

IN-SERVICE TEACHER TRAINING MODULE PREP-GRADE 2 SBC MATHEMATICS

**Facilitator Guide
2021**

In partnership with the National Department of Education and funded by the Australian Government



Department of Education



PNGAus Partnership

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The module has been developed as part of the Papua New Guinea Partnership Fund (PPF) Education program in partnership with the National Department of Education (NDOE) for use by Inservice teacher trainers and teacher training colleges to equip teachers in the early grades of primary with the proficiency to teach School Based Curriculum (SBC) Mathematics by applying effective numeracy teaching strategies. This document was edited, formatted, and published by the PPF team with assistance from the Curriculum Development Division (CDD) and the Teacher Education Division (TED) as well as other members of the Technical Working group, including PNGEI, DHERST and education advisors of the NGO partners.

The module builds on the teacher training programs developed by CARE International in PNG, Save the Children and World Vision during 2018-2019. These training programs reached elementary teachers in the West New Britain, Western Highlands, Jiwaka, Simbu, East Sepik, Eastern Highlands, Morobe, Madang and Central Provinces and the Autonomous Region of Bougainville. This earlier work used extracts from the 2015 Elementary Mathematics Syllabus, Teacher Guides and SBC kit produced and distributed by the Curriculum Development Division of the National Department of Education.

The Inservice Teacher Training Module is issued free to schools in Papua New Guinea. Teachers and schools have permission to use, share and adapt the materials.

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PNG Partnership Fund

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ICONS

Icon	Meaning
	Speak
	Group work
	Pair work
	Writing instruction
	Trainer tips

1. INTRODUCTION

The Papua New Guinea Partnership Fund (PPF) is an initiative of the Australian Government in partnership with the Government of Papua New Guinea (GoPNG). The PPF was established in 2017 to improve the coverage of quality basic services across PNG and achieve critical and sustainable outcomes at scale. The PPF is implemented by Abt PNG through the PNG-Australia Governance Partnership and runs until June 2022.

The program is implemented by non-government organisation (NGO) consortia who work with the National Department of Education (NDoE) and respective provincial authorities to improve literacy and numeracy in the early grades of school. The program aligns with the National Education Plan's focus areas of quality teaching and learning, local management and systems strengthening.

The consortia include:

- *Together for Education* (T4E): Led by World Vision in partnership with ChildFund, Library for All, CIMC and University of Canberra
- *Rapidly Improving Standards of Elementary* (RISE): Led by Save the Children in partnership with Callan Services for the Disabled National Unit and Summer Institute of Linguistics
- *Pikinini Kisim Save* (PKS): Led by CARE International in PNG in partnership with ADRA, University of Goroka and Queensland University of Technology.

Since 2017, the PPF education program has enabled 184,000 children to receive reading resources and support in the classroom and over 5,000 teachers from over 1,400 elementary schools to be trained. By 2022, the program aims to reach 236,716 elementary school age children from 1,736 elementary schools and train 6,048 elementary teachers in foundational literacy and numeracy to support delivery of the English and Mathematics School Based Curriculum. The program reaches 35 districts in Autonomous Region of Bougainville, East Sepik, Eastern Highlands, Western Highlands, Jiwaka, Simbu, West New Britain, Central, Madang and Morobe provinces and works closely with provincial education authorities in these provinces.

The PPF education program invests in the substantive components of quality teaching and learning through the provision of high-quality teacher professional development and teaching and learning resources. In 2020, a decision was made to produce a standardised teacher training program that could achieve two aims:

- Ensure consistency across the PPF education program in terms of content, key messages and literacy and numeracy skill development areas, and
- Have the in-service teacher training program endorsed and approved for replication and adaptation in teacher training colleges and in-service teacher training institutions across PNG in collaboration with DHERST and NDOE.

The in-service teacher training program for grade prep-grade 2 teachers covers the following:

- 40 hours of training on literacy strategies to support SBC English.
- 40 hours of training on numeracy strategies to support SBC Mathematics.
- Follows the principles of adult learning.
- Assumes that teachers have valuable experiences that can be drawn upon to strengthen their skills and abilities.
- Includes ideas on how to set up classroom libraries and reading clubs to promote a reading culture in schools and community.
- Includes gender and disability inclusion guidance.

1.1 In-service support modules

There are two in-service teacher support modules:

Module 1	Module 1 Prep – Grade 2 SBC English 1. Facilitator Guide	40 hours + self-learning tasks
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	2. Participant Handout 3. Pre- and post-test	
Module 2	Module 2 Prep – Grade 2 SBC Maths 1. Facilitator Guide 2. Participant Handout 3. Pre- and post-test	40 hours + self-learning tasks

1.2 Workshops

It is important that all trainers/lecturers/facilitators of this training have completed the Training of Trainers course on how to deliver this module to Prep – Grade 2 teachers in a five-day workshop. The training course will run through each session as it would be delivered for teachers.

Schools can also use the module for their own in-service and teachers can use it as a study guide. Please note that if used by teacher's colleges, the modality and timeframe for delivery will be different.

It is also important that for Module 2, reference is given to Module 1 and discussion in the opening session and perhaps throughout the training can draw on the previous training and the experiences of teachers from this initial training.

Discussion topics could include:

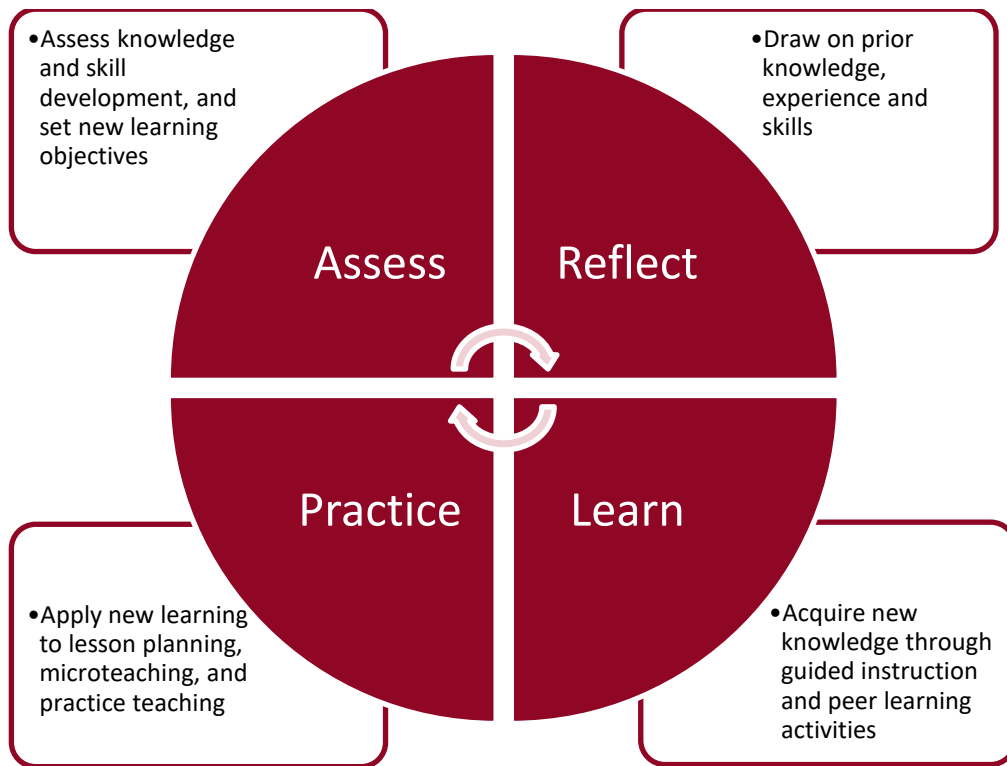
- Aspects of the training that we easy to apply in the classroom.
- Aspects of the training more difficult to apply in the classroom.
- If teachers received a monitoring visit – how was it? What did they learn?
- If teachers engaged in TLCs – how was it? What did they learn?
- What do you think we can take forward into Module 2 training – any lessons learnt?

1.3 Participants

The module is aimed at prep, Grade 1 and Grade 2 teachers, Head Teachers and Teachers in Charge (TICs), and other Education officers assigned to these grades.

1.4 Adult learning

The module uses adult learning strategies including peer teaching, paired and group discussion, problem solving and reflection. Each session is structured with a focus on **reflection** (a chance for teachers to reflect on practices in their classroom), **learning** (new knowledge and skills), **practice** (a chance to practice new skills together using the SBC and then **assessment** to check understanding of key concepts).



Many early grade teachers do not have strong English skills. To help teachers, the Facilitator Guide, and the Training of Trainers (ToT) will reinforce the use of:

- Short sentences without jargon or long words.
- Tok Pisin or Tok Ples translation.
- Allowing people to answer in Tok Pisin or Tok Ples.
- Visual aids and word lists.
- Giving teachers time to practice.
- Using an example or demonstration.
- Pausing frequently for questions.
- Checking participants understand and can repeat back information in their own words.
- Summarising learning points; and
- Speaking slowly.

2. PREPARATION FOR TRAINING

2.1 Module outcomes

By the end of the workshop, early grade teachers will be able to:

1. Confidently teach and assess elementary students using the SBC Mathematics syllabus and teacher guides.
2. Demonstrate how to use scripted lesson plans effectively to enhance students' numeracy skills.
3. Demonstrate how to use different numeracy strategies to improve student's performance in numbers and operations, quantities and measurement, geometry and data and mathematical relations.
4. Allocate more time for students to solve mathematical problems during Mathematics lessons.

(prepare this on poster paper in advance of the training)

2.2 Alignment with SBC content standards

Strand	Elementary Prep	Elementary 1	Elementary 2	Training content
Numbers and Operations	P.1.1 Find an easier representation for counting and comparing the numbers of concrete objects up to 120. P.1.2 Depending on the context, distinguish the number of objects and their position in order of objects with numbers and explain the condition carefully to the others. P.1.3 Compare larger or smaller numbers on the number sequence and number line and arrange in order. P.1.4 Use their understanding of numbers to count objects by 10 as a unit for place value. P.1.5 Understand the meaning of addition and calculate 1-digit numbers and 2 simple digit numbers. P.1.6 Understand the meaning of Subtraction and calculate 1-digit numbers and 2 simple digit numbers	1.1.1 Understand the meaning and representations of numbers using place value by making 10 and 100 up to 1000. 1.1.2 Understand the use of relative size of numbers in various situations. 1.1.3 Show and represent the meaning of half and quarter as equally divided part of a whole using pictorial or concrete objects. 1.1.4 Extend their understanding of addition and subtraction to calculate 2-digit numbers.	2.1.1 Appreciate and use their understanding of representing, recognising, reading, and writing of numbers up to 10,000 using base 10 place value 2.1.2 Understand the meaning of multiplication as repeated addition and represent it in various situations. 2.1.3 Extend their understanding of addition, subtraction, and multiplication to solve simple problems	Day 1 & 2

Quantities and Measurement	P.2.1 Understand and compare quantities and produce arbitrary units of measurement. P.2.2 Read o'clock time in relation to long and shorthand on the clock face.	1.2.1 Understand and compare length of objects using the units of measurement such as centimetre (cm) and metre (m) 1.2.2 Extend the understanding of standard units of measurement in length to add and subtract quantities of measurement using scale. 1.2.3 Understand and set the units of time and duration in hours and days	2.2.1 Understand and compare volume of liquids using the standard units of measurement for volume such as millilitre (mL), decilitre (dL) and Litre (L) 2.2.2 Use the scale on clock face to represent their daily activities and how long it takes	Day 3
Geometrical Figures	P.3.1 Understand the characteristics of geometrical figures through observation and composing using familiar shapes of objects	1.3.1 Understand and investigate components of triangles and quadrilaterals as geometrical figures 1.3.2 Knowing boxes by the component of the faces and make a box.	2.3.1 Understand and investigate the common properties of sphere and circles as geometrical figures	Day 4
Data and Mathematical Relations	P.4.1 Find patterns and recognise their structure in addition and subtraction. P.4.2 Explore and represent number of objects in form of picture and figures and interpret their patterns.	1.4.1 Apply using rules for inverse operation to calculate addition and subtraction 1.4.2 Understand and use simple tables and graphs to represent and compare various types of situations in everyday life.	2.4.1 Understand the structure of multiplication tables and use it for up to 9 x 9 multiplication table.	Day 4 & 5

2.3 Materials

Material	Number	Check
Facilitator Guide	1 per participant and 1 per trainer	
Participant Workbook	1 per participant and 1 per trainer	
Pre-test	1 per participant in English and Tok Pisin	
Post-test	1 per participant in English and Tok Pisin	
Workshop evaluation	1 per participant	

Daily register	1 per day
Certificates	1 per participant
SBC Teaching guides and syllabus	bring what is available
<u>Workshop stationery on display table each day</u>	Enough for workshop
1. Exercise books 2. Name badges 3. Stationery (markers, flip chart, pens, pencils, tape, sticky notes, chalk) 4. Materials for making flash cards (cardboard, markers, tape, scissors) 5. Other (please list)	
<u>Workshop equipment set up on display table each day.</u>	1 per workshop
1. Flipchart 2. Blackboard 3. Medical kit 4. Other (please list)	
Each school should bring the SBC Elementary Mathematics Syllabus and three Teacher Guides (note: You may need to check with TICs about this to ensure there are enough copies to share in the training. Please also check that the Syllabus is the correct one – e.g., has 4 strands)	1 per school
Resources for numeracy strategies on display table each day (this list assumes 6 table groups = 30-36 p for the training) • Dice (12) – 10 sided preferred • Container of stones • Container of small sticks • Container of shells or seeds • Container of beer bottle caps • Container of bottle caps • Photocopied money (see annex for template) • Examples of Measures for 1kg, ½ kg, ¼ kg, ½ L, ¼ L • Beam balance (if available), meter ruler, tape measure • Collection of containers and empty packets of dry food • Bucket as well as mugs, cups, and pots	• 6 balls of string/wool • 6 packs of playing cards. • Number flashcards • 2 D shape flash cards • 3 D shape flash cards • Counting stick • Clock face • A number line from 0 to 50 (with something to attach it to the wall) • A 100s chart (with something to attach it to the wall) • Flash cards for days of the week, Months and Dates
Resources to be included in Maths bilums if you wish to make these before or during the training.	Maths bilums are a great way to store resources for student group work, particularly in Prep and Grade 1 when



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students use a lot of concrete objects to solve maths problems.

Inside the bilums you should include:

- 20 bottle caps
- 20 stones
- 20 shells
- 20 sticks of the same length
- 20 sticks of different lengths
- Number flashcards
- String (10 cm, 50 cm, and 100 cm)
- Shape flashcards
- Money (pretend) and coins
- 1-2 dice (or 10-sided dice if available)

2.3.1 Preparation required for each day.

Day of training	Materials to be prepared
Orientation evening	▪ Workshop overview – large print out and post on the wall so that you can go through during Orientation. ▪ Print out copies of the pre-test (1 per person) ▪ Print out daily register. ▪ Title – workshop rules – on poster paper for the rule making session
1	▪ Day 1 Session outline on poster paper with times so that participants to follow the schedule on the day. ▪ Set up of resource table
2	▪ Day 2 Session outline on poster paper with times so that participants to follow the schedule on the day. ▪ Set up of resource table
3	▪ Day 3 Session outline on poster paper with times so that participants to follow the schedule on the day. ▪ Set up of resource table
4	▪ Day 4 Session outline on poster paper with times so that participants to follow the schedule on the day. ▪ Set up of resource table
5	▪ Day 5 Session outline on poster paper with times so that participants to follow the schedule on the day. ▪ Set up of resource table. ▪ Print out copies of the post-test (1 per person) ▪ Print out copies of the evaluation (1 per person)

2.4 Instructions to schools and teachers

Send invitations at least three weeks before the workshop. Inform the inspectors, Provincial Department of Education and Church Education Agency (CEA) of the participant list. Send a reminder call or text to teachers one week and one day before the workshop. This is an EXAMPLE only. Please adapt to suit your context.

..... **Project**

To: _____ school

Dear _____ (*list TIC and teachers invited*)

You are invited to an SBC Mathematics workshop from

Sunday _____ (*date and time*)

Friday _____ (*date and time*)

At _____ (*venue*)

The first session starts on Sunday afternoon at _____

Your trainers will be:

Trainer's name	Mobile

Please call or text _____ **on** _____ **to confirm your attendance.**

Teacher's name	Sex	Mobile	Baby/infant? Y/N

Travel, accommodation, meals, and materials will be provided by the If you have a baby, the project will pay for your baby and babysitter to attend.

Please bring:

- SBC Mathematics syllabus and SBC Mathematics Teacher Guides (EP, E1 and E2)
- Mosquito net

If you have special diet or need childcare for a baby or nursing infant, please tell your trainer.

Please tell your Board of Management and P&C chairpersons. Your inspector and Provincial Education Adviser have been informed.

2.5 Workshop health checklist (for organisers) adapt based on context.

Item	YES	NO
1	Is the venue safe, secure, and healthy?	
2	Is the accommodation safe, secure, and healthy?	
3	Are required social distancing measures in place at the venue?	
4	Do staff and participants have required PPE?	
5	Has the venue been deep cleaned?	
6	Is hand sanitiser available in each of the training rooms and dining room?	
7	Is the food healthy, nutritious, and plentiful?	
8	Is the water clean?	
9	Are the toilets working, clean and is there soap, hand sanitiser and toilet paper?	
10	Are special diets catered for?	
11	Can teachers bring babysitters for nursing children and mothers?	
12	Has a release letter with names and information on the workshop been sent to the Provincial Education Advisor, District Education Advisor, inspectors, and church education agencies?	
Other questions		
13	How are teachers traveling to the workshop? Is it safe for women to travel?	
14	How will teachers be reimbursed?	
15	What happens if a teacher is sick or absent?	
16	Who needs to know about the workshop, and have they been informed?	
17	Who needs to be invited to the workshop?	

2.6 Workshop overview

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
	Orientation	Day 1	Day 2	Day 3	Day 4	Day 5
0800-1000	<i>Travel to workshop</i>	Session 1 Welcome & Icebreaker - Reflection on current practice - Skills children need to learn maths	Session 5 Numbers and operations – key understanding Key terms used in elementary maths	Session 9 Practice session using concrete and visual strategies - Using bundles - Micro-teaching session from previous evening's preparation	Session 13 Introduction to Measurement - Measurement game - Micro-teaching session from previous evening's preparation	Session 17 SD shapes in our environment 3D activities - Playing shops – using money in everyday situations
1000-1030						
1030-1200		Session 2 SBC elementary mathematics standards - Elementary content standards - Exploring SBC teachers guides	Session 6 Place value - Ones, tens, hundreds - Place value in the teaching guides	Session 10 More on subtraction - Strategies for subtraction - Subtraction in the teaching guides	Session 14 Key understandings in Measurement Key terms used in measurement	Session 18 Data and Mathematical relations - Identifying patterns - Reading graphs - Practice
1200-1300						
1300-1430		Session 3 Exploring the SBC Mathematics teaching guides. - standards continued - Scripted lessons	Session 7 Count all, count on, count back and number lines. - Strategies for addition and subtraction - Number lines in the teaching guides	Session 11 Addition and subtraction stories - Creating stories - Using the teaching guides - Acting out/drama	Session 15 Telling the time Practicing SBC maths lessons focused on telling the time and using time throughout the day	Session 19 Assessment - Assessment in elementary - Developing assessment tasks
1430-1500						
1500-1630	Orientation Registration Pre-test	Session 4 Learning maths from everyday activities How children learn maths concepts from concrete to abstract	Session 8 Totals of ten, doubles and halving Making tens to help solve maths operations	Session 12 Multiplication and fractions - Relationship between addition and multiplication - Using the teaching guides	Session 16 Introduction to geometry and 2D shapes 2D shapes - Lessons focused on 2D shapes in the teaching guides	Session 20 Evaluation and Post-test - Post-test - Workshop evaluation

	Project overview Rules					
Night session 1830-2000	Welcome speeches. Prayer Meal	Night activity 1 FREE-TIME	Night session 2 Micro-teaching preparation	Night session 3 Micro-teaching – addition and subtraction	Night session 4 Preparation (playing shops)	Night activity 5 FREE-TIME/return home

3. ORIENTATION AFTERNOON

Sunday 1500-1730

Minutes	Activity
15	- Welcome speeches and project overview. - NGO host - Trainers - PDOE - Inspector or church education agency representative - Thank the province, church education agencies, National Department of Education and Australian Government.
30	- Review of Module 1 - Post training support - lesson observations and TLCs (sharing positive experiences) - Sharing of successes and challenges in applying literacy teaching strategies learnt during the training in their classrooms. - Changes they have seen in their English lessons
15	- Explain the workshop outcomes. - Give out the Participant Guidebook (one per participant). DO NOT give out the Facilitator Guide (this will happen on Friday). - Explain the workshop overview. - Find out which teachers have brought: - SBC Mathematics syllabus and Teacher Guides
15	- Go through the materials on the display table. - Say that the workshop will involve working in small groups at your tables. - Each table has 4-5 teachers per table. - Explain that each table group will need to gather resources for the workshop. Each table should make their bag of concrete objects from the resources provided. - Allow time for teachers to gather their resources and place in the middle of each table group.
15	- Workshop rules - Ask participants to list workshop rules. - Record these on the flip chart - Explain the workshop logistics (meals, accommodation, travel, health, and safety)
45	Pre-test

- a. Explain the pre-test:
 - i. We want to find out what you know about the SBC.
 - ii. At the end of the workshop, we will give you the same questionnaire.
 - iii. This helps us find out what you have learnt.
 - iv. This is not an exam, but we want you to try to complete it yourself.
 - v. Some of the topics might be new to you but do not worry. You will learn it during the workshop.
 - vi. If you do not understand the question, please ask.
 - vii. If you do not know the answer, do not worry. We will teach you this week. Just write "Don't know" or leave it blank.
 - viii. We have English or Tok Pisin versions of the pre-test. Please tell us which one you want to use.
- b. Ask participants to complete the pre-test on their own.
- c. Help participants with any questions they do not understand. Translate into Tok Pisin or Tok Ples if needed. Give encouragement.
- d. Collect these, check them and follow-up any missing biographical information

- | | |
|-----------|---|
| 15 | <ul style="list-style-type: none"> 1. Ask participants to tell a partner: <i>What am I looking forward to in the workshop?</i> 2. Listen to feedback. 3. Prayer 4. Welcome meal |
|-----------|---|

4. DAY 1

4.1 Learning Objectives

By the end of the day teachers will be able to:

- Explain the skills required to learn mathematics in the early grades.
- Describe the importance of using concrete objects in early grade mathematics.
- Describe the Elementary Mathematics content standards.
- Explain the key features of the SBC Mathematics teachers guide including the structure of Mathematics scripted lessons.

4.2 Today's SBC Mathematics focus on content standards

Strand	Elementary Prep	Elementary 1	Elementary 2
Numbers and Operations	P.1.1 Find an easier representation for counting and comparing the numbers of concrete objects up to 120. P.1.2 Depending on the context, distinguish the number of objects and their position in order of objects with numbers and explain the condition carefully to the others. P.1.3 Compare larger or smaller numbers on the number sequence and number line and arrange in order. P.1.4 Use their understanding of numbers to count objects by 10 as a unit for place value. P.1.5 Understand the meaning of addition and calculate 1-digit numbers and 2 simple digit numbers. P.1.6 Understand the meaning of Subtraction and calculate 1-digit numbers and 2 simple digit numbers	1.1.1 Understand the meaning and representations of numbers using place value by making 10 and 100 up to 1000. 1.1.2 Understand the use of relative size of numbers in various situations. 1.1.3 Show and represent the meaning of half and quarter as equally divided part of a whole using pictorial or concrete objects. 1.1.4 Extend their understanding of addition and subtraction to calculate 2-digit numbers.	2.1.1 Appreciate and use their understanding of representing, recognising, reading, and writing of numbers up to 10,000 using base 10 place value 2.1.2 Understand the meaning of multiplication as repeated addition and represent it in various situations. 2.1.3 Extend their understanding of addition, subtraction, and multiplication to solve simple problems

4.3 Workshop DETAILS

8.00 –
8.30

SESSION 1 - Welcome and Icebreaker!

Activity 1: (30 mins)



“Welcome to the first day of teacher training on SBC Mathematics. Today we are going to learn about the numeracy skills required in the early grades and how this forms the foundation of learning maths in primary and secondary school. You will also read through the SBC Mathematics teaching guide and begin to unpack how a Maths scripted lesson is structured and how the content strands of the SBC Mathematics syllabus are taught.

Let us begin with a fun activity.

*All teachers know about that the most effective way to learn something new is to **do it**. Sometimes we call this 'learning by doing'. Learning maths is best done through practice and in early grades, through games using objects.*

*This first game is called **sticks and rubber bands**.*



In your table groups provide the following instructions.

- You will be given a pile of sticks and some rubber bands.
- Your task is to find out how many sticks there are in your pile and then explain why your answer is correct with another group.
- Proving your answer by counting the sticks again, one by one, will take too long.
- Reflect on the following question: How can you prove your group's answer is correct much more quickly by using the materials in front of you?

Allow a few minutes for groups to complete the exercise together and explain their answer to another group ensuring each group explain why their answer is correct.

In plenary, ask the following questions to the whole group.

- How did you use the sticks and rubber bands to solve the problem?
- What skills did you use to solve the problem?
- Do you think this would be an activity, children at Elementary school would enjoy? If yes, what are your reasons?

In plenary share the following



Trainer tips

- This simple activity covers some of the concepts we will learn about in the training this week. You will learn about bundling tomorrow and learn how useful it is to solve addition and subtraction problems.
- Learning by doing or as the SBC calls it 'playful learning' helps children learn maths.
- Working with concrete objects helps children solve problems and overtime this helps them solve problems in their head.
- We can use inexpensive or local materials for teaching maths.



Teacher Tip: Materials

Numeracy concepts can be difficult to understand for children if they cannot see the ideas (this is called **abstract thinking**). Make sure that there are lots of materials in the class for numeracy such as stones, sticks, shells, and shapes so that children can see the problem they need to solve.



8.30 –
9.00

Activity 2 (30 mins)

Reflection on current practice

The purpose of this activity is to reflect on your students learning and your experiences teaching Mathematics in elementary/the early grades.



"We are going to reflect on our students learning and your experiences teaching Mathematics."



Complete the following table and prepare to share your experiences with members of your table group.

One challenge that you face teaching Mathematics to your students.	
One difficulty that your students face when they are learning to do mathematics.	
One strategy that helps children learn to solve maths problems.	
One teaching skill that <u>you</u> have developed for teaching Mathematics that you could share with other teachers.	



Once teachers have completed the table individually, ask teachers to share their reflections with each other.

In plenary, talk through each area, capturing highlights from each group on the blackboard/whiteboard.



Trainer tips

- Maths's ideas should be explored in ways that stimulate interest and curiosity and create and enjoyment of mathematics.
- Students learn best when we,
 - Build on prior knowledge and experiences,
 - Make a connection with their world, and
 - Use ideas and skills in a logical and ordered way to solve real problems.
- Learning from mistakes and reflecting on how problems are solved are important steps in students learning about mathematics.

9.00 – Activity 3 (45 mins)

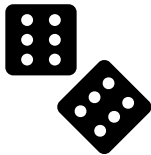
10.00 Skills that children need to do maths.

This session will help break down some of the different skills children need to learn mathematics.



*"This next activity is called the **Dice Sum Game**. You will play with a partner. Each pair will receive two dice and 22 stone/bottle caps (11 stones/bottle caps for each player).*

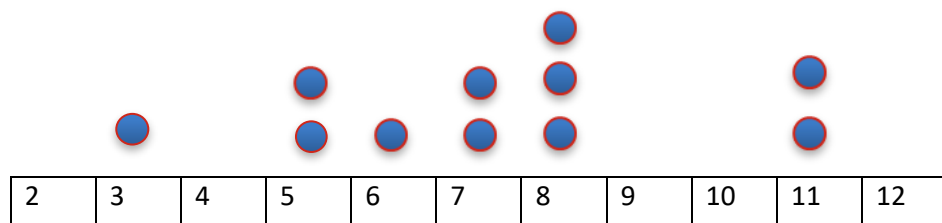
Show what dice looks like.



Discuss options if dice is not available. e.g., mini cube boxes that you can make yourself, two sets of cards numbered 1-6.

Each player should turn their book to landscape and make a number line from 2 to 12 in their notebooks. The space between numbers must be large enough for the counters to fit on the numbers.

Draw the number line on the board to show teachers how to do this:



Show participants that counters can fit above each number. Read the instructions aloud

Read through the instructions below carefully.

INSTRUCTIONS

- Each player should place their 11 counters on their number line in any arrangement.
- You can put more than one counter on a number and none on others.
- Take turns rolling the two dice.
- Add the numbers on the rolled dice together.
- Remove one stone/bottlecap that is on the number that matches the sum of the dice.
- If there is more than one stone/bottlecap on that number, the player can only remove one.
- The winner of the game is the first player to remove all eleven counters, (so think carefully about where on your number line you would like to place your counters).

Check if there are questions.

Allow 5-10 mins to play the game.

In plenary, ask the following questions. Remind teachers that if they were playing a game like this with students, they could ask a similar set of questions.

- Why does the number line only go from 2 to 12?
- What would be the best arrangement of counters to win this game? In other words, which sums occur most frequently?
- What math skills were addressed by this warm-up activity?
- How could you change the instruction to make this simple for children to play?
- Could you play this game for subtraction?



Trainer tips

- With two dice, 2 is the smallest possible sum which you would get if both dice fell on a 1; 12 is the largest possible sum which you would get if both number cubes fell on a 6.
- The frequency of a sum will depend on how many number combinations on the dice will make that sum.
 - For example, there is only one way to get 2: 1+1.
 - But there are several ways to get 6: 3+3, 4+2, 2+4, 5+1, 1+5. This makes it more likely that you would get a sum of 6 than a sum of 2. (write these on the board to share the teachers)
- It takes time and experience for children to notice patterns and make connections between them.
- This game develops students' skills in **addition, counting and introduces the concept of making predictions and number bonds, which we will learn more about tomorrow.**

Students also practice using concrete objects which support students learning. It is also a game that requires students to work in teams and take turns.

BREAK

10.30-
11.20

SESSION 2 - Elementary Mathematics Standards

Activity 4: (50 mins)



"The SBC Elementary Mathematics Syllabus lists content standards by grade under four headings of Strand 1: Number and Operation, Strand 2: Quantities and Measurement, Strand 3: Geometrical Figures, and Strand 4: Data and Mathematical Relations. It is important to note that there was a slightly early version of the 2015 Syllabus that organised the strands into 5. As the teacher guides use the 4 strands, this is what we will use for the training. Please check that you have a copy of the correct syllabus. It is important that all Elementary teachers understand the content standards for children in their grade. It is also important for teachers to understand what children already know (from previous grades) and what they will be expected to know (in future grades)."



Work in your grade level groups.

Each group gets a set of cards. **(Prepare card pack in advance – refer to Annex A – content standards – jumbled for Activity 4 by printing out copies and cutting each strand as a separate card).**

Provide each group with a piece of butcher paper with a matrix on it listing the four strands and the three grades, like this.

Strand	EP	E1	E2
Number and operations			
Quantities and Measurement			
Geometric figures			
Data and mathematical relations			

Members of the group arrange the cards by strand and grade so that, when they finish, they see the sequence of learning in Mathematics across the three grades of Elementary School.

To conclude the task, each grade level group shows the other groups their completed matrix. Any differences can be debated. The result can be compared with the correct chart in the Annex or in the Introductory pages of this training manual.

Conclude the session with the following:



Trainer tips

	It is important to remember that children learn in different ways and they bring a lot of prior learning to maths lessons. Children experience maths every day from a very young age in their activities at home and in the games they play. For example, they arrange things, compare things, draw lines, roll, and flip objects and work with patterns, measurement, and operations with their family members as part of everyday activities. For instance, some of your children may be in E1 but they still need to learn some EP content standards. Some children may be in E2 and they are needing support with some standards from E1. We must find ways to support those children to move from one stage to the next and sometimes this means going back before going forward.
11.20 – 12.00	Activity 5: (40 mins) Elementary Mathematics standards cont.: The purpose of this activity is to continue developing awareness of the SBC syllabus and standards expected of children in EP – E2.  In the same groups as the previous activity, ensure that each group has a copy of the correct syllabus and several teaching guides.  In groups, study the syllabus for your grade level. ▪ Identify any standards that are only mentioned in one grade level. ▪ Identify the standards that are similar across the grades but show a sequence of development. ▪ Write your thoughts on why some standards might be similar across the three grade levels. See if you can identify any differences. ▪ Consider which standards your students are currently achieving and those that students find hard to achieve. Discuss the reasons for this. Allow 15 minutes for the discussion. Ask groups to write their responses on butcher paper. Display each of the group's work so that other teachers can see what was accomplished in the small groups. Summarise the key learning below:  Trainer tips 1. Each standard is the knowledge and skills that the child needs to have developed by the end of that grade. 2. In EP, children are introduced to the early skills of counting, number patterns and basic number operations. They learn 1 digit addition and subtraction. Children learn about basic shapes, direction, telling time and money and comparing things (e.g., longer/taller; heavier, bigger) 3. In E1, children learn how to solve 2- and 3-digit addition and subtraction problems. They learn to count to 1000 and can collect and represent data in different ways. They learn about comparing things by measuring them (length, mass/weight, capacity, time etc.). 4. In E2, children learn numbers up to 10,000 and can do simple 2-digit multiplication problems. They learn about measuring things using standard units such as

metres/centimetres; kilograms; litres; hours, minutes and seconds, minutes, hours, day, week, month, year.

BREAK

13.00 **SESSION 3 - Exploring the SBC Maths teaching guides.**

- **Activity 6 (40 mins)**

13.40



In table groups with teachers from the same grade level, make sure you have at least one copy of the grade level SBC Mathematics teaching guide.

This session will provide an opportunity for teachers to familiarise themselves with the structure of the teaching guide and find out where to locate important guidance for teaching mathematics.



“The SBC Mathematics Teacher Guide is almost a complete package. Most of the planning is done for you. The scripted lessons which we will explore later are not as complete as you may be familiar with from the English teaching guide, but the important elements of each lesson are covered and there is very useful information about how to structure a week’s maths lessons.”



In your groups, answer the following questions based on the introduction to the teaching guide. These are important elements of teaching maths in elementary.

- What are the principles of curriculum learning set out in the maths teaching guide (hint: there are three)?
- What is the minimum allocation of time for teaching of maths in Elementary Schools in one week?
- According to the guidance on assessment – when should assessments be carried out?
- What advice is offered on multigrade teaching?
- What are three learning and thinking strategies mentioned in the teaching guide?

Allow 15 minutes for groups to complete the questions.

In plenary, ask one group to share their answer to one question and continue this way through the questions allowing for other groups to offer additional suggestions.

Here are the answers:



Trainer tips

- **What are the principles of curriculum learning set out in the maths teaching guide (hint: there are three)?**
 - Children learn best when new learning is built on what they already know in their culture and home,
 - when children play, use real objects, and solve real life problems, and
 - when mathematics is fun, challenging, and structured.
- **What is the minimum allocation of time for teaching of maths in Elementary Schools in one week?**

	○ 240 mins, although we recommend at least 60 mins per day (300 mins per week). ▪ According to the guidance on assessment – when should assessments be carried out? ○ During each lesson – formative ○ End of each lesson – formative and summative ○ End of each week - summative ○ End of each term – summative ○ End of grade 2 - summative ▪ What advice is offered on multigrade teaching? For multigrade teaching, the class is made up of students of different ages, abilities, interests and needs. A successful multigrade classroom: (a) provides opportunities for students to work in small groups, pairs, individually and as a whole class. (b) group work has a purpose, is challenging and the instruction is clear. (c) Grouping can be done based on 1) ability, 2) interests, 3) learning needs, and 4) mixed ability. ▪ What are three learning and thinking strategies mentioned in the teaching guide? ○ Mental Mathematics ○ Number Rhymes and songs ○ Games (Memory games, Number bonds game, Shape games) ○ Interactive story e.g., fraction story to reinforce half. ○ Mathematical vocabulary: Oral work based on practical activities, reading aloud and silently, writing, and recording in variety of ways, mathematics dictionary. ○ Response strategy – thumbs up – down- across. ○ Role Play (action/kinaesthetic) ○ Visual clues ○ Oral clues – Questioning about: ▪ Remembering facts ▪ Using facts ▪ Predicting ▪ Applying reasoning ▪ Interpreting results ▪ Designing and comparing procedures ○ Class involvement ○ Investigations and problem solving
13.40 – 14.30	Activity 7 (50 mins) Getting to know how Mathematics scripted lessons are arranged. The purpose of this activity is to develop an understanding of how the scripted lessons of the SBC are arranged.  <i>“Now it’s time to familiarise ourselves with the daily scripted lessons. In your group, review a week’s scripted lesson for Mathematics. Once you have read through the week’s daily lessons, work as a group to answer the following questions.</i> 

- 1) How does each maths lesson begin? Is it different from how English lessons begin?
- 2) What are the 5 steps in a maths lesson?
- 3) What step covers 'new learning'?
- 4) What happens in the conclusion step each day? Why do you think this is important?
- 5) Besides scripted lessons, what other information in the Mathematics teacher guide can help you teach your lesson?
- 6) From your analysis, is there anything missing in your scripted lesson that you may need to include to teach your lessons?

After pairs have reflected on the questions, ask groups to share their responses. Please use the Training Tips below for a guide to the answers.



Trainer tips

- 1) The objective step. This is different from the English lesson which starts with a song, a jingle, or music.
- 2) Objective, starter, introduction, teacher and student activity, conclusion, and assessment
- 3) Introduction
- 4) The teacher does an activity to check whether students have understood the new learning and extend their knowledge of the new learning – such as writing. This is important to determine whether the content standards are being met and whether some students need additional support.
- 5) At the end of the guide there is a dictionary of key maths terms – this will help teach Mathematics. There is also a list of songs to sing which could be used to open the lesson. The term plan provides guidance on what to cover each day of the term and its related content standard.
- 6) Here are some ideas: limited student action songs that can help reinforce numbers and operations. No instruction to use songs at the back of the teaching guide, no guidance on simple formative assessment methods, no instruction on how to integrate the learning and thinking strategies mentioned in the teaching guide, no formal opening and closing of lessons – e.g., today we will learn this – tomorrow we will learn this.

Before ending the session summarise the benefits of scripted lessons:

NDoE provides scripted lessons and termly overviews to:

- *Ensure lessons are made up of different activities,*
- *Reduce the burden on teachers (no need to write a termly plan or daily lesson plan)*
- *Cover all the standards,*
- *Consistency across schools*
- *Provides a standard template which teachers can build upon with practice*

BREAK

15.00
–
15.45

SESSION 4 - Learning maths from everyday activities

Activity 8: (45 mins)

In this session we will reflect on what experiences and prior learning children bring to their class and how we can make classrooms great places for Maths learning.

In this first activity, we will reflect on Maths skills children learn when they play and do activities at home and in their community.



"Children bring a lot of prior learning to elementary classes. This activity helps us connect children's activities with different maths skills."



Using think-pair-share, brainstorm the following two questions?

What everyday activities do children do that help them develop skills in Maths? From that activity, what Maths skill/s is/are being learnt?



In table groups, develop the following table of ideas.

What everyday activities do children do that help them develop skills in Maths?	From that activity, what Maths skills are learnt?

Allow 10 mins for groups to complete their table.

Ask a few groups to share their ideas with the rest of the class.

Now, let us do an activity together and see if our answers are the same. You can work individually or with another person to complete the following table.

No.	Play activity	Maths skill or understanding
1	Building a simple house out of sticks and leaves	
2	Arranging similar and different shaped and coloured leaves in different patterns and sequences	
3	Pretending shells are money and using them to play imaginary market or shop	
4	Helping mum or dad plant corn in the garden by putting the seeds in the ground.	
5	Helping mum or dad divide up the cooked sweet potato for all the family members	
6	Sharing some cake with friends.	
7	From a pile of mixed shells, putting all the white ones together in one group and the multi-coloured ones in another group.	

8	Drawing squares in the dirt and playing hopscotch.	
9	Drawing shapes in the sand with a stick and decorating with shells in interesting patterns.	
10	Helping mum or dad fill up the water bucket with a bag or basket from the well.	
11	Finding out if any buttons are missing on a shirt	
12	Helping mum or dad measure the flour and water to make bread.	

Here are the answers to help with the debrief.



Trainer tips

1. Counting, weight, balance, measurement
2. Patterns and sequences – sorting and arranging, skills used in measurement.
3. Addition and subtraction, knowing about money, problem solving.
4. Counting, pattern identification, measurement
5. Multiplication, division, equal parts, parts of a whole, measurement
6. Parts of a whole, division, equal parts, measurement
7. Grouping strategies, measurement, sorting
8. Geometry, addition, mental mathematics
9. Geometry, addition, sorting, and measurement.
10. Volume, weight, measurement
11. Counting, geometry, sorting
12. Measurement, weight, counting, addition

An important tip to remember: **Make it real!** The more children understand how to use maths in real life, the more interested they will be to learn.

Look at these real-life problems below and ask teachers to reflect on their use of maths every day.

"Mary has 10 piles of rambutans to sell at school market. Each pile has 5 rambutans. How many rambutans did Mary collect?"



"We have 20 bush knives to use to cut the grass but there are 30 children in the class. How many children will be left out?"



"The pineapple plant in our school garden has flowered. It will take another 6 months before it is ready to eat. If it is March now, when will it be ready?"

15.45
–
16.30

Activity 9 (45 mins)

Concrete – Abstract

The purpose of this activity is to learn why it is important to ask children to explain how they will solve a problem or how they arrived at their answer. We will also investigate how a child develops their understanding of Maths.



In pairs discuss the following question.

Why might it be important to ask children to explain how they plan to solve a problem or how they arrived at their answer?

Explain the following to teachers:

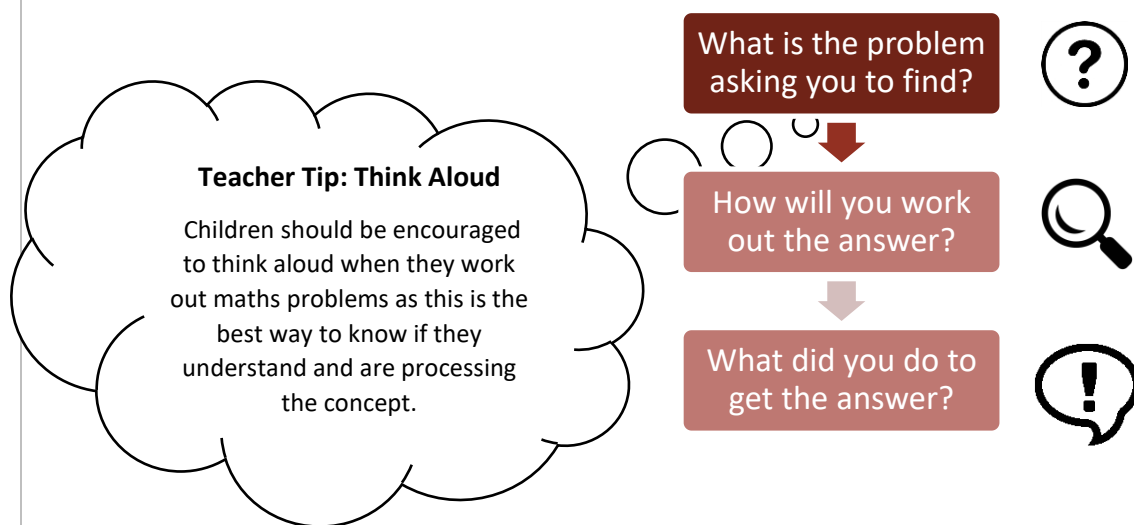


Trainer tips

Teachers have found that one of the best ways to find out if children really understand a maths concept is to listen to them talk about it, to explain it. Generally, if children can talk confidently about a maths idea or concept, this indicates that they understand the concept and are likely able to apply it.

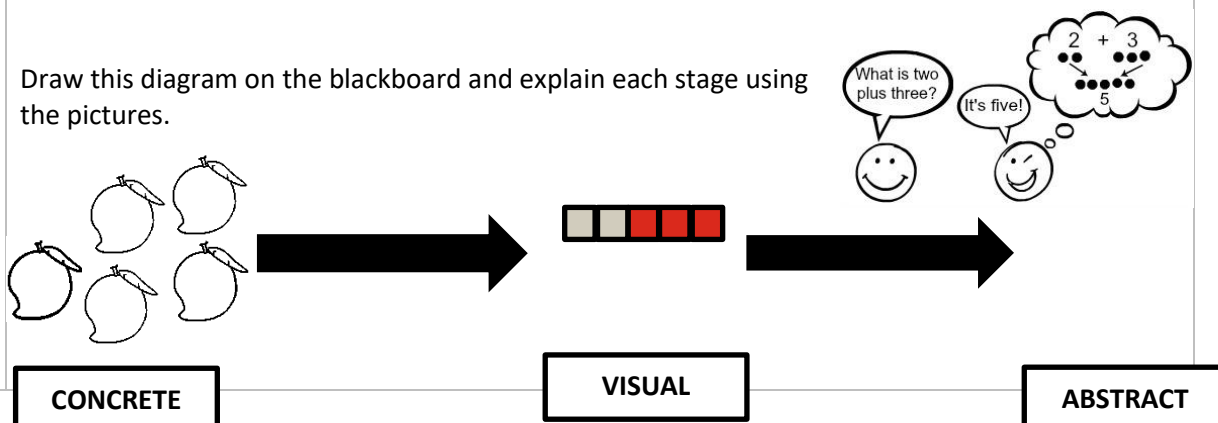
Children who learn how to do something by copying the teacher, or a fellow student, are often unable to apply a maths idea in an unfamiliar context.

Therefore, good teachers do ask the student to explain why or how they worked out their answer.



*"In maths, like other areas, children pass through **developmental stages**. There are individual differences, and every child develops at their own pace. They also approach learning in different ways – some children are naturally curious, whilst others are not. Some children do not worry if they make mistakes, whilst others do not like taking risks. In maths, children move from the **concrete** to the **abstract**. At the concrete stage, children use (**MANIPULATE**) materials to count, add/subtract, measure, and learn about shapes. These are sometimes called **MANIPULATIVES**, but we can call them concrete objects. At the abstract stage children can do these things mentally or by using numbers, strategies, and tools/instruments. Many children also go through a middle stage, which is often called **REPRESENTATIONAL** or **VISUAL**. At this stage, students draw or represent the problem in a visual or pictorial way.*

Draw this diagram on the blackboard and explain each stage using the pictures.



After discussing the three stages.



In pairs discuss the following question.

- (1) How could a child at the **CONCRETE** stage add numbers 7 and 8?
- (2) How could a child at **VISUAL** stage add 7 and 8?
- (3) How could a child at **ABSTRACT** stage add 7 and 8?

After for volunteers to share their responses.

Refer to the following when discussing the answers to the group.



Trainer tips

1. They would use concrete objects or objects. They might create two piles of blocks. One with 7 blocks and the other pile with 8 blocks. They could then count these individually to add up to 15.
2. They might make use graph paper and colour in 7 blocks one colour and then 8 blocks of the same row in another colour and then count them up to answer the problem.
3. Students will be able to think through the problem in their heads applying strategies they have learnt to add up 7 and 8 together.



*"In Elementary school, most children will be working at the concrete and visual levels, **especially when teachers are introducing a new concept for the first time**. Therefore, early grade maths teachers need to use a lot of materials in their classes. To learn maths, children must hold things, move them around, group and regroup them, compare, match, and classify them, look for similarities and differences between them – these experiences are the foundation of real learning in maths and are built on in primary and secondary schooling.*



In table groups discuss the following activities in the table and decide whether they are examples of concrete, visual or abstract. Try to form agreement in the group.

No.	Activity	Concrete, visual or abstract
1	Children classify a pile of leaves into groups by colour and shape	
2	Teacher does a quick mental arithmetic quiz – simple subtractions	

3	Teacher explains about wholes and halves by cutting up fruit	
4	Children chant the numbers from 0 to 20	
5	Children answer addition sums using the number line to help them	
6	Children compare five sticks and arrange them in order of length	
7	Children read word problems and solve using their own strategies	
8	Children arrange a set of cards with 2-digit numbers on them from the lowest to the highest number	
9	Children cut paper into 2D shapes – square, circle, rectangle, triangle	
10	Children tell the time shown by hands on a cardboard clock-face	
11	A child skip counts by fives when asked to do so by her teacher	
12	Children find out whether there are more seeds or shells by matching one-to-one and seeing which group has some left over	
13	Teacher helps a group of children sequence themselves by height	
14	Teacher tells a story about children sharing mangoes. Children listen and model events in the story with stones to find out how many mangoes each child received.	
15	Some children use sticks and bundles of sticks to work out the answers to subtraction sums written on the board. Some children work out the answers using only the numbers.	

Go through the answers and discuss those where responses varied.



Trainer tips

- 1.** Concrete
- 2.** Abstract
- 3.** Concrete
- 4.** Abstract

5. Visual
6. Concrete
7. Abstract
8. Concrete
9. Concrete/visual
10. Concrete
11. Abstract
12. Concrete/visual
13. Concrete
14. Visual
15. Concrete/visual/abstract

Conclude the session but discussing the collection of concrete objects we have on display and what else we can collect to help students learn maths.

Teacher Tip: Concrete objects

Here are some examples of concrete materials to have in the classroom for children to play and learn with.



Sticks and rubber bands. Used for counting, making groups, sharing groups, bundling into 10s and to show place value (ones, tens, hundreds)	Coconut husks or cut open bottles. Used for sorting items, collecting counters, and grouping	Stones, shells, or bottle tops Can be used as counters for adding, subtracting, grouping, and sharing or have numbers written on them for sequencing and place value or for simply arranging into patterns by number, shape, or colour
Leaves Used for making patterns, comparing size, counting.	Fruit Used for fractions, dividing, comparing shape, weight and counting.	Bottles/jars/cans Used for sorting, measuring capacity and games such as addition bowling and sequence staking.

	String Used for comparing or measuring length, height, and width of objects.	Toilet rolls Used to create number games in which children twist to model different numbers or number stories.	Boxes Used to look at 3D shape, size, and volume (how many apples fit in this box?)
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5. DAY 2

5.1 Learning Objectives

By the end of the day teachers will be able to:

- Use different strategies to teach children simple operations – addition and subtraction.
- Use the SBC Maths teaching guide more effectively due to an increased understanding of its structure and instruction.

5.2 Today's SBC Mathematics focus on content standards

Strand	Elementary Prep	Elementary 1	Elementary 2
Numbers and Operations	P.1.1 Find an easier representation for counting and comparing the numbers of concrete objects up to 120. P.1.2 Depending on the context, distinguish the number of objects and their position in order of objects with numbers and explain the condition carefully to the others. P.1.3 Compare larger or smaller numbers on the number sequence and number line and arrange in order. P.1.4 Use their understanding of numbers to count objects by 10 as a unit for place value. P.1.5 Understand the meaning of addition and calculate 1-digit numbers and 2 simple digit numbers. P.1.6 Understand the meaning of Subtraction and calculate 1-digit numbers and 2 simple digit numbers	1.1.1 Understand the meaning and representations of numbers using place value by making 10 and 100 up to 1000. 1.1.2 Understand the use of relative size of numbers in various situations. 1.1.3 Show and represent the meaning of half and quarter as equally divided part of a whole using pictorial or concrete objects. 1.1.4 Extend their understanding of addition and subtraction to calculate 2-digit numbers.	2.1.1 Appreciate and use their understanding of representing, recognising, reading, and writing of numbers up to 10,000 using base 10 place value 2.1.2 Understand the meaning of multiplication as repeated addition and represent it in various situations. 2.1.3 Extend their understanding of addition, subtraction, and multiplication to solve simple problems

5.3 Workshop DETAILS

8.00
–
8.30

SESSION 5 - Numbers and operations – key understanding

Activity 10: (30 mins)



“Today we are going to learn about numbers and operations and become more familiar with the strategies that are used in the SBC Mathematics teaching guides. The concept of numbers is more difficult than we might imagine.

Children need to understand: 1) the number symbols (1,2,3,4 etc) and that they represent quantity, 2) terms like ‘more’, ‘less’, ‘bigger’ and ‘smaller’ (see Annex C), 3) the counting sequence, 4) how to classify, match, compare and order numbers and objects up to 10,000, and 5) how to use simple operations such as addition and subtraction.



In pairs, ask participants to review the 4 categories below and brainstorm resources, tools, and strategies that they could use to teach these concepts/skills.

Counting Identifying numbers, sequencing, counting with understanding, comparing, and ordering, skip counting in 2s, 5s, 10s, 100s	Place Value Knowing the value of different digits in 2-digit numbers (10s and 1s), using place value to add subtract multi digit numbers.
Addition and Subtraction Understanding that numbers can be combined, reduced, or compared; solving problems using multiple methods (concrete materials, drawing, counting on, skip counting, mental arithmetic) and simple equations/algorithms, understanding that addition is how many altogether and subtraction is how many left or the difference between, recalling basic addition/subtraction facts (mental arithmetic).	Problem Solving Understanding what the problem is asking, deciding on how to solve it, being able to discuss thought process and explain how to solve a question, showing working out.



Allow 5 minutes for pairs to brainstorm resources, tools, and strategies for each.

Ask for volunteers to share their responses.

Check their answers with the following:



Trainer tips

Counting: Resources: Counters such as stones and shells and number cards

Place Value: Resources: sticks and rubber bands, playing cards, place value charts showing ones, tens, hundreds etc.

Addition and Subtraction: Resources: counters or other concrete materials, number lines for counting, skip counting and counting on, 10 frame boxes, dice; Strategies: number lines, counting on, counting all, taking away, grouping/bundling and regrouping/unbundling, place value charts.

Problem solving: Resources: objects, counters, paper to draw the problem and solve it, real life problems and materials, **Strategies:** acting out/drama.

8.30 Activity 11: (60 mins)

9.30 Introducing operations



"In the next activity, you will learn more about the counting system. Today, you will also learn about place value, addition, and subtraction."



In pairs discuss the following question.

What does the term Operations mean in mathematics? What are some examples of simple operations?

After a few minutes, ask for volunteers to share their response.

Once shared, summarise the following:



Trainer tips

- The basic operations in elementary mathematics are addition, subtraction, multiplication, and division.
- Subtraction is the opposite of addition, and division is the opposite of multiplication.

+ <i>add, more, sum, plus, total, increase, together, join, combined</i>	- <i>Subtract, minus, less, difference, take away, decrease, remove</i>
X <i>Multiply, groups, times, lots of</i>	÷ <i>Divide, equal parts, share, out of, each</i>

- The = sign is an important symbol in basic operations to also be familiar with. We use language such as, equal, the same as, equal to.
- Addition is combining things/numbers to find out how many altogether whereas subtraction is taking things away.
- Multiplication is how many altogether when you combine groups of the same number and division is sharing of whole thing or group of things into smaller, equal parts.



In table groups, present another problem for them to solve.



Consider the following problem and solve it in your groups.

Suppose I have a basket with 7 pieces of fruit.

Some of the fruits are bananas and some of the fruits are mangoes.

How many of each could I have?

What are the different ways I can represent a total of 7 pieces of fruit using bananas and mangoes?

You will be given a bag with 10 stones and 10 bottle caps. Work in groups for the next 10 minutes to represent your

solutions to this problem by:

1. Using concrete objects (stones and bottle caps)
2. Drawing (visual)
3. Using symbols (equations and words)

After 10 minutes discuss some of the solutions by asking first for volunteers to share their suggestions.

Use your notebook to record solutions.

Discuss some of the solutions that you came up with and share the following.

1	 +6	       = 7 fruit	5	     +6	  = 7 fruit
6	      +1	 = 7 fruit	3	   +4	    = 7 fruit
2	  +5	      = 7 fruit	4	    +3	   = 7 fruit

Ask a follow-up question:

Can you think of ways to make this problem less challenging and ways to make this problem more challenging?



Trainer tips

- Children should be encouraged to use concrete objects and pictures to solve and represent problems like these.
- Answer 1: The problem can be made simpler by using a smaller total. It can be made more difficult by increasing the size of the total and by increasing the number of types of fruits to three types.

- Students learn best when learning is real-life (using concrete objects, symbols, and pictures) were encouraged. In addition, the emphasis of the problem is on problem- solving, not on getting the “right” answer. There are many possible solutions.
- There are different options for presenting as a visual. One way would be to use frames.



In table groups, take turns to read out the key definitions that are used when learning about operations.

Composing and decomposing or breaking and combining

Numbers can be broken down into parts and put together again. For example, 6 can be broken down into two parts: 3 and 3 or 5 and 1. We can also combine two numbers to make 6, for example 3 and 3 or 4 and 2.

$$6 = 3 + 3 = 6 = 5 + 1 = 6 = 4 + 2 = 6$$

We often break up numbers to emphasize different place values. The number "362" can be broken down into 300 and 60 and 2 by decomposing the number into hundreds, tens, and ones (place values).

362

$$300 + 60 + 2$$

Making tens

Tens are Friends!

I can...

- 1 Choose a card
- 2 Split one addend to make a ten from the other addend
- 3 Find the sum

$7 + 4 = \underline{\quad}$

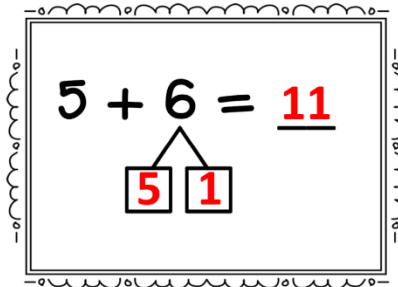
3

1

$7 + 4 = \underline{\quad}$

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In EP, students learn all the combinations that make ten (e.g., **2 + 8**, **3 + 7**). Students apply that knowledge in a strategy known as “make a ten”. To use the strategy, students break down one of the numbers to make a ten from the other. If you look at the example pictured above, the 4 is split into 3 and 1. The 3 is combined with the 7 to make 10, and then the 1 is added for 11.

Doubling	 Using doubles Using Doubles involves breaking down one number to make a double with the other number. For example, 7 + 8 is the same as 7 + 7 plus 1 more.
Halving	Halving is separating a quantity into two equal groups.
Number bonds	A number bond is a simple addition of two numbers that add up to give the sum. Using number bonds, one can instantly tell the answer without the need for the actual calculation. ... Number bonds help us to understand that a whole number is made up of parts. These parts could be in different proportions. Number bonds of 10 for example are: 1 + 9, 2 + 8, 3 + 7, 4 + 6, 5 + 5
Skip count:	Skip count means counting by a number that is not 1. For example, skip counting by 2 would be 2, 4, 6, 8... Skip counting by 5 would be 5, 10, 15, 20, 25... Skip counting by 10 would be 10, 20, 30, 40... Skip counting by 100s would be 100, 200, 300, 400...
Multi-digit number:	A digit is a single numeral like 2 or 7. A multi-digit number is a number that is made up of more than one digit. For example, 34, 657, and 7891 are multi-digit numbers. 34 is a two-digit number, 657 is a three-digit number, and 7891 is a four-digit number.
Inverse operations:	Operations that are opposites of each other. Addition and subtraction are inverse operations. Multiplication and division are inverse operations.

Ask a follow up question to the whole group before ending the first session.

What skills were addressed by the warm-up activity about fruits in a basket?



Trainer tips

- Maths skills were used to answer the warmup activity.
 - It is a good example to teach number bonds up to 7.
 - Identifying numbers and knowing the count sequence
 - Counting with the understanding that numbers tell “how many” are in a set.
 - Decomposing and composing numbers, and
 - Representing and solving problems involving addition and subtraction using multiple methods including simple equations

BREAK

10.30
–
11.00

SESSION 6 - Place value

Activity 12: (30)

Place value is a concept that can be difficult for children and adults to understand, so we will take some time now to review some concepts.



"We are now going to talk about our place-value system."



In pairs, brainstorm what is place value?

Ask for volunteers to share their responses.



Trainer tips

To summarise, every digit (or numeral) within a multi digit number has a value based on its position in relation to the other digits in the number. For example, in the number 22, the 2 in the ones place represents the quantity of 2, but the 2 in the tens place does not represent the quantity of 2, it represents 2 tens or the quantity of 20.

Write the number 22 on the blackboard to show which is the one's column and which is the tens column.

Tens	Ones
2 tens	2 ones

ABOUT PLACE VALUE

- Place value refers to the fact that the value of a numeral is determined by the place it holds in relation to other numerals in a multi-digit number.
- We have a base ten number system which is based on the concept that each place value in a number is ten times greater than the place to its right.
 - Example: the number 333 equals $300 + 30 + 3$
 - The first 3 is in the hundreds place.
 - The second 3 is in the tens place.
 - The third 3 is in the ones place.
 - 300 is ten times bigger than 30 which is ten times bigger than 3.

Hundreds	Tens	Ones
3 hundreds	3 tens	3 ones



The following chart shows the place values from the ten thousands place to the ten thousandths place:

Ten thousands	thousands	hundreds	tens	Ones (or units)	. decimal	tenths	hundredths	thousandths	Ten thousandths
---------------	-----------	----------	------	-----------------	-----------	--------	------------	-------------	-----------------

The only place in our number system which represents single, isolated items is the units or the one's place. For example, in the number 45, the 5 represents 5 individual items but the 4 does not represent 4 items. Instead, the 4 in 45 represents 4 tens or 40 items.

Together the 4 and the 5 in 45 represent one quantity composed of parts (four tens and five ones).

Tens	Ones
4 tens	5 ones
	

IMPLICATIONS FOR TEACHING:

To understand place value, children need many experiences of physically grouping items into tens,

hundreds and ones and linking their experience to standard numerical notation.



"Let us do some more practice."

Write the number **4,567** on the blackboard.

How would you break this number into four parts using the place value of each of its digits?

In other words, how many ones, tens, hundreds, thousands, are there in this number?

Ask for a volunteer to write the answer on the board.



Trainer tips

ANSWER:

$$4,000 + 500 + 60 + 7 = 4,567$$

thousands	hundreds	tens	ones
4000	500	60	7

We have just taken **4,567** and written it as a sum of the values of each of its digits.

This is called writing a number in its **expanded form and breaking it down in this way is decomposition. We covered these terms yesterday.**

Expanded form:

Expanded form refers to a number that is broken up to show how much each digit in the number represents. In other words, writing a number in expanded form involves pulling the number apart and expressing the number as a sum of the values of each digit.

Example, the expanded form of **345** is: **300 + 40 + 5.**



In pairs, answer the following reflection questions?

You can take notes about your discussion in your notebooks.

1. How do you teach place value? If you have never taught place value, how would you teach place value?
2. What are some of the challenges you anticipate when teaching place value?

Allow a few minutes for pairs to discuss and share responses in table groups.



Trainer tips

- Consider referencing your own cultural number system as a way of reinforcing the concept of place value.
- It is also important to emphasise that the place value system we use in SBC maths is base 10.
- It is important to understand that while place value is important for E1 and E2 – it is also important for EP where the correct order of numbers is taught and there is a big focus on the concept of increasing and decreasing.
- The use of bundles and sticks, which we will more about during the training is a great strategy to teach place value.
- The concept of place value is abstract, and students often need to see place value using concrete objects and visuals to help students learn more about the concept.

Activity 13: (45)

Practicing place value

Let us look at how place value is taught in E1. In elementary, place value is not introduced and strategies such as grouping is not taught as a way of solving problems. Most addition and subtraction problems are solved using counting on, counting all and counting back.

Here is a lesson from Term 1, Week 7.

TERM 1 WEEK 7 MONDAY PLACE VALUE

LESSON TOPIC: Place Value
STRAND: Number and Operation
CONTENT STANDARDS: 1.1.2

1 OBJECTIVE

Write 2 digit numbers between 10 and 30 in tens and units.

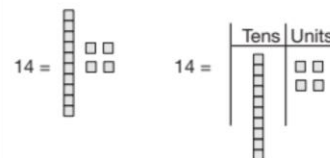
2 STARTER

Sing 'On the way to school today' with the children.

3 INTRODUCTION

Write a number on the board, e.g. 14.

Tell the children to draw pictures using base 10 materials to show that number.



Tell them that $14 = 10 + 4$

Explain that you can show this on a place value table using base 10 materials, as above. Show them how to do this together on the board.

4 TEACHER AND STUDENT ACTIVITY

Show the children 3 more examples of 2 digit numbers.

Put the children into pairs and ask them to write these 2 digit numbers and show them using base 10 materials on a place value table:

- 1) 12
- 2) 17
- 3) 10
- 4) 18
- 5) 20



5 CONCLUSION AND ASSESSMENT

Assess the children on their ability to recognise units, recognise tens and being able to write 2 digit numbers between 10 and 20 by asking for their answers from the previous activity.

Make a note of those children who are not able to do this and those who find it easy. Use the information when planning tomorrow's lesson.

Work through the lesson plan with participants making sure to reflect on the previous days and the days to come in that week to see the sequence of learning.

Let us consider E2 now.

TERM 1 WEEK 9 WEDNESDAY

1 OBJECTIVE

Explain the mental arithmetic strategies they have used to solve addition and subtraction problems from 0 to 50.

LESSON TOPIC: Multiplication up 2 digit numbers

STRAND: Number and Operation

CONTENT STANDARD: 2.1.2

2 STARTER

Say the 2 times table together.
Shuffle the 2 times table flashcards.
Show one card and ask the children to write down the answer.
Check to see if they are correct.
Repeat with other 2 times table flashcards.
Repeat the activity with the 10 times table flashcards.

3 INTRODUCTION

On the board write the sum $46 - 20 =$
Ask if it is an addition or subtraction problem.
Tell the children that they must find the answer using mental arithmetic. Ask how they could do it.
Remind them how to count back in tens by remembering 46 and using their fingers to count backwards.
Write the answer $46 - 20 = 26$.
Write $34 + 30 =$
Ask if it is an addition or subtraction problem.
Ask how they could solve it. Explain that they could count on from 34 in tens, so 44, 54, 64. Or they could break 34 into $30 + 4$. They could add 30 and 30 then add 4 to 60.
Write the answer $34 + 30 = 64$
Repeat using different numbers.

5 CONCLUSION AND ASSESSMENT

Pick one pair to show one of their problems.
Ask them for their answer and to explain the way they did it.
Ask the class if they agree with the answer and how they did it.
Repeat with 2 more pairs of children.
Make a note of those children not able to solve the problems and those finding it too easy. Use this information when you plan tomorrow's lesson.

4 TEACHER AND STUDENT ACTIVITY

Put the children into pairs.
Write 5 addition and 5 subtraction problems on the board.
Tell them to work in pairs to solve the problems using mental arithmetic.
Move around the classroom, assessing the children by listening to them. Give help where needed. If some children are finding it too easy, give them more difficult problems.



Work through the lesson plan with participants making sure to reflect on the previous days and the days to come in that week to see the sequence of learning.



"Let us look at how this is applied for sums, building on the E2 lesson plan above."

Write the sum $32 + 24$ on the blackboard.

- How would you teach this problem to your students?



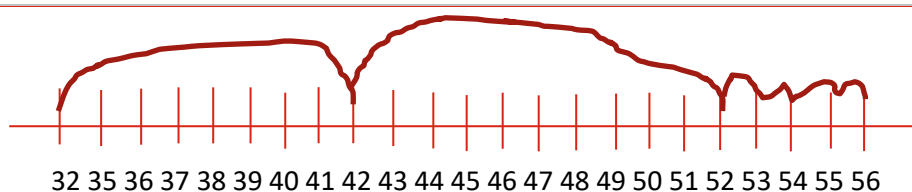
In pairs, list all the different ways (reflecting on what you learnt yesterday) to solve this sum.

Ask for volunteers to share some of their ideas.



Trainer tips

- Lines could be one way.



Follow through this sequence in your demonstration.

POTENTIAL ANSWERS:

Standard form (algorithm):

32

+24

Then add the ones column (which gives you 6), followed by the ten's column (which gives you 5).

The answer is 56.

Expanded form:

$30 + 2 (=32) +$

$20 + 4 (=24)$

$50 + 6 (=56)$

When you are adding 24 to 32, you are adding the **ones** first: $4 + 2 = 6$.

When you add the 2 and the 3 that are in the **tens place**, you are really adding $20 + 30$ which gives you 50.

$50 + 6 = 56$.

- Bundling using place value can help you see this using concrete objects.

Tens	Ones
30	2
20	4
Total = 50	Total = 6
$50 + 6 = 56$	

BREAK

13.0
0 –
14.3
0

SESSION 7 - Count all, count on, count back and number lines.

Activity 14 (90 mins)

This session will focus on addition and subtraction and we will learn four techniques that can be applied in our SBC maths lessons to help students add and subtract.



"We are going to learn about some strategies to teach to our students that will help them add and subtract numbers. We will then practice these using our SBC teaching guides."



In pairs discuss the following question.

1. What are some strategies that you already know that can help children learn to do addition and subtraction?

Allow a few minutes for teachers to reflect on the question.

Ask for volunteers to share their thoughts in plenary.

Summarise by sharing the following, demonstrating the examples provided for 'count all' and 'count on'.



Trainer tips

- The best way for elementary students to do addition and subtraction is to use concrete objects and to show the sum visually.
- For the sum $5 + 3$, children can be taught to count out 5 'stones' and then add on 3 more stones. Students then count the total number of stones. This is called the '**count all** strategy' and it is the most basic type of strategy.
- As children grow in their maths understanding, they can also apply a more advanced strategy called '**count on**'. When shown the problem $5 + 3$, children who have a strong number sense, will know that it will be faster to start at the larger number 5 and 'count on' 3 to arrive at the answer '8'. The way they would solve this problem is to start at 5 and using their fingers to show 3, say 5....6,7, 8! Remember that children will be more likely to understand this over time by using concrete objects first and then work to present this visually before focusing on the number forms.
- Similarly, children can '**count back**' for subtraction. Take the sum $10 - 5$. Students learn to count backwards by 5 starting from 10.
- You can help children develop these skills by doing problems like this each day.
- Use the phrases "how many altogether" and "how many left/left over" or "how many more" or "what's the difference between" to help your students become familiar with these forms of words and the operations of addition and subtraction.
- Maths questioning is very important for teachers to practice. Remember that it is the process that counts – the way that students solve problems and explain how they have arrived at the answer.



In table groups, practice the following sums using 'count all', 'count on' and 'count back' strategies. Make sure you use concrete objects (such as shells and stones) to help you.

2. $4 + 8 =$
3. $9 + 5 =$
4. $10 - 4 =$
5. $8 - 3 =$

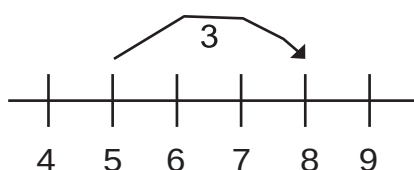
Encourage each teacher at the table to practice both strategies. If you have time, practice being teachers and students asking for explanations on how they are solving the problems.

Allow 5 minutes and then ask for volunteers to demonstrate their strategies for each of the problems.



Another way to teach students to do this problem is by using a number line. It is a great idea to have a number line in your room all year and refer to the number line frequently when doing addition and subtraction problem solving. Number lines can be hung around the room or placed on the floor.

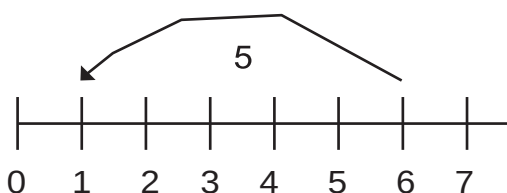
Draw a number line on the board like this and write the sum $5 + 3$



Starting from 5, using the number line count forward 3. The line that it rests on is 8.

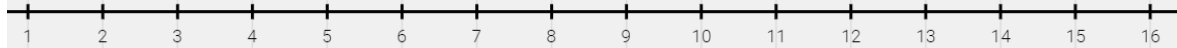


In this example - the sum is $6 - 5$.



Starting from 6, using the number line count down 5. The line that it rests on is 1.

Draw a number line to begin: (remember that you should look at the numbers in the sum to determine the starting point of the number line and the endpoint.)



Let us do a few together.

1. $4 + 8 =$
2. $9 + 5 =$
3. $8 - 4 =$
4. $8 - 6 =$



"Now that we have seen this demonstration, it is your turn to consider how we can use number lines as well as count all and count on strategies in our maths lessons."

Provide this instruction:



In table groups, select a lesson to practice using these maths strategies.

- EP – Term 3 – Week 3 Monday-Friday (select one day)
- E1 – Term 1 – Week 8 – Wednesday or Thursday
- E2 – Term 2 – Week 7 (Wednesday) or Week 9 (select one day)

Once you have selected a lesson, study it first. Review the full weeks lessons.

Reflect on the following questions:

- 1) What is the progression of learning from the start of the week to the end of the week?
- 2) What strategies are used to solve the maths sums?
- 3) If number lines were not used, how could they be used to help children with the sums?

Allow 20 minutes for groups to work on the questions based on the selected lesson.

Ask for volunteers to present their lesson – (have one table for each grade present) by describing how they would use count all, count on and lines to help children with their sums.



Trainer tips – some ideas

- The SBC scripted lessons already use concrete objects. This is great and we should always continue to use concrete objects to solve problems.
- Applying different strategies helps children come to maths in their own way. We know that children learn differently, so having different strategies can make sure we reach all children in the classroom.
- Lines can be used for complex multi digit addition and subtraction problems. You do not need to start your line at 0. Instead start your line at the digit before the first number in the problem so if the problem is $14 + 9$ start the number line at 13. The end of the number line should be a digit after the sum so in the example above, the number line will end at 24.
- Remember to use the phrases “how many altogether” and “how many left/left over” or “how many more “or what’s the difference between” to help your students become familiar with these forms of words and the operations of addition and subtraction.

BREAK

15.00
–
15.45

SESSION 8 – Totals of ten, doubles and halving

Activity 15: (45 mins)

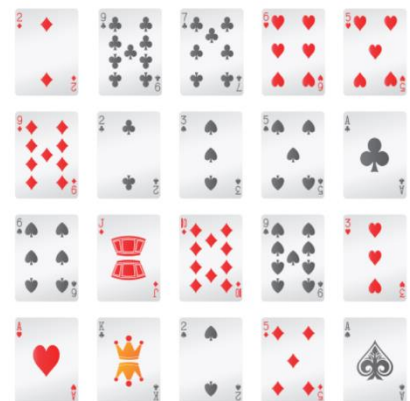
This is a game that is played with a deck of cards in pairs or threes.



“Games are a great way to help children develop their skills in maths. In this game, we will focus on the strategy of making 10s. This game helps children develop their mental math skills. For example, a child who knows the numbers that add up to 10 can look at 14 and 6 and know that would equal 20 without needing to ‘count on’ from 14. This child would immediately recognise that the 4 in 14 and the 6 make up 10.”

Here is the instruction for this game:

- Students play this game in pairs or threes.
- Lay out 20 cards face up in four rows of five, removing jokers, jacks, queens, and kings first.
- Put aside the rest of the deck.
- Take turns to find combinations of 2 or more cards that will total 10 exactly.
- When these combinations are found, put them aside.
- Continue to play until no more combinations of 10 can be made.
- When the game is over, write down the combinations of 10 that were made using addition notation.



Here is what the combinations might look like.

1	9
2	8

3	7
4	6
5	5
6	4
7	3
8	2
9	1



"This is a great game isn't it? Now let us consider how we can use this game in our maths lessons. In EP, by Term 1 – week 4 & 5 work is beginning on combining numbers to make up 10 and by Term 3, week 3 – more work is done on simple additions. For E1- Term 1 – week 8 + 9, simple addition and subtraction problems are a focus and of course E2, there is a big focus.



In your table groups discuss the following:

- How could you modify this for EP?
- How could you vary or extend this game for E2 students who are learning 2-digit addition?
- Do you have any further ideas on variations?

Ask for volunteers to share their responses.

Check their answers with the following:



Trainer tips

Modifications: You could set the task for addition up to 6 instead of 10 and reduce and number of cards

Extensions: Increase to a total of 20 instead of 10. You could also add in the jacks, queens, and kings which would represent 10's for an extra layer of complexity.

15.45

Activity 16: (45 mins)

16.30

Making tens and doubles

The objective of this session is to further explore strategies to use for addition and subtraction.



"Children do not build maths understanding simply by doing different drills and repetitive problems. Memorising facts does not lead to understanding. One might think that getting children to memorise facts rather than think about the relationships between numbers is a faster and better way to teach. But this is not so.

We are going to identify a few more strategies. Making tens and doubles is used in the curriculum, especially in E2. e.g., Term 1, Week 9 Friday and Term 3, Week 7 Tuesday.

Write the two problems on the blackboard.

$$9 + 7 = 10 + 6 = 16$$

$$6 + 7 = 6 + 6 + 1 = 13$$

Ask the question – Look at the two problems. Can anyone identify the patterns in each?

Allow a few minutes to see if anyone can identify the patterns?

Let us look at the first one.

Ask a follow up question – Can anyone look at the example and explain how this type of problem can be solved in a way that uses 10s?

After a few suggestions – go through slowly using the following. Demonstrate by drawing on the blackboard and going through the steps.

9 + 7 - how can this sum be made easier but still be the same? Ah, perhaps by using 10s.

9 easily becomes 10 by adding 1. To make this the same sum, we would then need to subtract 1 from 7 – so the new sum is 10 + 6

Ah...so easy – the answer is 16

9 +	7
10 +	6
16	

Making tens only works if the students have a sound understanding of +1/-1 and +10/-10 (for example, using objects, 100 square, number line and 10s frame).



In pairs try a few different sums using tens.

$$48 + 8 =$$

$$59 + 7 =$$

$$28 + 6 =$$

Allow a few minutes for the pairs to try the problems.

Ask for volunteers to share their answers.

Check their responses with the following:



Trainer tips

- $48 + 8 = 50 + 6 = 56$
- $59 + 7 = 60 + 6 = 66$
- $28 + 6 = 30 + 4 = 34$

Let us look at the second problem.

Ask a follow up question – Can anyone look at the example and explain how this type of problem can be solved in a way that uses doubles?

After a few suggestions – go through slowly using the following.

6 + 7 - how can this sum be made easier but still be the same? Ah, perhaps by using doubles. 7 easily becomes 6 + 1, which corresponds with the first number, so the new sum is 6 + 6 + 1 Ah...so easy – the answer is 13

6 +	7
6 +	6 + 1
13	

Share the following:



Trainer tips

- In this strategy we are helping children find doubles. Doubling a number is an important skill for children to learn. If they know their doubles, they can use that knowledge to add or subtract numbers. So, to use the strategy, children must be able to easily and quickly double numbers. When you are using this strategy, you are showing children that the number 7 can be broken into 6 + 1.



In pairs try a few different sums using doubling.

$$5 + 8 =$$

$$6 + 9 =$$

$$3 + 5 =$$

Allow a few minutes for the pairs to try the problems.

Ask for volunteers to share their answers.

Check their responses with the following:



Trainer tips

- $5 + 8 = 5 + 5 + 3 = 13$
- $6 + 9 = 6 + 6 + 3 = 15$
- $3 + 5 = 3 + 3 + 2 = 8$

A good example to show expansion to primary is to show that if you know double 5, you also know double 0.5, 50, double 500, double 5000 etc. so these are very useful facts and useful for the Term 3 and 4 in E2.

16.30
–
16.45

Explain the Prepare to Teach activity:

- Tonight, in your table groups, choose a lesson from the list we referred to in today's sessions. Choose a lesson that you have not yet practiced.

	▪ You might like to practice using one of the strategies that were taught today, such as number lines or making tens. ▪ Here are a few options for lessons but you can also select your own. ▪ EP – Term 3 – Week 3 Monday-Friday, Term 4 – Week 4 – Mon-Friday (select one day), ▪ E1 – Term 3 – Week 1 – Week 2 Mon-Friday (select one day) ▪ E2 – Term 2 – Week 7 or Week 9 (select one day) ▪ Prepare to show the group in tomorrow morning's session.
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6. DAY 3

6.1 Learning Objectives

By the end of the day teachers will be able to:

- Use different strategies to teach children simple operations.
- Use the SBC Maths teaching guide more effectively due to an increased understanding of its structure and instruction.

6.2 Today's SBC focus on content standards

Strand	Elementary Prep	Elementary 1	Elementary 2
Numbers and Operations	P.1.1 Find an easier representation for counting and comparing the numbers of concrete objects up to 120. P.1.2 Depending on the context, distinguish the number of objects and their position in order of objects with numbers and explain the condition carefully to the others. P.1.3 Compare larger or smaller numbers on the number sequence and number line and arrange in order. P.1.4 Use their understanding of numbers to count objects by 10 as a unit for place value. P.1.5 Understand the meaning of addition and calculate 1-digit numbers and 2 simple digit numbers. P.1.6 Understand the meaning of Subtraction and calculate 1-digit numbers and 2 simple digit numbers	1.1.1 Understand the meaning and representations of numbers using place value by making 10 and 100 up to 1000. 1.1.2 Understand the use of relative size of numbers in various situations. 1.1.3 Show and represent the meaning of half and quarter as equally divided part of a whole using pictorial or concrete objects. 1.1.4 Extend their understanding of addition and subtraction to calculate 2-digit numbers.	2.1.1 Appreciate and use their understanding of representing, recognising, reading, and writing of numbers up to 10,000 using base 10 place value 2.1.2 Understand the meaning of multiplication as repeated addition and represent it in various situations. 2.1.3 Extend their understanding of addition, subtraction, and multiplication to solve simple problems

6.3 Workshop DETAILS

8.00 –
8.30

SESSION 9 – Practice session using concrete and visual strategies.

Activity 17 (30 mins)

Practice

The purpose of this activity is to practice 10's and doubles in our maths lessons.



"We are now going to practice using 10's and doubles in our lessons. This time, we will work through an example together. Let us study this lesson."

TERM 4 WEEK 4 WEDNESDAY

1 OBJECTIVE

Make number sentence and stories from numbers 0 to 50 using '+', '-', and '='.

2 STARTER

Show the children a number flashcard between 1 and 19.
Ask, 'How many more need to be added make 20'.

5 CONCLUSION AND ASSESSMENT

Ask one pair to read out their story.
Ask the class to work it out.
Check to see if they agree with the pair.
Repeat with other pairs.
Make a note of those children not able to solve the problems and those finding it too easy. Use this information when you plan tomorrow's lesson.

LESSON TOPIC: Exploring circle and spheres
STRAND: Geometrical Figures
CONTENT STANDARD: 2.3.1

3 INTRODUCTION

Tell the children a number story, e.g. 'The farmer worked very hard planting beans. In one hour she planted 24 beans and she planted another 24 in the next hour. How many beans did she plant altogether?' [48]
Ask the children what number sentence you could write. Listen to their answers.
On the board write $24 + 24 =$ and read the number sentence.
Tell them one way to find the answer is to say 'double 24'.
Remind them that 24 can be broken into $20 + 4$ and an easy way to find the answer is to double 20 then double 4 and add the answers together.
Write $20 + 20 = 40$, $4 + 4 = 8$ and $40 + 8 = 48$.
Repeat the story using '12 + 12'

4 TEACHER AND STUDENT ACTIVITY

Write 5 addition sums, e.g. $21 + 21 =$, $13 + 13 =$, $22 + 22 =$, $14 + 14 =$ and $23 + 23 =$ on the board.
Put the children into pairs. Tell them to work out the answers.
Write the number sentences in their books and read them out loud.
Ask them to make up their own number story for one of the sums and solve it.

Discuss each step in the lesson.

Note the strategies that are being used in the lesson to help children.



Trainer tips

(1) Making tens

(2) Doubles

Now I will demonstrate the lesson.

Go through each step in the lesson slowly and carefully.

Ask the question – Based on what you have learnt today, do you have any suggestions on how the lesson can be enhanced?

Ask volunteers to share their ideas.



Trainer tips

- Number lines could be encouraged.
- Concrete objects could be used to validate answers

8.30 –
9.15

Activity 18 (45 mins)

Practice

Write the sum $28 + 19$ on the blackboard.

- How would you teach this problem to your students?

POTENTIAL ANSWERS:

Standard form (algorithm):

1

28

+19

7

Then add the ones column, which gives you 17. You write the 7 below the 8 and 9, and 28 you “carry” the 1 like this: + 19

Then you add the numbers in the ten’s column (2 and 1) as well as the 1 that you “carried.”

This gives you 4.

The answer is 47.



“I am now going to model a strategy called bundling. Bundling uses sticks and rubber bands so concrete objects to solve this problem.”

Represent the 28 with two bundles of 10 sticks and eight single sticks.

Then, separately, represent the number 19 using one bundle of 10 sticks and nine single sticks.

TENS	ONES
2	8 +
	
	
1	9
	



“How many bundles of 10 do we have all together? If we put together all the bundles of ten, we will have 3 bundles of 10.

Now count the number of single sticks that we have altogether. How many are there?

There are 17 single sticks. Could we make any bundles of 10 using these single sticks?

Make a bundle of 10 out of your 17 sticks.



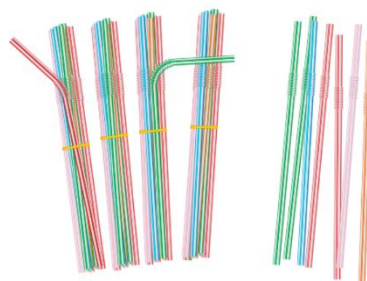
“We can make one bundle of 10 from single sticks. This leaves 7 single sticks.

Now how many bundles do we have?

How many single sticks do we have?

We have 4 bundles of 10 sticks and 7 single sticks which gives us 47.

*When you “carry” one, you are adding 1 ten to the tens column because you had enough ones to create another ten. This is called **regrouping**. **Regrouping is when you split a number apart and reorganise the parts to solve a problem.***



Trainer tips

- Children need a lot of experience regrouping with concrete objects to add numbers where regrouping is required.
- Teachers need to model how to regroup using concrete objects.



“Now it is time to practice this strategy using the maths teaching guides.

	 In table groups from the same grade level, use bundles of sticks and regrouping to demonstrate a lesson sequence choosing a lesson from this list of options. ▪ EP – Term 4 – Week 4 – Monday – Friday (choose a day) ▪ E1 – Term 2 – Week 4 – Monday – Friday (choose a day) ▪ E2 – Term 1 – Week 5 – Monday – Friday (choose a day) Walk around the room to check that groups understand the task. Ask them to reflect on the following in their planning. ▪ What part of the lesson can you use bundles of sticks and regrouping? ▪ What would be the key steps required? (e.g., model first on the blackboard?) ▪ What is the benefit of using bundles of sticks and regrouping for this lesson?
9.15 – 10.00	Activity 19 (45 mins) Micro lessons from yesterday The purpose of this activity is to observe some of the micro lesson’s teachers prepared the previous evening. If there are 6 groups, create pairs. Group 1 can present to Group 2 and then swap over. Each group presents to another group and then the other group demonstrates. Assign three reviewers from each group who will be responsible to provide feedback. Two of the reviewers will provide constructive positive feedback – what worked well. One review will provide constructive feedback on areas for improvement. The micro lessons are a segment of a full lesson. Please encourage teachers provide relevant context to the micro lessons. For example: <i>.....This lesson is taken from The micro lesson provides an activity that This micro lesson demonstrates the use of strategy.</i>

BREAK

10.30 – 11.15	SESSION 10 - More on subtraction Activity 20 (45 mins)  <i>“Let us consider how the strategy using bundles and grouping can help us solve maths problems. Let us focus on problems that require ‘borrowing’, which is common in E2.</i> Write 34 – 16 on the blackboard. Can anyone answer this question using the standard approach? Allow the volunteer time to complete the problem, encouraging the volunteer to explain how he/she is solving the problem as they go. Affirm their work. The standard algorithm or procedure is to write the numbers vertically.
---------------------------------	---

34

- 16

You would subtract the ones first. Since you cannot subtract 6 ones from 4 ones, you would need to 'borrow' a 1 from the 3 to make the 4 into 14. It becomes 14 because it is from the 'tens' column.

2

~~3~~¹4

-1 6

1 8

When you subtract the 6 from 14, you would get 8. Then you would subtract the numbers in the ten's column (1 from 2) which would give you 1. The answer would be 18.



In pairs, answer the following reflection questions?

You can take notes about your discussion in your notebooks.

1. Do you think some students would struggle with this?
2. What would be the explanation for this, based on what you have learnt so far in the training?
3. What ideas do you have, reflecting on the strategies you have learnt so far about numbers that you could use to help students solve this problem?

Allow a few minutes for pairs to discuss and share responses in table groups.



"Let us consider using bundles of sticks to solve this subtraction problem."

10's	Ones
30	4
— —	
10	6

Follow this instruction in your explanation as you demonstrate: Make sure you demonstrate using sticks first and then the tables so that teachers can see the connect between concrete and visual.

We can see that 34 is made up of 3 bundles of ten and 4 loose sticks. You now need to take away 16 from 34. **If we think of 16 in terms of bundles of sticks, how many bundles of ten and how many single sticks would we have?**

Allow for any suggestions from participants.

16 would be 1 bundle of ten and 6 ones. This is what we need to take away from 34. Let us take away the 10 first. **If we take one bundle of 10 away from 34, what would we be left with?**

10's	Ones
------	------

20	4

Allow for any suggestions from participants.

After taking away a ten from 34, we would be left with 2 tens and 4 ones or 24.

Now we need to take away 6 ones from the 2 tens and 4 ones that are remaining. **How can we do that?**

10's	Ones
10	14

Allow for any suggestions from participants.

If we have two bundles of ten and 4 single sticks, the only way to take away 6 single sticks would be to split one of the bundles of tens into single sticks or ones.

How many bundles of ten and how many single sticks or ones do you have now?

10's	Ones
10	8

Allow for any suggestions from participants.

What do we have left?

Allow for any suggestions from participants.

You will have one bundle of ten and 8 single sticks left, or 18.

Because you had to take away 6 ones from 4 ones, you had to 'borrow' 1 from the tens. When you borrow one during subtraction, you are taking one of your tens and converting it into ten ones. This is another way of regrouping. Remember that regrouping is when you split a number apart and reorganise the parts to solve a problem.

Ask any questions before moving on.



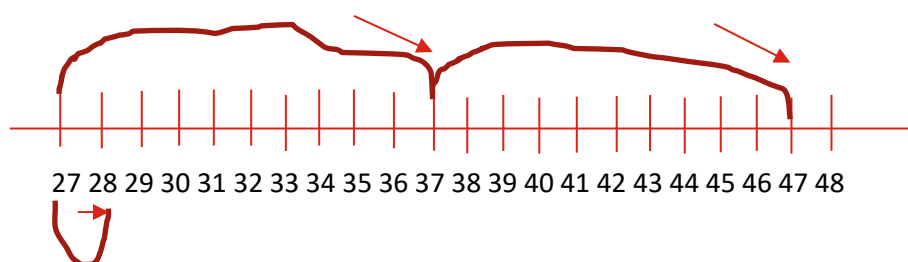
"Another way to solve subtraction problems is to use number lines. For more visual learners, this is a great strategy. Sometimes the algorithm method involves many steps and often children forget the steps or do the steps in the wrong order – this can lead to frustration.

Number lines do not need to go up in 1s. For large multi-digit addition or subtraction number lines can go up by 10s: or 5s. In addition, only the part of the number line that is needed can be drawn.

In elementary and E1, children learn how to skip count.

Write the following problem: $47 - 19 = 28$ on the blackboard.

We can draw an open number line at 27 and end up at 48.



The strategy to use here is to recognise that 19 is close to 20 (difference of 1) and it is faster to make jumps of 10 backwards, rather than counting by 1s backward 19 spaces.

Because we jumped back 20 spaces, we must move forward 1 space, to account for the difference of 1 between 19 and 20.



In table groups from the same grade level, practice these subtraction problems using lines and the technique that was just demonstrated.

- $26 - 9 =$
- $15 - 8 =$
- $67 - 28 =$
- $52 - 19 =$

Allow table groups to work on their answers, then ask for volunteers to come forward and draw a number line and demonstrate how the solution can be found.



"Before finishing the day, we will now talk briefly about subtraction and the kinds of strategies that children can use to become efficient problem solvers. Remember for addition – we have 'count all' and 'count on'. For subtraction there is 'removing'. You can also use 'count on' for subtraction. Remember also that the language that we use with students should be simple for them to understand – for example - addition is how many altogether and subtraction means taking away to find out how many are left over."

Go through each briefly.

Let us take the removing strategy. In a problem such as $73 - 4$ – the easiest way to arrive at the solution would be to remove the 4 from 73 by counting backwards – 73, 72, 70, 69. This is removing.

With another problem, $35 - 27$, the adding strategy would seem more efficient – 28, 29, 30, 31, 32, 33, 34, 35.



Trainer tips

- When numbers are close together, it makes sense to add on; when they are far apart, to work backward.

11.15 –
12.00

Activity 21: (45 mins)

Practice teaching subtraction from your teaching guides



"We are now going to apply what we have just learnt in some real lessons from your teaching guides."



In table groups from the same grade level, use lines to demonstrate a lesson sequence choosing a lesson from this list of options.

- EP – Term 4 – Week 4 – Monday – Friday (choose a day)
- E1 – Term 2 – Week 4 – Monday – Friday (choose a day)
- E2 – Term 4 – Week 4 – Thursday

You will need to select the lesson that has a focus on subtraction.

Ask them to reflect on the following in their planning.

- What part of the lesson can you use the number line?
- What would be the key steps required? (e.g., model first on the blackboard?)
- What is the benefit of using a number line for subtraction?



Trainer tips

- It may seem strange and difficult to solve problems in this way as you have not had experience with this strategy. However, teaching children new strategies at a young age, before they have committed to solving problems in one way, will build their fluidity with maths concepts.
- Once children are familiar with this strategy and have mastered skip counting forward and backward, they will be ready to be extended with more complex subtraction problems.

BREAK

13.00 –
13.45

SESSION 11 - Addition and subtraction stories

Activity 22 (45 mins)

Sometimes we know these as word problems or maths stories. We can solve word problems in many ways. Building on the three strategies we have learnt this morning and the use of concrete objects; we are now going to have some fun acting out word problems.



"I am now going to use 'drama' or 'acting out' to solve some maths problems."

May I have five volunteers to come to the front of the room?

Follow these instructions:



Trainer tips

- Ask the five volunteers to line up at the front of the class.
- Say – that the volunteers are ‘birds sitting on a branch’.
- {insert name}, {insert name}, {insert name} {insert name} and {insert name} are birds sitting on a branch. {insert name} and {insert name} fly away.
- (Pause for the two mentioned participants to ‘fly away’. Encourage participants to use flying motions.
- Ask – how many birds are left on the branch?
- Wait for an answer from the class.
- How can we show this using numbers and operations?
- Wait for an answer from the class.
- Write $5 - 2 = 3$ on the board. 5 is the original number of birds sitting on the branch. 2 is the number of birds that flew away and 3 is the number of birds that stayed sitting on the branch.



“That was fun. Now, let us work in our grade level groups. I will write some problems on the board. Your task is to solve the problem using drama/role play and then show how the problem is written using numbers.



In groups work on the following problems. They can use their own names or other names to fill in the gaps.

1. _____, _____, _____, and _____ are working on a farm.
_____, and
_____, also come to work at the farm. How many people are working on the farm?
2. _____, _____, and _____ are birds sitting in a tree. _____ and _____ flies
away. How many birds are left in the tree?
3. _____ put five books on the teacher’s desk and _____ put two more books on the
teacher’s desk. How many books are on the table altogether?
4. _____, _____, _____ and _____ are standing near the door.
_____ and

_____ are sitting on the floor near the door. How many more children are standing than sitting?

Allow 10 minutes for groups to practice acting out the work problems and presenting these problems using numbers.

Ask for volunteers to share each answer.



Trainer tips – some ideas

1. $4 + 2 = 6$

2. $3 - 2 = 1$

3. $5 + 2 = 7$

4. $4 - 2 = 2$

- Remember that students can represent word problems using concrete objects instead of or in addition to acting them out.
- Remember that students can also solve these problems using lines, when they are in the number form.
- Key understandings addressed:
 - Know that numbers can be joined and separated, and addition is putting together or adding to while subtraction is taking apart and taking from
 - Represent and solve problems involving addition and subtraction using multiple methods including simple equations.
 - Develop quick recall of basic addition/subtraction facts.
- If you do a scenario where a certain number of things leave and the same number returns, children will begin to see that subtraction and addition are inverse operations.

13.45 –
14.30

Activity 23: (45 mins)

Maths stories in SBC scripted lessons



"Now that we have seen this demonstration and we have practiced some word problems in table groups, it is your turn to consider how we can use drama/role play and concrete objects to solve word problems when we are teaching maths using the scripted lessons."

Provide this instruction:



In table groups, select a lesson to practice at your tables.

- EP – Term 3 – Week 3 Monday-Friday, Term 4 – Week 4 – Mon-Friday (select one day),
- E1 – Term 2 – Week 8 – Mon-Friday (select one day)

- E2 – Term 2 – Week 7 or Week 9 (select one day)

Once you have selected a lesson, study it first.

Reflect on the following questions:

- 1) How does the lesson begin – Was there an action song (TPR) or jingle? If not, can you suggest one that relates to the lesson?
- 2) What happens in the 'introduction'?
- 3) What happens in the teacher and student activity?
- 4) Are concrete objects or any strategies used to solve the problems?
- 5) How would you act out the problem, present the problem in a drawing or use concrete objects?

Allow 20 minutes for groups to work on the questions based on the selected lesson.

Ask for volunteers to present their activity – (ask different tables to present from the previous activity) by describing how they act out the problem, present the problem in a drawing or use concrete objects?



Trainer tips – some ideas

- With children, you may want to allow them to get used to acting out stories before they write them with numbers.

BREAK

15.00 –
16.30

SESSION 12 - Multiplication

Activity 24 (90 mins)

The purpose of this activity is to learn about the relationship between multiplication and addition and practice some strategies that connect the two concepts.



"We are now going to work with multiplication situations. Multiplication is related to addition, and we will explore this relationship together."

Children often ask to memorise the multiplication tables. Whilst it is helpful for children to gain confidence with multiplication, memorisation of the multiplication tables without an understanding of what it means to multiply results in shallow knowledge that cannot be flexibly applied to problem-solving.



In pairs, I want you to brainstorm things that come in groups. Here are a few questions for you.

You can take notes about your discussion in your notebooks.

1. What things come in 2s?
2. What things come in 4s?

Allow a few minutes for pairs to discuss and share responses in table groups.



Trainer tips

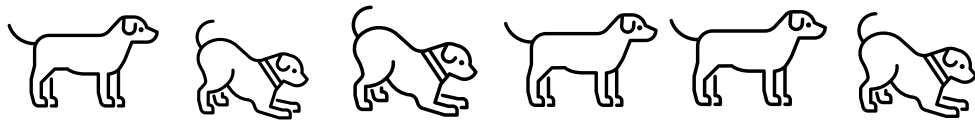
1. Eyes, ears, legs, arms, wings of a bird, wheels of a bicycle
2. Wheels of a car, legs of a cat, wheels of a cart, legs of a pig, legs of a dog.



"Now let us consider the legs of a dog."

Ask the question and write on the blackboard – If I had 6 dogs, how many legs would there be?

I will first show you with pictures.



$$4 + 4 + 4 + 4 + 4 + 4 = 24$$

Write a 4 under each dog with an addition symbol in between each 4. You should end up with

$$4 + 4 + 4 + 4 + 4 + 4 = 24$$

We have 6 dogs so there are 6 groups of 4. This can be written as 6×4



Trainer tips

Multiplication deals with groups of equal sizes so 6×4 means 6 groups of 4. We know that this equals 24 which is the same as $4 + 4 + 4 + 4 + 4 + 4 = 24$. Multiplication is repeated addition.

In EP and E1, it is important to know that multiplication is not taught but grouping and addition strategies are practiced. In E2, children learn to memorise times tables up to 10. There is not much focus on the connection between addition and multiplication. The money lessons in Term 4 are great to practice this strategy.



In table groups from the same grade level, follow the method we used previously to enhance the maths lesson. Here are some options of lessons.

- EP – Term 3 – Week 8 – Monday – Friday (choose a day) – steps 1 + 2 only.
- E1 – Term 1 – Week 4 – Monday – Friday (choose a day) – steps 1 + 2 only.
- E2 – Term 3 – Week 4 or 5 – Monday – Friday (choose a day)

Write on the board the instructions:

	Represent the multiplication scenario using: (1) Pictures (2) An addition problem (3) A multiplication problem As you prepare the lesson sequence, reflect on the following in their planning. What part of the lesson can you use the multiplication scenario or part of the strategy? What would be the key steps required? (e.g., model first on the blackboard?) What is the benefit of using these three steps to teach multiplication? Allow 30 mins for groups to prepare their response. Ask groups that are ready to present their work in front of the class. Before the end of the session, allow time for questions from the teachers.  Trainer tips When introducing multiplication, it is important to put it in a real-life context so that children see how the symbols are related to their experience. Therefore, you should start with objects that are familiar to the experience of students. Maths is more interesting and understandable to students when it is not just numbers and symbols but when it is connected to something that is meaningful to them.
16.30 – 16.45	Explain the Prepare to Teach activity: ▪ Tonight – EP teachers are to work in groups of four and prepare to demonstrate a lesson using concrete objects. ▪ For E1 teachers, choose a lesson that is focused on addition and subtraction and use bundles of sticks and regrouping to solve the problems. ▪ For E2 teachers, choose a lesson that is focused on addition and subtraction and use lines to solve the problems. Prepare to show the group in tomorrow morning's session.

7. DAY 4

7.1 Learning Objectives

By the end of the day teachers will be able to:

- Familiarize teachers with skills children need to develop in measurement.
- Practice different teaching strategies that can support SBC lessons on measurement.
- Practice using Maths scripted lessons and adapting activities to ensure children grasp the key concepts.

7.2 Today's SBC focus on Content Standards

Strand	Elementary Prep	Elementary 1	Elementary 2
Quantities and Measurement	P.2.1 Understand and compare quantities and produce arbitrary units of measurement. P.2.2 Read o'clock time in relation to long and shorthand on the clock face.	1.2.1 Understand and compare length of objects using the units of measurement such as centimetre (cm) and metre (m) 1.2.2 Extend the understanding of standard units of measurement in length to add and subtract quantities of measurement using scale. 1.2.3 Understand and set the units of time and duration in hours and days	2.2.1 Understand and compare volume of liquids using the standard units of measurement for volume such as millilitre (mL), decilitre (dL) and Litre (L) 2.2.2 Use the scale on clock face to represent their daily activities and how long it takes
Geometrical Figures	P.3.1 Understand the characteristics of geometrical figures through observation and composing using familiar shapes of objects	1.3.1 Understand and investigate components of triangles and quadrilaterals as geometrical figures 1.3.2 Knowing boxes by the component of the faces and make a box.	2.3.1 Understand and investigate the common properties of sphere and circles as geometrical figures

7.3 Workshop DETAILS

8.00 –
8.45

SESSION 13 - Introduction to Measurement

Activity 25: (45 mins)

The purpose of this activity is to build an understanding of the key concepts that are covered in measurement.



“For children to understand concepts of measurement and to develop their measuring skills they need to be involved in practical measuring activities. There are three broad stages of development in children’s understanding of measurement and skills in measuring which Elementary teachers should understand.



In pairs, try to identify what the three stages might be.

Allow a few minutes for pairs to generate ideas.

Ask for volunteers to share their ideas.

In summary, share the following:



Trainer tips

The three main stages of development in measurement, all referred to in the SBC, are:

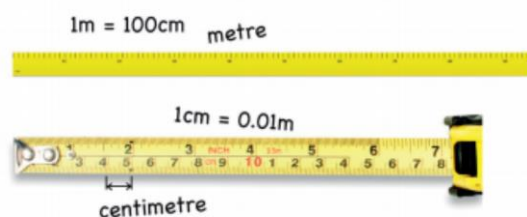
1. Measurement by direct comparison



2. Measurement using non-standard units.



3. Measurement using international standard units (metre [m], kilogram [kg] and litre [L])



We will learn more about these today.



In table groups from the same grade level, review the following table and answer the reflection questions below.

Grade level	Measurement stages of development and activities
EP/E1	Measurement by direct comparison – teach this through play activities, practicing language of comparison (longer/shorter, lighter/heavier, bigger/smaller than), estimating, one-to-one comparison of objects, ordering/sequencing of several objects. Look at an EP teaching guides to find some examples.
EP/E1	Measurement using non-standard units (such as handspan and feet) – teach this through practical measuring activities (using sticks, strings/ropes, light/heavy objects, containers of different shapes and sizes), estimating, ordering/ sequencing of several objects using a cultural unit of measurement or choosing a suitable non-standard unit. Look at an E1 teaching guide to find some examples
E1/E2	Measurement using standard units – teach this through lots of concrete measurement activities; using a ruler/simple tape measure (or string); scales and 1 litre measuring jug or container; estimating then measuring and ordering; simple fractional measurements using standard units – e.g., $\frac{1}{2}$ and $\frac{1}{4}$ m, kg, or L. Look at an E2 teaching guide to find some examples. 

Let us think about practical learning activities for children in each of the three stages of development in relation to measuring length, weight, and capacity.



In pairs, try to fill out as much as possible of this table.

Please note that **money and time** are a little different from other forms of measurement as children work with standard units from the beginning. They can do this because the standard units are familiar to them through life experiences (markets or shops, times of day, events on days of the week, birthdays, etc.)

Property	Direct comparison/EP/E1	Non-standard units/E1/E2	Standard units/E2
Length			
Weight			
Capacity			
Money			
Time			

Here are some answers that you can use to give ideas and suggestions to teachers. It would be great if you can demonstrate some of these using the resources on the resource table.

Property	Direct comparison	Non-standard units	Standard units
LENGTH	<i>Gather a big bundle of sticks and ask children to order them from short to long by direct comparison. Ask children to compare things in nature.</i>	<i>Children measure the length and width of a classroom desk by using several different kinds of sticks (toothpicks, matches, twigs, pencils etc.)</i>	<i>Children estimate, then use a 1m stick to measure, the length and width of part of the school playground. Estimate fractions of a metre in $\frac{1}{2}$'s and $\frac{1}{4}$'s</i>
WEIGHT	<i>Make a collection of stones. Compare weights and make estimates of lighter than and heavier than ... Sequence the objects from lightest to heaviest.</i>	<i>Children make a collection of a set of small standard objects (e.g., textbooks, slates, cans of sand). Using a beam balance, use them to measure the mass of a selection of other objects.</i>	<i>Children collect a set of objects. Arrange them from lightest to heaviest by estimation. Then use a set of scales to measure weight of objects in whole kilograms, $\frac{1}{2}$'s and $\frac{1}{4}$'s</i>
CAPACITY	<i>Make a collection of containers such as cups, cans, or bottles. Order them from smallest to largest capacity by pouring water between them and finding out which ones hold more than others</i>	<i>Children collect a range of containers (cups, cans, bottles etc.) ...Choose the smallest container (e.g., a small cup) as a non-standard unit. Pour water from the small container to fill each of the other containers. Sequence in order of capacity (how many cups ?)</i>	<i>Children find a 1 litre container and use it to fill up various objects and then arrange them in order of capacity from smallest to largest in litres. Estimate fractions of a litre in $\frac{1}{2}$'s and $\frac{1}{4}$'s where appropriate.</i>

	EP	E1	E2
MONEY	<i>Play "shop" with empty packets, tins, bottles etc. and trade for coins/tokens. Talk about money and its uses.</i>	<i>Answer questions or solve problems involving making up, adding, or subtracting amounts of money using coins and notes/tokens up to PGK50.00; begin to be</i>	<i>Answer questions or solve problems involving making up, adding, or subtracting amounts of money using coins and notes/tokens up to PGK100.00; make</i>

		Play with real coins and notes to PGK2.00 (or tokens) to learn names and values	able to answer simple questions/solve problems mentally.	mental calculations to answer questions/solve problems involving money
	TIME	Use and understand language of time - day/night; morning/afternoon; sunrise/sunset; short time/long time; clock; time school starts and finishes; days of the week; recognize hourly intervals on a clock-face.	Read day, month, and year; read a date (e.g., 18 th June 2021) Recognize "o'clock" and "half past" the hour on a clock-face	Use a calendar to locate and read day, month, and year. Recognize "o'clock", "half past", "quarter past" and "to" on a clock. Be aware of, and record, how long an event takes.
	After 20 mins, ask for volunteers to share their ideas and work through each measurement area. Provide suggestions from the table above to help teachers think of different ideas.			
8.45 – 9.15	Activity 26 (30 mins) Comparisons The purpose of this activity is to practice an activity about 'comparison' which is suitable for all classes, but especially suitable for EP.  <i>"Measurement is a topic in maths that deals with making comparisons between something that is being measured, like an object, and a type of measurement which may be classified as 'non-standard' or 'standard, such as handspan and centimetres if the length of the object is to be measured."</i>  Trainer tips Assemble bags of 5-6 objects ahead of time. Ideally, the bags should have identical objects. You should have one bag for every table group. Examples of objects that can be included: an empty tall plastic bottle, a pencil, an eraser, a textbook, an orange, and a stapler. The objects should vary in length and weight and when ordered by each attribute (property), the order should be different.  <i>"We will now do an activity to practice talking about measurement."</i> Provide the following instruction: ▪ Order the objects using length, from the shortest object to the longest object. Record this order in your notebooks. ▪ Reorder the same objects using weight, from the lightest object to the heaviest object. Record this order in your notebook. Allow teachers to complete the task. When they finish, give them the following reflection questions. 1. Which task was easier for you? Do you think this task would be easier for children too? Why? 2. What methods did you use to order the objects?			

	Ask for volunteers to share their answers to the task and their reflections on what was easier and the methods they used to order the objects. Trainer tips ▪ If groups had different orders when they ordered their objects by length, make a note of all the different orders. Then ask participants to think about why the orders are different. One possibility is the way in which participants interpret the 'length' of an object and/or where they position each object relative to each other and at the base. ▪ To determine which objects are longer - you need to first consider the longest side of each object. Then you would compare the longest sides of each object with each other. ▪ To compare the weight of the objects, you would need to hold one object in each hand and compare how heavy they feel. ▪ When ordering objects using different attributes, the order may change. Children would learn from experience that the length of an object does not determine its weight – two objects that have similar lengths and even similar sizes could have different weights. ▪ The key to developing skills in measurement is to give children a lot of experience with early measuring activities, particularly comparative activities and real tasks involving comparison using non-standard units around the classroom and the school environment. This prepares children for when they move on to measurement using international standard units and measuring tools such as rulers, tape measures, scales, 1 litre containers in tasks which relate mathematics to real life experiences.
9.15 – 10.00	Activity 27 (45 mins) Micro lessons from yesterday The purpose of this activity is to observe some of the micro lesson's teachers prepared the previous evening. If there are 6 groups, create pairs. Group 1 can present to Group 2 and then swap over. Each group presents to another group and then the other group demonstrates. Assign three reviewers from each group who will be responsible to provide feedback. Two of the reviewers will provide constructive positive feedback – what worked well. One review will provide constructive feedback on areas for improvement. The micro lessons are a segment of a full lesson. Please encourage teachers provide relevant context to the micro lessons. For example: <i>.....This lesson is taken from Term III, Week 2. The micro lesson provides an activity that transitions from the decoding exercise to the reading exercise..... This micro lesson demonstrates the use of strategy.</i>

BREAK

10.30 –
11.30

SESSION 14 - Key understandings in Measurement

Activity 28: (60 mins)

The purpose of this activity is refresh understandings in measurement.



“Let us spend some time looking at the kinds of skills we are trying to foster around measurement in young children up to grade 2.”



In pairs, review the following definitions together.

Property	Definition
Length	the distance from one end to the other end of an object.
Weight	a measure of how heavy or light that something is.
Capacity	a measure of the amount that something can hold or the amount of space that a container takes up.
Money	a measure of value or a means of payment, using coins or banknotes
Time	the ongoing sequence of events taking place - The past, present and future. The basic unit of time is the second. There are also minutes, hours, days, weeks, months, and years.



“Let us do an exercise together.”

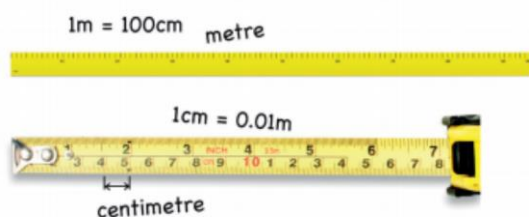
Write the task on the board.

- Measure the length of the desk in centimetres.
- Measure the length of the desk in metres.

Work in pairs to do the measurement.

Answer the following question:

What has the greater number of units when you measure the desk – centimetres or metres?



Why do you think this is?

Allow teachers time to undertake their measures and to answer the questions.

Share the following when the participants have finished.



Trainer tips

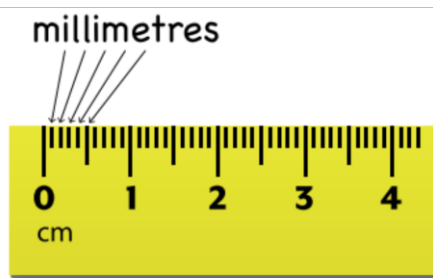
- The smaller the size of the unit you use, the more units there will be in a measurement.
- Centimetres are smaller than metres. Therefore, there will be more centimetres in the measurement.
- The larger the size of a unit used to measure, the fewer units there will be in measurement.
- Metres are larger than centimetres. Therefore, there will be fewer metres in the measurement.

We can summarise this by saying: **there is an inverse relationship between the size of unit and number of units in a particular measurement or in other words it is when a unit is the reverse of the measure. e.g., the larger the unit the smaller the measure, the smaller the unit, the larger the measure.**

Now demonstrate the following:

If I measured this pen in centimetres and then in millimetres, which number would be higher, the number of centimetres or the number of millimetres? Why?

Measure the pen in both centimetres and millimetres in front of the class.



Ask for volunteers to share their answer.

Confirm by saying: The number of millimetres is higher. This is because millimetres are a smaller unit of measurement than centimetres.



“Let us practice standard and non-standard measurement and consider the advantages and disadvantages of both.”

Write the description of the task on the blackboard.

In this task we will measure lengths using hands and feet.

Your task is to work as a group and measure the length of a segment of the room, firstly with your feet and then with your hand. Each of you should take a measure using your feet and your hand.

Remember: place one foot after the other with the heels touching the toes.



Record your answers in the table provided.

Name of person	Length using feet	Length using hands

Once you have finished, answer the following questions.

1. Which measure is larger, feet or hands?
2. Which person had the smallest measures in feet? Why?
3. Which person had the largest measures in hands? Why?
4. Why are the measures different?

5. What are the advantages and disadvantages of using feet and hands to measure?

Ask for volunteer groups to share their answers to the rest of the class. Discuss similarities and differences with other group's measures.



Trainer tips

- Remember: the larger the size of a unit used to measure, the fewer units there will be.
- Children need a lot of experience to realize that a bigger foot will result in fewer steps.
- Measuring is never exact – there may be gaps or overlaps in the persons steps, or perhaps the person did not start or stop in the same place each time.
- The main advantage of using hands/feet is that they are always with you wherever you go.
- The main disadvantage is that different people have different-sized hands and feet so measurements can be inconsistent and difficult to communicate.
- Hands and feet are often used for estimation.



"Now let us try using standard units of measure and see if the advantages and disadvantages are the same as non-standard measurement."

In this task we will measure length using a ruler.

Your task is to work as a group again and measure the same length as before but this time with a ruler.

Record your measurements in the table below. Each person should take a measure.

Name of person	Length using a ruler

Once you have finished, answer the following questions.

- (1) Are the lengths the same or slightly different? Explain your answer.
- (2) How would you check for accuracy?
- (3) What are the advantages and disadvantages of using a ruler to measure length?

Ask for volunteer groups to share their answers to the rest of the class. Discuss similarities and differences with other group's measures.



Trainer tips

- The lengths are likely going to be the same or almost the same.
- You can check for accuracy by doing the measurement again.
- Children need experience with measuring so try to find as many opportunities as possible for children to measure things with a ruler so that they become familiar with standard tools and units for the measurement of length.
- Standard measures are often used for accuracy.



"We are now going to review our teaching guides and check what activities are used to help students learn about measurement."



In table groups from the same grade level, review the teaching guide for one day or a few days during that week and answer the reflection questions.

- EP – Term 1 – Week 7 – Monday – Friday
- E1 – Term 2 – Week 9 – Monday – Friday
- E2 – Term 3 – Week 8 - Monday – Friday

Reflect on the following:

1. What objects are measured in the lessons this week?
2. How are these things measured? Is this using a standard or non-standard unit of measure?
3. What strategies are used to connect students with the concept of measurement?
4. How did learning progress from Monday – Friday?

Allow 15 minutes for teachers to review the lesson/s in groups and complete the questions.

Ask for a volunteer who can report on EP, then another for E1 and then E2. Summarise after each one using the summary prepared below.



Trainer tips

- In EP, the week's example focuses on measuring height and length in non-standard ways. Children spend the week using string and handspan and arm's length measuring their height and the length of objects in the classroom and around the yard.
- In E1, the week's example focuses on estimating and measuring heavy objects using improvised balances. Exercises were done to arrange according to heaviest to lightest.
- In E2, the week's example focuses on estimating, measuring, and recording weight using a scale balance and solve simple weight problems using 1kg, $\frac{1}{2}$ kg $\frac{1}{4}$ g. The lessons use bags of rice and different problems are posed comparing different weights.
- Reinforce the use of language in measurement and questions such as how long, how heavy, how wide, etc and the use of units of measurement to complete answers – e.g., it is 12 cm long – it is 3 metres wide.

BREAK

13.0
0 –
13.4
5

SESSION 15 - Telling the time

Activity 29 (45 mins)



"In elementary, children are introduced to analog clocks and learn how to read a clock face. Because children are increasingly exposed to digital technology, having awareness of digital time is important and can be integrated into lessons and students understanding that each hour has 60 minutes. This is a difficult skill that takes time to develop. Many children struggle with telling time. Children need repeated exposure to time and concepts about time, from teachers talking about time in ways that are concrete and relevant to children and showing time on the clock."



Using think-pair-share, brainstorm ways that teachers can include talking about time in the classroom in a way that is relevant to children.



Allow 3 minutes for teachers to generate a list.

Ask for volunteers to share some of their ideas with the rest of the class. Generate a list on the blackboard.

Here are some examples to add to the class list.



Trainer tips

- Talking about time in daily routines like asking children what they do when they wake up, after school, at night.
- Asking children to estimate how long a particular task, like walking to school might take. This helps children link time to actual numbers.
- Talking explicitly about a clock-pointing out the minute and hour hands, showing seconds elapse on a digital clock, announcing the time at different times of the day, talking about age, who is older, younger.



"These are good suggestions. Teachers can also keep a large clock in the room with moveable hands, red for the hour hand and blue for the minute hand and ask children different questions regarding the clock. As much as possible, teachers should refer to the actual time, noting how much time is left until the next lesson, or how much time has elapsed since starting the lesson."

I will now share one game with you that you can play with your students in the classroom to develop their skills in telling time.

The first game is: **Time Bingo.**

Draw a bingo board on the blackboard.

Write a list of times in a column, making sure there are more time choices listed on the board than there are spaces on the bingo card. Here is one that is relevant for each grade.

EP	E1	E2
12:00 (twelve o'clock)	12:30 (half past twelve)	9:45 (quarter to ten)
3:00 (three o'clock)	3:00 (three o'clock)	8:15 (quarter past eight)
6:00 (six o'clock)	6:30 (half past six)	10:30 (half past ten)
4:00 (four o'clock)	4:00 (four o'clock)	12:15 (quarter past twelve)
2:00 (two o'clock)	2:30 (half past two)	7:15 (quarter past seven)
5:00 (five o'clock)	5:00 (five o'clock)	5:30 (half past five)
7:00 (seven o'clock)	7:30 (half past seven)	4:45 (quarter to five)
9:00 (nine o'clock)	9:00 (nine o'clock)	2:15 (quarter past two)
1:00 (one o'clock)	1:30 (half past one)	7:30 (half past seven)
10:00 (ten o'clock)	10:00 (ten o'clock)	10:15 (quarter past ten)
11:00 (eleven o'clock)	11:30 (half past eleven)	1:15 (quarter past one)
8:00 (eight o'clock)	8:00 (eight o'clock)	8:45 (quarter to nine)

Ask teachers to fill their 3×3 grid with times from E2. They need to add one time to each grid. If they are only familiar with analog they can write the times in analog form. The diagram below is written in digital form.

10:00	1:30	9:45
12:00	8:15	2:30
3:45	4:00	6:00

To play the game, the teacher uses the clock with moveable hands to show the time.

Do you have this time on your board?

If you do, place a marker over it.

First one to cover all their squares wins the game.

13.4
5 –
14.3
0

Activity 30 (45 mins)

Practice

The purpose of this activity is to study the teaching guides and learn how time is taught in elementary.



"We are now going to review our teaching guides and check what activities are used to help students learn how to read the time."



In table groups from the same grade level, review the teaching guide for one day or a few days during that week and answer the reflection questions.

- EP – Term 1 – Week 7 – Monday – Friday
- E1 – Term 3 – Week 5 – Monday – Friday
- E2 – Term 4 – Week 2 – Monday – Friday

Reflect on the following:

1. What is the objective of the lessons on time this week?
2. What strategies are used to connect students with times of the day?
3. How did learning progress from Monday – Friday?

Allow 15 minutes for teachers to review the lesson/s in groups and complete the questions.

Ask for a volunteer who can report on EP, then another for E1 and then E2. Summarise after each one using the summary prepared below.



Trainer tips

- Reinforce the importance of students coming to school every day because each lesson provides important background to the next lesson. If a child misses a day of school, this progression is disrupted.
- In EP, the week's example focuses on concepts of day and night and what key activities (breakfast, lunch, and dinner) occur throughout the day. By the end of the week, the

	teacher has introduced the times of day and connected this to key activities and time intervals, such as day and night, morning, and afternoon. The clock is introduced and the concept 'o'clock to represent hour. ▪ In E1, the week's example focuses on reading day, date, month, and events using calendar and reading the time in hours and half hour on clock face. Each day they focus on describing the day and date and by the end of the week students are reading from the clock face to the hour and half hour. ▪ In E2, the week's example focuses on reading day, date, month, and year and recording how long daily events last e.g., hours of darkness, morning lessons. Sequencing of events across the day is ordered in the correct way such as morning, recess, lunch, afternoon, dinner. Times are practiced for times by 15 mins using the term 'quarter to' and 'quarter past'.
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BREAK

15.00 – 15.45	SESSION 16 - Introduction to geometry and 2D shapes Activity 31: (45 mins)  <i>"We are now going to learn about very fun part of maths – geometry. Geometry is a topic in maths that involves the study of shapes, their properties, space and the relations of points, lines, and angles. In the final session today, we will learn ways in which teachers can promote the learning of these concepts in their classrooms."</i>  In pairs, list all the shapes that you see in this room. The shapes can be two dimensional or three dimensional. Ask for volunteers to create a list on the blackboard. Add the items below if they are not mentioned.  Trainer tips ▪ Rectangles – doors, desk, blackboard, textbook, books, windows ▪ Circles – clock face, buttons on a shirt, ▪ Cylinder - pencils and pens, chalk, chair leg As we observe, our environment can give us practice in identifying and naming shapes. Geometry is the most visible branch of mathematics in the physical world. Experiences in geometry for children should begin with familiar objects and should use a variety of materials to develop appropriate vocabulary and build understanding of concepts like shape, size, and symmetry. Symmetry is an important concept in geometry, and it is where students learning about halves of a whole.
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“Let us play a game using sticks and forming shapes. One-way teachers can teach about geometry is to use concrete materials to construct and re-arrange shapes.



In table groups gather a collection of sticks of standard size (e.g., sticks or even toothpicks).

Work through the following problems and questions, using the sticks.

No.	Instruction	Questions
1	a square with sides which are 2 sticks long	How many sticks are used?
2	a triangle with each side 3 sticks long	How many corners/angles does it have?
3	a triangle with sides of 3 x 4 x 5	What do you notice about this shape?
4	a rectangle with sides of 7 X 2 sticks	how many corners/angles does it have?
5	a triangle with two sides of 5 and one side of 3 sticks	What can you say about the angles in the triangle?
6	a rectangle with sides of 3 and 5 sticks	Can you use all these sticks to make a square?

Once the problems are solved, reflect on the following questions.

1. What are these shapes called?
2. What grade level could make models like this?
3. What skills would students be developing if they did this activity?



Trainer tips

Answers:

- (1) 8
- (2) 3
- (3) One angle is right angle or 90 degrees.
- (4) 4
- (5) two large angles and one small/sharp one
- (6) yes – 4 X 4.

In response to the reflection questions – the shapes are square, triangle and rectangle – all shapes that elementary students learn. These shapes are taught from EP. They are learning about angles, sides, faces, and other features of 2D shapes.

Now construct a series of problems by drawing on the board the following



In pairs, work through the following problems to see if you can find the solution.

No.	Drawing	Problem
-----	---------	---------

1	Trainer draws 2 adjoining 1x1 squares with a common side.	By taking away 1 stick, leave no squares.
2	Trainer draws 5 sticks on the board in a bundle	Use 5 sticks to construct 2 triangles
3	Facilitator draws 6 sticks on the board in a bundle	Use the 6 sticks to make a square and a triangle.
4	Trainer draws 3 adjoining triangles, the middle one shares sides with others to left and right.	Remove one stick to make two triangles.
5	Trainer draws 2 x 2 square with 2 rows, 2 columns.	Take away two sticks leaving two squares
6	Trainer draws 3 1x1 squares with adjoining sides in an L shape.	Move two sticks to different positions to create only 2 squares.



Once the exercise is complete, reflect on the kind of skills that are used to work out these problems.

After a few minutes ask for volunteers to share some ideas.



Trainer tips

- The key skill is problem solving but students would also need to know their shapes and the characteristics of each shape in terms of sides and angles.
- Students would also need fine motor skills to move the sticks and form shapes with the sticks.
- Students would also need information processing skills to understand the problem and be able to picture the solution in their heads.

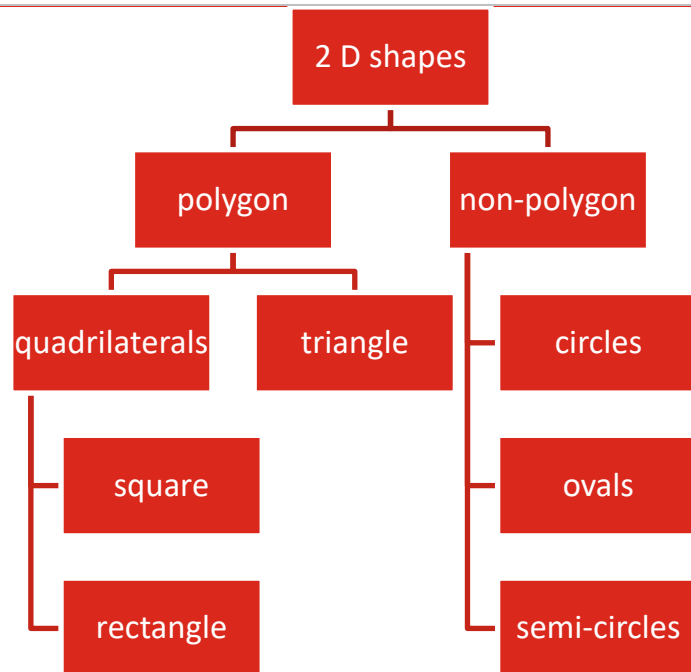


"We are now going to learn about 2D shapes and then practice some lessons focused on geometry from our teaching guides.

First, let us familiarise ourselves with the two groups of 2D shapes.

Go through this explanation with teachers, referring to the flowchart as you go.

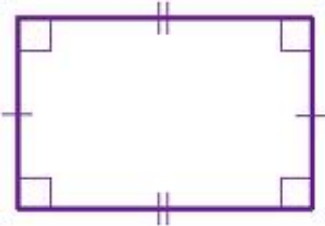
2D shapes are either polygons, if they have straight sides or not polygons if the shape has some or all curved sides such as circles, ovals, or semicircles. Polygons are classified by the number of sides they have. For example, a three-sided shape is a triangle, and a four-sided shape is a quadrilateral.



Rectangles and Squares are common types of quadrilaterals. How would you describe their characteristics or features?

Allow a few minutes for pairs to think of some answers then ask for volunteers to come up the front and write and draw their quadrilateral, explaining the features as they go.

Refer to this table which is also found in Annex B.

Categories of Quadrilaterals		Example
Rectangles	Four straight sides and four 90° angles	
Squares	Four straight <i>equal</i> sides and four 90° angles (is a type of rectangle)	



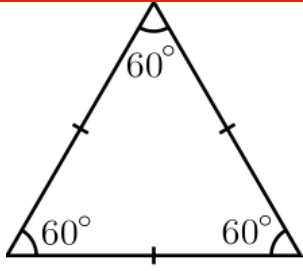
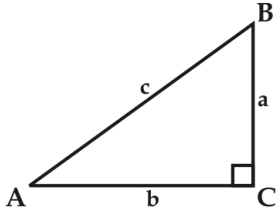
"Triangles are also divided into categories. The two common ones that are explored a little in E2 are equilateral triangles and right-angled triangle."



In pairs, what are the characteristics or features of these two types of triangles.

Allow a few minutes for pairs to think of some answers then ask for volunteers to come up the front and write and draw their triangle, explaining features of the triangle as they go.

Refer to this table which is also found in Annex C.

Categories of Triangles		Example
Equilateral	Three equal sides (and three equal angles of 60°)	
Right-angled triangle	A triangle with one 90° or right angle	

An important aspect of student learning in relation to 2D shapes is the concept of symmetry.

Turn to E2 Term 2, Week 5 which covers the topic of symmetry.

Discuss the learning progression from Monday – Friday.

Discuss how the lessons could be enhanced that week.

15.45

Activity 32: (45 mins)

–
16.30

Practice

The purpose of this activity is to study the teaching guides and practice some lessons that focus on teaching 2D shapes in geometry.



"We are now going to review our teaching guides and study the use of different strategies to help students learn about 2D shapes in geometry."



In table groups from the same grade level, review the teaching guide for one day or a few days during that week and answer the reflection questions.

- EP – Term 2 – Week 6 – Monday – Friday
- E1 – Term 3 – Week 9 – Monday – Friday
- E2 – Term 2 – Week 2 - Monday – Friday

Reflect on the following:

1. What is the objective of the lessons this week focused on shapes?
2. What strategies are used to connect students with these shapes?
3. What activities are done throughout the week with the students?
4. What preparations would be required to prepare for the lessons that week?

Allow 20 minutes for teachers to review the lesson/s in groups and complete the questions.

Ask for a volunteer who can report on EP, then another for E1 and then E2. Summarise after each one using the summary prepared below.



Trainer tips

- In EP, the week's example focuses on understanding the features of squares/rectangles, triangles, and circles. Students collect objects, identify objects, sort objects, and describe them. Later in the week they make paper planes and other figures with different shape cut outs.
- In E1, the week's example focuses on identifying, sorting, and naming four sided shapes in their environment. They learn how to describe their features and their different names. They draw on the classroom environment and external environment and name objects that have a similar shape.
- In E2, the week's example focuses on identifying, sorting, and naming the most common 2D shapes in the environment. They learn how to describe their features and their different names. They identify many different types of shapes in their classroom and environment.

16.30
–
16.45

Explain the Prepare to Teach activity:

- Tonight, your task will be to develop a shop stall for a game that the whole group will play tomorrow. This game will focus on using money which is an important learning area in measurement.



- Here are the key steps:
 1. Decide what stall you will make – e.g., snacks, fruits, vegetables, stationary, kitchen equipment etc. Collect as many items as possible. Aim for 10-20 items.

Fruit



Vegetables



Toys



Ice Cream



2. Label each item with a price. Think of reasonable prices for the items in your shop.
3. Make some money (banknotes and coins) or use monopoly money/pretend money. You might decide to use shells if available.
4. Set up your stall on a desk – name your stall and organise the items so they are easy to see.
5. Instructions for the game will be provided tomorrow.

8. DAY 5

8.1 Learning Objectives

By the end of the day teachers will be able to:

- Plan and conduct teaching and learning activities that help students understand 3D features in geometry.
- Plan and conduct teaching and learning activities that help students understand data and mathematical relations.
- Follow the lesson plans and identifying ways to enhance the lessons using strategies that support student's understanding of mathematics concepts.
- Apply the term assessment tasks for mathematics as required in the SBC syllabus.

8.2 Today's SBC focus on content standards

Strand	Elementary Prep	Elementary 1	Elementary 2
Geometrical Figures	P.3.1 Understand the characteristics of geometrical figures through observation and composing using familiar shapes of objects	1.3.1 Understand and investigate components of triangles and quadrilaterals as geometrical figures. 1.3.2 Knowing boxes by the component of the faces and make a box.	2.3.1 Understand and investigate the common properties of sphere. and circles as geometrical figures
Data and Mathematical Relations	P.4.1 Find patterns and recognise their structure in addition and subtraction. P.4.2 Explore and represent number of objects in form of picture and figures and interpret their patterns.	1.4.1 Apply using rules for inverse operation to calculate addition and subtraction 1.4.2 Understand and use simple tables and graphs to represent and compare various types of situations in everyday life.	2.4.1 Understand the structure of multiplication tables and use it for up to 9 x 9 multiplication table.

8.3 Workshop DETAILS

8.00 –
9.15

SESSION 17 - 3D shapes in our environment

Activity 33: (75 mins)



“Welcome to the fifth and final day of teacher training on SBC Mathematics. Today we are going to learn about 3D shapes and about the fourth strand in SBC Mathematics called data and mathematical relations. We will practice some assessment tasks so that you will be ready to assess students effectively during the year.

Let us begin with a session on geometry.



In pairs, list all the 3D shapes that you can think of. Also list some objects in our environment that have that shape.

Allow a few minutes for teachers to brainstorm and write their lists.

Ask for volunteers to share their list of 3D shapes and objects with the rest of the class.

Use this list to complement the class list.

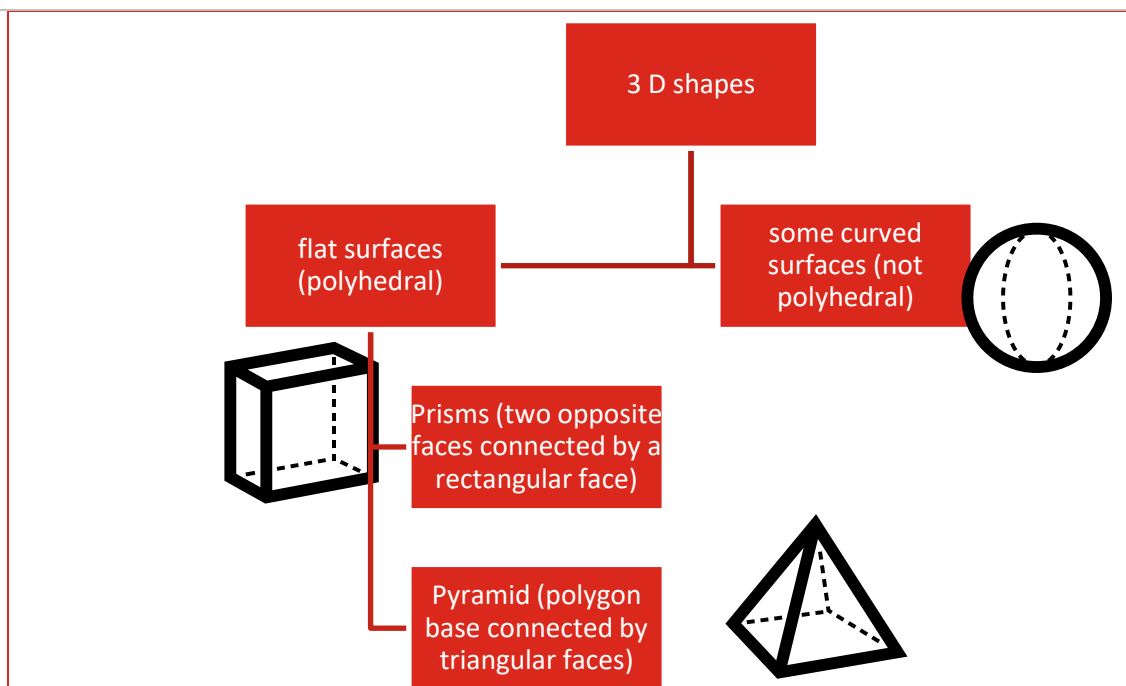


Trainer tips

- Sphere – soccer balls, tennis balls,
- Cylinders – biscuit tin, pencil pr pen, tennis ball container, cup, barrel,
- Cone – ice cream cone
- Cube -
- Cuboid – rectangular prism

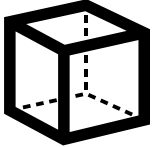
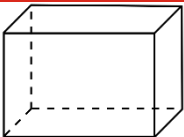
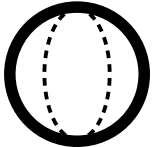
Go through the explanation carefully, referring to the flow diagram and pictures.

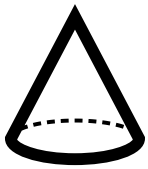
A 3-D shape is either polyhedral (only flat faces) or not polyhedral (do not have only flat faces). Prisms and pyramids are types of polyhedral. Prisms are 3-D shapes that have two congruent faces (have the same shape and size) connected by rectangular faces. Pyramids are 3-D shapes that can have any polygon as a base with all other faces being triangles that connect at a single vertex.



"3D shapes are introduced in E1 and given more focus on E2. Teachers can help children notice similarities and differences between 3-D shapes including: The shapes of the faces, the number of edges, and the number of vertices (corners).

The 3D shapes covered in E2 are:

3D shape	Number of vertices (corner)	Number of faces	Number of edges	
Cube	8	6	12	
Cuboid (rectangular prism)	8	6	12	
Sphere	0	0	0	
Cylinder	0	2	2	

	Cone	1	1	1	
9.15 – 10.00	 <i>“Let us have some fun making a cube. There is a template in Annex. You will need scissors. If you have time decorate the cube. As you make the cube take note of the number of faces, edges, and corners.</i> Allow 10 minutes for teachers to work on their cube. Walk around the class and quiz teachers on the number of faces, edges, and vertices. Reflect as a whole class on the advantages of doing practical exercises like this to learn about 3D shapes. Review Term 2, Week 9 E1 and reflect on the weeks’ progression in terms of learning about 3D shapes. What are the strengths of the lessons this week? What aspects of the scripted lessons could be enhanced based on your new understanding of scripted lessons and Maths strategies?				
	Activity 34 (45 mins) Playing shops – practicing counting and using money Now it is time to shops. Make sure the stalls have been set up. Remember that you can play shops or markets – the maths concept is the same. Each pair is given 40 kina in pretend money. (there is a template in Annex if pretend money is needed). In pairs discuss the following questions before going shopping. ▪ What will you buy from the shops? ▪ Which notes/coins will you need? ▪ Which notes/coins will you receive in change? You might like to write a list and make calculations in your notebooks. From your table, each pair takes turns to play shopkeeper, while the other pairs shop. After 20 mins of playing, sit down and reflect on the activity. 1. What are some of the benefits of playing a game like this? 2. What Maths skills do we use when we play shops?  Trainer tips				

	▪ End the session by explaining that playing shops is used as a game in the Mathematics teaching guides. In Elementary 2, Term 3 Week 4 and 5 is focused on money and Week 5 – playing shops is the key strategy. In Elementary 1, Term 3 Week 6 and 7 is dedicated to money and playing shops is a key strategy. Even in Elementary, Term 3 Week 8 focuses on playing shops. ▪ To maximise learning when playing shops, the teacher should continue to ask questions to students. How much does it cost? How much kina will you have left over if you buy this item? Do you have enough money to buy this item? How much do these two items cost if you buy both? etc.
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BREAK

10.30 – 11.15	SESSION 18 - Data and mathematical relations Activity 35: (45 mins) The purpose of this activity is to become familiar with the focus learning areas within the strand: data and mathematic relations and learn a few simple strategies to support children’s development in this area.  <i>“This strand involves ways of thinking and methods that can be commonly used in handling quantities and geometrical figures. In this strand, children are introduced to algebraic expressions and their purpose in solving mathematical equations. Students also learn how to interpret and organise numbers and quantities and represent them by using simple tables and graphs. They also learn skills in interpreting these representations. In EP and E1, data and mathematic relations focus on classification and patterns and in E1 and E2, there is a focus on number patterns and predicting the missing element in a maths pattern or algorithm, such as If $5 + A = 8$, what is the value of A? By E2, children are also expected to be able to make, read and interpret simple graphs.</i> <i>Let us look initially at algebra. Algebra deals with number patterns and patterns. Children can learn to describe and record the patterns using diagrams, words, or symbols.</i>  In pairs, study the number chart over the page and answer these reflection questions. ▪ What patterns do you notice? ▪ What pattern do you notice with the odd numbers? ▪ What pattern do you notice with the even numbers? ▪ What pattern do you notice with the numbers that have both digits the same? ▪ What pattern do you notice with the numbers that end with 6? ▪ What pattern do you notice with the numbers that end with 0?
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LOOKING FOR PATTERNS: IN A 100S CHART

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

Allow 5 minutes for teachers to answer the questions based on the number chart.

Ask for volunteers to share their answers with the rest of the class.

Use these answers to complement the class answers.



Trainer tips

- 5.** Each row increases by 10 moving down. Each column goes up in 1 moving to the right.
- 6.** All odd numbers are in similar rows (rows 1, 3, 5, 7 and 9)
- 7.** All even numbers are in similar rows (rows 2, 4, 6, 8 and 10)
- 8.** Each number with the same digit is located on that row and column. For example - to find where 22 is – go to 2nd row, 2nd column. To find where 88 is – go to 8th row, 8th column. It is also a pattern of 11.
- 9.** They are all located in the 6th column.
- 10.** They are all located in the 10th column.

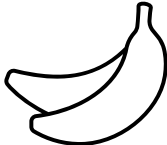
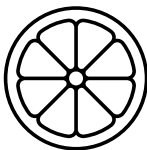


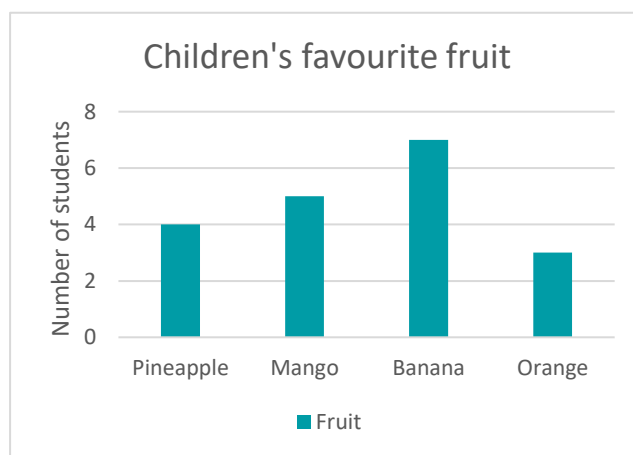
"Now, let us look at some graphs and do some interpretation. Let us play a game and record our favourite fruit."

Draw a table on the board and ask teachers to add a line that represents which fruit is their favourite.

Here is an example as an idea.

In this example – 2 students love pineapples, 5 students love mangoes, 7 students love bananas, and 3 students love oranges.

Pineapple 	Mango 
II	IIII
banana	oranges
	
IIII II	III



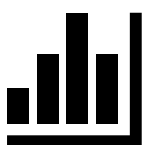
Once teachers have identified their favourite fruit, ask teachers to create a graph that shows the results pictorially. The example provided is one idea.



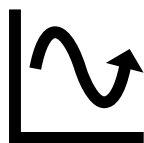
Trainer tips

There are many different types of graphs. A pictorial graph which is presented above is the common one used in elementary because it helps students understand when they see pictures.

Graphs can be in columns. Columns are useful when showing types and comparisons.



Graphs can be in lines. Lines are used to show change. e.g., rainfall over the months of the year.



Graphs can also be shown in pie charts. Pie charts are used to show parts of a whole.



Allow 10 minutes for teachers to prepare their graphs.

Ask for volunteers to show their completed graphs.



In pairs, reflect on the following questions about the exercise.

1. What are the advantages of using graphs to present data?
2. If you were asked to describe the result, what would you say.
3. What features make a good graph?

Allow a few minutes for pairs to complete the questions.

Ask for volunteers to share their responses.

Use these answers to complement the class answers.



Trainer tips

1. It is easy to see the result visually.
2. Bananas are the most favourite fruit in the class and the least favourite fruit was apples.
3. Clear lines and different colours to represent different data. Appropriate labels and icons to help students understand the graph.

The key advantage of using graphs is that it helps show the results. Students should be encouraged to explain their results from the graph, and this can be encouraged if the teacher asks lots of questions about the graph. This will promote discussion.

11.15 –
12.00

Activity 36: (60 mins)

Practice

The purpose of this activity is to study the teaching guides and practice some lessons that focus on data and mathematical relations.



“We are now going to review our teaching guides and study the use of different strategies to help students learn about data and mathematical relations.”



In table groups from the same grade level, review the teaching guide for one day or a few days during that week and answer the reflection questions.

- EP – Term 2 – Week 4 – Monday – Friday
- E1 – Term 3 – Week 8 – Monday – Friday
- E2 – Term 4 – Week 6 – Monday – Friday

Reflect on the following:

1. What is the objective of the lessons this week focused on data and mathematical relations?
2. What strategies are used to connect students with the concepts taught?
3. What activities are done throughout the week with the students?
4. What preparations would be required to prepare for the lessons that week?

Allow 20 minutes for teachers to review the lesson/s in groups and complete the questions.

Ask for a volunteer who can report on EP, then another for E1 and then E2. Summarise after each one using the summary prepared below.



Trainer tips

- In EP, the week’s example focuses on recognising and completing simple patterns in colour, shapes, and sizes. The lessons for the week are spent ordering and sorting and creating patterns using concrete objects – local resources that children can find at home or in their environment. This is a very interactive week for students. Note – the strand mentioned in this week’s scripted lessons do not match the content. Pictures and objects will really help this week’s lessons.
- In E1, the week’s example focuses on select and sorting real objects by two features e.g., shape, colour, or size. This week, students spend time collecting data and organising their data into tables where columns represent different features. Objects are from children’s own environment or information about their families.
- In E2, the week’s example focuses on representing and interpreting data. Students select and sort real objects by three features – e.g., shape, colour, and size. They learn how to represent data in graphs and how to explain what they see in the graphs.

BREAK

13.00 –
13.45

SESSION 19 - Assessment

Activity 37: (45 mins)

The purpose of this activity is to become familiar with the expectations for regular assessment in elementary and to learn a few simple strategies to assess children's mathematical knowledge and application.



"Assessment is an important component of teaching. Every day in every lesson we should check student's understanding. There are different forms and formats for assessment. It is hoped teachers use regular assessment to identify students who may need additional support."



In pairs, write down what you think the purpose of assessment is.

Allow a few minutes for pairs to consider this question. Ask for volunteers to share their ideas.

In your explanation refer to the following explanation.



Trainer tips

Summary of Potential Answers:

- To improve classroom instruction in mathematics – to help the teacher teach more effectively and address learning gaps or challenges.
- To provide useful information to the students on how they are tracking against standards and where they may need extra support.
- To provide evidence on how students are meeting expected standards.

Assessment is used to inform about students' progress by measuring what a student has learned. Teachers use this information to improve student learning by:

- observing students' learning during day-to-day activities in the classroom and planning revision lessons to cater for students' weaknesses as well as strengths.
- measuring what a student has learned over a period against the SBC content standards.

NOTE: It is important to measure children's understanding of concepts and skills taught during weekly lessons, (**formative assessment**) but it is also important to measure children's progress over time and against Standards set by the Department of Education. (**summative assessment**)



In table groups, review the Teachers Guide to see how assessment is used in elementary and answer the following reflective questions.



- When are assessments carried out in elementary?
- What skills and knowledge are assessed in these assessments?
- What assessments methods are used in scripted lessons?

Allow time for participants to answer the questions and then summarise using the following information.



Trainer tips

- Explain that the Elementary Mathematics Teacher Guides do not have written up assessment tasks for each term like the English Teacher Guides. This means that the teacher must develop their own assessment tasks.
- In each lesson there is a component for assessment. This is formative assessment and is very important as it will indicate which students have understood the concepts covered during the lesson and which students may benefit from some additional support.
- At the end of each term, there is an assessment form which needs to be completed for each student. This assessment form captures the results of students against the expected standards.
- The assessment is based on the scripted daily lesson plans, so it is important that children do not miss any lessons.
- In the content overview, the last week of each term is dedicated to assessment.
- In scripted lessons some assessment methods are:
 - Ask a problem and have all the students answer it – to determine who has understood and who has not.
 - Pop quiz using flashcards.
 - Ask students to explain how they answered a question.
 - Students show their workings in their workbooks.



Now, let us look a little closer at the end of term assessment forms. According to the guidance, what are teachers expected to do.



In groups again, try to find out what the administration requirements are for assessments.

- *What does the teacher need to do to record student results?*
- *How does the teacher administer assessments?*
- *What is your usual practice?*
- *Do you have set assessment tasks already?*
- *What challenges do you face in developing assessment tasks?*

Allow time for participants to answer the questions and then summarise using the following information.



Trainer tips

- Assessment should be carried out in each lesson. The teacher watches and listens to the children and judges how they are doing. This is called formative assessment.
- The Teacher Guide includes photocopiable assessment records for you to use. You need one for each child. These are located at the back of each grade teachers guide.

	▪ You should keep the assessment records in the child’s assessment folder and fill them out at the end of every week. If you have it, you should also put in any written or picture evidence of the child’s learning and progress. ▪ At the end of each term, you must bring out the child’s assessment folder and use it in the parent/teacher conference. ▪ When you pass the child on to their next teacher, you should sit down with them and discuss the child’s progress and abilities using these sheets. ▪ There is limited specific guidance on how to develop appropriate assessment tasks.
13.45 – 14.30	Activity 38 (45 mins) Developing term assessment tasks  <i>“Teachers are required to develop simple assessment tasks at the end of each term is required. Let us develop some assessments together and we can then create an assessment booklet which you can use for your classes this year.</i> Explain the task:  Trainer tips Follow the instructions carefully: Assign teachers a term according to their grade. Ask them to review the assessment records at the end of the teacher guides. Explore options for assessing children against each week learning focus during week 10 of each term. Agree on tasks that students might complete to show their achievement of the required content standard. Develop 2-3 tasks per content standard that aligns to the week’s learning focus. Consider the format that you might use for the assessment, e.g., oral assessment with pictures of the problems to solve. Instructions that include objects that students can use to help them solve problems. Once complete, prepare to present your assessment to the rest of the group. After 30 minutes, allow some groups to share their suggested assessment tasks. Gather all the suggested tasks to develop the assessment booklet, which can be distributed at the next TLC. Conclude by reminding teachers about the following:  <i>“In assessing children’s learning in maths during the year teachers want to know how they are progressing – who are doing well and who are falling behind and need extra attention.</i>

Teacher Tip: Formative Numeracy

Students should be assessed on the skills and processes that they have in numeracy, not just the correct answers. It is important that students can show what they know and what they need help with. Only assessing on answers will not show the strengths and weaknesses the student has in numeracy.

e.g Billy had 12 kina. He gave 4 kina to his sister. How many kina does he have left?

Problem Solving	Set up	Calculation	Correct answer
Do they understand the problem and use the correct operations? $12K - 4K = ?K$	Did they set up the working out correctly? $\begin{array}{r} 12 \\ -4 \\ \hline \end{array}$	Did they calculate the equation correctly? $\begin{array}{r} 12 \\ -4 \\ \hline \end{array}$	Do they have the correct answer? 8 kina
e.g. recognised it is a subtraction problem	e.g set out the algorithm correctly showing understanding of place value	e.g. subtracted the equation they are working out correctly.	e.g. the answer they found is correct with correct units of measurement



In pairs, discuss why it is important to see children's workings out when they are solving mathematics problems?

Ask for volunteers to share their ideas after a few minutes.



Trainer tips

Conclude by saying that it helps show where students may not be fully understanding a concept or process step and provides clues for the teacher so that they can address misunderstandings. It also provides a basis for students to check their workings and make their own corrections over time.

BREAK

15.00 –
16.30

SESSION 20 - Evaluation and Post-test

Activity 39: (30 mins)

Ask participants to complete the Post-Test (allocate 45 mins for this task). Collect these in and make sure each one has the correct name, date, elementary school, and province.

	Ask participants to complete the Workshop Evaluation (allocate 30 mins for this task). Collect these. Explain the next steps: ▪ When is the next training? ▪ What is the next training about? ▪ When will the next teacher learning circle be held? ▪ What resources will be sent to the school? ▪ What to do if they need help or advice? ▪ What to do when they get back to school (e.g., tell their Board of Management, tell their Parents & Citizens group, tell their inspector and church education agency)? Thank the participants for their hard work during the workshop. Give each teacher a copy of the Facilitator's Guide for their own self-study or school-based in-service. Finish with closing speeches, thanks, certificates, and a prayer.
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ANNEX

A-1: SBC content standards

Strand	Elementary Prep	Elementary 1	Elementary 2
Numbers and Operations	P.1.1 Find an easier representation for counting and comparing the numbers of concrete objects up to 120. P.1.2 Depending on the context, distinguish the number of objects and their position in order of objects with numbers and explain the condition carefully to the others. P.1.3 Compare larger or smaller numbers on the number sequence and number line and arrange in order. P.1.4 Use their understanding of numbers to count objects by 10 as a unit for place value. P.1.5 Understand the meaning of addition and calculate 1-digit numbers and 2 simple digit numbers. P.1.6 Understand the meaning of Subtraction and calculate 1-digit numbers and 2 simple digit numbers.	1.1.1 Understand the meaning and representations of numbers using place value by making 10 and 100 up to 1000. 1.1.2 Understand the use of relative size of numbers in various situations. 1.1.3 Show and represent the meaning of half and quarter as equally divided part of a whole using pictorial or concrete objects. 1.1.4 Extend their understanding of addition and subtraction to calculate 2-digit numbers.	2.1.1 Appreciate and use their understanding of representing, recognising, reading, and writing of numbers up to 10,000 using base 10 place value. 2.1.2 Understand the meaning of multiplication as repeated addition and represent it in various situations. 2.1.3 Extend their understanding of addition, subtraction, and multiplication to solve simple problems.
Quantities and Measurement	P.2.1 Understand and compare quantities and produce arbitrary units of measurement. P.2.2 Read o'clock time in relation to long and shorthand on the clock face.	1.2.1 Understand and compare length of objects using the units of measurement such as centimetre (cm) and metre (m). 1.2.2 Extend the understanding of standard units of measurement in length to add and subtract quantities of measurement using scale. 1.2.3 Understand and set the units of time and duration in hours and days.	2.2.1 Understand and compare volume of liquids using the standard units of measurement for volume such as millilitre (ml), decilitre (dl) and litre (l). 2.2.2 Use the scale on clock face to represent their daily activities and how long it takes.

Geometrical Figures	P.3.1 Understand the characteristics of geometrical figures through observation and composing using familiar shapes of objects.	1.3.1 Understand and investigate components of triangles and quadrilaterals as geometrical figures. 1.3.2 Knowing boxes by the component of the faces and make a box.	2.3.1 Understand and investigate the common properties of sphere and circles as geometrical figures.
Data and Mathematical Relations	P.4.1 Find patterns and recognise their structure in addition and subtraction. P.4.2 Explore and represent number of objects in form of picture and figures and interpret their patterns.	1.4.1 Apply using rules for inverse operation to calculate addition and subtraction. 1.4.2 Understand and use simple tables and graphs to represent and compare various types of situations in everyday life.	2.4.1 Understand the structure of multiplication tables and use it for up to 9 x 9 multiplication table.

A-2: SBC content standards, jumbled for Activity 4.

Strand	Elementary Prep	Elementary 1	Elementary 2
Numbers and Operations	Understand the meaning of multiplication as repeated addition and represent it in various situations. Understand the meaning and representations of numbers using place value by making 10 and 100 up to 1000. Understand the meaning of addition and calculate 1-digit numbers and 2 simple digit numbers. Understand the meaning of Subtraction and calculate 1-digit numbers and 2 simple digit numbers. Show and represent the meaning of half and quarter as equally divided part of a whole using pictorial or concrete objects.	Appreciate and use their understanding of representing, recognising, reading, and writing of numbers up to 10,000 using base 10 place value. Extend their understanding of addition and subtraction to calculate 2-digit numbers. Find an easier representation for counting and comparing the numbers of concrete objects up to 120. Use their understanding of numbers to count objects by 10 as a unit for place value.	Extend their understanding of addition, subtraction, and multiplication to solve simple problems. Depending on the context, distinguish the number of objects and their position in order of objects with numbers and explain the condition carefully to the others. Compare larger or smaller numbers on the number sequence and number line and arrange in order. Understand the use of relative size of numbers in various situations.
Quantities and Measurement	Understand and set the units of time and duration in hours and days. Extend the understanding of standard units of measurement in length to add and subtract quantities of measurement using scale.	Understand and compare quantities and produce arbitrary units of measurement. Use the scale on clock face to represent their daily activities and how long it takes. Understand and compare volume of liquids using the standard units of measurement for volume such as millilitre (ml), decilitre (dl) and Litre (l).	Read o'clock time in relation to long and shorthand on the clock face. Understand and compare length of objects using the units of measurement such as centimetre (cm) and metre (m).
Geometrical Figures	Understand and investigate components of triangles and quadrilaterals as geometrical figures. Understand and investigate the common properties of spheres and circles as geometrical figures.	Understand the characteristics of geometrical figures through observation and composing using familiar shapes of objects.	Knowing boxes by the component of the faces and make a box.

Data and Mathematical Relations	Apply using rules for inverse operation to calculate addition and subtraction.	Understand the structure of multiplication tables and use it for up to 9 x 9 multiplication table. Explore and represent number of objects in form of picture and figures and interpret their patterns.	Find patterns and recognise their structure in addition and subtraction. Understand and use simple tables and graphs to represent and compare various types of situations in everyday life.
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B: Language of SBC Mathematics

EP	E1	E2
up	over	next
down	under	before
on	small	each
in	last	under
out	first	different
into	more	same
with	fast	end
all	many	once
some	after	across
big	round	than
small	around	along
at	right	
now	inside	Directions: North, South, East, West, right, left, straight on, front, back
back	left	
old	lots	Comparison: long-longer-longest; short-shorter-shortest; small-smaller-smallest; big-bigger-biggest; tall-taller-tallest; fat-fatter-fattest; light-lighter-lightest; heavy-heavier-heaviest
by	even	
day	long	
time	short	
	tall	
Numbers: 0 to 100	Numbers: 0 to 1000	Numbers: 0 to 10000
	add, more. subtract, take away, less	whole, half, quarter double
	heavy-light; full-empty	
Time: morning, afternoon, night, day The seven days of the week	Time: today, yesterday, tomorrow, “o’clock”, “half past” The 12 months of the year	Time: second, minute, hours, tonight, midnight, noon, evening, now, later, soon, o’clock, quarter past

C: Terminology used in this guide

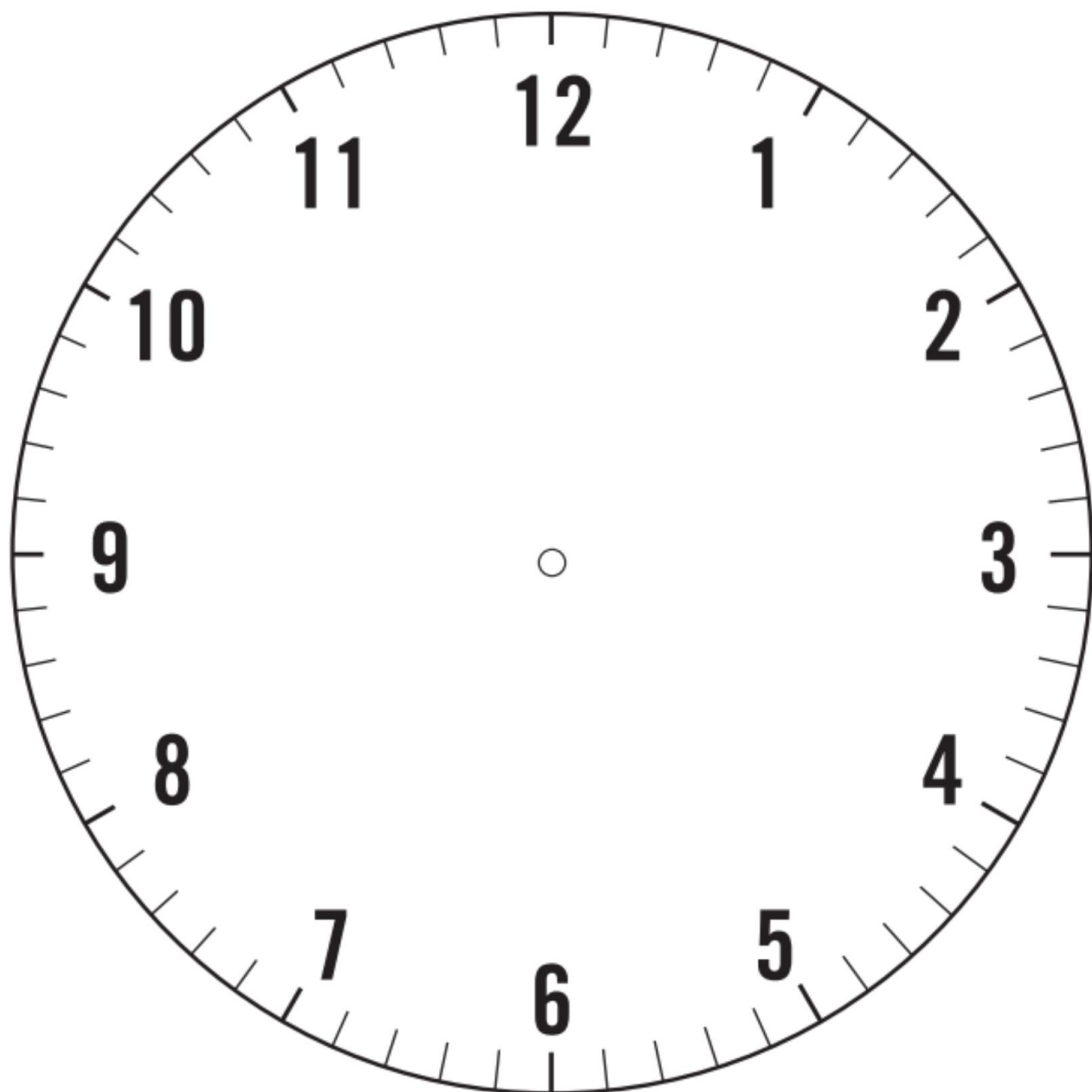
Abstract stage (of development)	When children can solve problems mentally without concrete materials.
Algorithm	A way to arrange and work with numbers to solve problems.
Angle	Where two lines meet (in a 2D shape)
Capacity	How much liquid a container holds. Measured in millilitres (ml) and litres (l)
Classification	A category in which something is put.
Clockwise	Turning to right
Comparison	To consider similarities and/or differences between two objects.
Concrete materials	Objects which can be used to demonstrate or model maths concepts or solve problems.
Concrete stage (of development)	When children use real objects to understand maths concepts and solve problems.
Digits	see Numeral.
Formative assessment	Assessments made continuously to measure children's learning progress.
Fraction	part of a whole (number or object). In elementary, we use whole, half and quarter.
Length	How long, high, or wide an object or space is. Measured in millimetres (mm), centimetres (cm) and metres (m).
Manipulatives	Concrete materials which children can hold and move around [manipulate]
Mixed ability group	A group of learners with different levels of understanding and skills
Non-standard unit	A unit of measurement accepted and used in a particular society/setting, such as handspan.
Number	A word to describe a quantity of things (e.g., "a dog has <u>four</u> legs")
Number bonds	Fact families. Knowing pairs of numbers which make larger numbers. E.g., $1 + 4 = 5$, $4 + 1 = 5$, $5 - 1 = 4$, $5 - 4 = 1$, $2 + 3 = 5$
Numeral	A symbol which has a meaning in number (e.g., the numeral "4")
Operations	(in maths) Addition, subtraction, multiplication, and division
Ordering	Putting in sequence, e.g., from small to large or large to small, light to heavy etc.
Plane shapes	Shapes described by their length and breadth and having area, but not volume (also called Two Dimensional shapes or 2D shapes). Flat shapes such as squares, triangles, and circles.
Pictorial graph	Simple graph that uses pictures to show data.
Place value	Describing numbers as hundreds, tens, and ones. It can be shown in real objects like bundles and sticks.
Right angle	A corner of 90 degrees inside a solid.
Solids	Shapes described by their length, breadth and width/depth which have volume (also called Three Dimensional shapes or 3D shapes). Solid shapes such as sphere, cone, and cube.
Standard	Skills and knowledge children must learn by the end of the grade.
Standard unit	A unit of measurement widely accepted in a country or internationally, such as metre, kilometre.
Strands	Components of the PNG Elementary Maths Curriculum – there are four in total.
Summative assessment	an assessment of student learning at the end of a program or grade
Three dimensional shapes	See Solids , above
Two dimensional shapes	See Plane shapes , above.
Weight	How heavy an object is. Measured in grams (g) and kilogram (kg)

D: 100s frame

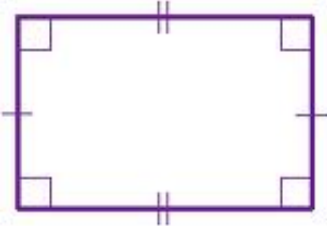
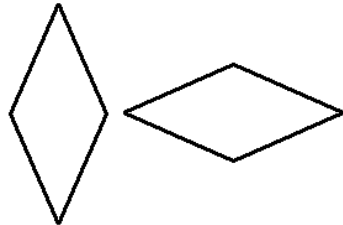
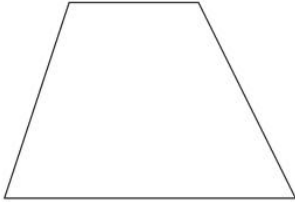
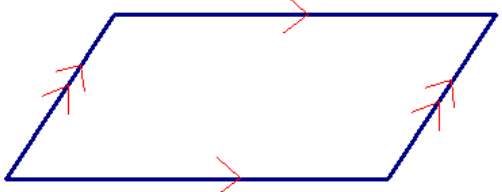
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
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91	92	93	94	95	96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

E: Clock face

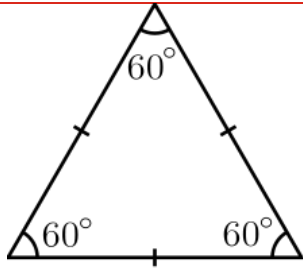
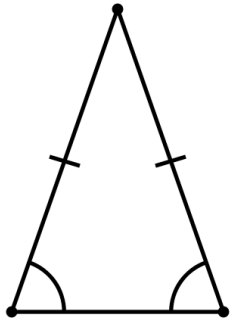
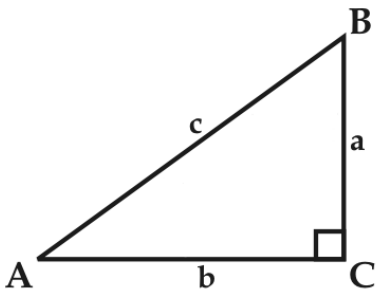
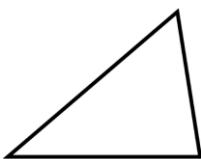
Analogue Clock



F: Quadrilaterals

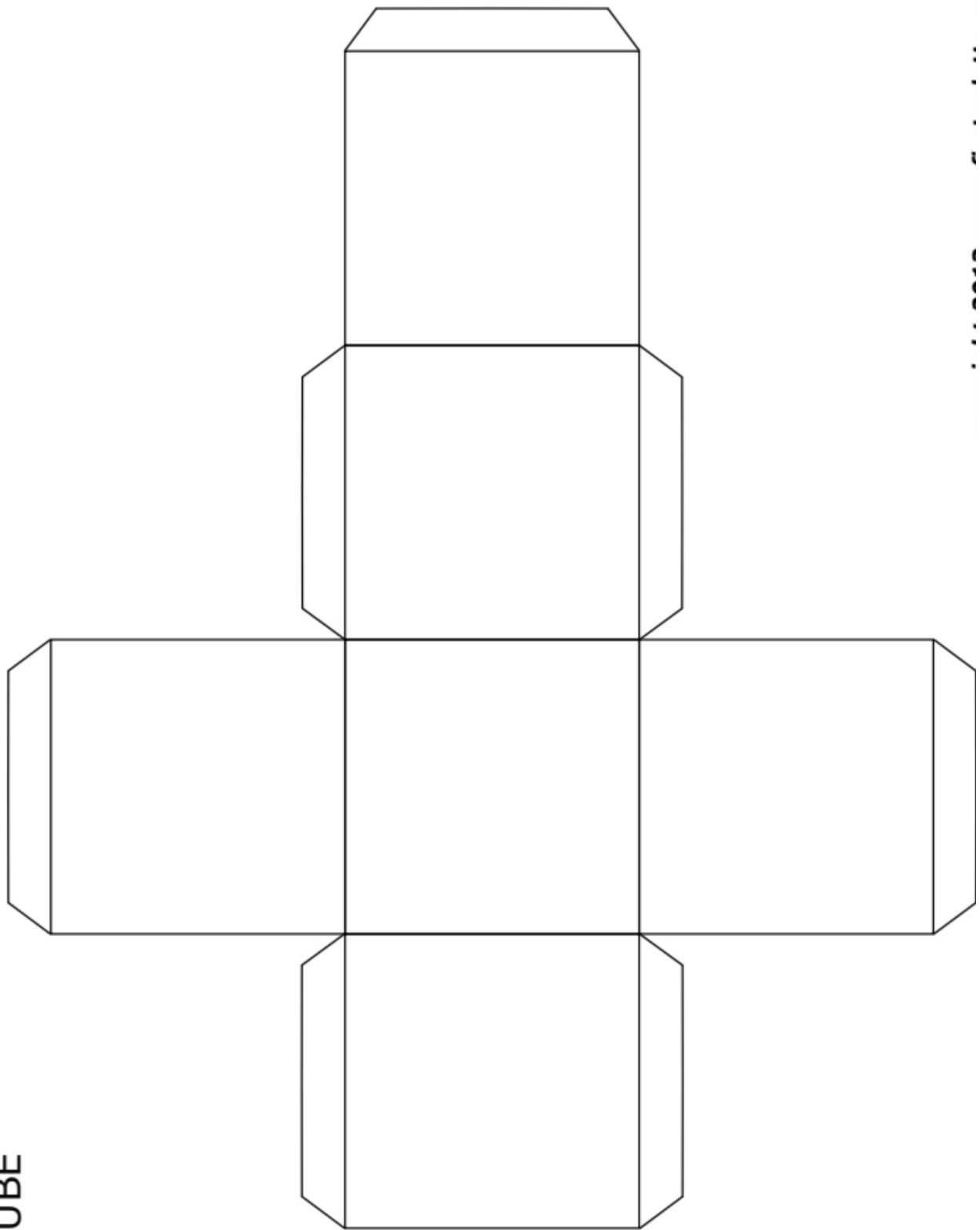
Categories of Quadrilaterals		Example
Rectangles	Four straight sides and four 90° angles	
Squares	Four straight <i>equal</i> sides and four 90° angles (is a type of rectangle)	
Rhombus	A quadrilateral with equal sides no matter what the angles are (a square is a type of rhombus)	
Trapezium	A quadrilateral with one pair of parallel sides	
Parallelogram	A quadrilateral with two pairs of parallel sides (rectangles and rhombuses are parallelograms)	

G: Triangles

Categories of Triangles		Example
Equilateral	Three equal sides (and three equal angles of 60°)	
Isosceles	Only two equal sides (and two equal angles)	
Right-angled triangle	A triangle with one 90° or right angle	
Scalene	A triangle with three sides of different lengths (and three different angles)	

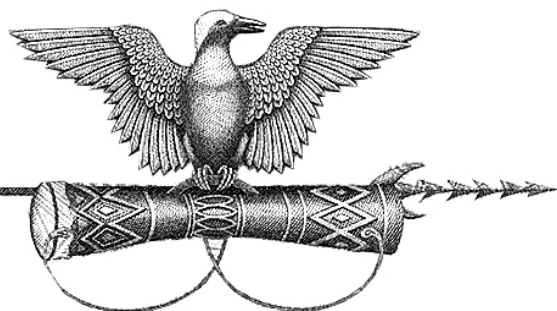
H: 3 D cube templates

CUBE



I: KINA for playing shops.

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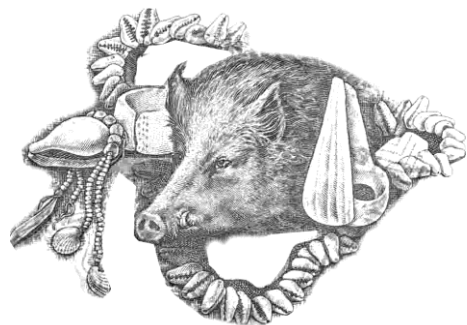
2KINA

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10KINA

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100_K

J: Classroom Assessment Records – Mathematics

(adapted from Save the Children's RISE Elementary SBC Assessment Record Book)

Province	
School	
EMIS code	
Teacher	
Class	
Grade	
Year	

Instructions

1. Copy the students' names from the Student Attendance Register.
2. Each term, assess the students using the tasks in the Teacher Guides. Give a score for each standard as per the rubric.
3. Meet with the student's parents each term. Give the parents a Report Card each term.

Scoring

0	Not achieved yet (N)
1	Partly achieved (P)
2	Achieved standard (A)

Each term assesses each child against the standards. Give 2 marks if a child achieves the standard. If they partly achieve the standard, give them 1 mark. If they have not achieved that standard yet, give them 0. Add up the total marks each term. For example,

Maths E2										
#	Name (alphabetical order)	Number & operation								
		Count, read, write and order numbers 0-100 or more	Double and halve 2-50	Compare and order sets of objects and numbers 0-100	Write numbers in hundreds, tens and units 0-100 or more	Break and combine a number into hundreds, tens and units	Ad sets of objects and numbers 0-100 or more	Make number sentences and stories and solve addition problems 0-100 or more	Do repeated addition for number 10	Read and use +, - and =
1	ALICE KAUBA	2	1	2	1	0	1	1	2	2

Children with disabilities

Children with disabilities may need assistance to achieve a standard (for example, a blind student may need a story read to them before they answer questions). Use the code WA if assistance was given.

J: Pre-test

About you

(NOTE: complete 1.1-1.7.7 if you did not attend Module 1 training. If you attended Module 1 training complete 1.1-1.4)

1.1	Province													
1.2	Your name													
1.3	Your sex (circle)	a. Male b. Female												
1.4	Your age (years)													
1.5	Do you have a disability? (circle)	a Yes b. No												
1.6	What is your mobile phone number?													
1.7	Your job <i>Tick one</i>	Elementary teacher TIC Inspector PDOE officer Church education officer Other (please state)												
	For Teachers only													
1.7.1	Write the name of the school you teach at													
1.7.2	Write the name of the district your school is in													
1.7.3	Which grades are you teaching? <i>Tick all that apply</i>	EP E1 E2												
1.7.4	How many children from each grade are in your class?	<table border="0"> <tr> <td>EP</td> <td></td> <td>E1</td> <td></td> <td>E2</td> <td></td> </tr> <tr> <td>M</td> <td>F</td> <td>M</td> <td>F</td> <td>M</td> <td>F</td> </tr> </table>	EP		E1		E2		M	F	M	F	M	F
EP		E1		E2										
M	F	M	F	M	F									
1.7.5	What grade did you finish school? <i>Tick one</i>	Grade 8 Grade 10 Grade 12												

1.7.6	What is your highest level of teaching qualification? <i>Tick one</i>	None Still in training Certificate in Elementary Teaching Diploma Degree
1.7.7	Have you received in-service training before? <i>Tick all that apply</i>	Standards Based Curriculum Vernacular literacy/home language English Phonics Child protection Behaviour management

We will do the same questionnaire at the end of the training to see how much you have learnt. The questionnaire is for training purposes only.

2.1	How confident are you in using the daily scripted lessons for mathematics?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not used them yet
2.3	How confident are you in completing the SBC mathematics term assessment forms for each child?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not used them yet
2.4	How confident are you in teaching counting and basic operations?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not taught them yet
2.5	How confident are you in teaching measurement, including telling time and money?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not taught them yet
2.6	How confident are you in teaching geometry?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not taught them yet

2.7	How confident are you in teaching data and mathematical relations?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not set one up yet
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Knowledge based questions.

3.1	What is the minimum amount of time for teaching mathematics each week according to the syllabus?	a. 90 minutes b. 180 minutes c. 240 minutes d. 360 minutes	/1
3.2	List three strategies that you can use to help children do addition and subtraction?	a. b. c.	/3
3.3	List the four strands of the Mathematics syllabus.	a. b. c. d.	/4
3.4	What are the three curriculum principles for teaching maths that are applied to SBC Elementary mathematics?	1. 2. 3	/3
3.5	What are three of the 3D shapes taught in elementary	1. 2. 3	/3

3.6	'counting on' is a strategy that can be used for addition and subtraction. True or False?	a. True b. False	/1
3.6	Formative assessments should be undertaken every day. True or False?	a. True b. False	/1
3.8	A hand span is a standard unit of measure? True or False	a. True b. False	/1
3.9	Multiplication is taught in elementary. True or False?	a. True b. False	/1
3.10	A meter is a standard unit of measure? True or False	a. True b. False	/1
3.11	Bundling of tens is only useful for addition? True or False	a. True b. False	/1
3.12	A child generally moves from abstract to concrete. True or false?	a. True b. False	/1
3.13	Concrete objects should be used throughout elementary? True or false?	a. True b. False	/1
3.14	Number lines is a useful strategy for solving subtraction problems. True or false?	a. True b. False	/1
3.15	In the number 3872, 7 is in the tens place? True or false?	a. True b. False	/1
3.16	It is expected that children in E2 know their multiplication tables up to 12. True or false?	a. True b. False	/1

TOTAL /25 points

L: Post-test

About you

1.1	Province	
1.2	Name	

Confidence based questions.

2.1	How confident are you in using the daily scripted lessons for mathematics?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not used them yet
2.3	How confident are you in completing the SBC mathematics term assessment forms for each child?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not used them yet
2.4	How confident are you in teaching counting and basic operations?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not taught them yet
2.5	How confident are you in teaching measurement, including telling time and money?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not taught them yet
2.6	How confident are you in teaching geometry?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not taught them yet
2.7	How confident are you in teaching data and mathematical relations?	a. Very confident and can train other teachers b. Confident c. I need some help d. I have not set one up yet

Knowledge based questions.

3.1	What is the minimum amount of time for teaching mathematics each week according to the syllabus?	a. 90 minutes b. 180 minutes c. 240 minutes d. 360 minutes	/1
3.2	List three strategies that you can use to help children do addition and subtraction?	a. b. c.	/3
3.3	List the four strands of the Mathematics syllabus.	a. b. c. d.	/4
3.4	What are the three curriculum principles for teaching maths that are applied to SBC Elementary mathematics?	1. 2. 3	/3
3.5	What are three of the 3D shapes taught in elementary	1. 2. 3	/3
3.6	'counting on' is a strategy that can be used for addition and subtraction. True or False?	a. True b. False	/1
3.6	Formative assessments should be undertaken every day. True or False?	a. True b. False	/1
3.8	A hand span is a standard unit of measure? True or False	a. True b. False	/1

3.9	Multiplication is taught in elementary. True or False?	a. True b. False	/1
3.10	A meter is a standard unit of measure? True or False	a. True b. False	/1
3.11	Bundling of tens is only useful for addition? True or False	a. True b. False	/1
3.12	A child generally moves from abstract to concrete. True or false?	a. True b. False	/1
3.13	Concrete objects should be used throughout elementary? True or false?	a. True b. False	/1
3.14	Number lines is a useful strategy for solving subtraction problems. True or false?	a. True b. False	/1
3.15	In the number 3872, 7 is in the tens place? True or false?	a. True b. False	/1
3.16	It is expected that children in E2 know their multiplication tables up to 12. True or false?	a. True b. False	/1

TOTAL /25 points

M: Answers to the pre- and post-assessment

Knowledge based questions.

3.1	What is the minimum amount of time for teaching mathematics each week according to the syllabus?	c.240
3.2	List three strategies that you can use to help children do addition and subtraction?	These are the options. 1. Count on 2. Count all 3. Number lines 4. Bundling 5. Making tens 6. Doubles 7. Count back
3.3	List the four strands of the Mathematics syllabus.	1. Counting and operations 2. Measurement 3. Geometry 4. Data and mathematical relations
3.4	What are the three principles for teaching maths that are applied to SBC Elementary mathematics?	1. Children learn best when new learning is built on what they already know in their culture and home, 2. when children play, use real objects, and solve real life problems, and when mathematics is fun, challenging, and structured.
3.5	What are three of the 3D shapes taught in elementary	These are the options. 1. sphere 2. cone 3. cube 4. cuboid/rectangular prism 5. triangular prism 6. pyramid
3.6	'counting on' is a strategy that can be used for addition and subtraction. True or False?	a. True
3.7	Formative assessments should be undertaken every day. True or False?	a. True
3.8	A hand span is a standard unit of measure? True or False	b. False (a hand span is a non-standard unit of measurement) b. False (multiplication is introduced in E1 but mostly taught in E2)
3.9	Multiplication is taught in elementary. True or False?	a. True

3.10	A meter is a standard unit of measure? True or False	a. True
3.11	Bundling of tens is only useful for addition? True or False	b. False (bundling of tens can be used for multiplication, division, subtraction, and addition)
3.12	A child generally moves from abstract to concrete. True or false?	b. False
3.13	Concrete objects should be used throughout elementary? True or false?	a. True
3.14	Number lines is a useful strategy for solving subtraction problems. True or false?	a. True
3.15	In the number 3872, 7 is in the tens place? True or false?	b. True
3.16	It is expected that children in E2 know their multiplication tables up to 12. True or false?	b. False (E2 students learn multiplication up to 10)

TOTAL

/25 points

N: Example lesson observation form

Name of Observer & Organisation			
Date of school visit			
School name:	District:	Class observed:	Teacher's name:
Subject observed			
SBC lesson #			
Attendance	Girls	Boys	
Enrolment:	Girls	Boys	
Observation length	Start	Finish	

Area	Indicator	Yes	No	Comment
1. Opening the lesson	Evidence of ... ▪ lesson objectives shared with students ▪ check on prior knowledge ▪ engaging students in the topic			
2. Use of teaching and learning resources	Evidence of ▪ Use of SBC scripted lesson ▪ use of SBC teaching resources (flashcards, Shell books, etc.) ▪ use of own teaching aids (word cards, etc.)			
3. If English	Evidence of ▪ Connecting students to the meaning of the text ▪ use of questioning before, during and after story-time or reading ▪ individual, pair or shared reading activity ▪ individual, pair or group work to complete tasks ▪ Use of literacy games/strategies to support student learning ▪ student writing activity			

4. If Maths	Evidence of ▪ use of concrete objects (local objects – e.g., bottle tops, small stones, beads, match sticks etc.) ▪ use of lines or grouping strategy to solve addition and subtraction problems ▪ Use of maths games to support student learning ▪ Individual, pair or group work to complete tasks ▪ Student writing activity
5. Inclusion & classroom management	Evidence of ▪ use of positive discipline – ▪ Evidence of effective classroom management ▪ Differentiation to encourage all students to participate & learn ▪ Fair treatment of boys and girls and encouraging and supporting girls and boys to engage actively
5. Assessing students understanding	Evidence of ▪ checking student's understanding ▪ Evidence of checking whether objectives have been met
6. Closing a lesson	Evidence of ▪ recap & feedback to students ▪ Evidence of next lesson topic
7. Feedback	1. Two Positives/strengths of the lesson 2. One recommendation for improvement

O: Strategies that we want to see in teachers

No.	Strategy
1	Use of concrete materials/concrete objects
2	Use of 10 frames to stimulate visual problem solving
3	Maths-rich classroom
4	Use of 100 square and number lines
5	Use of non-standard and standard measures
6	Concrete, visual, and abstract differentiation
7	Starts each lesson with a maths song or jingle
8	Uses real-life examples/link to real world
9	Problem solving and open-ended questions
10	Check's students understanding during the lesson
11	Asks lots of questions and encouraged students to explain how they solved the maths problem
12	Uses strategies such as counting on, counting all, making tens and doubles effectively
13	Can explain the steps to solve a problem clearly
14	Can explain place value using examples

P: Workshop evaluation

1.1	Province	
1.2	Date of workshop	
1.3	Names of your trainers	a. b.

Were the outcomes achieved?

2.1	1. Understand how to teach and assess using the Mathematics syllabus and teacher guides.			
2.2	2. Demonstrate how to teach using scripted lesson in the SBC Mathematics teacher guides.			
2.3	3. Demonstrate how to use concrete objects effectively.			
2.4	4. Practice strategies for improving children's maths skills.			
2.5	5. Using number operation strategies in the classroom such as number lines and place value			
2.6	6. Understand how to assess children against SBC content strands			

What was the best thing you learnt at the workshop?

How can we improve the workshop?

Q: Daily register

Workshop	SBC Mathematics	Province	
Day and date		Trainers	

#	Name	Sex	School	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
