Read/Say
Reading and saying encourages children to involve in every activity taken in the class

Do
Learning by doing enhances the capacity of conceptual understanding.

TEACHING MANUAL FOR NUMERACY

Write
Writing always reinforces what they learn by doing reading and listening

SOLVE
Take time to think about the operations and the steps to find an answer

TEACHING MANUAL FOR

NUMERACY

This manual is compiled for the
Targeted Instruction in Sierra Leone (TISL) project

Table of Contents

DIFFICULTIES FACED WHILE LEARNING MATH

This page wil help you anticipate the difficulties pupils might face in order for you to address them in your lesson

Number Concepts:

If there is a lack of a basic understanding of numbers, over a period of time the fear of maths increases. The following are common difficulties that are addressed in our lessons.

Number Concept: Rote learning is a good strategy for remembering formulas and tables, but explaining how they are formed can be difficult. It can be understood easily by using practical knowledge. This helps children to overcome problems with abstract presentation. Common problems with number concepts include follows:

- **Identifying:** finding or writing numbers randomly is difficult.
- **Reversal:** children get confused while writing two or more than two digit numbers. They don't understand place value. For example, not knowing the difference between 23 and 32 or writing 23 when 32 is said.

Basic Operations:

Children are not clear about how to present the problem in mathematical form. Sometimes children get confused with mathematical terms and their meaning in everyday language. Place value confusion means that they have problems in deciding where to start addition-subtraction operations, where to write answers or where to borrow the numbers.

It is important that children understand the concepts behind doing the operations and that they connect these concepts with the metathetical vocabulary. When this is done then they can do rote memorization to help with mental math skills.

LEARNING CAPABILITIES

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

Reading more

Read/Say
Reading and saying encourages children to involve in every activity taken in the class

Know

Do
Learning by doing enhances the capacity of conceptual understanding.

Write
Writing always reinforces what they learn by doing reading and listening

SOLVE
Take time to think about the operations and the steps to find an answer

INVESTING STUDENTS

The first step of ensuring pupils success is getting pupils excited about learning. When they like learning, they are more likely to behave well and try to understand the materials. Below are some strategies to use to get pupils excited about learning and excelling.

1. Create a Class identity

- Create a poem, song or chant that your pupils can recite at the beginning of class, as they get into groups or as they are finishing the day.
  For Example: *Good better best, today I did not rest, I know my good got better and my better will impress.*

3. Anchor Learning in Goals?

- The BIG GOAL: Tell pupils why what they are learning is important in their personal development. Make sure to relate this For example: The big goal of module 1 literacy is for you all to be excellent readers so that you can read and understand words in newspapers and books.
- Have pupils read the OBJECTIVES for the class each day. Ask them and/ or explain how meeting the days objectives will get them closer to their big goals for the class.
- Close Lessons by asking pupils what they learned and why it matters to them. You can also task them with teaching their lessons to a younger sibling or another relative.

2. Develop Class Culture

- **Identity**: Give your class a name that allows them to aspire to certain attributes.
  For example: *We are the warriors. Warriors are fearless and always try. Todays lesson may seem difficult, but remember that as warriors, we will not be defeated. We will move ahead until we win.*
- **Attention grabber**: Create a word or phrase that could be used as a call and response for when you want to wrap up an activity, or to address the class whole group.
  For example **call**: Warriors
  Response: We are the Warriors!
- **Class Objects** - bring in items to remind pupils of the class personality. You can also use them to give to pupils to hold when they are speaking or to use as prizes for pupils who show excellent behaviour and academic progress.
  For example: This gold medal is a special medal and is worn by warriors. The pupils who raise their hand, pay attention and comes everyday will get the medal of honour

CLASSROOM GROUPINGS STRATEGIES

You should use three approaches to teaching and learning literacy: whole group approach (involving the whole class), small group approach (smaller part of the class, with one leader) and individual approach (self or supervised learning, particularly, reading, writing and interpretation). Each of these approaches have their advantages and limitations, which is why you should move between the three approaches in all of your classes.

WHOLE GROUP APPROACH

Involves the teacher giving one set of instructions to the entire class.

Advantages:

- **Class management:** the teacher can reach out to a large number of pupils in a limited time.
- **Comfort level of the group:** since the whole class participates together, the shy pupils feel more comfortable and relaxed.
- **Kinesthetic activities:** children can sing and dance together to develop their kinesthetic skills.

Examples of whole group activities: Games involving movement, Action songs and Rhymes, Mind maps

Limitations

- More suitable for 'average' pupils. Above average pupils find it less challenging and tend to get bored. While pupils lagging behind feel a bit lost because they do not keep pace with the rest of the class.
- Children repeat after the teacher monotonously without paying attention, which results in minimum learning.
- Some pupils do not participate at all.
- Individual teacher attention is not possible.

SMALL GROUP APPROACH

Here, the class is divided into small groups and the teacher assigns activities to each group. Group members work together to complete the task successfully.

Advantages

- **Challenging:** the small group teaching-learning process gives pupils the opportunity to be challenged.
- **Comfort zone:** the shy pupils get the chance to participate actively as they feel more comfortable.
- **Skills building:** pupils get the opportunity to emerge as leaders. Pupils help each other in completing the tasks and this develops their social skills like patience, tolerance and brotherhood.

  Examples: games, activities like crossword puzzles, riddles, etc.

Limitations:

- Pupils with leadership qualities can overshadow other pupils in their group.
- Teacher finds it difficult to manage small groups as he/she will have to go from one to the other.

INDIVIDUAL APPROACH

Individual approach in any teaching-learning process is essential. It cannot be replaced by whole or small group. The objectives achieved cannot be measured without individual learning approach. It is self-learning, where pupils can learn at their own place with freedom and creativity.

Advantages:

- Pupils learn the basic skills of reading and writing at their own pace.
- It is important for pupils at each level of learning from basic to advanced.

Examples: Some of the individual learning approaches are completing worksheets, copying in the exercise books and writing tests.

Limitations:

- In class individual learning is limited to assessment.
- May be difficult to give all of the individual attention necessary

PARTNER WORK

Given the "Classroom Grouping Strategies" on the preceding page, below are some pointers to help make sure that groupings and partner work are done correctly. Many times teachers fear partner and group work because of chaos or cheating. Using those steps below should lessen the occurrence of these things.

1. PREPARE IN ADVANCE

- **Assign Partners** in advance. This can be done in the beginning of the year and carried throughout the year in order . However, if attendance may be an issue or if classes change often, assign partners at the beginning of each class and sit next to their partners.

- **Be Strategic** with how you partner pupils. If you know that there are ways in which certain pupils might complement each other or distract each other, factor this into how you choose partners. This will maximize their learning without your direct instruction

- **Give Roles** for small groups. If you are doing an activity with 3 or 4 pupils per group, make sure everyone understands how they are expected to contribute. If this is not made clear, then one student may dominate and others may be overshadowed. In such an instance, not everyone benefits.

2. CREATE A GOOD CULTURE

- **Invest** pupils in working with partners by telling them pupils have a special way of explaining things to each other, that is why you will be using partner work to make sure everyone understands the material
- **Show** both excellent and poor partner work by role-playing what it looks, sounds and feels like to give and receive ideas and criticisms. Make sure to point out how you are using positive language and that you are also grateful for your partners input.
- **Praise** excellent partner work often. Make sure to point out partners who are working well together and what they are doing that's praise worthy. ie. "I see Esi and Mohammed are sharing their ideas and waiting for the other one to finish before they speak"

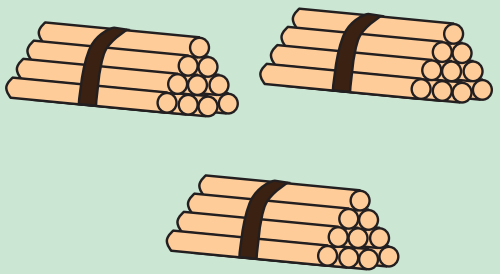
3. ESTABLISH A ROUTINE

- **Getting into Groups** should be fun and exciting. You can have pupils sing songs or recite chants as they find their partners or gather materials for small group work.
- **Incorporating Partner Work** into every lesson so that pupils anticipate working together and fully expect to have the opportunity to interact with their peers.

USING THE TEACHING AND LEARNING MATERIALS

Using Manipulatives

Many people associate manipulatives with only counting but you can also use those materials to facilitate grouping, discussions, games and other activities to promote numeracy and other citizenship skills.



Straws/ Twine

Grouping: Pupils pick one of the straws, then form groups based on the color of the straw they chose.

Differentiating: Have pupils chose a color or assign specific pupils certain colored straws, and have each color represent a different activity based on skill or learning style

Building Numbers: Pupils can have fun trying to invent ways to form numbers using straws. Because numbers like '8' or '9' might be difficult, see if you can challenge pupils to think of creative ways to get it done. This is an an excellent brain teaser to use in the opening of class.

Number Tracing: Give pupils some pieces of twine to manipulate into various numbers.

Marbles

Tracing: Give each pupil a piece of chalk. Show them how to write a number on the chalkboard. Show them both numerical and word versions of the same number. Have them copy the numbers on their own slates. Check their work then give pupils oware marbles, or ask them to collect small stones, and cover the outline of the number with the marbles or stones

	Motivation: Once in a while, place marbles on pupils' desk whenever they get an answer correct or are on task. At the end of class, have them count their marbles. Have pupils who have the greatest number of marbles come to the front of the class. Designate them teacher helpers for the next day/week or allow them to play games in the beginning or end of the intervention. NOTE: Try not to use prizes like food or toffee as it can be hard to keep up with this.

Straws/ Twine

	Picking Partners: Pupils pick one of the straws, then form groups based on the color of the straw they chose. Pupils pick one of the straws, then form groups based on the color of the straw they choose.
	Counting and Operations: Use straws in module 1 for basic counting and then in module 2 and 3 to do operations. For example, having them add yellow straws to pink straws. You can also have them make groups to help with multiplication. With this, you must make sure they know the different between multiplication groupings and bundles of ten for place value.
	Group/ Place Value: Have pupils use straws to make bundles of tens. When you get to 100s, if there are enough straws, they can make bundles of tens and gather ten of those to make bundles of a hundred.

Using Slates

Slates are an excellent way to give informal assessments to make sure pupils understand the lesson along the way. They are also ways to engage whole class, small group and individuals and they allow pupils to express themselves in different ways (writing or drawing).

	Fingers: Practice writing numbers with their fingers on their slates. Instead of having them practice in the air, they can practice on their slates without chalk, before giving them chalk to continue.

	Make stories: Have pupils pass around a slate or whiteboard while adding the different parts to a word problem. At the end, have one of them read the final sentence aloud. For example, you can have the first student write "Anna has 8 apples" then the next student might add "She ate four apples". The last student might write "How many apples are left?" Then they can read their sentence aloud and then choose a student to give the answer. This will help them to understand word problems by using important words that align with operations. This can also be done with multi step operations, though that might require heavy monitoring in case the numbers do not come out correctly.
	Find the Number: Call out a set of numbers. Have pupils circle the numbers from the set of numbers on their board and lift up the board when they are done. Walk around and see their work to ensure they identified and circled the right numbers.
	Bingo: Have pupils draw a tic- tac- toe grid on their slate. Ask them to fill in the nine spaces with numbers from a number bank you have given on the board (the number bank should have between 12 & 15 numbers in it). Choose a number from the bank and write it on the board. If pupils have a match, have them cross it out on their board. The first one to get 3 numbers horizontally, vertically or diagonally wins. You can also call out various addition or subtraction problems and they must match the answer with a number in their board. This is ideal for module 2 and 3 pupils. For example, you might say "3+5" and they must find "8" on their board.
	Board Race: Ask a question out loud and ask that everyone write their responses to the question on their chalkboard. Have the first one to get the answer raise their board. NOTE: this could discourage some children who have difficulty writing and may encourage sloppiness, but can be a fun way to energize a class while still focused on content
	All Aboard!: Similar to 'Board Racing', Ask a question out loud and ask that everyone write their responses to the question on their slate. However, in this one, when pupils have written their answer, have them flip their boards so no one else can see. When you see all boards flipped, have them all raise their boards so you can see who understand and who does not. Use this to ask pupils how they arrived at their answers before telling them who is correct.

Learning Steps by Level

	Number Recognition 1-99	Learning Large Numbers	Addition	Subtraction	Multiplication	Division
Numbers	√		√ Without carryover	√ Without borrowing		
Basic operations	√	√	√ With carryover (2-digit)	√ With borrowing (2-digit)	√ Tables of 2, 5, 10	
Advanced operations			√ With carryover (3-digit)	√ With borrowing (3-digit)	√ Tables 2 to 10	√

Section Descriptions

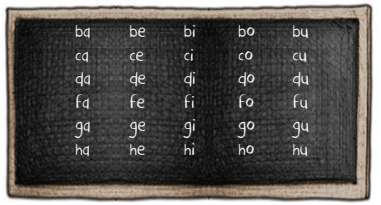
Learning Objectives:
What pupils should know and be able to do by the end of the lesson.

Materials:
Lists of the TLMs and other resources the Instructor will need to prepare for the activities planned for the lesson. The Instructor is encouraged to prepare other TLMs or resources depending on the activities the Instructor uses for the lesson.

Instructor Notes:
Tips on how to use the Instructorl pedagogy for teaching numeracy, and advice about how to positively work with pupils.

Opening
Use this to get pupils excited about the lesson and get to them thinking about the topic.

Teach and Learn:
The Teach and learn section describes how the Instructor should introduce numeracy concepts. Some lessons may need to be presented over several days. Depending on the learning ability and pace of the pupils, the Instructor may need to introduce several steps of the lesson and reinforce the steps with practice activities to ensure pupils understand the concepts outlined under each step.



Practice and Do
Activities the Instructor should do with pupils to practice the concepts learned under the Teach and Learn. The Practice Activities will help reinforce the numeracy concepts taught to pupils. This is where instructors practice with students in a whole group

Reinforce Understanding
Every lesson must incorporate exercise, where pupils practice in partners or individually.

Word Problems
Describes an activity Instructors can do with pupils to practice lis tening, speaking, and problem solving with numeracy. All story activities focus on building pupils, listening, speaking and problem solving skills.

Assess and Reflect on Learning
Describes activities the Instructor can use to evaluate whether or not pupils understand the concepts taught during the lesson. Think about how pupils did and what you may need to review.

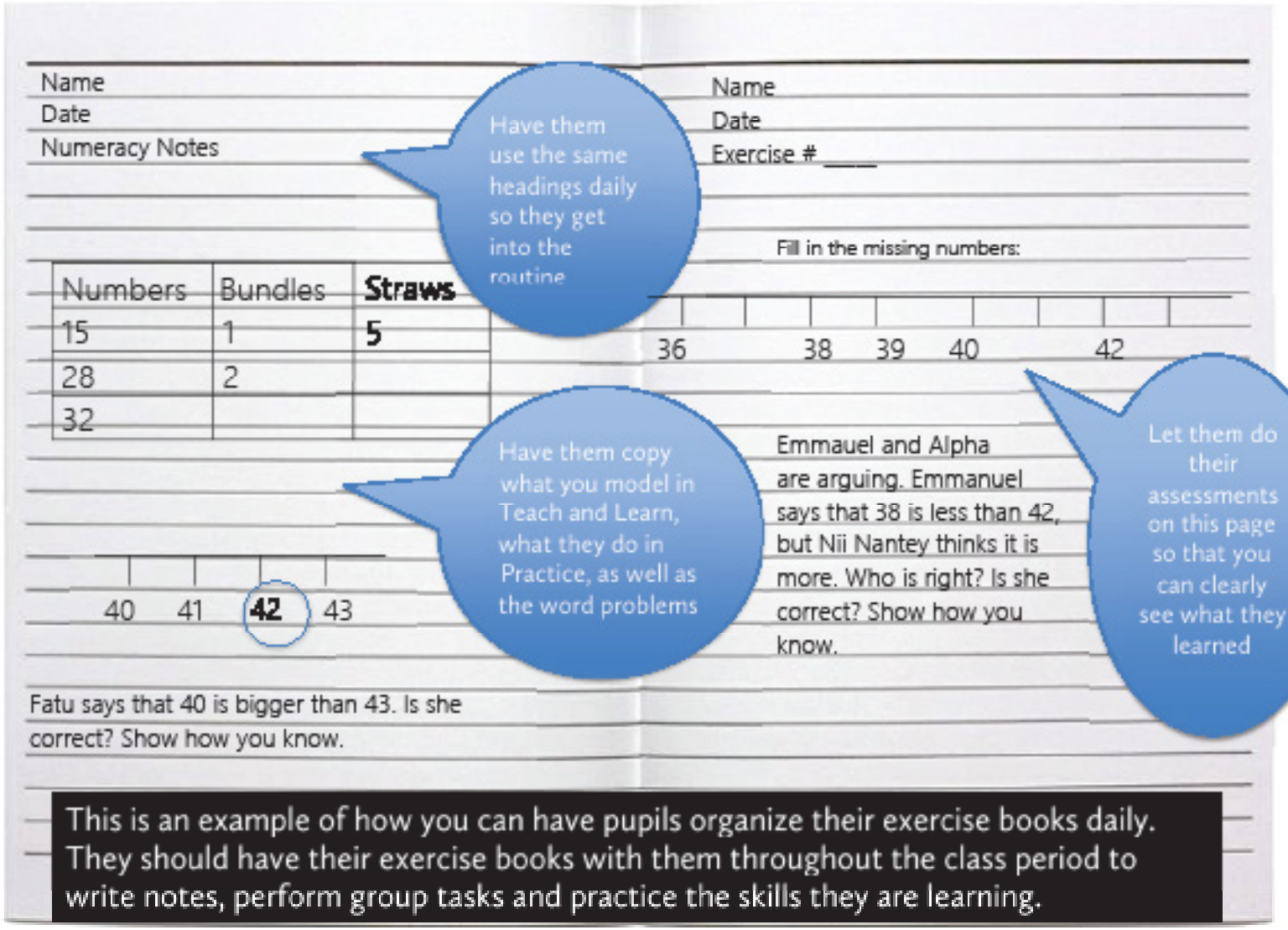
How To Use This Manual

This manual is designed to assist you in your teaching. It gives you guidance on how to teach numbers and operations. The chart on the previous page and the milestones on pages 15 to 17, are provided to help you know which topics are appropriate to teach to each level. If you find that the children are learning slower or quicker, you should adjust your pace of teaching accordingly. Also remember that you do not have to wait until you are done teaching numbers to introduce simple operations. For example, when children know numbers 1-5, you can teach addition and subtraction with these numbers.

While you go through this manual and prepare to teach, you should practice the lessons using the TLMs at home, before you go to class. That way you can avoid making mistakes in front of the pupils.

There are activities in the activity book to help you reinforce the different lessons you teach to the children. Between this manual and your activity manual you should have enough material to help you plan all your lessons.

Sample Exercise Book



NUMERACY LEARNING MILESTONES

Level 1: Numbers

When pupils are starting out with numeracy, they first begin to recognize that numbers are all around them. They should be familiar with numbers like their birthday and understand that, like their age, many numbers represent a quantity.

- [ ] Recognize and write numbers between 1-99
- [ ] Understand that numbers have place value
- [ ] Perform simple tasks involving counting
- [ ] Use comparison words (“bigger,” “smaller,” “less,” “more,” etc)
- [ ] Understand the meaning of the symbols -,+ and =
- [ ] Know how to read the addition & subtraction charts
- [ ] Add and subtract 2-digit numbers, without carryover or borrowing
- [ ] Solve problems expressed as sentences (word problems)

NUMERACY LEARNING MILESTONES

Level 2: Basic operations

At this level, pupils should work on more challenging addition and subtraction problems and early multiplication. Here, they should continue to increase their number recognition skills to 10,000 and understand the different place values as they do so

☐	Recognize and write large numbers up to 10,000; and identify the place value for each digit
☐	Add and subtract 2-digit numerals with carryover or borrowing
☐	Add and subtract 3-digit numerals without carryover or borrowing
☐	Understand the meaning of the symbols x (multiply)
☐	Know multiples of 2, 5 and 10
☐	Know how to read the multiplication chart

NUMERACY LEARNING MILESTONES

Level 3: Advanced operations

At this level, pupils should consolidate their knowledge of addition and substraction, work on more challenging multiplication and early division.

- [ ] Add and subtract 3-digit numerals with carryover or borrowing
- [ ] Understand the meaning of the symbols x (multiply) and ÷ (divide)
- [ ] Understand division & multiplication are opposites
- [ ] Know multiples of 2 to 10
- [ ] Solve simple division problems

NUMBER RECOGNITION 1-99

Opening:

1. Have children sing a song like “Buckle My Shoes” or “Hallelujah to the Lord 10 times”
2. Ask them to review the numbers they have learned the day before by having them say the numbers in order or writing numbers on the board and having them identify the numbers

Objective:
To understand numbers with its place value

Materials:

- Number chart
- Straws and rubber bands to make bundles
- Exercise books
- slates

Teach and Learn:
Use Number chart for the number recognition activity:

3. Say the numbers without using the number chart, 1 2 3 4, etc. Pupils say the numbers after you.
4. Place your finger on the numbers as you say the number in order. Children say the numbers after you. This helps the child understand the position, sound and symbol of the number.
5. Children point to the number on the number chart and read it.
6. Have children write the numbers in the air on their slate.

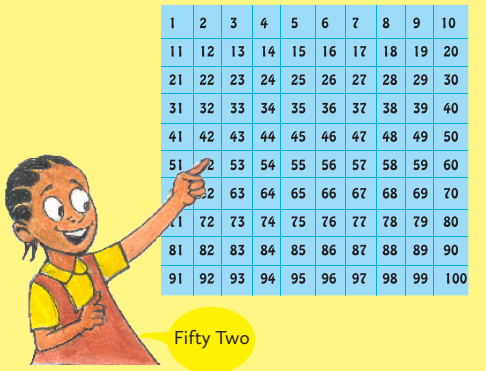
Step 1

One, Two, Three, Four, Five, Six...

One Thousand, Two Thousand, Three Thousand,... Nine Thousand,..

Twenty Six, Twenty Seven, Twenty Eight...

Steps 2 & 3



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

Fifty Two

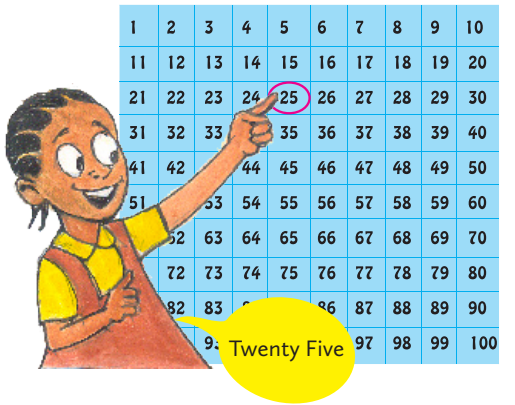
Practice and Do:

1. Children pick-up any number of straws and count straws, 1 2 3 4, etc. They say the numbers loudly as they count off each straw. If the child can't count ask another child to assist them.
2. Children show the number they counted in the chart by pointing to the number.
3. Ask children to write the number in the air before writing it down in their exercise books.
4. If the number of straws exceeds 10, tell them to bundle 10 straws together with a rubber band. Thus, children understand that one bundle means 10! And only 10 straws make 1 bundle. Less than 10 straws stay loose. (Have them repeat after you as you tell them this).
5. Explain the place value by asking them to say the number of bundles in any two digit number. For example: when you say: "27", children say: "2 bundles and 7 loose straws"..
6. At this stage, introduce the concept of tens and ones by explaining that the bundles are the tens and the loose straws are the ones. Have children practice writing down the numbers in the place value table

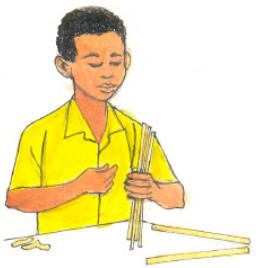
Step 1

Read, Do, Count

Steps 2



Step 4 & 5



Bundles	Straws
2	7

Ten	Ones
2	7

Instructor's Note:

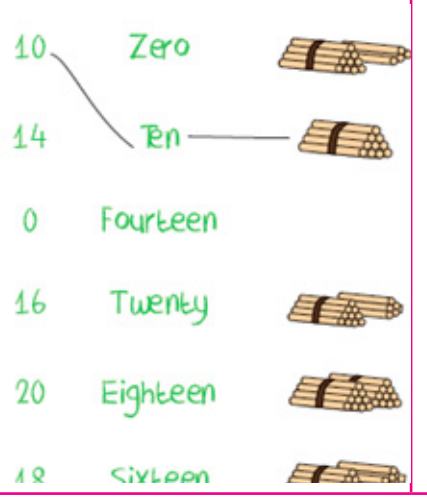
This exercise helps children understand number counting with place value. Straws are easy to handle, count, and make bundles of ten. The advantage of using bundles is that children can 'see' that tens are bigger than ones. Thus, children can confidently start

Reinforce Understanding:

1. Choose one or two of the activities outlined in the 'Levels at a Glance' chart (number of activities depends on time available)
2. Model the activity once so that students see what it looks like and what it means to do the activity well. This is important because it ensures that students understand the expectation for the activity
3. Ask pupils questions about the directions and your modeling to ensure they understand your expectations.
4. Walk around to give needed assistance and offer guidance.

Step 1

Read, Do, Count



Steps 2

Instructor's Note:

This exercise helps children understand number counting with place value. First start using straws because straws are easy to count, make and open bundles of ten. The advantage of using bundles is that children can 'see' that tens are bigger than ones. For example, they understand that in the number 28, 2 is in the tens place, and hence, it is bigger than 8, which is in the ones place. Thus, children can confidently start expanding the number.

Word Problems:

1. Choose a type of word problem you will be using (ie. Word Problem Drills or Who is Right, etc.)
2. Write at least two word problems out on the board for students to read and also copy down.
3. Have them underline key words and circle the numbers that they will use to answer the question
4. Allow them to solve the problem and make sure they explain how they arrived at the answer.

Assess and Reflect

Assess

1. Make sure to ask pupil 3- 5 questions that include 1 word problem, one Comparing Numbers problem and one fill in the blank problem
2. NOTE: you can mirror these problems after their respective activities in the activity books (ie Number Sequence Activity 5 Questions)
3. Example Assessment:
   - Fill in the missing numbers: ___ , 2, 3, ___, ___, 6
   - Fill in the blank with a <, > or = sign: 5 _____ 8
4. Aminata and Kamara were arguing. Aminata says that there are 8 mailboxes and Kamara says there are six. Who is correct?

5. Record their scores in your milestone chart to keep track of their progress

Reflect on learning:

1. Were students able to master counting, ordering and comparing numbers between 1 and 99? How do you know?
2. What activities did you do that were most effective in teaching the lesson?
3. What activities did you struggle with teaching?
4. What did pupils struggle with in the lesson? Please note this everyday for use in the review lessons

Closing:

1. Have each child write a number they learned that day on their slates. Tell them to make sure no one else can see the number.
2. Once they have a number, have them work with a partner to see if they can guess each other's numbers. They can only ask yes or no questions and they must take turns asking questions about each others number (back and forth)
3. Model the kind of questions they can ask such as "is your number bigger than 4?" or "is your number less than 8?" or "Does your number come between 5 and 7".
4. NOTE: They CAN NOT ask questions like "is your number 4, is your number 5, is your number 6" and so on as this would defeat the purpose of allowing them to practice number orders and comparing numbers.
5. Walk around to keep them on task and to see if there are any gaps in understanding.

LEARNING LARGE NUMBERS 10, 100, 1,000, 10,000

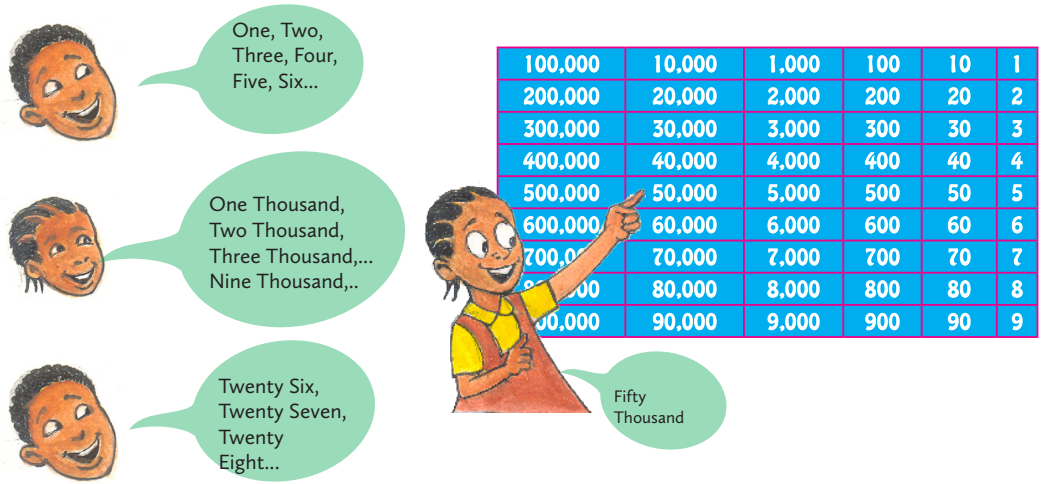
Objective: To understand numbers with their place value	**Materials:** • Number chart • Currency notes
Opening Ask them to review the numbers they have learned the week before by having them say the numbers in order or writing numbers on the board and having them identify the numbers	

Teach and Learn:

1. Say the numbers ...

2. Explain that numbers are made up of digits and that digits take certain places.
3. show that a digit is one single number between 0 & 9. Show that digits occupy spaces by putting a number up and dividing it. ie. 3|2|5| As in 325.
4. Explain the ones, tens, hundreds and thousands place based on the category of numbers you are teaching

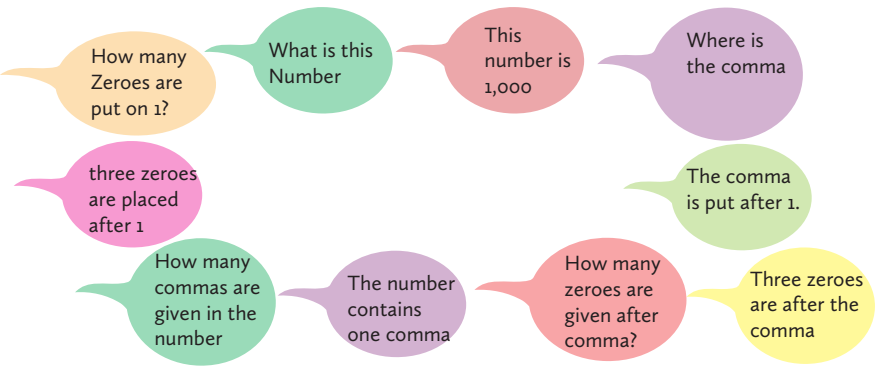
Step 1-3



100,000	10,000	1,000	100	10	1
200,000	20,000	2,000	200	20	2
300,000	30,000	3,000	300	30	3
400,000	40,000	4,000	400	40	4
500,000	50,000	5,000	500	50	5
600,000	60,000	6,000	600	60	6
700,0	70,000	7,000	700	70	7
8 ,00	80,000	8,000	800	80	8
,000	90,000	9,000	900	90	9

Step 4-5

Ask questions to Children



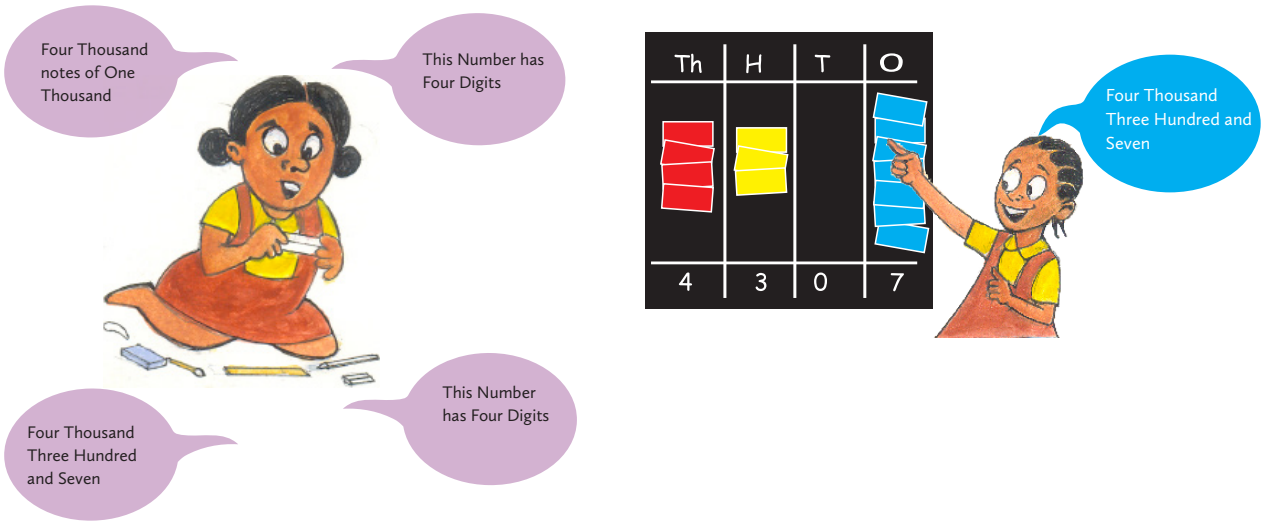
Practice and Do:

1. Write any number on the board. Read it loudly and slowly to make children understand the place value of each digit in the number.
2. Encourage children to discuss the number they hear and see by talking about which numbers they hear and which place values they hear.

3. Ask children to expand the number using currency notes of appropriate place value.
4. Ask children to place the currency notes in the given place value table according to the numbers' place value.

Steps 1 & 2

Steps 3 and 4



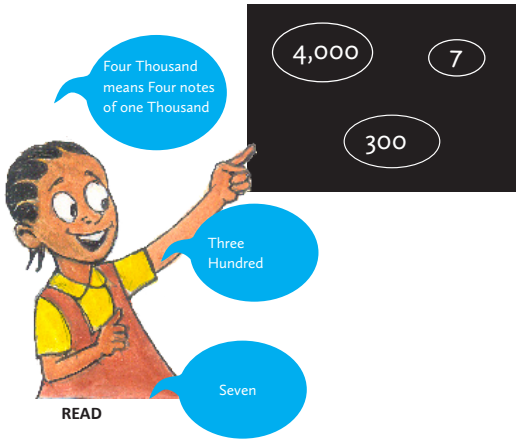
1. Ask children to write the number in the place value table.

2. Read out the number.

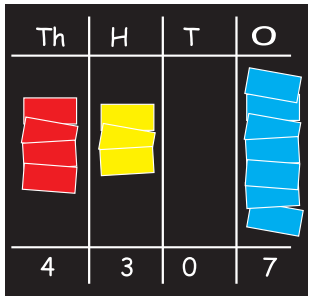
Steps 5 & 6

WRITE

Th	H	T	O
4		0	0
	3	0	0
			7
4	3	0	7



READ



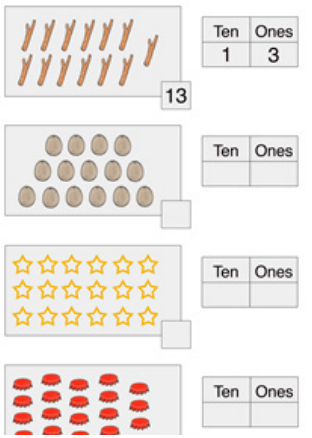
SAY

Instructor's Note:

The exercise of reading expansion chart helps children understand the meaning of hundreds and thousands by using commas. The use of bundles is appropriate for teaching number in the tens. For larger numbers – hundreds, thousands, etc. – use currency notes. Encourage children to identify the place value of numbers when they listen to a number. Make sure they are also writing out the numbers in words to practice the skill of writing and identifying numbers as words. This is good preparation for word problems

Reinforce Understanding

1. Choose one or two of the activities outlined in the 'Levels at a Glance' chart (number of activities depends on time available)
2. Show them the activity once so that students see what it looks like and what it means to do the activity well. This is important because it ensures that students understand the expectation for the activity
3. Ask pupils questions about the directions and your modeling to ensure they understand your expectations.
4. Walk around to give needed assistance.



Word Problems

1. Choose a type of word problem you will be using (ie. Word Problem Drills or Who is Right, etc.)
2. Write at least two word problems out on the board for students to read and also copy down.
3. Have them underline key words and circle the numbers that they will use to answer the question

Assess and Reflect

Assess

1. Make sure to ask pupil 3- 5 questions that include 1 word problem, one Comparing Numbers problem and one fill in the blank problem
2. NOTE: you can mirror these problems after their respective activities in the activity books (ie Number Sequence Activity 5 Questions)
3. Example Assessment:
   - Fill in the missing numbers: ___ , 233, 234, ___, ___, 237
   - Fill in the blank with a <, > or = sign: 225 _____ 252
   - Christiana made 12,000 Leones from selling units yesterday. Abubakarr made 10,000 Leones. Who made the most money yesterday?
4. Notice that in the assessment questions, we try to ask things we know would normally confuse students to ensure we were able to address those confusions in the lessons
5. Record their scores in your milestone chart to keep track of their progress

Reflect on learning:

1. Were students able to master counting, ordering and comparing numbers between 100 and 10,000? How do you know?
2. What activities did you do that were most effective in teaching the lesson?
3. What activities did you struggle with teaching?
4. What did pupils struggle with in the lesson? Please note this everyday for use in the review lessons

Closing

1. Have each child write a number they learned that day on their slates. Tell them to make sure no one else can see the number.
2. Once they have a number, have them work with a partner to see if they can guess each other's numbers. They can only ask yes or no questions and they must take turns asking questions about each others number (back and forth)
3. Model the kind of questions they can ask such as "is your number bigger than 4?" or "is your number less than 8?" or "Does your number come between 5 and 8".

Note: They CAN NOT ask questions like "is your number 4, is your number 5, is your number 6" and so on as this would defeat the purpose of allowing them to practice number orders and comparing numbers. Encourage them to ask place value questions at this stage. Such as "Is the number in the ones place between 3 and 5"?
Show them how you would ask and record the answers to the questions.

ADDITION

Objective:
To understand the concept of "+"(plus) with word problems.

Materials:
• Straws and rubber bands

Opening:

1. Instead of giving children sums to solve, start by creating a word problem that children can solve intuitively. For example, say:

   Foday has 15 pencils. Mamakoh gave him 3 more pencils. Now tell me how many pencils does Foday have with him now? Use names of pupils in the class. Make sure to model how you would think through the questions by doing a 'Think Aloud' A Think aloud allows pupils to get into your head

2. Then, ask children:

   What is given in the problem? What is asked? What mathematical operation will you do? Addition? Subtraction?
   This discussion helps the children understand the language of math. Show pupils the addition chart, and tell them that this chart will help them with their addition. Show them how to use it

Step 1, 2 & 3

READ

Foday has 15 pencils. Mamakoh gave him 3 more pencils. Now tell me how many pencils does Foday have with him now?

LISTEN

SAY

What is told?

Foday has fifteen pencils.

Mamakoh gave him three more.

Fifteen means One bundle and five Straws.

Three means three Straws.

3. Take the children through the problem step by step.
   a. First ask Foday: *"how many pencils do you have?" Foday answers, then take 15 straws and count them with the children, after that give them to Foday.*
   b. Then write the number 15 on the board clearly. Then ask Mamakoh: *"How many pencils did you give Foday?" Mamakoh answers, then take 3 straws and give them to Foday. Write the number 3 below the number 15 clearly on the board.*
   c. Then ask *Foday* to count the straws in his hand. He should have 18.
   d. Write the plus sign between the 15 and 3, draw a line and write the number 18 below it. *Now ask the whole class, "Foday had 15 pencils with him. Mamakoh gave him 3 more pencils. So how many pencils does Foday have with him now?"*

Step 1, 2 & 3

WRITE

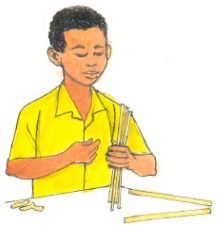
Bundle	Straws	
1	5	Pencils
+	3	Pencils

How many pencils does Foday have now?

SAY

Teach and Learn:

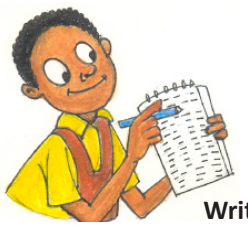
1. Model how you would write the problem and the answer in the place value table.
2. Use the straws to show how you would do the addition problem
3. Bring children's attention to the "+"(plus) sign and discuss its shape (e.g., the "+" sign is 2 lines crossing each other). Tell children to think of the "+" sign as 'and' (2 and 5)
4. Return to the addition chart; ask pupils a basic sum, for example 7 plus 9. Ask pupils to find the answer on the chart. Repeat the exercise until pupils know how to use the chart to find answers.



Do

Fifteen and Three together comes Eighteen

	Bundle	Straws	
+	1	5	Pencils
		3	Pencils



Write

RULE ADD THE STRAWS FIRST

15 plus 3 Pencils becomes 18 Pencils

	Bundle	Straws	
+	1	5	Pencils
		3	Pencils
	1	8	

Say

0	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10	11
3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13
5	6	7	8	9	10	11	12	13	14
6	7	8	9	10	11	12	13	14	15
7	8	9	10	11	12	13	14	15	16
8	9	10	11	12	13	14	15	16	17
9	10	11	12	13	14	15	16	17	18

Instructor's Note:

At first, teach addition without carry over up to 100 (e.g. 15+11). This means that the ones column adds up to no more than 9. For more advanced pupils, teach addition with carry over up until 1000 (23 +19), (458+56), (265+563), etc. This means that the ones column adds up to more than 9. After, teach addition with carry over up until 10,000 (5941+1356), (2350+689), etc. This means that the ones and tens column can add up to more than 9.

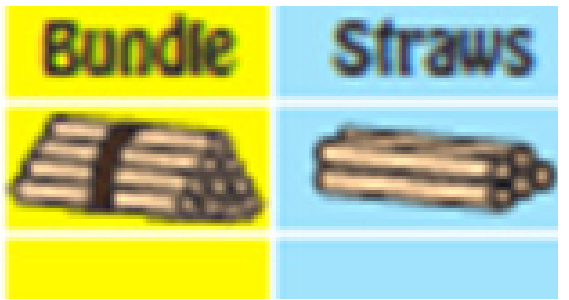
Practice and Do:

1. Write 5 or 6 different addition facts on the board
2. Ask children to use the straws to help them solve the problems.
3. Have the children use the place value charts to also show how they solved the problem
4. After students complete the problems, have them create 3 of their own addition problems
5. Let them switch exercise books with a partner and have their partner solve the problem using the straws and place value chart
6. Have students check each others work to make sure it is correct

Step 1

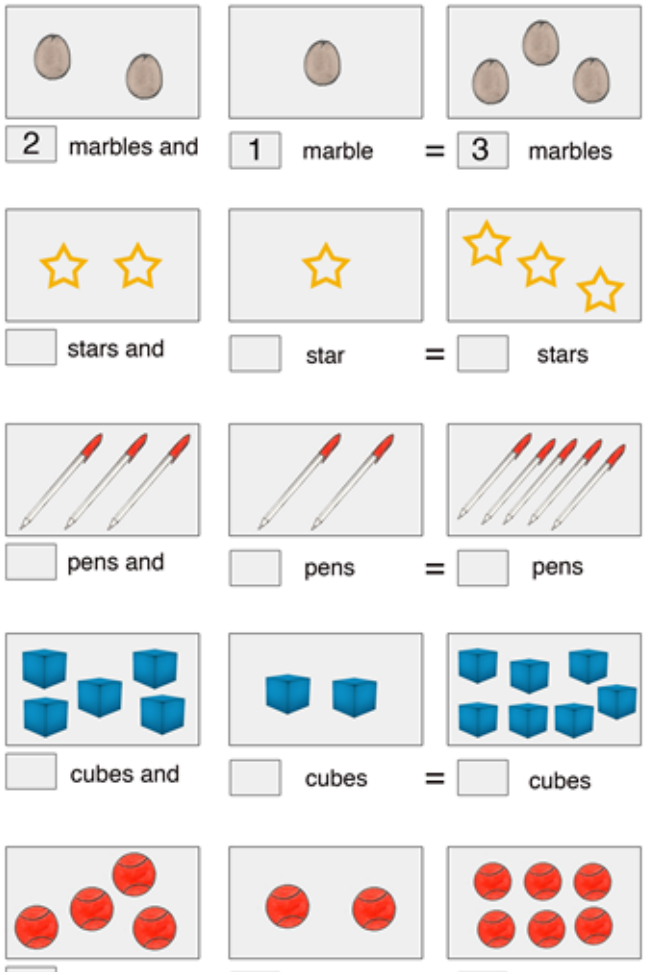
Step 1

Step 3



Reinforce Understanding

1. Choose the activities outlined in the 'Levels at a Glance' chart.
2. Model the activity once so that students see what it looks like and what it means to do the activity well. This is important because it ensures that students understand the expectation for the activity.
3. Ask pupils questions about the directions and your modeling to ensure they understand your expectations.
4. Walk around to give needed assistance.



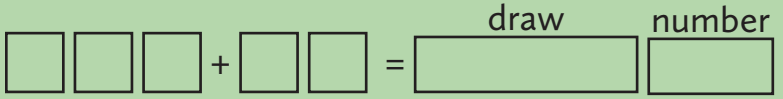
Word Problems

1. Choose a type of word problem you will be using (ie. Word Problem Drills or Who is Right, etc.)
2. Write at least two word problems out on the board for students to read and also copy down.
3. Have them underline key words and circle the numbers that they will use to answer the question

Assess and Reflect:

Assess

For example

1. 4 + 8
2. 

3. Issa has 6 oranges and his brother gives him 4 more, how many does he have in total?
4. Make sure to ask pupil 3- 5 questions that include at least 2 word problems as well as normal addition problems.
5. Record their scores in your milestone chart to keep track of their progress

Reflect on learning:

1. For beginners: Were students able to add numbers between 1 and 99, including those requiring regrouping? How do you know?
2. For advanced: Were students able to add numbers above 100, including those requiring regrouping? How do you know?
3. What activities did you do that were most effective in teaching the lesson?
4. What activities did you struggle with teaching?
5. What did pupils struggle with in the lesson? Please note this everyday for use in the review lessons

Closing:

1. Give students a challenge by having them do a "Bonus' Addition question where they must add multiple numbers together (for example 4 +5 +8+ 9)
2. Allow students to work in pairs if they want in order to figure out how they would add them together.
3. NOTE: This is meant to help students speedily add and is more of an extension activity.

SUBTRACTION

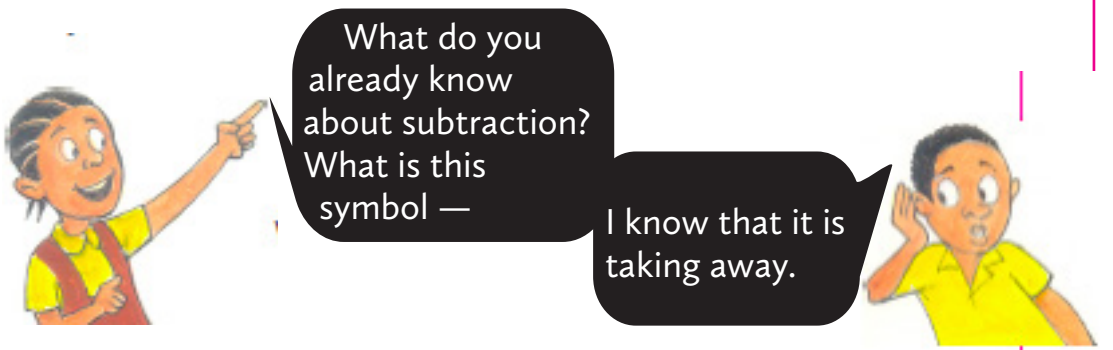
Objective:
To understand the concept of "-" (minus) with word problems

Materials:
• Straws and rubber bands

Opening:

1. Ask students what they may already know about subtraction. ie. " What does this - mean?" or "How might you solve a problem like 8-2?"
2. 2. Ask students how addition and subtraction are similar and different. Explain that they are opposites and that they create fact families ie. 5-3= 2/ 2+3= 5

Steps 1 & 2



Instructor's Note:

In the beginning, teach subtraction without borrowing up to 100 to help pupils understand the concept of subtraction. (e.g. 15-11). This means that the number in the ones column of the larger number is bigger than the number in the ones column of the smaller number. As you see pupils begin to understand the concept, teach subtraction with borrowing up to 1000 (e.g. 15- 17). This means that the number in the ones and tens column of the larger number is smaller than the number in the ones and tens column of the smaller number. At the advanced stages, teach subtraction with borrowing up to 10,000 (e.g. 4557- 3568). This means that the number in the ones and tens column of the larger number is smaller than the number in the ones column of the smaller number.

For advanced pupils only: In order to understand the 'borrowing' concept, it is important for children to see that only one of the hundred cedis notes has to be broken to give tens; and only one of these tens cedis notes has to be broken further and so on. Once you show this concept to children using currency notes, repeat the same process but, this time, write each step of the sum on the board. With real currency notes they go through the steps of borrowing and carrying forward. They can then easily represent it in the mathematical frame, as shown above.

Objective:
To understand the concept of "-" (minus) interlink with word problems

Materials:
• Straws and rubber bands

Teach and Learn:

1. Instead of giving a subtraction problem, give students a word problem that children can solve intuitively
   Hawa has 5 beads but here little sister asked for two. If she gives her sister 2 beads, hour many will she have left.
2. Model what is given in the word problem, then model what is asked and what mathematical operation you will do
3. Model how you would solve the problem using straws numbers under 100 or currency notes numbers over 100 — see the 'Practice and Do' section for how to model this activity.
4. Repeat the above exercise with another word problem but ask students what is given, what is asked and what mathematical operation they would do. Then have them walk you through how they would use straws or currency notes to solve the problem

NOTE: Subtraction can be very confusing, especially with borrowing. Modeling will ensure students understand how they can think of the problems using the resources they have.

Steps 1 & 2

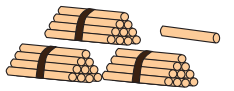
READ

If you have 31 mangoes and take away 17, how many mangoes do you have left?

What is told? You have 31 mangoes
You take away 17

LISTEN

31 means 3 bundles and 1 straw 17 means
1 bundle and 7 straws



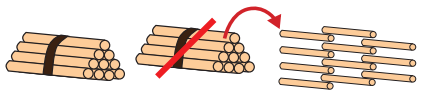
Practice and Do:

1. Write 5 or 6 different subtraction problems on the board
2. Ask children to use the straws to help them solve the problems. You can use the straws to model and explain borrowing in module 2 and 3 but you can also use notes.
3. Have the children use the place value charts to show how they solved the problem (make sure to check for the borrowing)
4. After students complete the problems, have them create 3 of their own subtraction problems
5. Let them switch exercise books with a partner and have their partner solve the problem using the straws/cedi notes and place value chart
6. Have students check each others work to make sure it is correct

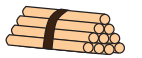
Instructor's Note:

Pay attention to the pictures on the right to help you teach borrowing

RULE SUBSTRACT THE STRAWS FIRST



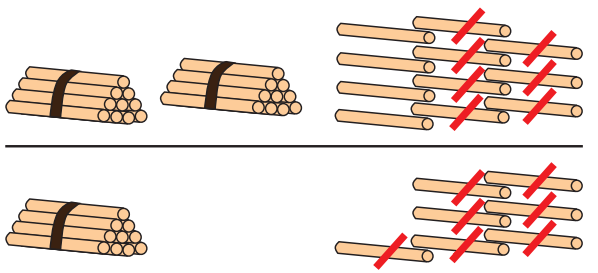
Since we can't take away 7 from 2, we open up 1 bundle. Now, there are 11 loose straws



To remember we opened up a bundle, we will cross 3 and write a small 2 in the bundle box. We will also write a small 1 in the ones box to remember that there are 11 loose straws

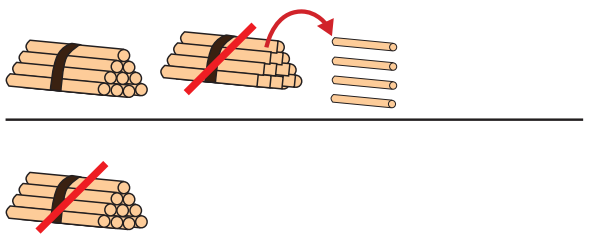
	Bundle	Straws	
			
	$\not{2}^{2}3$	$^{1}1$	Mangoes
-	1	7	Mangoes

Now, solving subtractions is easy! We can take away 7 straws from 11. (we have 4 straws left(



	Bundle	Straws	
			
	$\not{2}^{2}3$	$^{1}1$	Mangoes
-	1	7	Mangoes
		4	

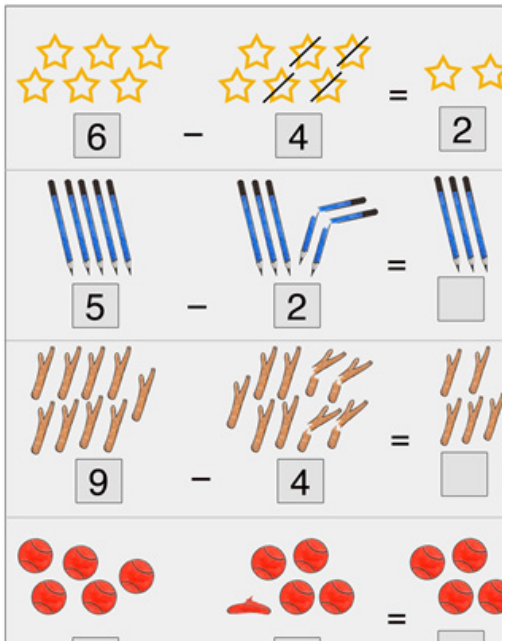
We take away 1 bundle from 2 bundles. (We have 1 bundle left).



	Bundle	Straws	
			
	$\not{2}^{2}3$	$^{1}1$	Mangoes
-	1	7	Mangoes
		4	

Reinforce Understanding

1. Choose activities outlined in the 'Levels at a Glance' chart.
2. Show the activity once so that students see what it looks like and what it means to do the activity well. This is important because it ensures that students understand the expectation for the activity
3. Ask pupils questions about the directions and your modeling to ensure they understand your expectations.
4. Walk around to give needed assistance



Word Problems

1. Choose a type of word problem you will be using (ie. Word Problem Drills or Who is Right, etc.)
2. Write at least two word problems out on the board for students to read and also copy down.
3. Have them underline key words and circle the numbers that they will use to answer the question

Assess and Reflect

Assess

1. 16 - 5
2.  = Write problem = Write answer
3. Helen has SLL 1500, she takes a drop in and has to pay SLL 500. How much does she have left.
   Bonus: if it cost SLL 500 to get back home, does she have enough money left? How do you know? This is an extention question just to get pupils thinking. It could be used in the closing
4. Make sure to ask pupil 3- 5 questions that include at least 2 word problems as well as normal subtraction problems.
5. Record their scores in your milestone chart to keep track of their progress

Reflect on learning:

1. Beginners: Were students able to subtract numbers between 1 and 99?
2. Advanced: Were students able to subtract numbers between 1 and 10,000, including those requiring borrowing? How do you know?
3. What activities did you do that were most effective in teaching the lesson?
4. What activities did you struggle with teaching?
5. What did pupils struggle with in the lesson? Please note this everyday for use in the review lessons

Closing:

1. Give students a challenge by having them do a "Bonus' subtraction question where they must subtract multiple numbers from each other (for example 58- 20- 10- 3)
2. Allow students to work in pairs if they want in order to figure out how they would add them together.
3. NOTE: Make sure that you create these problems in advance so that students are not getting negative answers. This will confuse students.

MULTIPLICATION

Objective:	**Materials:**
To understand the concept of multiplication	• Straws • Number Chart

Opening:

1. Children will be able to solve multiplication and division problems easily if they have learnt the tables. Ask the children to say the tables every day. Make a multiplication chart for each child, like the one in the picture on the right hand side.

2. Introduce other games to help children remember the tables easily. (see the activity book for games).
3. Have students write the tables as fast as possible in 2 minutes everyday to drill in the numbers

Steps 1 & 2

Say Times Table from beginning

Start in the Middle

Interrupt

Instructor's Note:

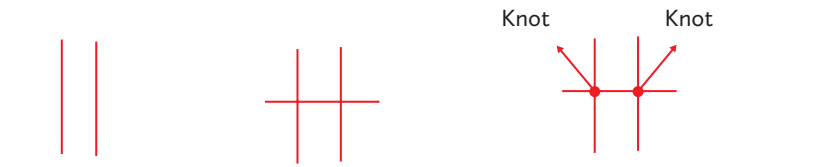
For advanced children, teach them the multiplication tables up to 10. While it is important they understand how multiplication works, it is equally important in the remedial stages to introduce rote memorization as well

Teach and Learn:

Teach multiplication using the ladder concept:

1. Write a multiplication fact on the board (e.g. 2x1) and explain to children that we can solve multiplication facts by drawing tables. Remember to say the multiplication problem out loud, "2 times 1".
2. Ask children to place 2 straws horizontally on their table and then place another one vertically across the 2 straws.
3. Ask children to count the meeting points. 2 crossed by 1 gives 2 points. Therefore, explain to children that when we multiply 2 with 1, we get 2.
4. Bring children's attention to the "x" (multiplication) sign. Discuss with children how it is different than the "+" (plus) sign and the "-" (minus) sign.
5. Draw on the board a multiplication problem (e.g. 3x2) and ask children to draw the corresponding ladder. You can also draw a ladder on the board and ask children to write the corresponding multiplication fact.
6. If the table method seems too confusing for students, you can do it outside of the table and draw arrows so students see the visuals. Then you can put it back in the place value table to help students see how place value is related to multiplication.

Steps 1-4

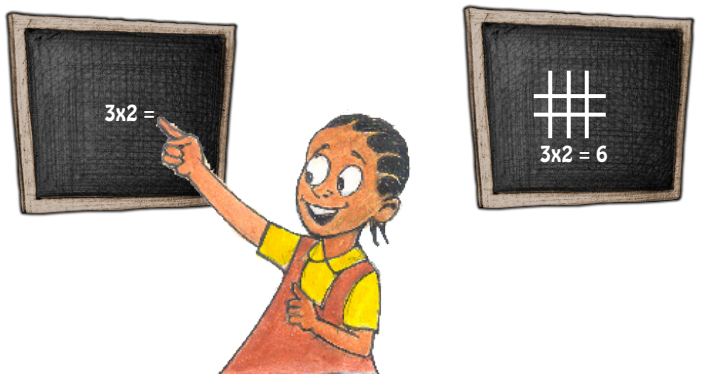


Two Vertical Lines

One Horizontal on Two Vertical Line

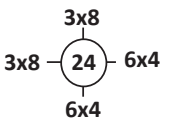
When you put 1 Horizontal on 2 Vertical you will 2 Knots

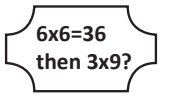
Step 5



Practice and Do:

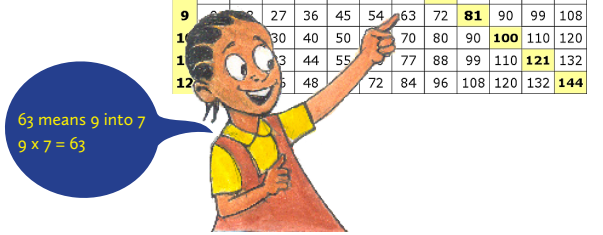
1. Write 4 or 5 multiplication fact on the board
2. Ask children to use the straws to help them solve the problems.
3. Then have children draw the ladder they used in their exercise books
4. After students complete the problems, have them create 3 or 4 of their own ladders
5. Let them switch exercise books with a partner and have their partner write out what the multiplication problem would be and the answer.
6. Have students check each others work to make sure it is correct





Times Table - 12x12

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



Reinforce Understanding

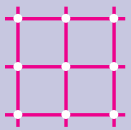
1. Choose one or two of the activities outlined in the 'Levels at a Glance' chart (number of activities depends on time available)
2. Model the activity once so that students see what it looks like and what it means to do the activity well. This is important because it ensures that students understand the expectation for the activity
3. Ask pupils questions about the directions and your modeling to ensure they understand your expectations.
4. Walk around to give needed assistance and

Word Problems

1. Explain the types of words you see in typical multiplication word problems. ie. each, total, evenly, equally.
2. Choose a type of word problem you will be using (ie. Word Problem Drills or Who is Right, etc.)
3. Write at least two word problems out on the board for students to read and also copy down.
4. Have them underline key words and circle the numbers that they will use to answer the question
5. Make sure that they understand the importance of grouping in word problems.

Assess and Reflect:

Assess

1. 4 x 8
2.  = problem 3 x 3 = answer _____
3. Fatu has two friends. She wants to give 3 candies to each of them. How many candies will she give in total?
4. Make sure to ask pupil 3- 5 questions that include at least 2 word problems as well as normal multiplication problems.
5. You can also ask students to draw their answers out for some of the word problems
6. Record their scores in your milestone chart to keep track of their progress

Reflect on learning:

1. For advanced pupils: Were students able to master their multiplication tables up to 10? How do you know?
2. What activities did you do that were most effective in teaching the lesson?
3. What activities did you struggle with teaching?
4. What did pupils struggle with in the lesson? Please note this everyday for use in the review lessons

Closing:

1. Give students a challenge by having them do a "Bonus' multiplication question where they must multiply three or four numbers (for example 10x2x5)
2. Allow students to work in pairs if they want in order to figure out how they would add them together.
3. You can also do a multiplication "Board Wars" or "All Aboard".

Division

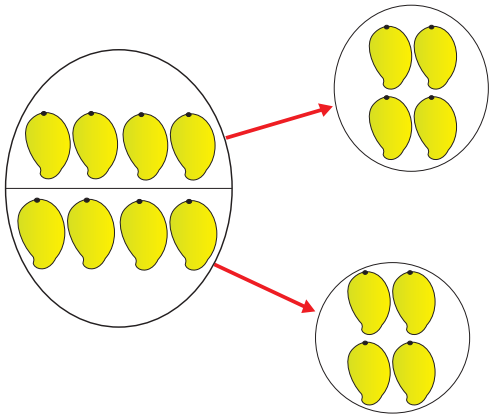
Objective:
To understand the concept of multiplication

Materials:
- Marbles

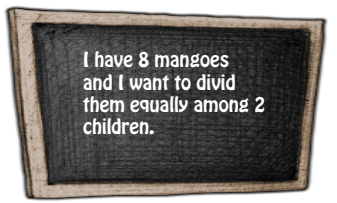
Opening:

1. Explain to pupils that division is about sharing – objects are shared (or divided) into a number of groups of equal size.
2. Ask children to give examples of situations in which they had to share something.
3. Tell children a word problem about division. For example, say: "I have 8 marbles. I want to divide these equally between the 2 children in the group. How many marbles will each child get?"
4. Then, ask children: "what is given in the problem? What is asked? How would you go about solving the problem?"

Step 1, 2 & 3



SAY



WRITE

SAY

- What is asked?
- How many mangoes will each child get?

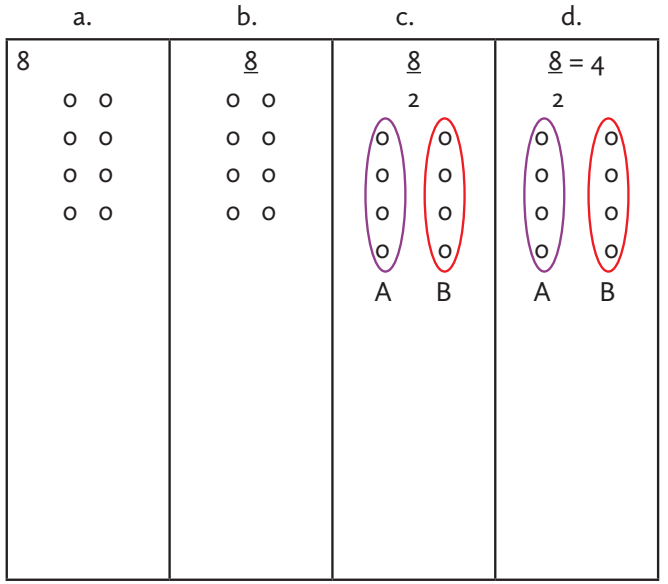
Teach and Learn:

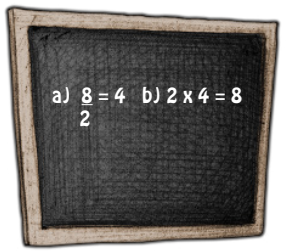
1. After discussing the problem, ask children to solve the problem using marbles.
   a. Ask pupils how many marbles they started with (8). Write and draw 8 marbles on the board.
   b. Draw a line under the 8. Explain to pupils that the line means sharing or dividing.
   c. Ask pupils the number of people they have to share the marbles with (2). Make groups of 2 out of the 8 marbles. Name the groups A and B.
   d. Ask pupils how many marbles each group got. Let children count what is in each group (4). Therefore 8/2= 4
   e. Repeat with other word problems to allow children practice dividing objects into equal parts
2. Explain to children that division also has an opposite. Explain that division is about sharing things into groups, while the opposite type of math, called multiplications is about combining these groups.
   a. Write 8/2 =4 2x4= 8. Ask pupils what they notice between the two equations.
   b. Explain to pupils that you can turn any division into a multiplication. First you cross out the number below the division sign (2) and the division sign. Then, you move both to the other side of the equal sign. Whenever you move a division sign onto the other side of the equal sign it becomes a multiplication sign.
   c. Similarly, you can turn any multiplication into a division. First, you cross out the multiplication sign and the 2. Then, you move them to the other side of the equal sign. Whenever you move a multiplication sign onto the other side of the equal sign it becomes a division sign.
   d. Have pupils practice turning divisions into multiplications and vice versa

Instructor's Note:

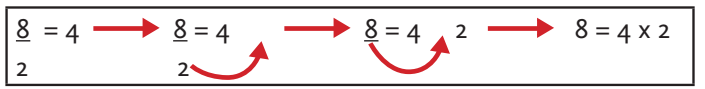
Explain number 2 after you are certain that students understand how to divide.

Steps 4 and 5





How are these equations like each other?



Practice and Do:

1. Write 4 or 5 division problems on the board
2. Ask children to use the straws or marbles to help them solve the problems.
3. After students complete the problems, have them create 3 or 4 of their own ladders
4. Let them switch exercise books with a partner and have their partner write out what the multiplication problem would be and the answer.
5. Have students check each others work to make sure it is correct"

Reinforce Understanding

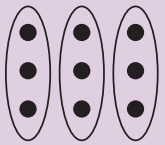
1. Choose one or two of the activities outlined in the 'Levels at a Glance' chart (number of activities depends on time available)
2. Model the activity once so that students see what it looks like and what it means to do the activity well. This is important because it ensures that students understand the expectation for the activity
3. Ask pupils questions about the directions and your modeling to ensure they understand your expectations.
4. Walk around to give needed assistance make sure to stress equally grape

Word Problems

1. Choose a type of word problem you will be using (ie. Word Problem Drills or Who is Right, etc.)
2. Write at least two word problems out on the board for students to read and also copy down.
3. Have them underline key words and circle the numbers that they will use to answer the question.

Assess and Reflect

Assess

1. 8 ÷ 2
2.  = problem _____ = answer _____
3. Helena has 20 mangoes, she wants to share them equally among her 4 friends. How many should she give each of her friends.
4. Make sure to ask pupil 3- 5 questions that include at least 2 word problems as well as normal division problems.
5. You can also ask students to draw their answers out for some of the word problems
6. Record their scores in your milestone chart to keep track of their progress

Reflect on learning:

1. Were students able to understand the concept of division (what it is and how to do it) and memorize their division/ multiplication fact families?
2. What activities did you do that were most effective in teaching the lesson?
3. What activities did you struggle with teaching?
4. What did pupils struggle with in the lesson? Please note this everyday for use in the review lessons

Closing:

1. Have children play “board wars” or “all aboard” with a set of division problem
2. You can also divide them into teams of four and give them problems as groups to work out. Try to use word problems in either one of the activities.