing partially drawn numbers.</li> <li>• Modelling and guided number writing.</li> <li>• Use of games and songs to reinforce learning.</li> </ul> |
|                   | <b>Counting errors</b><br>Skipping numbers when counting                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>• Practice counting forward and backwards.</li> <li>• Use counters and number lines for counting on.</li> <li>• Teach number patterns through activities.</li> <li>• Use games and songs to make counting fun.</li> </ul>                                |
| Operation Errors  | <b>Addition and subtraction mistakes</b> <ul style="list-style-type: none"> <li>• Not understanding addition as combining or counting on</li> <li>• Not understanding subtraction as taking away or counting back</li> </ul>                                                                                        | <ul style="list-style-type: none"> <li>• Use counters and number lines to teach addition (counting on) and subtraction (counting back).</li> <li>• Practice breaking apart numbers to build number sense.</li> <li>• Use real-life examples and hands-on materials.</li> </ul>                  |
| Procedural Errors | <b>Place value errors</b><br>Misalignment of digits in addition or subtraction                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Use of place value materials such as bundles of sticks and single sticks.</li> <li>• Use place value charts, tins, pockets, and the abacus to show digit placement.</li> </ul>                                                                         |
|                   | <b>Regrouping errors</b><br>Difficulty in carrying or borrowing during addition and subtraction                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Use of tens frames and sticks to model regrouping.</li> <li>• Demonstrate regrouping with place value materials like charts, pockets, tins, and abacuses.</li> </ul>                                                                                   |
| Conceptual Errors | <b>Misunderstanding place value</b><br>Not seeing the value of digits in different places                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Teach using place value tools (sticks, tens frames, charts, pockets, tins, and abacuses).</li> <li>• Use real-life examples and concrete materials to explain digit positions.</li> </ul>                                                              |
|                   | <b>Overgeneralisation</b><br>Applying one rule or method to all problems (e.g., always borrowing or carrying)                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>• Use practical examples with place value tools to show when regrouping is needed and when it is not.</li> <li>• Encourage learners to explain their thinking and compare strategies.</li> </ul>                                                         |

## 2.8 Concepts and Strategies in Numeracy

Learning mathematics is not just about memorising facts. It is about helping learners understand what they are doing and how to use what they know in real life. Learners should be able to connect with what they learn, see how different ideas are related, and apply their knowledge to solve problems.

In teaching mathematics, we focus on two key things:

- **Concepts** – These are the big ideas in math, like addition or subtraction.
- **Strategies** – These are the different ways or steps we use to teach those big ideas.

For example, **addition** is a concept. Using counters, number lines, or finger counting to teach addition are different strategies.

It is important to use different strategies when teaching the same concept. This helps meet the needs of all learners since children learn in diverse ways. Good strategies help learners work out answers easily, quickly, and correctly. This builds confidence and skill.

However, children do not always understand a concept the first time the teacher explains it. That is why teachers must regularly check learners' understanding using simple assessments. This helps the teacher know who needs more support and adjust their teaching to meet their needs.



### Reflection Questions

1. What kinds of mistakes have you seen learners make in math?
2. What do you usually do when you see these mistakes?
3. How do you check if your learners understand what you have taught?

### 2.8.1 Understanding Numbers

Number knowledge is the foundation for learning math and many other subjects. Learners need to understand how numbers work and how to use them in real life. This section explains some of the basic number concepts for early-grade learners.

#### 2.8.1.1 What Is Number Sense?

Children who come to school already have some ideas about numbers. Teachers should build on these ideas to help learners grow. Number sense means having a good understanding of:

- How numbers work
- How numbers are related
- How to use numbers in real situations

Number sense includes:

- Saying numbers in order (oral counting)
- Matching numbers to objects (one-to-one correspondence)
- Recognising numbers
- Comparing quantities (which is more or less)
- Finding missing numbers in a sequence

*NB: Strong number sense helps learners develop the skills they need for more advanced math.*

### 2.8.2 Why Numeracy Is Important

**Numeracy is important because it helps children make sense of the world.** At the foundational level, children learn skills such as counting, comparing, adding, subtracting, recognising patterns, and solving simple problems. These early skills are like the “roots” of a tree; when they are strong, the child can grow and understand more difficult math later on.

Children who develop strong numeracy skills early become more confident, participate better in class, and perform well in other subjects. They can also utilise these skills in everyday life, like in sharing items fairly, understanding time, or recognising numbers in their environment. Research shows that early numeracy is one of the strongest predictors of a child’s success in school.

Numeracy helps learners:

- Sort and organise numbers
- Count objects
- Recognise and write numbers
- Compare which number is bigger or smaller
- Put numbers in order from smallest to biggest (or vice versa)

*NB: All of these skills are key to doing well in math.w*

### 2.9 Scope and Sequence of Number Concepts

As a teacher, it is important to follow the curriculum. This helps ensure that learners are taught the right content for their grade level. Teaching content that is too easy or too hard can hold learners back.



#### Reflection Questions

1. Do you often check the curriculum to guide your teaching?
2. What happens when learners are not taught what they need for their grade level?

Table 2 shows what learners should be taught in addition and subtraction from Grade 1 to Grade 3. It also includes simple teaching strategies to help learners understand and remember these basic math skills, as guided by the Competency-Based Curriculum (CBC).

Children who develop strong numeracy skills early **become more confident**, participate better in class, and perform well in other subjects.

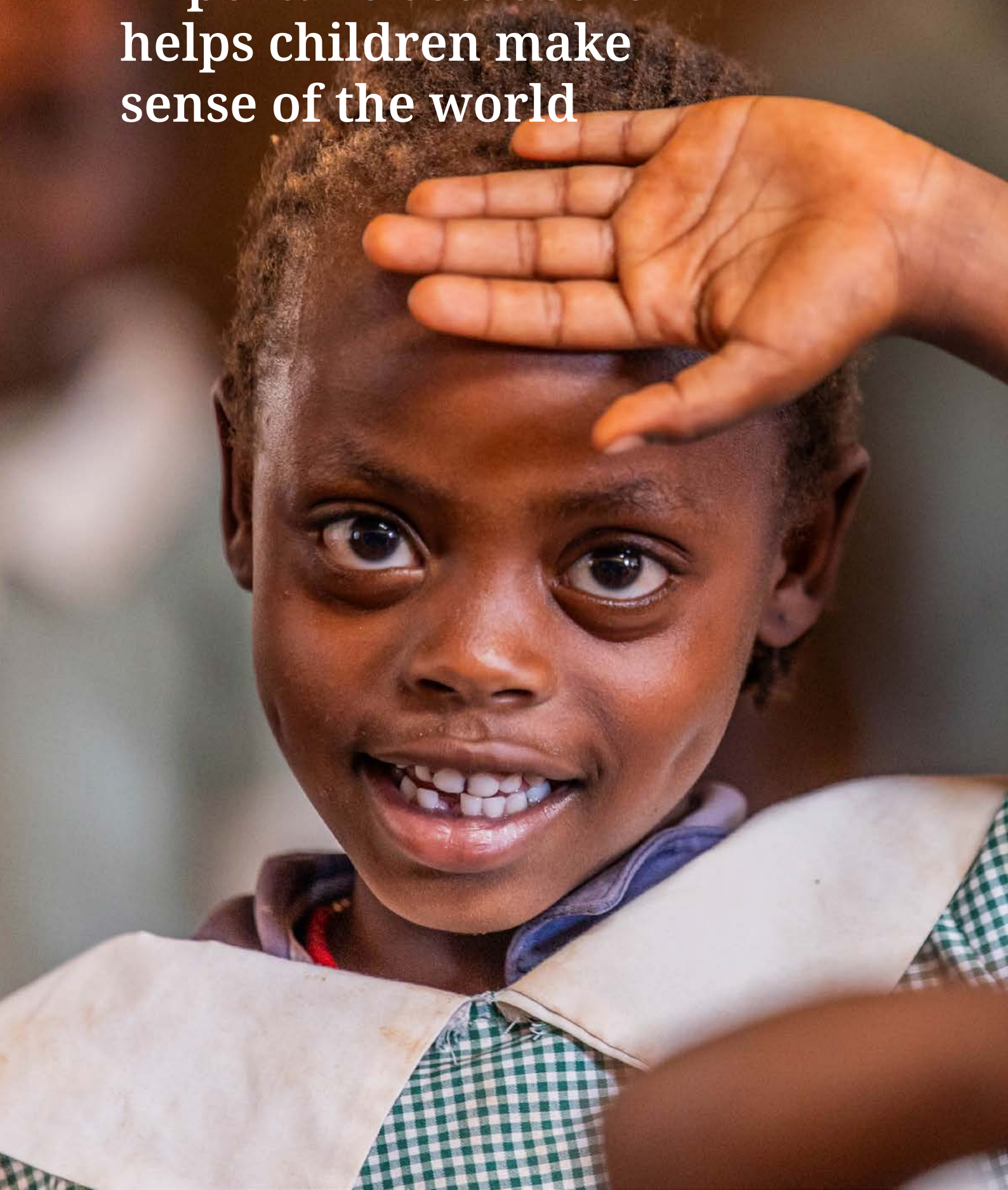


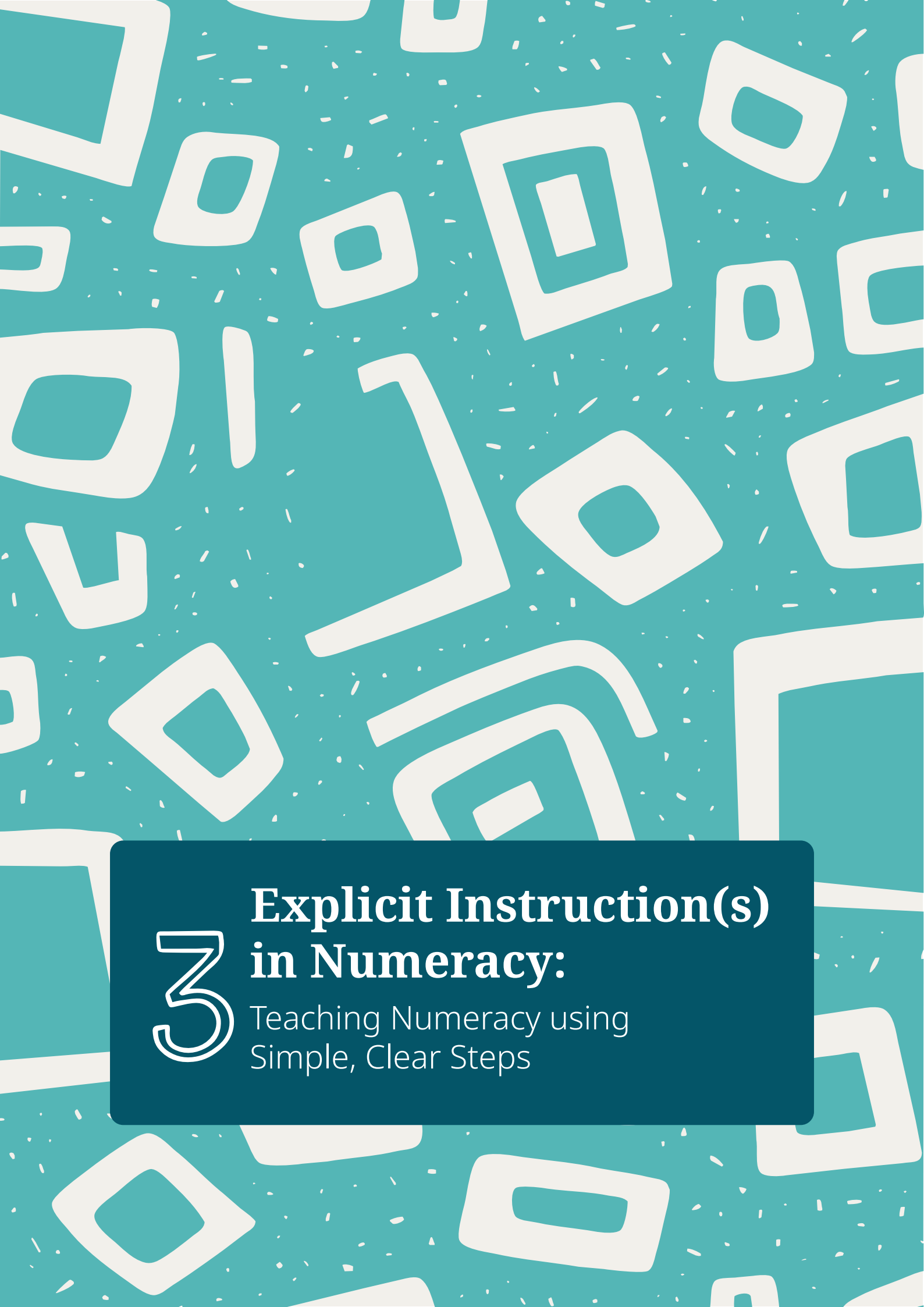
Table 2: Scope and Sequence of Number Concepts and Strategies (Grades 1–3 – CBC)

| Grade           | Sub-Strand      | Concept(s)                                                                                                                                                                                                                                                                                        | Suggested Strategies                                                                                                                                                                                                            |
|-----------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Grade I</b>  | Whole Numbers   | <b>Counting numbers</b><br>Counting forward and backwards                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Use of number lines</li> <li>• Use of number rhymes and songs</li> <li>• Use of concrete objects (counters)</li> </ul>                                                                 |
|                 |                 | Reading numbers in symbols and words                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Use of flash cards and number charts</li> <li>• Tracing and modelling with number cards</li> </ul>                                                                                     |
|                 |                 | Writing numbers in symbols and words                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Use of flashcards</li> <li>• Tracing, copying, and completing numbers</li> <li>• Play-based number writing activities</li> </ul>                                                       |
|                 | Addition        | <ul style="list-style-type: none"> <li>• Understanding addition</li> <li>• Using addition and equal symbols</li> <li>• Adding up to 3 single-digit numbers</li> <li>• Adding a 2-digit to a 1-digit number (no regrouping, <math>\text{sum} \leq 50</math>)</li> </ul>                            | <ul style="list-style-type: none"> <li>• Modelling with counters</li> <li>• Use of number line counting</li> <li>• Use of place value apparatus (e.g., charts, tins)</li> <li>• Use of flashcards</li> </ul>                    |
|                 | Subtraction     | <ul style="list-style-type: none"> <li>• Understanding subtraction</li> <li>• Using subtraction and equal symbols</li> <li>• Subtracting single-digit numbers</li> <li>• Subtracting 1-digit from 2-digit (no regrouping)</li> <li>• Missing number patterns in subtraction (up to 50)</li> </ul> | <ul style="list-style-type: none"> <li>• Use of modelling with counters</li> <li>• Use of number line counting backwards</li> <li>• Use of place value apparatus</li> <li>• Use of flash cards and subtraction songs</li> </ul> |
| <b>Grade II</b> | Number Concepts | <ul style="list-style-type: none"> <li>• Reading and writing numbers (symbols up to 100)</li> <li>• Matching number names with objects</li> <li>• Understanding number values</li> </ul>                                                                                                          | <ul style="list-style-type: none"> <li>• Use of number cards and flashcards</li> <li>• Use of concrete objects (counters)</li> </ul>                                                                                            |
|                 | Whole Numbers   | <ul style="list-style-type: none"> <li>• Counting forward and backwards</li> <li>• Missing number patterns (up to 100)</li> </ul>                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• Use of number line activities</li> <li>• Singing and physical counting games</li> </ul>                                                                                                |
|                 | Place Value     | <ul style="list-style-type: none"> <li>• Understanding place value up to 100</li> <li>• Reading and writing numbers 1–20 in words</li> </ul>                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Use of place value charts, tins, and tables</li> <li>• Use of flashcards and number games</li> </ul>                                                                                   |
|                 | Addition        | <ul style="list-style-type: none"> <li>• Add 2-digit to 1-digit (with/without regrouping)</li> <li>• Add 2-digit to 2-digit (with/without regrouping)</li> <li>• Add multiples of 10 (<math>\text{sum} \leq 100</math>)</li> <li>• Missing number patterns in addition (up to 100)</li> </ul>     | <ul style="list-style-type: none"> <li>• Use of place value tools</li> <li>• Breaking apart strategy</li> <li>• Use of bundles of sticks (tens frames)</li> <li>• Use of counting forward</li> </ul>                            |

|                  |               |                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                           |
|------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | Subtraction   | <ul style="list-style-type: none"> <li>Subtract 1-digit from 2-digit (no regrouping)</li> <li>Subtract 2-digit from 2-digit (with/without regrouping)</li> <li>Subtract multiples of 10</li> <li>Missing number patterns in subtraction (up to 100)</li> </ul>                                 | <ul style="list-style-type: none"> <li>Use of place value tools (charts, tins)</li> <li>Use of bundles of sticks</li> <li>Use of counting backwards</li> </ul>                                                            |
| <b>Grade III</b> | Whole Numbers | <ul style="list-style-type: none"> <li>Counting forward up to 1000</li> <li>Counting backwards in 100s from 1000</li> <li>Place value (hundreds)</li> <li>Reading and writing numbers (symbols: 1–1000; words: 1–100)</li> <li>Identifying missing numbers in patterns (up to 1000)</li> </ul> | <ul style="list-style-type: none"> <li>Use of number lines (forward/backwards)</li> <li>Use of place value charts and apparatus</li> <li>Use of flashcards</li> <li>Use of physical counting and pattern games</li> </ul> |
|                  | Addition      | <ul style="list-style-type: none"> <li>Add 3-digit to 1- or 2-digit (with/without regrouping)</li> <li>Add 3-digit to 3-digit (with regrouping)</li> <li>Creating number patterns (up to 1000)</li> </ul>                                                                                      | <ul style="list-style-type: none"> <li>Use of place value apparatus</li> <li>Use of counting games and forward patterns</li> </ul>                                                                                        |
|                  | Subtraction   | <ul style="list-style-type: none"> <li>Subtract 2-digit from 3-digit (with/without regrouping)</li> <li>Subtract 3-digit from 3-digit (with regrouping)</li> <li>Solve missing number problems (up to 1000)</li> </ul>                                                                         | <ul style="list-style-type: none"> <li>Use of place value charts and materials</li> <li>Use of counting backwards</li> <li>Use of pattern games and story problems</li> </ul>                                             |

Numeracy is  
important because it  
helps children make  
sense of the world



The background is a teal color with a pattern of white, hand-drawn geometric shapes, including squares, rectangles, and L-shapes, some of which are nested. There are also small white speckles scattered across the teal background.

# **3 Explicit Instruction(s) in Numeracy:**

Teaching Numeracy using  
Simple, Clear Steps

### 3.1 Helping Learners Correct Mistakes in Math

Sometimes, learners make the same mistakes repeatedly in math. To help them improve, teachers need to:

- Identify the exact mistake the learner is making.
- Focus only on that mistake, instead of re-teaching the whole topic.
- Use simple tools like real objects (counters, blocks) or drawings to explain the correct method.
- Give the child many chances to practice with support.

### 3.2 How to Help with Correct Mistakes

1. **Talk to the learner:** After looking at their work, explain where the mistake is and let them know you will work together to fix it.
2. **Teach clearly:** Focus on the specific error. For example, if the child did NOT regroup when adding, show where and how to regroup.
3. Use helpful strategies:
  - o **Manipulatives:** These are real objects like bottle tops, sticks, or place value blocks that children can touch and move to understand math better.
  - o **Drawings or pictures:** For learners who are ready, drawings can help show what is happening in a math problem.

### 3.3 What Is Explicit Instruction?

This is a way of teaching that is very clear and step-by-step. Table 3 highlights clear and step-by-step methods of teaching:

Table 3: Components of Explicit Teaching

| Components of Explicit Instruction |                                                                                                                                                                                                                                                                        |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Modelling                          | <ul style="list-style-type: none"> <li>• The teacher models/ demonstrates the completion of a few sample problems</li> <li>• The teacher leads the learner through more sample problems</li> <li>• The teacher points out difficult aspects of the problems</li> </ul> |
| Guided Practice                    | <ul style="list-style-type: none"> <li>• The learner completes problems with the help of either the teacher or peer guidance</li> <li>• The teacher monitors the learner's work</li> <li>• The teacher offers positive corrective feedback</li> </ul>                  |
| Independent Practice               | <ul style="list-style-type: none"> <li>• The learner completes the problems independently</li> <li>• The teacher checks the learner's performance on independent work</li> </ul>                                                                                       |

NB: After teaching, assess whether the learner has understood and can do the skill correctly.

### 3.4 Teaching Through Simple Demonstration

#### 3.4.1 Concept: Counting

Counting is one of the first math skills children learn. They start by saying numbers in order (oral counting) and then move to counting objects (e.g., stones, sticks). Over time, they understand that counting tells us "How many."

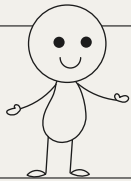
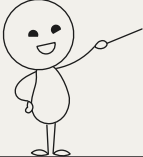
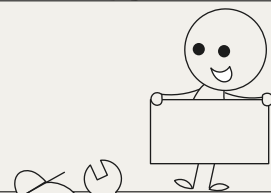
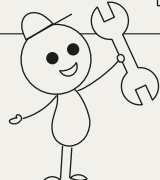
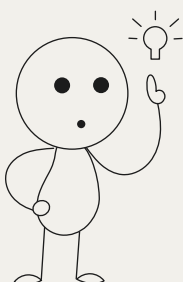
##### 3.4.1.1 Why Counting is Important?

Counting helps children understand numbers, how many things are in a group, and how numbers are used in math. It also builds skills like seeing patterns and solving simple problems.



## Strategies: Rote Counting and Counting On

Table 4: Rote Counting and Counting on for Grade 1

|                                                                                     |                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Introduction</b><br><p>Today, we shall learn about counting. I will count some numbers, and then you will also count.</p>                                                                                                                                                                                                |
|    | <b>Demonstration</b> <ul style="list-style-type: none"> <li>• Listen carefully. I am going to count from 1 to 5.</li> <li>• (The teacher to count from 1 to 5, three times, saying each number clearly and slowly)</li> </ul>                                                                                               |
|    | <b>Guided Activity</b> <ul style="list-style-type: none"> <li>• Let's count to 5 together. Count with me: 1-2-3-4-5.</li> <li>• Count from 1 to 5 several times with learners.</li> </ul>                                                                                                                                   |
|    | <b>Practice</b><br><p>In pairs, learners to count 1-2-3-4-5 to each other.</p>                                                                                                                                                                                                                                              |
|  | <b>Reflection and Feedback</b><br><p>After modelling or trying out an activity, participants should take time to reflect and share feedback.</p> <ul style="list-style-type: none"> <li>• What went well?</li> <li>• What could be improved?</li> </ul> <p>This helps improve teaching practice and learner engagement.</p> |

### 3.5 Teaching Rote Counting

Rote counting means saying number names in the correct order (e.g., "one, two, three, four, five"). Children usually learn this through songs, rhymes, chants, or short counting stories.

#### Easy Ways to Teach Counting

To help learners understand and enjoy counting, try the following:

1. Use real-life situations where children count things they see or use, like fruits, pencils, or steps. Show the link between what they count and how it looks as a number.
2. Sing and chant counting songs that go forward and backwards. Start from different numbers to keep it interesting.
3. Use play-based problems that involve counting, such as counting toys, blocks, or steps.
4. Play counting games that involve matching each object to one number name (this is called one-to-one correspondence).
5. Use tools like counters, number lines, and charts to make counting fun and meaningful. Use them in many different classroom activities.

### 3.6 Counting All Strategy

What it means:

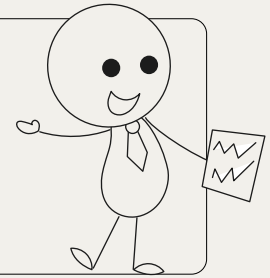
The child counts *every* object in two groups to find the total.

**Example:**

"You have 3 stones, and I give you 2 more. How many do you have now?"

The learner counts: **1, 2, 3** (first group), then **4, 5** (second group).

**Total = 5.**

**Why it is important:**

- It is the **first addition strategy** young children naturally use.
- It helps learners understand that addition means *combining two groups*.
- It supports number sense by connecting counting to real objects.

**How to teach it (Step-by-Step):**

1. Use real objects (sticks, bottle tops, stones, beans).
2. Make two groups and name them: "Here are 3. Here are 2."
3. Ask: "How many are there altogether?"
4. Help the child count every item from the beginning.
  - "Let's count all of them: 1, 2, 3, 4, 5."
5. Repeat using different objects until the child can do it independently.
6. Use drawings or counters to help children move from real to pictorial counting.

**When children are ready to move on:**

When they start to say, "*I already know the first group has 3!*" or they try starting from the bigger number.

This signals they are ready for **Counting On**.

**3.7 Counting On Strategy**

**What it means:** The child starts with the *larger* number and counts forward only the second group.

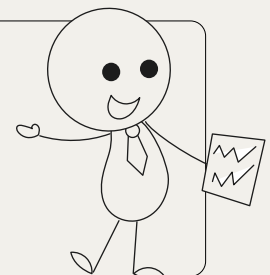
This is more efficient than Counting All because learners **do not recount everything**.

**Example:**

"You have 5 counters and I give you 2 more. How many now?"

The learner starts at **5**, then counts on: "6, 7."

**Answer = 7.**

**Why it is important:**

- It is a **big developmental step** from Counting All.
- Helps children work faster and more flexibly with numbers.
- Builds foundation for mental maths and addition facts.

## How to teach it (Step-by-Step):



### Tips for successful teaching:

- Always start with the **bigger number** — it makes counting on easier.
- Use hand signals: tap head for “start number”, tap fingers for “count on”.
- Praise reasoning, not speed: “Great thinking! You started at 6 and counted on 3.”

### 1.1.1. Helping Learners Move from Counting All to Counting On

Children move through these strategies naturally, but teachers can support the shift.

#### Encourage Counting On by:

- Asking: “What number can we start with?”
- Covering the first group and asking: “**Do we need to count these again?**”
- Using number lines to jump forward from the first number.
- Using story problems:
  - “You already have 4 apples. I give you 3 more...”

#### Signs a learner is ready for Counting On:

- They recognise numbers without counting (“subitising”).
- They say the first group’s amount quickly.
- They start counting from the larger number naturally.

### 1.1.2. Why These Strategies Matter

- They build strong early addition skills.
- They support the development of **mental math**.
- They help learners understand **quantity, number order, and addition** in real-life contexts.
- They form the base for later strategies like **Make 10, Doubles**, and **Decomposition**.

### 3.8 Understanding Representation and Symbols

Another important concept in early math is representation. This means using things like:

- Objects (manipulatives)
- Pictures or drawings
- Math symbols (like +, −, =)

to show what a number or math idea means.

When children use real objects or pictures to show a math idea, they are more likely to understand it. Using tools like counting blocks or drawings helps them make sense of numbers.

It is important for the teacher to guide learners in using these materials. This helps them make connections between:

- The number name they say (e.g., “three”)
- The symbol they write (e.g., “3”)
- The number of items they see (e.g., three apples)

Helping learners make this connection strengthens their number sense and improves how they feel about math.

### 3.9 Strategy Practice: Greater Than and Less Than

The strategy of greater than and less than is important in helping learners not only to represent the value of the number but also to compare numbers and their sizes.

*Table 5: Modelling and Comparing Numbers*

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b><br>Today we will compare numbers. I will show you how to use the number line to compare numbers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Demonstration</b> <ul style="list-style-type: none"> <li>• Write the numbers 6 and 9 on the board.</li> <li>• Draw a number line with numbers from 0 to 10.</li> <li>• Using the number line, identify which number is less than or greater than the other.</li> <li>• Emphasise the use of is greater than and is less than, e.g., 9 is greater than 6 and show how to use the symbols.</li> </ul>                                                                                                                                                                                                |
| <b>Guided Activity</b> <ul style="list-style-type: none"> <li>• Let's now compare numbers.</li> <li>• Write the numbers 13 and 19 on the board.</li> <li>• Which number comes first on the number line? Work with learners to identify which number is less than or greater than the other using a number line.</li> <li>• Write 13, a circle, and 19 on the board and ask the learners to write them down in their books.</li> <li>• Explain that on the number line, 13 is to the left of 19. 13 is less than 19. All the numbers to the left of 19 on the number line are less than 19.</li> </ul> |
| <b>Independent Practice</b><br>Learners in pairs to identify which number is bigger between each of the following pairs of numbers.<br>1) 5    8<br>2) 12   14<br>3) 11   17                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Reflection/Feedback**

Participants to reflect on the modelling and give feedback on what went well and what to improve on.

### 3.10 Introduction to Number Patterns

After learners understand sorting and counting, the next step is to introduce them to **number patterns**.

#### Activity: Let's Think About Number Patterns

- What is a number pattern?
- Why is it important to learn about number patterns?

You might have thought of the following:

A **number pattern** is a sequence of numbers that follows a specific rule.

#### Why number patterns are important:

- They help children think mathematically.
- They support learning of number operations like addition, subtraction, multiplication, and division.
- They help learners see how numbers relate to each other.
- They teach children how to predict what comes next in a sequence.
- They can be connected to learning about shapes and groups.
- They help children notice patterns in nature, design, and art.

#### Teaching Strategy: Counting Forward and Backwards

A helpful way to teach number patterns is through **counting forward and backwards**, using tools like a **number line**.

- **Counting forward** (e.g., 1, 2, 3...) is often easier for young learners.
- **Counting backwards** (e.g., 10, 9, 8...) can be trickier, so children will need more practice and clear examples from the teacher.

This practice is especially useful when learning about number operations and place value.

#### How to Find the Next Number in a Pattern

To help learners solve number patterns, guide them through these four simple steps:

1. Look at the pattern and find where the missing number should go.
2. Decide if the pattern is **increasing** (going up) or **decreasing** (going down).
3. Notice how the numbers are changing – by 1s, 2s, 3s, 5s, etc.
4. Use the correct operation: **add**, **subtract**, or, for older learners, **multiply** or **divide**.



#### Group Activity

Prepare a hundred's chart:

1. Identify the number patterns in the hundreds chart.
2. Discuss how you would use the hundreds chart to teach numbers and number patterns.

You may have come up with the following group activity using a hundred's chart:

### Group Activity: Using a Hundred's Chart

1. Create a **hundred's chart** (a chart from 1 to 100).
2. Look for different number patterns in the chart.
3. Discuss how you can use this chart to teach number patterns and counting skills.

### You may discover patterns like:

- Numbers increasing by 2 (2, 4, 6...)
- Numbers going down by 5 (100, 95, 90...)
- Patterns in columns (e.g., all ending in 5)
- Diagonal or zig-zag patterns

|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 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 |

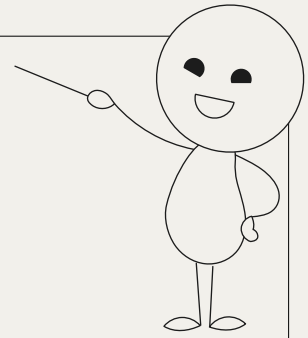
1. Counting forward by 10 from 5
2. Counting forward by 10 from 10

|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 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 |

3. Counting forward by 9 from 9

It is important for learners to be asked to explain why the patterns appear (and thereby explain the mathematics of the pattern).

12345



## Modelling: Counting Forward – Grade 1

### Introduction

Today, we will learn how to find missing numbers in patterns by counting forward. I will count some numbers, and then you will join me.

### Demonstration

I will show you how to find missing numbers in a number pattern.

Write the following examples on the board:

- 34, 36, 38, \_\_, \_\_, \_\_
- 40, 45, 50, \_\_, \_\_, \_\_

### Explain:

- In the first pattern, the numbers increase by 2. The missing numbers are 40, 42, and 44.
- In the second pattern, the numbers increase by 5. The missing numbers are 55, 60, and 65.

### Guided versus Independent Activity

Let's find the missing numbers together.

Write on the board:

- 38, 40, \_\_, 44, 46
- 12, 16, \_\_, 24, 28

Ask learners in pairs to find the missing numbers. Invite one pair to come and explain their answers on the board.

### Use guiding questions like:

- "By how many is the pattern increasing?"

### Work with learners:

- Counting forward by 2s: What is 2 more than 40? (Answer: 42)
- Counting forward by 4s: What number fits between 16 and 24? (Answer: 20)

### Independent Practice

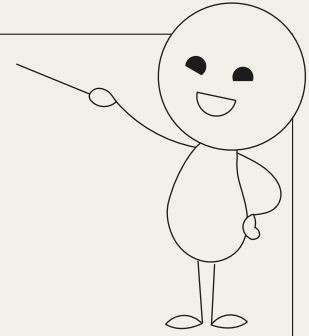
In pairs, learners fill in the missing numbers:

- 12, 14, 16, \_\_, 20, 22
- 12, 15, 18, \_\_, 24, 27

### Reflection/Feedback

Ask participants to reflect on the activity. What went well? What can be improved?

54321



## Modelling: Counting Backwards – Grade 1

### Introduction

Today, we will learn how to find missing numbers in patterns by counting backwards. I will count, and then you will join me.

### Demonstration

Write on the board:

- \_\_, \_\_, \_\_, 34, 36, 38
- \_\_, \_\_, \_\_, 40, 45, 50

### Explain:

- For the first pattern, count backwards by 2. The missing numbers are 28, 30, and 32.
- For the second pattern, count backwards by 5. The missing numbers are 25, 30, and 35.

### Guided Activity

Write on the board:

- \_\_, \_\_, 40, 42, 44, 46
- \_\_, \_\_, 16, 20, 24, 28

Ask learners in pairs to find the missing numbers. Pick a pair to explain their answers.

### Work with learners:

- Backwards by 2s: The missing numbers are 36 and 38
- Backwards by 4s: The missing numbers are 8 and 12

### Ask guiding questions:

- "By how many is the pattern decreasing?"

### Independent Practice

In pairs, learners complete the following patterns:

- \_\_, \_\_, 14, 18, 22, 26, 30
- \_\_, \_\_, 43, 45, 47, 49, 51, 53

### Reflection/Feedback

Participants reflect on the activity. What worked well? What needs improvement?

## 3.11 Operations on Whole Numbers

Learners need to understand both the steps and the meaning behind number operations. Often, they are only taught the steps without understanding the ideas behind them, like place value or how operations are related.

When teachers focus on key ideas, learners develop a better understanding of how numbers and operations work. To build this understanding, learners should:

- Use objects and drawings to solve problems
- Try out their own ways of solving problems
- Estimate answers before using formal methods

### Key Points on Operational Sense in Early Years

- Learners become fluent by using counting, breaking numbers apart, and understanding place value.
- Patterns help learners understand operations. They can use number lines, charts, drawings, and counters.
- Operations are connected. For example, addition and subtraction are opposites. Knowing this helps learners solve problems.
- Learners gain a deep understanding when they try different methods and solve real-life problems.

### 3.11.1 Addition Concept

Addition means putting groups of things or numbers together to find the total. A child's success with addition depends on how well they count, combine, and understand place value.

#### Activity: Where Do We Use Addition in Daily Life?

You may have thought of these examples:

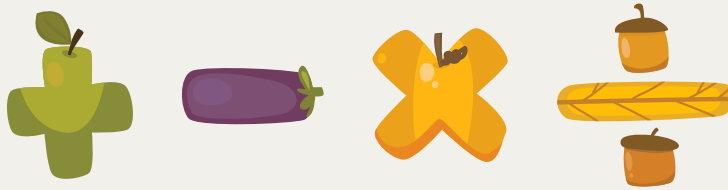
- Buying items from a shop
- Counting animals at home
- Adding bags of harvested maize
- Checking how many pages you have read in a book

Make examples meaningful and relevant to your learners' daily experiences.

#### Strategy Practice: Putting Together

This is the starting point for learning addition. It involves putting two groups of items together and counting them to get the total.

Before using symbols like + and =, learners should practice adding using real objects.



## Modelling: Addition as Putting Together – Grade 1

### Introduction

Today, we will learn how to put things together and count how many we have in total.

### Demonstration

Show two sets of bottle tops: one with 3, the other with 2. Put them together. Count aloud: “3 bottle tops and 2 bottle tops make 5.” Repeat with 2 and 2.

### Guided Activity

Take 4 pencils. Ask a learner to take 5 pencils. Let them put the pencils together and count the total. Have learners work in pairs to practice putting items together.

### Independent Practice

In pairs, learners use different materials in the classroom to practice putting together and counting.

### Reflection/Feedback

Participants reflect on the modelling. What worked well? What can be improved?

Addition Facts: Counting Strategies

| Example | Strategy Description                                                |
|---------|---------------------------------------------------------------------|
| $3 + 6$ | Counts all items using counters for both numbers and totals them.   |
| $3 + 6$ | Counts from the bigger number (6), using counters or fingers.       |
| $3 + 6$ | Counts on from 6 (7, 8, 9), using gestures like nodding or tapping. |

Encourage learners to explain how they solved the problem.

Number Relationship Strategies

| Example      | Strategy                 |
|--------------|--------------------------|
| $6 + 8 = 14$ | Use doubles: $6 + 6 + 2$ |
| $8 + 6 = 14$ | Break apart: $8 + 2 + 4$ |

### 3.11.2 The Concept of Subtraction

Subtraction means finding the difference between two numbers. It is the opposite of addition. In simple terms, subtraction helps us know how many are left when we take some away.

Encourage learners to share ideas such as:

- When we give away items, we are left with fewer.
- After buying something, the money we have reduces.

Subtraction helps children understand how numbers relate to each other. Learners build meaning by solving different subtraction problems using strategies like:

- Counting backwards
- Breaking numbers apart
- Using a number line

It is important that learners understand both "taking away" and "finding the difference."

### 3.11.3 Strategy Practice: Subtraction as Taking Away

Before introducing subtraction symbols, let learners practice taking away real objects. These activities should relate to everyday experiences.



## Modelling: Subtraction as Taking Away – Grade 1

### Introduction

Today, we will learn how to take away items and count how many are left.

### Demonstration

- Hold up 5 pencils. Take away 3 by placing them on a table. Ask: "How many are left?"
- Count the remaining pencils. Explain: "5 pencils take away 3 pencils, leaves 2 pencils."
- Repeat the process with 7 books and take away 4.

### Guided Activity

- Ask a learner to count 6 bottle tops. Take away 4. Ask: "How many are left?"
- Let pairs of learners practice taking away objects from the classroom.

### Independent Practice

Learners in pairs continue practising taking away using classroom materials.

### Reflection/Feedback

Discuss what went well during the modelling and what can be improved.

### 3.11.4 Counting Strategies for Subtraction Facts

Teachers should observe and record learners' methods, then share them with the class.

| Example | Strategy            | Description                                                           |
|---------|---------------------|-----------------------------------------------------------------------|
| 8 - 5   | Taking away         | Learner uses counters for 8, then removes 1 at a time for 5.          |
| 8 - 5   | Counting back-wards | Learner counts back from 8 (7, 6, 5, 4, 3) using fingers or counters. |

### 3.11.5 Number Relationship Strategies in Subtraction

When learners do not use counting, ask them to explain how they found the answer. These strategies show a deeper understanding.

| Example      | Strategy                                               |
|--------------|--------------------------------------------------------|
| $14 - 6 = ?$ | Think: What plus 6 equals 14? ( $6 + 8 = 14$ )         |
| $14 - 6 = 8$ | Break 6 into 4 and 2 ( $14 - 4 - 2$ )                  |
| $14 - 6 = 8$ | Break 14 into 10 and 4, then subtract ( $10 - 6 + 4$ ) |

Definitions:

- **Minuend** – the number we are subtracting from
- **Subtrahend** – the number we are subtracting
- **Difference** – the result after subtraction

## 3.12 Strategies for Addition and Subtraction: Using a Number Line

### Reflection

- A number line is a straight line where each point represents a number. At first, learners should start from 0 or 1. Over time, they will learn to use number lines mentally.

### Concepts that can be taught using number lines:

- Value of numbers
- Addition and subtraction
- Comparing numbers (greater than, less than)
- Finding missing numbers
- Number patterns

Encourage teachers to have a number line on the wall, board, or ground for teaching different topics.

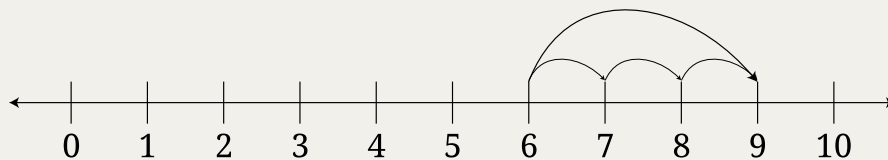
### Modelling: Addition Using a Number Line – Grade 1

#### Introduction

Today, we will learn how to add using a number line.

#### Demonstration

- Write on the board:  $6 + 3 = \underline{\quad}$
- Draw a number line. Start at 6 and count 3 steps forward. Stop at 9.



**Explain:**  $6 + 3 = 9$ .

#### Guided Activity

- Write:  $9 + 4 = \underline{\quad}$  and  $8 + 5 = \underline{\quad}$
- Ask learners to use the number line on the board or floor.
- Let learners jump forward to find the total.
- Draw what happens on the board.

#### Independent Practice

In pairs, learners solve:

- $7 + 6 = \underline{\quad}$
- $8 + 7 = \underline{\quad}$

They should draw number lines and show their work in their books.

#### Reflection/Feedback

Discuss what went well and what can be improved in the activity.

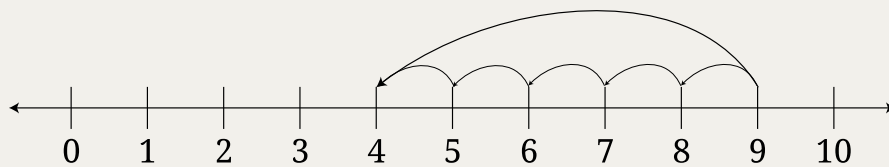
## Modelling: Subtraction Using a Number Line – Grade 1

### Introduction

Today, we will learn how to subtract using a number line.

### Demonstration

- Write on the board:  $9 - 5 = \underline{\quad}$
- Draw a number line. Start at 9 and count 5 steps backwards. Stop at 4.



**Explain:**  $9 - 5 = 4$ .

### Guided Activity

- Write:  $7 - 3 = \underline{\quad}$  and  $8 - 4 = \underline{\quad}$
- Let learners use the number line on the ground.
- Ask: "If you jump 3 steps backwards from 7, where do you land?"
- Draw the steps on the board.

### Independent Practice

In pairs, learners solve:

- $10 - 7 = \underline{\quad}$
- $9 - 6 = \underline{\quad}$

They should draw number lines and show their answers.

### Reflection/Feedback

Ask teachers to reflect on the activity. What worked well? What can be improved?

## 3.13 Subtraction as the Opposite of Addition

Addition and subtraction are opposite operations. They cancel each other out. When learners understand how addition and subtraction are connected, it becomes easier for them to solve problems. For example, knowing that  $5 + 3 = 8$  can help a learner figure out that  $8 - 3 = 5$ .

## Modelling: Subtraction as the Inverse of Addition – Grade 1

### Introduction

Today, we shall learn how to subtract numbers. I will subtract some numbers, and then you will also subtract.

### Demonstration

- Write on the board:  $8 - 5 = \underline{\quad}$
- Tell learners: "Let's think about it differently: What number plus 5 equals 8?"
- Using addition facts:  $3 + 5 = 8$
- Therefore, explain to the class that  $8 - 5 = 3$ .

### Illustration:

Draw 8 counters on the board. Circle 5 of them. How many are left? (3 counters)

### Guided Practice:

- Write  $18 - 6 = \underline{\quad}$  and  $\underline{\quad} + 6 = 18$
- Help learners find the missing number:  $12 + 6 = 18$
- So,  $18 - 6 = 12$

### Independent Practice:

In pairs, learners solve:

- $8 - 7 = \underline{\quad}$
- $11 - 6 = \underline{\quad}$

### Reflection/Feedback:

Discuss with learners what helped them find the answers easily.

## 3.14 Concept: Place Value

### Understanding Place Value

The value of a number depends on where the digit is placed. This is called place value.

Learners start to understand place value when they count numbers bigger than 9. As they count up to 100 and beyond, they begin to read and write bigger numbers.

For example, when a learner sees 13, they say 'thirteen', and when they hear 'thirteen', they write 13.

Place value is very important because it helps learners **add, subtract, multiply**, and **divide** numbers correctly.

Learners need a lot of practice to understand place value.

**In place value:**

- The position of a digit changes its value. For example, the '4' in 40, 14, and 417 has a different value each time.
- In our number system (base ten), each place is 10 times bigger than the one to its right. (For example: 10, 100, 1000)

Knowing place value helps learners understand that the same number can mean different amounts depending on where it is in the number.

**Learning About Place Value – Simple Guide****Materials You Might Have Prepared**

- Place value tools like:
  - Place value tins
  - Place value pockets
  - Place value charts or tables
  - Abacus
- Bundles of sticks (tied in tens and singles).
- Tens frame

**Modelling: Place Value of Digits in a Number – Grade 2****Introduction**

Today, we are going to learn about **the position of digits** in numbers and what each digit means.

***Demonstration (Teacher Shows)***

Use place value materials to show the value of the digit **3** in the numbers **13**, **39**, and **139**.

- In **13**, the digit **1** stands for **tens**, and **3** stands for **ones**.
  - › Put **one bundle** (10) in the tens tin and **three sticks** in the ones tin.
- In **39**, the digit **3** stands for **tens**, and **9** stands for **ones**.
  - › Put **three bundles** (30) in the tens tin and **nine sticks** in the ones tin.
- In **139**, the digit **1** stands for **hundreds**, **3** for **tens**, and **9** for **ones**.
  - › Put **one bundle** (100) in the hundreds tin, **three bundles** (30) in the tens tin, and **nine sticks** in the ones tin.

***Guided Activity (Teacher and Learners Work Together)***

Use your place value materials and guide learners to show the value of digits in numbers, for example, **26** and **67**.

- In **26**, the digit **2** is in the **tens** place, and **6** is in the **ones** place.
- In **67**, the digit **6** is in the **tens** place, and **7** is in the **ones** place.

## Practice in Groups (Learners Work Together)

Learners work in pairs or small groups to find the place value of **9** in these numbers: **19, 9, 923**, and **91**.

**Illustration:** Draw place value charts for each number:

| Hundreds | Tens | Ones |
|----------|------|------|
|          | 1    | 9    |
|          |      | 9    |
| 9        | 2    | 3    |
|          | 9    | 1    |

**Reflection:** Ask learners: "What did you notice about the number 9 in each number?"

- In **19**, **9** is in the **ones** place.
- In **9**, **9** is in the **ones** place.
- In **923**, **9** is in the **hundreds** place.
- In **91**, **9** is in the **tens** place.

**Reflection and Feedback**

After the activity, ask learners to think about and share:

- What went well during the lesson?
- What can be improved or what numbers can be used next time?

### 3.15 Strategy Practice: Tens Frame Strategy for Early Grade Teachers – Grade 2

#### What is a Tens Frame?

A **tens frame** is a simple tool used to help children understand place value (tens and ones). It is made of **2 rows and 5 columns**, giving a total of **10 spaces**. Each space can hold a dot, counter, or object.

|   |   |   |   |   |
|---|---|---|---|---|
| ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● |

#### Why use Tens Frames?

- They help children **see and count tens and ones** in a number.
- They support children to understand that **10 ones make a ten**.
- They make place value **visual and hands-on**.
- You can make them using simple materials like **egg trays, bottle tops, or sticks**.

## Modelling: Place Value of Numbers Using Tens Frames – Grade 2

### Introduction (Whole Class Discussion)

*Start the lesson by saying:*

"Today we are learning about **place value**. We will find out how many **tens and ones** are in different numbers."

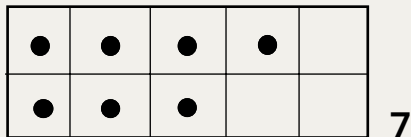
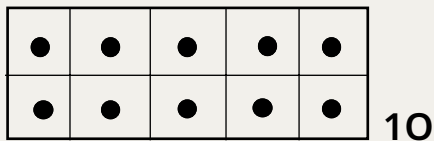
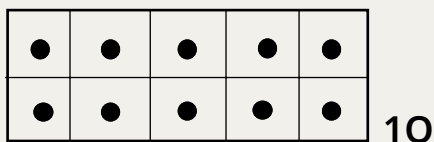
*Tell learners:*

"I will show you some numbers using tens frames. Then, you will try to find the tens and ones yourselves."

### Demonstration

*Teacher Demonstration (Show and Tell)*

**Step 1:** Draw **3 tens frames** on the chalkboard.



**Step 2:** Explain:

"Each frame holds **10 counters**—5 on the top row and 5 on the bottom row."

**Step 3:** Use a real object (egg tray or bottle tops on wood) to show the frames.

**Step 4:** Place **10 counters** in the first frame, **10** in the second, and **7** in the third.

**Step 5:** Ask:

"How many counters do we have altogether?"

Help learners count:  **$10 + 10 + 7 = 27$**

*Tell them:*

"This means we have **2 tens** and **7 ones**. The number is **27**."

Write: 2 tens + 7 ones = 27

**Guided Practice (With Learners)**

**Step 1:** Draw **2 tens frames** on the board.

|   |   |   |   |   |
|---|---|---|---|---|
| ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● |

|   |   |   |   |   |
|---|---|---|---|---|
| ● | ● | ● | ● | ● |
| ● | ● |   |   |   |

**Step 2:** Ask learners to copy the frames in their books.

**Step 3:** Together, fill in the frames with **10 counters** in one frame and **7** in the other.

Step 4: Ask:

“How many dots do you see? What number is this?”

Guide them to say:

1 ten and 7 ones = 17

Show the number **17** using your prepared materials.

(The teacher to display the number 17 using readily prepared tens frames)

**Independent Practice (Learner Pairs)**

In pairs, learners will:

- Draw tens frames for the numbers **26** and **36**.
- Use dots or small objects to fill the frames.
- Count and write how many tens and ones they have.

**Reflection and Feedback (Wrap-Up)**

Ask learners:

- “What did you learn today?”
- “Was it easy or hard to use the tens frames?”
- “What can we do better next time?”

Encourage learners to share what helped them understand tens and ones.

**Extra Tip: Alternative Materials**

You can also use:

- **Bundles of sticks** tied in tens (for tens)
- Single sticks (for ones)

These can be used in place of tens frames to help learners understand the same concept in a different way.

### 3.16 Teaching Regrouping in Addition for Grade 3 Teachers

#### What is Regrouping?

**Regrouping** is when we **make groups of tens** while adding numbers. It is sometimes called “**carry-ing**” (in addition) or “**borrowing**” (in subtraction).

It helps learners:

- Understand **place value** (tens and ones);
- Know why and when we carry or borrow; and
- Add large numbers more easily.

#### Modelling: Addition Involving Regrouping Using Spike Abacus – Grade 3

##### Part 1: Addition with Regrouping Using a Spike Abacus

###### Introduction

Tell the learners:

“Today we will learn how to **add numbers using regrouping**. We will use a tool called the **spike abacus** to help us.”

###### Teacher Demonstration

**Example:**  $126 + 245$

**Step 1:** Write  $126 + 245$  on the chalkboard.

**Step 2:** Using a spike abacus:

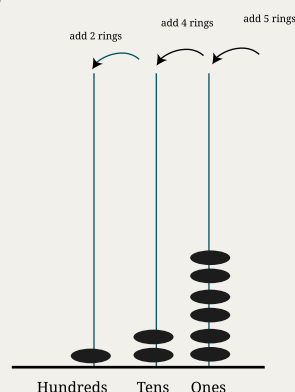
- Put rings to show the number **126** (1 hundred, 2 tens, 6 ones).
- Then add rings for **245** (2 hundreds, 4 tens, 5 ones).

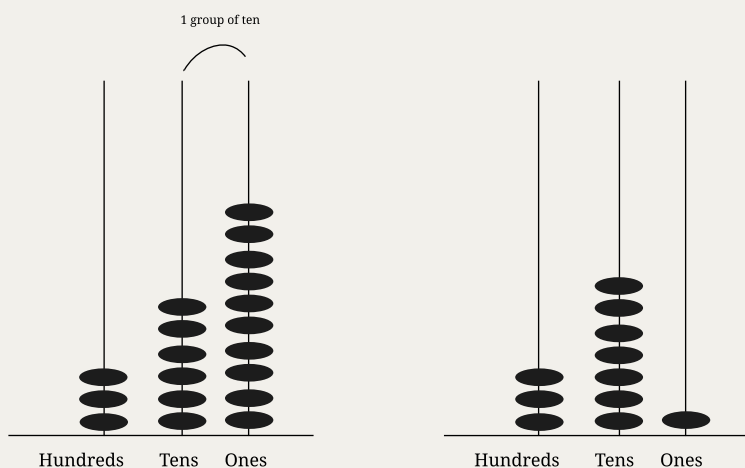
**Step 3:** Count the total number of rings in each column (ones, tens, hundreds).

**Explain:**

“In the ones spike, we now have **11 rings**. We regroup 11 ones as **1 ten and 1 one**. We move 1 ring to the tens spike and keep 1 ring in the ones.”

Continue with tens and hundreds in the same way.





**Final Answer:**  $126 + 245 = 371$

### Guided Activity

Work together with learners on this example:

**$217 + 114$**

- Use the spike abacus.
- Guide them to draw their work and count the rings.
- Help them regroup where needed.

### Independent Practice

Put learners into small groups. Give them the following problems to solve using a spike abacus:

1.  $264 + 227 =$
2.  $239 + 542 =$
3.  $486 + 337 =$

Let them draw or use real abacuses to show their working.

### Reflection and Feedback

Ask learners:

- "What did you enjoy about using the abacus?"
- "Was regrouping clear?"
- "What part was hard or needs more practice?"

Encourage them to share and support each other.

## Demonstration: Addition Involving Regrouping Using Place Value Table – Grade 3

### Introduction

Say to the learners:

"Today we are going to learn how to **add using a place value table**. I will show you first, then we will do it together."

### Teacher Demonstration

Step-by-step on the board, write  $18 + 15$  on the board as shown.

$$\begin{array}{r} 18 \\ + 15 \\ \hline \end{array}$$

### Explain:

- Add the **ones**:  $8 + 5 = 13$
- Regroup:  $13 = 1 \text{ ten} + 3 \text{ ones}$
- Write 3 in the ones place, and carry 1 to the tens.
- Add the tens:  $1 \text{ (carried)} + 1 + 1 = 3$
- The sum is **33**.

The sum is **33**

| 1    |      |
|------|------|
| Tens | Ones |
| 1    | 8    |
| 1    | 5    |
| 3    | 3    |

### Guided Activity

Step-by-step with learners, write  $28 + 17$  on the board and arrange it as shown.

$$\begin{array}{r} 28 \\ + 17 \\ \hline \end{array}$$

### Ask guiding questions:

- "What do we add first?" (Ones)
- " $8 + 7 = ?$ " (15)
- "How do we regroup 15?" (1 ten and 5 ones)
- "Where do we write the 5?" (In the ones place)
- "What do we do with the 1 ten?" (Carry to the tens)
- "What's  $1 + 2 + 1$ ?" (4)

The final answer is **45**

$$\begin{array}{r}
 1 \\
 2 \ 8 \\
 + \ 1 \ 7 \\
 \hline
 4 \ 5
 \end{array}$$

### Independent Practice

In pairs, learners solve:

1.  $16 + 7 =$
2.  $17 + 15 =$
3.  $26 + 19 =$

Let them draw place value tables and regroup where needed.

### Reflection and Feedback

Ask:

- "Was it easy to add using regrouping?"
- "What helped you understand better?"
- "What can we do to improve next time?"

Encourage learners to use both **abacus and place value methods** until they are confident.

## 3.17 Strategy Practice: Subtraction Using Spike Abacus

### Demonstration: Subtraction Using Abacus – Grade 3

PART 1: Subtraction Without Regrouping Using a Spike Abacus

#### Introduction

Begin the lesson by saying:

"Today we are learning how to subtract numbers using the **spike abacus**. This tool helps us understand how to take away numbers using place value."

#### Teacher Demonstration

Show learners how to subtract 2-digit numbers using a spike abacus.

#### Example 1: $154 - 122$

- › Step 1: Put **154** on the spike abacus using rings (1 hundred, 5 tens, 4 ones).
- › Step 2: Remove rings to subtract **122** (1 hundred, 2 tens, 2 ones).
- › Step 3: Count the remaining rings.
- › Final Answer:  **$154 - 122 = 32$**

**Example 2: 247 – 134**

- › Step 1: Show **247** on the abacus.
- › Step 2: Remove rings for **134**.
- › Step 3: Count what is left.
- › Final Answer:  $247 - 134 = 113$

**Guided Activity**

Work with learners to solve: **217 – 114**

- Let learners use the spike abacus.
- Encourage them to draw their steps.
- Ask them to count and write the answer.

**Independent Practice**

Learners work in groups to solve the following using spike abacus:

- 1)  $264 - 227 =$
- 2)  $784 - 763 =$

**Reflection and Feedback**

Ask learners:

- "What helped you understand subtraction today?"
- "What was easy or hard?"
- "What should we try next time to learn better?"

## Demonstration: Subtraction Involving Regrouping Strategy – Grade 3

PART 2: Subtraction With Regrouping Using Spike Abacus

**Introduction**

**Say:** "Now let's learn how to subtract when we need to **regroup**. This means we change a ten into ten ones to make subtraction possible."

**Demonstration****Teacher Demonstration****Example: 24 – 19**

- › Step 1: Show **24** on the abacus (2 tens and 4 ones).
- › Step 2: Since we can't subtract 9 from 4, regroup:  
Change 1 ten into **10 ones** -> Now you have **14 ones and 1 ten**.
- › Step 3: Subtract 9 from 14 ( $14 - 9 = 5$  ones).
- › Step 4: Subtract 1 ten from 1 ten = 0 tens.

**Final Answer:**  $24 - 19 = 5$

**Guided Activity**

Work together on:  $64 - 27$

- Guide learners through the regrouping step using the abacus.
- Ask prompting questions:

“Can we subtract 7 from 4?” (No)

“What do we do?” (Regroup one ten to get more ones)

**Independent Practice**

Learners solve the following using spike abacus or place value sticks:

- 1)  $34 - 18 =$
- 2)  $42 - 18 =$
- 3)  $55 - 17 =$

**Reflection and Feedback**

Ask learners to share:

- What they learnt about regrouping.
- What they found tricky.
- How they used the abacus to help.

Demonstration: Subtraction Involving Regrouping Using Place Value Table – Grade 3

PART 1: Subtraction With Regrouping Using Place Value Table

Introduction

Begin the lesson by saying:

“Today we are learning how to subtract numbers using the **place value table**. This tool helps us understand how to take away numbers using place value.”

**Teacher Demonstration**

$$\begin{array}{r} 23 \\ - 18 \\ \hline \end{array}$$

Example:  $23 - 18$

**Step 1:** Write the problem on the board:

**Step 2:** Show place value:

**Step 3:** Regroup:

Change 1 ten into 10 ones:

Now we have **13 ones** and **1 ten**

**Step 4:** Subtract:

$$13 - 8 = 5 \text{ ones}$$

$$1 - 1 = 0 \text{ tens}$$

| Tens | Ones |
|------|------|
| 2    | 3    |
| 1    | 8    |
|      |      |

Subtract ones from ones and tens from tens

| Tens | Ones |
|------|------|
| 2    | 3    |
| 1    | 8    |
|      |      |

Regroup 23 as 1 ten and 13 ones as follows

| Tens | Ones |
|------|------|
| 1    | 13   |
| 1    | 8    |
|      | 5    |

Subtract 8 ones from 13 ones to get 5. Subtract 1 ten from 1 ten to get 0 tens.

**Final Answer:  $23 - 18 = 5$**

**Guided Activity****Example:**  $53 - 27$ 

- Write the problem.
- Guide learners through regrouping and subtraction using the place value table.
- Prompt them with questions at each step.

Write  $53 - 27 = \text{---}$  on the board and arrange it as shown.

$$\begin{array}{r} 53 \\ - 27 \\ \hline \end{array}$$

Guide learners in aligning the digits in the numbers in the place value table.

Subtract ones from ones and tens from tens with regrouping.

| Tens | Ones |
|------|------|
| 5    | 3    |
| 2    | 7    |
|      |      |

**Independent Practice**

Learners work in pairs to solve:

1.  $36 - 7 =$
2.  $45 - 18 =$
3.  $66 - 19 =$

Encourage learners to draw place value tables and regroup correctly.

**Reflection and Feedback**

Discuss with the class:

- "What did you find helpful about the place value table?"
- "Did regrouping make subtraction easier?"
- "Where did you need help?"

## 3.18 Instructional Strategies for Numeracy

### 1. Check for Understanding and Give Feedback

It is important to regularly check if learners understand what you are teaching. You can do this by:

- Asking questions during or after teaching.
- Observing learners as they work.
- Using simple written activities like exit slips.

After checking, always give feedback. This helps learners know what they did well and what they need to improve on.

## 2. Monitor Learner Progress During Activities

As learners work on tasks, move around the classroom and observe:

- Who is struggling?
- Who needs a little support?
- Who is ready to move ahead?

Avoid standing in one place at the front of the class. Walking around helps you give immediate support where needed.

## 3. Modify Content Based on Learner Needs

Use checklists or records of learner performance to see who is understanding and who needs extra help. Based on what you observe:

- Review or re-teach important concepts.
- Adjust your materials to match learners' understanding.
- This helps ensure no learner is left behind.

Changing your teaching method can help more learners understand.

## 4. Adjust Teaching Methods When Needed

If some learners still struggle, try using different ways to explain a concept. For example:

- Use manipulatives (like counters or number lines).
- Work in pairs or small groups.
- Use pictures or models to explain ideas clearly.

## 5. Provide Remediation for Learners Who Need Extra Help

Remediation means giving short-term extra help to learners who have not fully understood earlier lessons. This can happen:

- In after-school math clubs;
- During one-on-one or small group sessions; or
- While other learners are in another activity (like PE or music).

The goal is to help these learners catch up quickly so they can continue learning with the rest of the class.

## 6. Use Differentiated Instruction

Differentiated instruction means teaching in ways that meet the different needs of your learners. Not all learners are the same, so you can:

- Group learners based on skills or needs;
- Give tasks with different levels of challenges; or
- Assign different activities to individuals, pairs, or groups.

This helps each learner succeed based on their own pace and ability.

## 4. Conclusion

This *Error Analysis Manual* for foundational numeracy learning marks a significant milestone in advancing the quality of early-grade mathematics instruction in Kenya and across Africa. Developed through a collaborative partnership between CEMASTEa and the Zizi Afrique Foundation (ZAF), it reflects a deliberate effort to translate research findings and classroom evidence into actionable strategies that improve foundational numeracy outcomes.

The journey began with a shared recognition that, despite progress under the Competency-Based Curriculum (CBC), many learners continue to experience difficulties in mastering basic mathematical concepts such as addition, subtraction, and place value. The Bungoma West Sub-County study provided critical evidence confirming that recurring factual, procedural, and conceptual errors were key barriers to learners' numeracy proficiency. These findings underscore the urgent need for a practical, teacher-centred approach to diagnosing and addressing learner errors.

In response, this manual was developed as both a training resource and a classroom reference tool, guiding teachers step-by-step on how to apply Error Analysis (EA) in their daily practice. By shifting the focus from simply marking right or wrong answers to understanding *why* learners make mistakes, the EA approach empowers teachers to become more reflective practitioners who teach with intentionality and empathy.

Throughout its three core units, Introduction to Error Analysis, Error Analysis in Practice, and Explicit Instruction in Numeracy, the manual provides a clear pedagogical pathway: from understanding the theory of errors, to applying analytical methods, to implementing corrective strategies through structured, hands-on teaching. The inclusion of classroom examples, modelling sessions, and reflective activities ensures that teachers can translate theory into practical action that directly benefits learners.

As teachers adopt and internalize the principles in this manual, they will enhance their ability to:

- Identify and interpret patterns of learner errors.
- Use diagnostic evidence to design targeted lessons.
- Apply the Concrete–Pictorial–Abstract (CPA) model to strengthen conceptual understanding.
- Cultivate learner confidence, fluency, and problem-solving skills in mathematics.

Ultimately, the *Error Analysis Manual* is more than a guide; it is a call to action for teachers, education leaders, and partners to embrace evidence-informed, innovative, and contextually relevant teaching. It reinforces the shared vision of CEMASTEa and ZAF: that every child, regardless of background, should have the opportunity to build strong numeracy foundations essential for lifelong learning and success.

By fostering reflective teaching and continuous improvement, this manual contributes meaningfully to Kenya's broader efforts towards quality, equitable, and inclusive education for all, anchored in data, driven by practice, and sustained by collaboration.



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## Reader's Notes

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