Understanding Mathematics

Teacher's Guide for Class 1

Department of School Education
Ministry of Education and Skills Development
Royal Government of Bhutan
Thimphu

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ROYAL GOVERNMENT OF BHUTAN
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MINISTRY OF EDUCATION
THIMPHU : BHUTAN

Cultivating the Grace of Our Mind

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FOREWORD

I am at once awed and fascinated by the magic and potency of numbers. I am amazed at the marvel of the human mind that conceived of fantastic ways of visualizing quantities and investing them with enormous powers of representation and symbolism. As my simple mind struggles to make sense of the complexities that the play of numbers and formulae presents, I begin to realize, albeit ever so slowly, that, after all, all mathematics, as indeed all music, is a function of forming and following patterns and processes. It is a supreme achievement of the human mind as it seeks to reduce apparent anomalies and to discover underlying unity and coherence.

Abstraction and generalization are, therefore, at the heart of meaning-making in Mathematics. We agreed, propped up as by convention, that a certain figure, a sign, or a symbol, would carry the same meaning and value for us in our attempt to make intelligible a certain mass or weight or measure. We decided that for all our calculations, we would allow the signifier and the signified to yield whatever value would result from the tension between the quantities brought together by the nature of their interaction.

One can often imagine a mathematical way of ordering our surrounding and our circumstance that is actually finding a pattern that replicates the pattern of the universe - of its solid and its liquid and its gas. The ability to engage in this pattern-discovering and pattern-making and the inventiveness of the human mind to anticipate the consequence of marshalling the power of numbers give individuals and systems tremendous privilege to the same degree which the lack of this facility deprives them of.

Small systems such as ours cannot afford to miss and squander the immense power and privilege the ability to exploit and engage the resources of Mathematics have to present. From the simplest act of adding two quantities to the most complex churning of data, the facility of calculation can equip our people with special advantage and power. How intelligent a use we make of the power of numbers and the precision of our calculations will determine, to a large extent, our standing as a nation.

I commend the good work done by our colleagues and consultants on our new Mathematics curriculum. It looks current in content and learner-friendly in presentation. It is my hope that this initiative will give the young men and women of our country the much-needed intellectual challenge and prepares them for life beyond school. The integrity of the curriculum, the power of its delivery, and the absorptive inclination of the learner are the eternal triangle of any curriculum. Welcome to Mathematics.

Imagine the world without numbers! Without the facility of calculation!

Tashi Delek.

Thakur S Powdyel

Thank you, Teacher. I can read this!

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INTRODUCTION

BACKGROUND

Mathematics is a beautiful and a profound subject. Apart from this fact, it is a necessary tool in the study of science, technology and other specialized areas of studies at the higher levels. It also has immense utility to offer in our daily lives, now more so than ever in this age of technology and information. By this, we are taking into account the broadened understanding of what mathematics is, which includes mathematical processes and competencies like reasoning, mathematical communication, connection, representation, and problem solving and decision making along with the knowledge of mathematical contents.

For these reasons, the prominent place that mathematics occupies in the school curriculum will only continue. But, while there has been no dispute about this fact, mathematics has not always been an enjoyable subject for students, as much as it should have been. The unpopularity of the subject, in general, is also evidenced in the students' generally low performance in examinations. There are many reasons for this, some of which are: certain myths surrounding mathematics such as that the subject is difficult by its nature, mathematical competency is determined by certain genetic leans in terms of gender and race; a not so exciting experience of adults and their attitude towards mathematics, which in turn influences the attitude of children towards it; and shortfalls in curriculum and instruction, and assessment systems which predominantly test and reward knowledge memorization without fostering true understanding. This scenario is specific not only to Bhutan, but all over the world, at least until quite recently. Fortunately, this need not continue. Every student can enjoy, understand and do reasonably well in mathematics. And, every student needs to learn significant mathematics. Researches, studies and initiatives around the world advocate and confirm this.

Realizing this, the Ministry of Education decided to invest in the improvement of teaching and learning of mathematics in our schools during the 9th and the 10th Five Year Plan periods (2003-2008, 2008-2013) as a priority. Thus, the following plan of action was set:

- Development of the School Mathematics Curriculum Framework PP-12
- Development of Textbooks and Teachers' Guide
- In-service Teacher Trainings to Implement the New Curriculum

The development of the School Mathematics Curriculum Framework PP-12 was undertaken and completed in 2004. The framework states the mathematical standards, mainly in terms of the mathematical contents and competencies, for each class from PP to 12. Since getting the framework correct was crucial for subsequent curriculum development, it is appropriate to mention two features of the developmental process related with it here. First, to ensure that the standards are at par with the international standards, the framework was developed with technical assistance from an international consultant. The standards in the framework was also informed and influenced to a great extent by the Mathematics standards set for the North American schools by the National Council of Teachers of Mathematics (NCTM), based in the United States of America. Second, to ensure that the standards address our specific requirements and situations, the draft framework was widely consulted with relevant stakeholders, including schools and teachers, relevant educational institutions and professionals for comments, feedback and reactions before its endorsement. So the framework we now have is a blend of international norms and our local needs.

With the development of the new Textbooks and Teacher's Guides the implementation of the new mathematics curriculum for classes 4 to 12 has been achieved, in stages, between the years of 2006 and 2009. To ensure quality by incorporating international and current best practices, the books for classes 4 to 12 were developed with technical assistance from a team of renowned international authors and mathematics educators. The new mathematics curriculum for class PP to 3 is being implemented during the years of 2011-2013, starting with class PP in 2011. The main curriculum documents for classes PP to

3 consist of Teacher's Guides and Student Activity Books. Effective use of these documents will help to achieve the objectives outlined in the framework.

The mathematics contents appropriate for Class 1 to achieve the standards set in the Framework are logically sequenced and elaborated upon through the chapters and lessons. The lesson activities in this Guide were carefully designed so that teachers can use them with or without modifications. It is, however, not intended to restrict the teachers from using their own ideas and styles. In fact, we would like to urge the teachers to go beyond the ideas presented in this Guide to access other relevant resources and, more importantly, to try out innovative, creative and resourceful methods in their teaching.

We would like the teachers to critically review the contents of this Guide as they teach. We would like to urge the teachers to give their comments and opinions on any aspect of the book to the Primary Mathematics Section of DCRD for its improvement.

HOW MATHEMATICS HAS CHANGED

Mathematics is a subject with a long history. Although newer mathematical ideas are always being created, much of what your students will be learning is the mathematics that has been known for hundreds of years, if not longer.

There are some changes in the content that you will teach in Class 1. Some of the contents are new. For example, content and ideas on Patterns and probability are new. Some contents from the previous curriculum were not included in Class 1. For example, formal contents on Money, Multiplication, Fractions, and Place Value are not included in class 1.

What you may notice most is a change in the approach to mathematics. Worldwide, there is now a greater emphasis on the need for students to understand the mathematics they learn rather than to memorize rote procedures. There may be so many reasons for this.

- In the long run, it is very unlikely that students will remember the mathematics they learn unless it is meaningful. It is much harder to memorize "nonsense" than something that relates to what they already know. The importance of learning core mathematical facts remains important, however.
- Some approaches to mathematics have not been successful; there are many adults who are not comfortable with mathematics even though they were successful in school.

In this program, you will find many ways to make mathematics more meaningful for the students.

- We will always talk about why something is true, not simply that it is true. This becomes the norm for students when they provide an answer to a question. For example, when students say that a sequence is a pattern, they have to always have a reason for why they think it is a pattern.
- As far as possible most of the teaching situations and contexts are drawn from the immediate surroundings of the students themselves, so that they can connect and relate easily to the mathematical ideas presented to them in the context of everyday lives. For example, the data for Data Management and Probability chapters are all collected from within the classroom, either related to students themselves or from the simple experiments they perform.
- Students will find direct connections among the mathematical ideas learnt in one chapter with those learnt in other chapters. For example, the concepts on shapes are used in making patterns and learning numbers.
- Students are required to exhibit their understanding of mathematical ideas through the need to communicate, talk, explain, and give reasons and use models or physical objects.
- When discussing mathematical ideas, we expect students to use the processes of problem solving,

communication, reasoning, making connections (connecting mathematics to the real world and connecting mathematical topics to each other) and representation (representing mathematical ideas in different ways, using manipulatives, graphs, and/or tables, for example).

- A significant amount of research evidence has shown that these more meaningful approaches work. Scores on international tests are higher when emphasis on higher levels of thinking accompanies the application of skills.

THE DESIGN OF THE TEACHER'S GUIDE FOR CLASS I

The Teacher's Guide for Class 1 contains 10 chapters as detailed in the Table of Contents, to teach the curriculum for Class 1. Each chapter of the Guide has the following features:

- Chapter Overview
- Lessons
- Chapter Assessment

Chapter Overview

The Chapter Overview describes the mathematical background to the chapter. It clarifies the key concepts and ideas in the chapter. It also describes briefly the general pedagogical aspects related with teaching the chapter. It has the following subsections.

Basic Principles

This contains the key mathematical ideas of the chapter, along with its pedagogical aspects, summarized in bulleted statements. This offers the benefit of easy reference to the key ideas.

Chapter Goals

These are broad but attainable goals that the students should achieve by the end of the chapter. The students' learning progress under each chapter should essentially be gauged against the chapter goals.

Maths Words

The key mathematics words and terms used during the lessons and which the students should use with understanding are stated here. These words should be put up, with appropriate illustrations, on the Maths Wall, either at the beginning of the chapter or as and when they appear for the first time during the course of the lessons.

Lessons

Each chapter is divided into a number of lessons, as can be seen from the Table of Contents. Each lesson has the following subsections.

Objective

One or two specific objectives pertaining to the lesson are stated here.

Materials

The required and suggested materials for the lesson are enlisted here.

Activity Description

This section, which appears right below the Materials section, describes how the lesson may be carried out. It usually contains activities for the students to carry out either in pairs or small groups. The activities are designed in logical sequence to provide the students with essential knowledge, skills and experience of mathematics so that the students achieve the objects set for the lesson. It usually contains sentences in boldface type: these are models of sentences that the teacher could use in talking about the activity including giving instructions and asking questions to the students. Although the activities are carefully designed to be suitable for use in schools across the country, they should be treated as samples only. As such they could be modified, adapted, or even replaced according to the teacher's classroom needs and the school's unique learning situations.

Maths Note

This section talks about specific mathematical concepts and issues related to the lesson, including some of the common mathematical misconceptions that students could have, and how to avoid them.

Assessment for Learning

This reminds the teacher of the main and related learning outcomes and processes that the students should experience during the course of the lesson. It also suggests how to support the students in alternative ways to help them achieve the objectives.

Extensions

Some lessons will have a section called Extensions. It describes additional lessons related to the title and the objectives of the lessons. It will be important to carry out these extended and additional lessons to consolidate the concepts under the main lessons.

Chapter Assessment

The overall purpose of the assessment is to improve student learning. Assessment should be an integral part of instruction. As such, assessment should be carried out on an ongoing basis, both formally and informally. Students exhibit their learning primarily by doing, showing and talking. As such, we should use strategies such as observing, listening, and asking probing questions to understand their learning progress.

Assessment is generally put under two types – Formative Assessment and Summative Assessment. **Formative Assessment** is the assessment that is carried out to see whether and how the students are learning. It is not meant to measure the students' learning. As such, no grades or marks are used in formative assessment. Formative Assessment is sometimes known as *Assessment for Learning.* **Summative Assessment** is assessment that is used to measure the students' learning (or level of it) against the learning standards or goals, at the time of using it. Letter grades or numerical marks are used as the measure of learning. Summative Assessment is sometimes known as *Assessment of Learning.*

For the purpose of assessing and helping the students understand and achieve the chapter goals, the assessment tips and ideas are all provided in an integrated manner within the lessons. On top of this, to provide for systematic record keeping, two main types of assessment methods are to be used to assess the students with each chapter. These methods are the **Chapter Checklist** for Formative Assessment and the **Interview-based Performance Task** for Summative Assessment. Further details on how to carry out the assessments are provided at the end of each chapter.

THE CLASSROOM ENVIRONMENT

This new curriculum requires a change in the classroom environment to include more pair and small group works, and an increased emphasis on communication. This way, students will become genuinely engaged in mathematical thinking instead of being mere spectators.

The lesson activities in this Guide are all designed for use in pairs or small groups. Of course the opportunity for whole class instruction is always there, especially for the introduction and closing of the lessons. The benefits of group work and communication are elaborated below. To facilitate these, the seating of the students in the classroom should necessarily be in small groups as opposed to all the students sitting facing the blackboard in neat rows.

Pair and Group Work

There are many reasons why students should be working in pairs or groups, including:

- to ensure that students have more opportunities to communicate mathematically (instead of competing with the whole class for a turn to talk)
- to make it easier for them to take the risk of giving an answer they are not sure of (rather than being embarrassed in front of so many people if they are incorrect)
- to see the different mathematical viewpoints of other students
- to share materials more easily

Sometimes students can work with the students who sit near them, but other times you might want to form the groups so that students who are struggling are working together. Then you can help them while the other students carry out the task mostly on their own. Students who need enrichment can also work together so that you can provide an extra challenge for them all at once.

Rules for Group Work

» Make sure you understand all of the work produced by the group.
» If you have a question, ask your group members first, before asking your teacher.
» Find a way to work out disagreements without arguing.
» Listen to and help others.
» Make sure everyone is included and encouraged.
» Speak just loudly enough to be heard.

You should set down rules of behaviour for the students when they work in groups, so that each student participates fully in the group task. You need to avoid a situation where four students are working together, but only one of them is really doing the work. You might explain and post Rules for Group Work, as shown here. It may take time in the beginning, but gradually, this would become a norm in your classroom in running group works effectively.

Once students are used to working in groups, you might sometimes be able to base assessment on group performance rather than on individual performance, for both formative and summative assessments.

Communication

Students should be communicating regularly about their mathematical thinking. It is through communication that they clarify their own thinking as well as show you and their classmates what they do or do not understand. When they give an answer to a question, you can always be asking questions like: **How did you get that? How do you know? Why did you do that next?**

Communication is practised in small groups, but is also appropriate when the whole class is working together.

Students will be reluctant to communicate unless the environment is risk-free. In other words, if students believe that they will be reprimanded or made to feel bad if they say the wrong thing, they will be reluctant to communicate. Instead, show your students that good thinking grows out of clarifying muddled thinking. It is reasonable for students to have some errors in their thinking and their use of language; you must help shape that thinking with encouragement. If a student answers incorrectly, you must ask follow-up questions that will help the student clarify his or her own thinking.

Many of the questions in the Guide require students to explain their thinking, or give reasons. This enhances both their communication skills and mathematical thinking.

MATERIALS NEEDED

The new mathematics curriculum and the Teacher's Guide require the use of concrete materials for the teaching and learning of mathematics. The use of concrete materials helps in representing and clarifying mathematical ideas. The following materials should be made available in the classroom for the proper teaching and learning of mathematics in Class 1.

Snap cubes

An adequate number of snap cubes in various colours should be available. Snap cubes are required in almost all of the chapters.

Pattern blocks

A set of pattern blocks consists of five 3-D shapes with the shape of the bases as a hexagon, a trapezoid, a square, a rhombus, and an equilateral triangle, as shown here. The pattern blocks may be made of wood, plastic, or rubber. They are normally coloured. It would be nice if the blocks in all three of these materials are available in the class. The pattern blocks are required especially for chapters on Geometry and Measurement.

Counters

Counters are simply, and normally, circular disc shaped roughly the size of a normal coin. Counters may be made of wood, plastic or rubber and are coloured. Counters are required especially for chapters on Numbers, Data Management and Probability. Counters can be easily improvised using stiff paper or plastic materials. They can also be substituted by other items in uniform size and shape such as snap cubes, pattern blocks, pebbles, buttons, and seeds for their intended uses.

3-D Geometric Shapes

A set of 3-D geometric shapes would consist of a cylinder, a cone, a cube (rectangular prism), a cuboid (rectangular prism), a sphere and a pyramid. About 3 to 4 such sets would be required for a class of about 30 students. These shapes are required especially for chapters on Geometry. 3-D shapes can be and should be improvised in the school. Some of them such as rectangular prisms, cylinders and spheres are found in the forms of common objects such as boxes, containers and balls.

Geo-board

Geo-boards are required for students to exploring making different 2-D shapes. Geo-boards can also be made or improvised in the school.

Student Activity Book

The Teacher's Guide for Class 1 has an accompanying Student Activity Book for individual students. The Activity Book is intended to help the teachers with extended activities for the students at the end of and during the lessons. The activity book also contains reproducible pages and assessment sheets to help the teachers with time and resources for teaching and assessment. Every student should get a copy of the Student's Activity Book.

Other Teaching Learning Materials

Besides the above materials, the following teaching learning materials would be necessary through the year:

- Scissors – about 10 for a class size of 30 students
- Newsprint papers – about 70 sheets to last for a year
- Chart papers – about 30 to last for a year
- Duct tapes – about 5 rolls to last for a year
- Sellotapes – about 3 rolls to last for a year
- Glue (preferably glue sticks) – about 3 for a year
- Crayons – a packet for each student
- Papers (duplicating papers) – about 3 reams for a year
- Rulers (15 cm long, 30 cm long, 1 m long) – about 10 to 15 for a class
- Feely bags – about 10 to 15 for a class
- Dice - about 10 pairs for a class

MATHS WALL

There should be a designated wall space for displaying relevant mathematical materials like charts, sight words, and students' works. The displays could be changed depending upon the chapters and topics being taught.

MATERIAL CORNER

It would be nice if a material corner could be set up in the class. It could be a cupboard, or a shelf at a suitable corner, where the materials are neatly placed and can be reached by students as and when required. The various materials could be placed in various containers with proper labeling. Students could help in the sorting, caring and maintenance of the materials.

MODE OF SUMMATIVE ASSESSMENT FOR CLASS 1

The Summative Assessment in Class 1 is to be done through the following three means.

- Interview-based Performance Task (for Continuous Assessments)
- Half-yearly examination
- Annual examination

Interview-based Performance Task for Chapters

An *Interview-based Performance Task* is a small task, usually a hands-on one, which you give the students to do, to see if the student understands certain embedded concepts and can perform the associated skills. You should make the task interactive between you and the student by asking related probing questions.

The Interview-based Performance Task for a chapter should be conducted towards the end of it with each student. It may not be necessary to carry out this assessment with a very formal setting. Instead, it could better be done in an informal manner, but with advanced planning.

Carrying out the Performance Task will reinforce the observations done with the Chapter Checklist and other formative assessments, and can assess the student against many of the chapter goals in a related manner.

Because the Interview-based Performance Task is required to be carried out for every chapter, it can be referred to as **Continuous Assessment**.

A ready-made format for one Interview-based Performance Task for each of the chapters for each student is provided as **Summative Assessment Recording Sheets**. They are included in the Student Activity Book at its end. You will have to cut out these sheets and file them in a ring binder file or folder for use and maintenance for each student.

A student's performance in each task is to be marked out of a total of 10 marks. As it will be clear from the formats in the **Summative Assessment Recording Sheets**, each task provides an opportunity for the teacher to assess the student's proficiency against the essential chapter goals. The interview prompts or the probing questions that go with the task should be focused towards eliciting the desired responses from the student, which would in turn serve as evidence of the student's acquirement of level of it of the concepts and skills.

As far as the marking scheme is concerned with the Interview-based Performance Task for the student, each key concept or skill mentioned is worth a total of 2 marks. If the student displays the understanding of a key concept or a performance of a key skill easily and proficiently, 2 marks can be awarded for it. If the student needed much probing and support to do that, 1 marks should be awarded. It the student needed a moderate amount of support to do that, 1.5 marks should be awarded. The total marks the student obtains for the complete task should then be converted to be out of 10 marks. In case a student cannot perform even at a minimum level, student should be retaught the key concepts and skills rather than failing the child until he or she is able to do the minimum. This approach ensures that no child is left behind in the learning process. As can be seen, such an assessment provides for opportunities to teach even when a student is being assessed.

Examinations

The students in Class 1 will be required to write both the half-yearly and the annual examinations.

Half-yearly Examination

The question paper for the half-yearly examination should be set out of 30 marks, with a writing time of 1 hour. The paper should not be divided into any section. There could be a total of 15 to 20 questions in the paper. The questions should be set from the chapters covered during the Term I period. The questions or instructions should be simple, direct, appropriate, and easy to understand by the students. Some of the students may also require help with explanation of the questions during the examinations, which should be provided. You could include appropriate questions similar to the ones in the Student Activity Book.

Annual Examination

The question paper for the annual examination should be set out of 50 marks, with a writing time of up to 1 hour. The paper should not be divided into any section. There could be a total of 15 to 20 questions in the paper. The questions should be set from all the chapters. The questions or instructions should be simple, direct, appropriate, and easy to understand by the students. Some of the students may also require help with explanation of the questions during the examinations, which should be provided. You could include appropriate questions similar to the ones in the Student Activity Book.

Student Progress Report Card

The scores from the two methods of summative sssessment will then be used to generate the Student Progress Report Card. The split of weighting among the Continuous Assessment (CA), the half-yearly examination, and the annual examination for the whole year will be as given below:

Term I		**Term II**		**Total**
CA (Interview-based Performance Task)	Half-yearly examination	CA (Interview-based Performance Task)	Annual examination	
30 %	15%	30%	25%	**100%**

The total CA mark obtained before the half-yearly break, depending on the number of chapters covered by then, should be converted to be out of 30% to be entered in the Student Progress Report Card. The CA marks after the half-yearly break should also be converted to be out of 30%, for entering in the Student Progress Report Card, giving a total of 60% for the CA for the entire year.

The marks obtained by the students in the half-yearly and annual examinations should be converted to 15% and 25% respectively for entering in their progress report card.

CHAPTER 1 NUMBERS TO 30

Chapter Overview

In Class PP, the students were introduced to numbers up to 10, including 0. The overall learning goal intentioned in Class PP in the area of Numbers was to allow the students to gain a good conceptual understanding of numbers along with the basic skills related to numbers up to 10. The specific learning goals for the students on numbers in Class PP included using numbers to represent small sets, representing numbers in various ways using concrete materials and drawings, representing a number in different ways, comparing two numbers or sets, saying the number sequences up to 10 both forward and backward, using numbers to count objects in a set, using numbers to talk about the position or order of objects in a sequence, and writing the numerals. To achieve these goals, various activities were designed to engage the students actively in the learning experiences that would promote their cognitive, psychomotor and affective development.

This chapter will consolidate the students' understanding and skills with numbers learned in Class PP, and then extend these up to the number 30. It will be essential to review some of the key ideas and activities from Class PP with the students before formally starting with this chapter. In particular, please see that the students can say aloud the counting rhymes in the correct order, recognize, and write the numerals correctly for each of the numbers up to 10, and represent sets containing up to 10 objects with numbers.

This chapter has 12 lessons as detailed in the Table of Contents. The concepts and experiences with numbers are further developed through the chapters 3, 6, 7 and 8.

Basic Principles About Numbers

- Numbers tell us about how many or how much.
- It does not matter in which order we count; the number in the set does not change. But when using ordinal numbers, order does matter. (If 8 items are moved around, there are still 8 items, but the item that was 3rd may no longer be 3rd.)
- In counting, one and only one, number is said for each object, and the last number spoken tells how many.
- To understand what a number means, the students must experience and create many representations for the number.
- Relating numbers to 5, 10 and 20 helps us compare numbers, giving meaning to those numbers and hence, supports subsequent work in addition and subtraction.

Chapter Goals

- Compare quantities and be able to say and write which is more, less (or fewer), and the same.
- Sort sets based on the attribute of number.
- Relate and describe a number in terms of 5, 10 and 20.
- Describe the teen numbers as 10 and some more, and numbers more than 20 as two tens and some more or 20 and some more.

- Say the counting rhymes forward to 30 and backward from 30.
- Read and write the numerals, as well as the number names in words for numbers up to 30.
- Locate numbers up to 30 on a number line.
- Use ordinal numbers up to 10^{th}.
- Skip count by 2s, 5s and 10s to 30.

Maths Words

More, less, fewer, the same, number line, 5-frame, 10-frame, double 10-frame, triple 10-frame.

Lesson 1 Counting Forward and Backward

Objectives

Count forward from 1 to 10 and backward from 10 to 1.

Materials

Linking cubes (or counters and/or pebbles)
An empty container, preferably a tin can
A number line

Have the students chant the number names in correct order from 1 to 10 and back from 10 to 1. This could be done in various ways such as suggested below.

Have an empty container and a bunch of linking cubes ready. Display or show a handful of cubes to the students (not more than 10 at a time), and have them guess the number of cubes: **How many cubes do you think I have here?** After providing all the students opportunities to tell their guesses, say: **How can you check your guess? How can we be sure of how many cubes there really are in here? ... Let us count to see how many cubes we really have here.** Then drop the cubes one by one in the container; as you drop each cube say the number names in sequence. Have the students join you in saying out the number names. The last number name said is the number of counters: **So, how many cubes are in this can?** Take one cube out from the container. As you take it out, say: **I am taking one cube out. How many cubes are in the can now?** Take one more cube out and ask similarly. Repeat the process until there are no more cubes in the container. This gets the students into saying the number names backwards.

Repeat the guessing, dropping of counters, and counting backward for various numbers of cubes.

Next, ask: **How many fingers do we have on our hands?** After the students have responded, say: **How can we use counting to see how many fingers we have? Let us count our fingers.** Have the students join you as you raise and count the fingers one by one from thumb of the right hand to the thumb of the left hand with the palm of the hand facing you. After all the 10 fingers are raised, ask: **How many fingers are raised?** Have the students close the thumb of the left hand, and ask: **How many fingers are raised now?** Ask them to subsequently close the fingers one by one in order and ask the number of fingers raised until all the fingers are closed.

Put up the number line with numbers from 0 to 10 so that everyone can see it. Have the students say in unison the number names both forward and backward with the help of the number line.

A few essential questions to ask during the course of the lesson are: **What comes after 4, 5, 6, …? What comes after 10, 9, 8,…? Start at 5 and count forward to 10. Start at 5 and count backward to 1**

Maths Note

Counting on (counting forward) and counting backward are vital skills to help students prepare for addition and subtraction.
In this lesson the focus is on counting forward and backward with the numbers from 1 to 10. But such practice should be extended to numbers beyond 10 later on at appropriate times even though specific lessons are not designed.

Assessment for Learning

Ensure that all the students can recognize the numerals for each number and can count the numbers both forward and backward quite fluently.

Lesson 2 Representing Numbers to 10 in Different Ways

Objectives

Represent numbers up to 10 in a variety of ways, whether the numbers are presented orally or in numerals.
Count objects to 10.

Materials

Numeral cards from 0 to 10
Number line
Linking cubes, counters and pattern blocks

> **Maths Note**
>
> By representing a number in different ways, students understand that the number does not change no matter how the number is represented. The concept that the count or the number stays the same regardless of how the objects are arranged or regardless of the change in the sizes of the objects is known as conservation of a number.

Put up the number line. This could be the same as in the previous lesson. Have the students say out the number names from 0 to 10 as you point to the numerals on the number line.

Then show the numeral cards to the students in a random order. For each of the numeral cards shown, have the students say the number name and raise the corresponding number of fingers on their hands.

Choose a numeral card, say 5, and show how to represent number 5 with 5 linking cubes by arranging them in a certain way. Say: **This is showing 5**. Then make another arrangement, and say: **We can show 5 this way also.** Make another arrangement for 5 using pattern blocks or counters for the students to see. Display the three arrangements or designs on a desk top and invite students to talk about the similarities and differences among them. **What is different about the three designs? What is the same?** The main point to drive home here is that all three represent or show the number 5. But it is equally useful to have the student observe and talk about the differences and similarities. Invite a student to make yet another design for 5.

Different arrangements showing 5

> **Assessment for Learning**
>
> Watch, ask and listen to find indications that the students realize that groups of items can look different but still show the same number. **(Do these designs look different? What is the same for all of these?)**

Group the students into pairs or small groups. Provide a numeral card for each group. Then distribute adequate numbers of the linking cubes, or counters or pattern blocks. Ask them to make different designs for the number as per the card they have got. As the students work, go around and ask them to tell about what is the same and what is different about their designs. You could also invite the students to move around to look at the work of other groups and encourage them to ask one another about their designs.

A few essential questions to ask during the course of the lesson are: **How many are there? How else could you show….? Would the number change if you moved … to ….? Do these designs look different? What is the same for all of these?**

Lesson 3 Sorting Based on Number

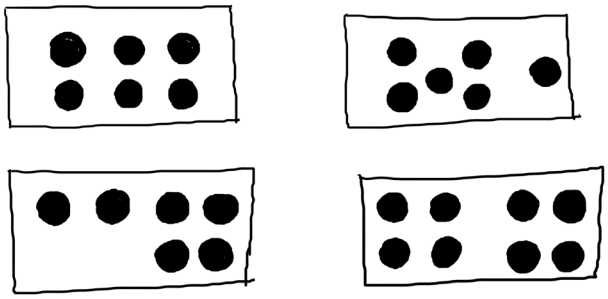
Objectives

Recognize multiple representations of a given number and distinguish them from representations of other numbers.

Materials

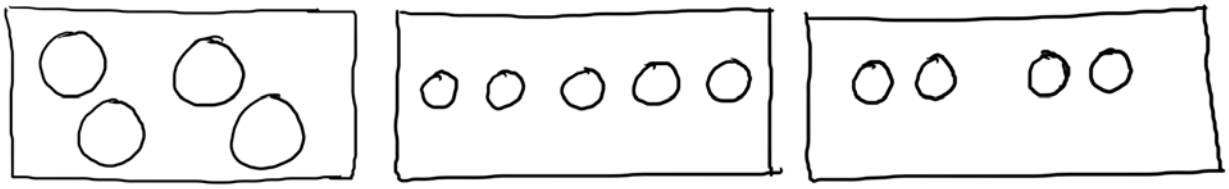
None

Make a set of 4 dot pictures where 3 of the pictures represent, in different ways, a particular number, e.g. the number 6, but the last picture represents a different number, e.g. 8. Show the pictures to the students, and say: **Three of these pictures are the same, and one of them is different. Which one is the different picture? Why or how is this one different from the rest? How are these three pictures the same?**



Ask the students to make dot pictures for each other in their note books, where they show one number in a lot of ways, and include one picture of the number that is different and ask which one is different.

Also draw pictures of different sizes and shapes either on the board or on chart papers to ensure that size and shape do not matter for numbers. For examples, to represent 4 in different ways, draw 4 large items in a set, and 4 small items in another set, and then 5 items in a third set. Ask them as to which of the sets is different and why.



A few essential questions to ask during the course of the lesson are: **How do you know that these numbers are the same? How can you tell that all these pictures show (6)? Does size matter in counting? Did the size of the items help you decide which number was different?**

Maths Note

In order to make sure that the students have a firm grasp of various numbers, they need to be able to distinguish them from other numbers. For example, they need to realize that 6 can be represented in different ways and all of them have something in common that the representations of, for example, 8 do not. Make sure that the students realize it is the number of objects, and not the size or shape of them that matters.

Assessment for Learning

Make sure that the students realize it is the number of objects, and not the size or shape of them that matters.

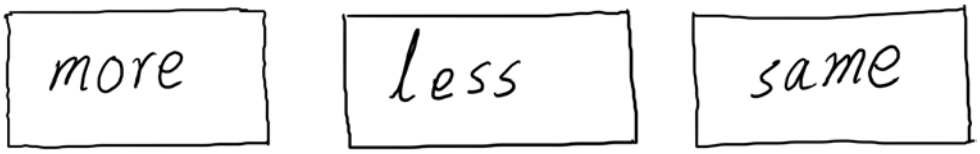
Lesson 4 Comparing Quantities

Objectives

Compare two sets with numbers up to 10 by using words like more, less and the same.

Materials

Linking cubes, counters, pattern blocks, pebbles
Cards that read 'more'
Cards that read 'less'
Cards that read 'same'



Have the students compare the objects and things you can see around in the classroom and use the words like more, less and the same: **Are there more windows or more doors in the classroom? How do you know that? How many doors are there? How many windows are there? So, 6 (the number of windows) is more than 2 (the number of doors), or 6 is more than 1!** Post an index card that reads **more** on the board. Then ask: **Do we have fewer windows or fewer doors in the room?**...

Make sure that the students can understand the meanings of more, less and the same or equal by having them compare various pairs of sets, including the number of boys and the number of girls.

Make sure that occasionally the smaller set is made up of physically bigger items, so that size does not become an issue in the count. Make sure that sometimes the sizes of the sets are obviously different (e.g. 8 compared to 2) and sometimes closer in quantity. Have the students compare the sizes of sets they can match up (e.g. counters) as well as those they are unable to match up (e.g. chairs or windows).

Divide the class into pairs (or into small groups, if the class size is large). Distribute to each pair (group) a handful of linking cubes (or pattern blocks, or counters, or pebbles) and two index cards, one that reads **more** and the other that reads **less**. Using their their linking cubes (or counters or pattern blocks) students are to create two sets with one set having more cubes than the other. Have them display the index cards appropriately. Go around and ask them questions such as: **Which of your two sets is more? Which is less? How do you know that this set is more than this? How do you know that this set is less than this? If you move one cube from this set to this set, will it still be more/less?** With each group, create a situation with two sets having the same nuber of cubes, and ask: **Now, which set has more? Is it then correct to keep the cards for each set the same? So when the two sets have the same number of cubes, we say the same, and for which we use this card.** Replace the two cards with the two

Maths Note

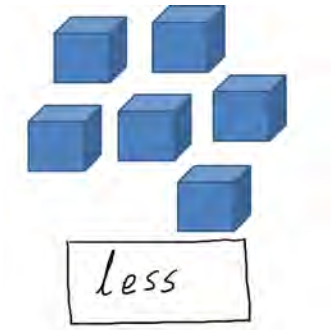
There are two ways the students might use to decide which of the two numbers is more; they might use one-to-one correspondence or matching to see if there are any left-over items in one set. The set with the left-over items has more. Another way to decide which of the two amounts is more is to see which number comes later in the counting sequence. For example, 5 is more than 4 since you say 5 after you say 4 when you count. It is important for the students to compare numbers both by describing which is more and by describing which is less. They need to know that if A is more than B, then B is less than A. They need to know that if the sets have the same number, we say they are equal.

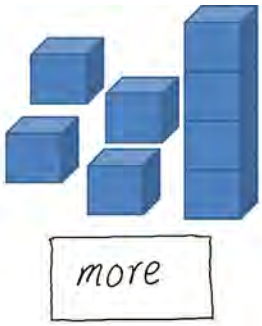
index cards that read the same.

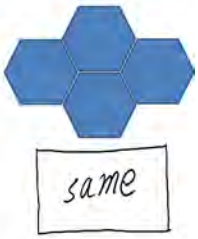
After the above group work, have the students put their two sets together. Then challenge them to make a set according to your instructions such as: **Make a set that is more than 4**. Inspect each group's set, inviting the students along, to show to the students that more than one set will be valid for this criterion. Then continue with instructions such as: **Make a set that is more than 8. Make a set that is less than 4. Make a set that is less than 2. Make a set that is less than 1.**

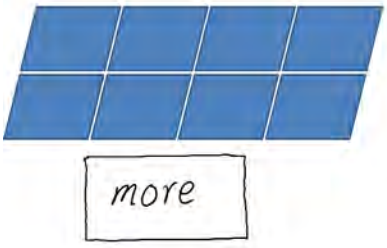
> Assessment for Learning
>
> Ensure that the students can explain why one set or one number is more than or less than the other.

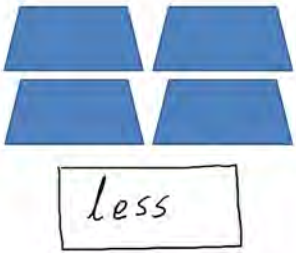
A few essential questions to ask during the course of the lesson are:
How do you know that this set is more than this set?
How do you know that 8 is more than 7?
What do you say when one set has 5 and the other set also has 5?
What is the number that is one less than 4?... one less than 3?... one less than 2? One less than 1?











Lesson 5 Comparing Numbers to 5 and 10

Objectives

Determine whether a given number from 1 and 10 is more or less than 5, more or less than 10 and how much more or less.

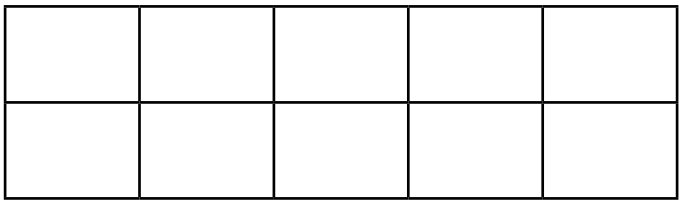
Materials

Large 10-frames, one for each group
Counter (or linking cubes)

Ask the students to count the number in a group, for example, the number of people at their table, and have them compare with 5 and 10. **How many students are there in this group or at this table? How do you know? OK, let us count? Is (6) more than 5 or less than 5? How many more is (6) than 5? Is (6) more than 10 or less than 10? How many less is (6) than 10?** You could encourage raising fingers on the hands to compare a number to 5 and 10. Repeat this with a few other groups.

Tell the students that one way to compare numbers to 5 and 10 is to use a 10-frame. A 10-frame is a rectangular array of boxes of 2 rows and 5 columns. Show them a 10-frame, and count with them the number of boxes in the first row, and then continue the counting with the second row to 10. Tell that we can use it to show numbers by putting counters in the boxes starting at the top left, moving right and then moving to the second row.

A 10-frame:



Demonstrate comparing a number, say 7, to both 5 and 10, by first putting 7 counters on the 10-frame, and comparing it, first, to 5, and then to 10.

Provide a 10-frame and some counters to each pair or small group of students. Ask them to show various numbers on the 10-frame, and then to compare to 5 and 10, by providing instructions such as: **Show the number 8 on the 10-frame. Is 8 more than 5 or less than 5? By how many is 8 more than 5? How do you know that? By how many is 8 less than 10? How do you know that?** Repeat this for other numbers. **Show me a number which is more than 5? What is your number? Show me a number which is less than 5? What is your number? Show me a number which is 1 less than 10. What is that number? Show me a number which is 2 less than 10. What is that number? Show me a number which is 2 less than 5. What is that number? Show me the 10.**

Maths Note

The numbers 5 and 10 are important referents, or benchmarks that help the students make sense of other numbers. We tend to use 5 and 10 since they relate to the numbers of fingers on one or two hands. The use of 5-frames and 10-frames to represent numbers is an effective tool and strategy for the students to compare the numbers to 5 and 10. The use of a 10-frame to represent numbers is a simple but powerful tool for the students to see the numbers in teen as a group of 10 and some more, until a number reaches 2 groups of 10. In other words, it is a powerful tool to teach the place value concept informally to the students.

Special Note

Although no specific lesson has been designed for the students to read and write the numbers in words, you should teach them how to read and write numbers up to 10, including 0 in words around this time. A few activities on this are included in the Student's Activity Book, but they might require more practice. You may like to link teaching this with the ideas provided in the English curriculum, especially for letter formation and the letter sounds.

A few essential questions to ask during the course of the lesson besides the above examples are:

Show me a number which is more than 5 but less than 10.
You fill the first row of a 10-frame and 2 more boxes of the second row. How many are there?
Why is a number less than 5 also less than 10?

Assessment for Learning

As the students represent or show the numbers on the 10-frame, ensure that they place the counters systematically, first beginning at the top left, then going to the right and then repeating in the second row. Also provide enough encouragement and opportunity for the students to explain their responses to your questions, such as how do you know that 7 is more than 5, and by how many is it more?

Lesson 6 Using Ordinal Numbers

Objective

Use ordinal numbers up to 10th in describing the positions of objects in a line.

Materials

Newsprint/chart paper
Crayons
Marker pens
Cutout pictures of some animals (e.g., bear, donkey, horse, crocodile, tiger)

Make up and tell a simple story in which some animals compete in a race. For example, say: **Once upon a time, there was a big forest. In the forest lived a bear, a donkey, a horse, a tiger and a crocodile. One day, one of the animals - the donkey - suggested that they compete in a running race. The other animals agreed to what the donkey said. So, now the animals are getting ready for the race.** Put up pictures of the animals along a vertical line at one end of the board, or chart paper, as you say their names. **They are now ready to run.** Draw a finish line. **Who do you think will come first? Why do you think so? Then who do you think will come second? Third? Fourth? Who do you think will complete the race last?**

Maths Note

Although position does not matter at all with counting how many, it matters when using ordinal numbers. The ordinal to be used depends on where the item is in relation to a designated first item. For example, the x below is 2nd if starting from the left, but 4th if starting from the right.
O X O O O
It is important that the items be in lines so that it is clear about how to move forward in the line.





start finish

Draw 10 simple shapes such as a circle, a triangle, a rectangle, a sun, a moon, a star, a flower, a leaf, an apple a heart on the board or chart paper as shown below.

Say: **I have drawn some shapes here in a line. How many shapes do you think are there? Let us count them, one, two, three,…ten.** This would tell the students that we use numbers to count how many there are. **Can you name the shapes?** Pointing to the shapes ask: **What is the name of this shape? What is this shape?** Then say: **I drew this circle first. I drew this triangle second,** … As you say these write 1st, 2nd, 3rd,… .10th in order below each shape starting from the circle on the left. After that, ask the students to repeat saying the ordinal numbers from 1st to 10th as you point on the ordinal numbers, as a practice of saying the ordinal numbers. Then engage the students in responding to questions based on the shapes such as: **What is the 1st shape? What is the 2nd shape? What is the 10th shape? What is the position of the sun? What shape is between the 3rd and the 5th shapes? What ordinal number comes after 5th? What ordinal number comes before 5th? Etc.**

Assessment for Learning

See that the students use ordinal numbers to describe the positions of objects arranged in a line. Also see that the students can name the basic shapes such as circle, rectangle, triangle, cylinder, cone, and rectangular prism. This should not be difficult as the students learned these shapes in class PP.

Lesson 7 Representing Numbers to 20

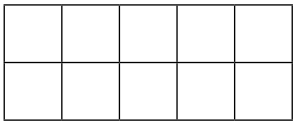
Objectives

Represent/model quantities up to 20.

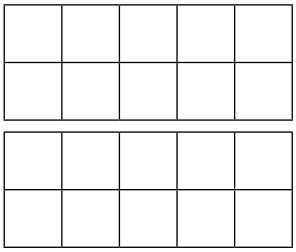
Materials

10-frames
Double 10-frames
Counters or Linking cubes

A 10-frame



A double 10-frame



> **Maths Note**
>
> The numbers from 11 to 19 are often challenging for students. This is particularly the case for 13 to 19 because the words for the numbers are in reverse order from the numerals; for example, we say sixteen, with the six said first, but we write 16, where 6 is written last.
> Using two 10-frames is helpful in encouraging the students to see these teen numbers as 10 and more, e.g. 14 as 10 and 4 more or 19 as 10 and 9 more.
> Although there is only one formal lesson on the teen numbers, it is important to review this concept many times over many days.

Show a handful of counters or linking cubes (about 7) to the students and ask: **How many counters do you think are here?** Let them guess. **How can we know how many counters there really are?** The natural way would be to count the counters by saying the counting words aloud. Ask the students to join you in the counting. Keep the set aside on the table. Pick up a few counters (say, 3) and ask**: How many counters do you think are here now? How do you know?** The students may not even need to count this time. They could be simply *subitising* the number. *Subitising* is the inherent ability in us to know how many there are at a glance simply by looking, if a set has not many objects. And, you could count to confirm it. Tell the students that we could also use 10-frames to help us determine how many there are. Ask how many we had for the first set. Place the counters from the first set on a 10-frame one by one starting from the left, going right and then moving to the next row. Ask them pointing to the top row of the 10-frame: **How many counters are in this row? Or what number does this row show? And how many are in this row** (referring to the second row)? **Altogether there are 7** (count on from 5, e.g. **5, 6, 7**)

Then have about 13 counters in hand and ask the students to guess how many there are. **How can we know how many there are?** Ask the students to say the counting words as you drop or separate a counter each from the group. Some students may know the counting words beyond 10

and some may not. Both are fine. Then show them how to represent 13 on a 10-frame: **Let us put these counters on the 10-frame. Do you think we can fill up all the ten boxes of the 10-frame? Let us see. How many are outside the 10-frame? So we have 10 counters here (referring to the filled up 10-frame) and 3 more counters outside. It is 10 and 3 more.** Then remove one counter from the three which are outside the 10-frame, and ask: **How many counters are here now?** Some students may say twelve. Accept the answer. But emphasize in seeing and saying it as 10 and 2 more. Then remove one more counter and repeat the process. Then have 4 counters outside the frame and repeat the process of having the students see and say 10 and some more. Then demonstrate placing 13 or 14 counters on a double 10-frame.

Distribute a double 10-frame each and varying numbers of counters from 11 to 19 to pairs and groups of students. Ask them to place the counters they have on their double 10-frames. As they work, go around and get them to talk about the number of counters as 10 and some more. After all the groups have finished, ask: **Which groups have 10 and 1 more? Which groups have 10 and 8 more?** Get the other groups to look at such a display. Repeat this process for all the numbers up to 19.

Then finally, get all the groups to fill up both the 10-frames and get them to talk about the number as 10 and 10 more or two tens. Some students might recognize it as twenty. Accept that.

A few essential questions to ask during the course of the lesson are:

Pointing to some representations of the teen numbers, for example to a model showing 15, ask: **What number do these two 10-frames show? How much more than 10 is it? How many more counters do you need to completely fill the second 10-frame?**

Assessment for Learning

Ensure that all the students can say the teen numbers as 10 and some more, and twenty as two tens.

Lesson 8 Writing the Numbers to 20

Objectives

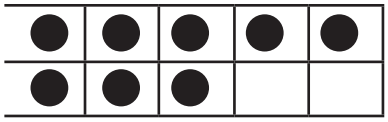
Read and write the numerals for numbers from 11 to 20.
Count quantities up to 20.
Read and write the numbers from 11 to 20 in words.

Materials

10-frame flash cards
Picture models for numbers 11 to 20, using double 10-frames made on chart papers as shown below
Numeral cards (11 sets of 10 and 1 each of the numerals from 1 to 9 with an additional card for 2)

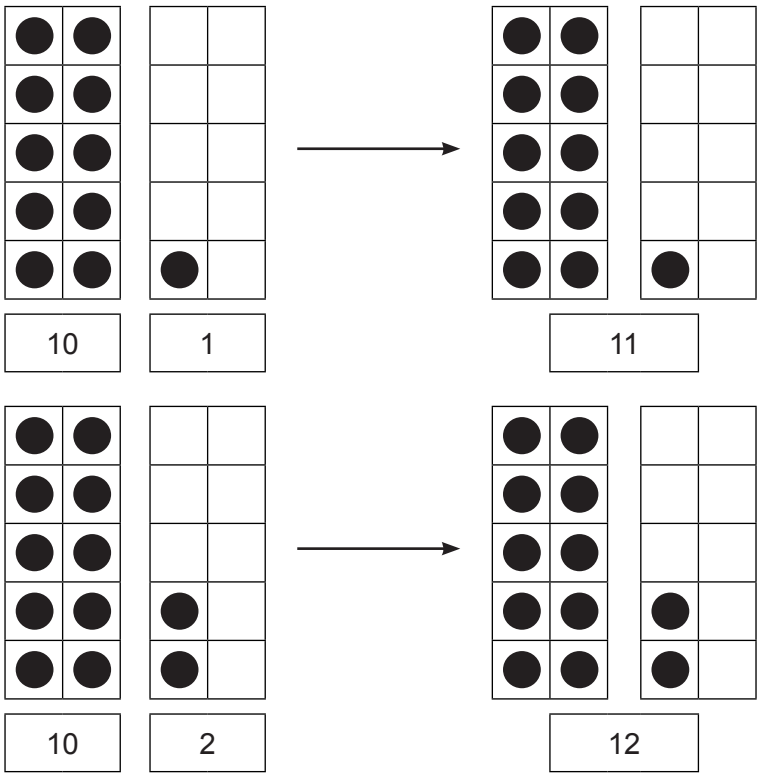
> **Maths Note**
>
> It is essential to tell students how to read each of the numbers from 11 to 19. Make sure they understand that the digit on the right tells how many more than 10 to model. For example, 17 is a full 10-frame and another frame with 7 items in it.

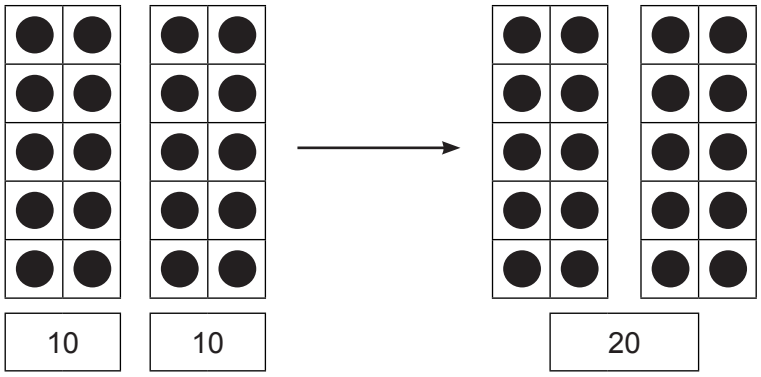
Show a 10-frame with dots in it such as the following to the students and ask them: **What number does this 10-frame show? Is 8 more than 5 or less than 5? How many more is it than 5? How many less is it than 10?** Repeat the process for a few more numbers. While doing this, show the 10-frames both horizontally and vertically so that the students see that the number of counters is important, and not whether the frame looks to be standing up or on its side.



> **Special Note**
>
> Although there is no formal lesson designed, the students should be taught and provided with practices to write the numbers to 20 in both numerals and words, over the next several days on an ongoing basis.

Put up the chart containing the models for the numbers from 11 to 20.





Starting from the model for 11, ask how many each of the double 10-frames shows. **How many dots does this show? Or what number does this double 10-frame show? This shows 10 and 1 more**. Stick a numeral 10 under the filled up 10-frame, and the numeral 1 under the 10 frame showing 1 dot. Continue for the rest of pictures to the one showing 20, emphasizing the number 10 and __ more for each. Then coming back to the picture showing 11, tell that 10 and 1 more is called 11. Move the numeral 1 over the 0 of the 10. Have the students say the word **eleven**. Repeat the process to 19. For 10 and 10 more, say that it is two tens. Then tell that two tens is called **twenty**. And show the numeral as 20.

Then have the students say aloud the numbers from 11 to 20 as you point to the numerals on the chart. Practice this a few more times. Then using the picture showing 20, have the students count the dots along with you aloud from 1 to 20.

A few essential questions to ask during or near the end of the lesson are:

Show me number 13. Is 13 more than 10 or less than 10? How many more is 13 than 10?
Show number 18. How many is 18 more than 10? Is 18 more than 20? How many do you need to get to 20 from 18? What number comes after 18? What number comes before 18?
What is 14? How much is it more than 10? How much is it less than 15?

Write the numerals from 1 to 20 on the board, and have the students write them in their notebooks. Circulate in the class to see that they are writing the numerals properly.

Assessment for Learning

Ensure that all the students can count and say the number words clearly up to 20. Also, see that the students can describe a teen number in terms of 10 and some more.

Extension

Teach the student to write the numbers in words alongside the numerals for numbers from 1 to 20. This might need to be extended over the next several days. You could also assign the writing exercise as homework, since the student could carry out the writing as simply a practice exercise.

Lesson 9 Building a Number Line

Objectives

Read and make a number line and place numbers from 1 to 20 on the line. Say what numbers come right before and right after a given number up to 20.

Materials

A number line with the numbers from 0 to 10 already written on it and with provision for writing numbers to 20

Tell the students: **Today you are going to make a number line together.** The students should be familiar with a number line up to 10 from Class PP. Put up the number line on the chart so it is fully visible and at a height where students can reach to paste the numerals later. Say: **This is a number line. It has numbers in order as we count starting with 0 on the left. The numbers are equally spaced on the line. Here we have the numbers from 0 to 10. I want to have the numbers up to 20 on the number line with your help. First, let me mark the line to show where each number from 11 to 20 should be.** Show how you make the marks on the number line which are equally spaced. **So, what number should come next to the right of 10?** Write the numeral 11 there. **What number will come after 11?** Write the remaining numerals to 20 with the help of the students.

Then have the students say the numbers from 0 to 20 in sequence as you point to each. Also, practice counting backward using the number line.

Ask the students to close their eyes for a moment. Cover a number with a sticky note pad, for example, 12, and ask: **What number is missing? What number comes after 11? What number comes before 13?** Repeat similarly for a few more numbers.

Based on the number line, engage the students in discussing and responding to questions like:

What number is to the right of 5? What number is to the right of 10? What number comes to the left of 5? Repeat for some more numbers, so that the students are clear about the idea of being to the right or left of a number. **What number sits between 15 and 17? What number comes before 10? What number comes after 10?** etc

Have the students make a number line in their notebooks by first drawing a straight horizontal line and then marking the lines equally spaced before writing the numbers below each of the markings.

Maths Note

Number lines are useful for showing comparisons among many numbers all at the same time. They also help the students to recognize both counting forward and counting backward of numbers in a sequence. Number lines are used as tools for adding and subtracting numbers.

Assessment for Learning

See that the students understand the meaning of before, after, right, left and between, and answer appropriately for the numbers on the number line.

Lesson 10 Representing Numbers From 21 to 30

Objectives

Represent/model numbers from 21 to 30.
Count numbers up to 30.
Read and write numerals for numbers from 21 to 30.

Materials

Triple 10-frames
Counters and linking cubes
A tin container

Show a handful of counters or linking cubes (about 10) and have the students guess the number. **How many counters do you think are here in my hand? Do you think it will be more than or less than 20? Let us count and find out.** Then show a group of counters (about 24 or between 20 and 30), and ask: **Now how many counters do you think are there? Will it be more than 20? Let us count, one, two, three, … nineteen, twenty. I still have a few more. So, it is more than 20. Let us continue to count, one, two, three, four. So this is 20 and 4 more. When we have more than 20 we can show the number using a triple 10-frame.** Show the students a triple 10-frame and show them how to represent 24 on it.

Distribute a triple 10-frame and a varying numbers of counters from 21 to 29 to each pair or group of students. Ask them to put the counters on their triple 10-frames. As they work, go around and help them with placing the counters on the frames. Ask them how many counters they have. Ask them to count out loud for you and listen to how they count – whether count one by one, or whether by 5s or 10s.

After all the groups have finished, ask: **Who has 20 and 3 more?** Have other students look at the groups' models. Have all say, **20 and 3 more is called 23**. Write 23 on the board, keeping adequate space before it and after to write other numbers from 21 to 30 later. Repeat this for all the numbers to 29. Then have all the groups fill up their triple 10-frames completely. **Now how many counters do you each have?** Have the students realize that it is now 20 and 10 more, as well as 3 tens. And have them say**, 20 and 10 more is 30; 3 tens is 30.** Write 30 on the board after 29.

Extend the number line made in an earlier lesson to 30. Have the students practice saying the numbers from 1 to 30 in order first with and later without the help of the number line.

Have the students practise writing the numerals up to 30. Ensure that every one writes the numerals correctly.

A few essential questions to ask during the lesson are: **What number will fill a double 10-frame completely? What number will fill a triple 10-frame completely? Show me number 28 on a triple 10-frame. How many is it more than 20? How many is it less than 20?**

Maths Note

Although place value is not yet formally introduced (in other words, students do not learn about ones place, tens place, etc.), the students can gain a sense of the fact that the numbers 21 to 30 follow a similar pattern as the teen numbers after 10. They are informally looking at 20 as 2 tens and 30 as 3 tens and the other numbers (such as 21, 22, 23, 24, …) as a certain amount more than 20. Although there is only one formal lesson on the numbers in the 20s, it is important to work with these numbers repeatedly over many days.

The use of the triple 10-frames to represent the numbers from 21-30 is useful for the students to visualize these quantities.

Lesson 11 Numbers on a Calendar

Objectives

Relate the numbers to 30 with the dates on a calendar.
Write the dates for the different days in a calendar month.

Materials

A calendar for the month (that would be either February or March)
Chart paper with the format drawn for the dates of a month as shown below
Marker pens

Month: _____						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Put up a calendar for the current month so that everyone can see it. Tell the students that it is the calendar for the current month. Explain and draw their attention to the dates and the days of the week. Have the students observe that the numbers for a month always begin with 1, but not necessarily in the first column. You could also show them the calendar for a few other months to elaborate on this point. Ask: **What day is today? What is the date today? If today is March 5th, what date will tomorrow be? What is the last number on the calendar? What day is the last day of the month?**

Put up the format for a month's calendar drawn on chart paper on the board at a height where the students can reach it easily. Write the 1st date of the month as it appears in the real calendar. Put away the real calendar. Tell that we are going to create the calendar for the same month together. Read aloud the days of the week. Say the first day of the month starts on (Wednesday) as it is the date 1. Then write the next few dates (e.g. 2, 3 and 4). Ask what date will come next after 4. Ask student volunteers to come forward and complete writing the dates. After creating the calendar, further engage the students with questions such as the following: **How many days are there in a week? What are the days of the week? How many weeks are there in the month of (March)? The first Sunday in the month falls on date (5). On what dates does the 2nd Sunday fall? How many Sundays are there in this month? On what dates do you not have to come to school? Why is that? What number is below 10? What number is above 10? What number is to the left of 10? What number is to the right of 10? What day is the 9th of the month?** You can also mark the government or local holidays and event on the calendar.

Maths Note

A calendar is offers a real-life situation where students actually see the numbers to 30 (or 31). It is different from many of the other charts students meet in maths since the chart is 7 columns wide rather than 5 or 10 columns wide, which is more typical of other number situations. It is important for students to learn that the number of days in each month is not the same and that different months need not start on the same day of the week.
The students should also learn the names of the days of the week and associate them with the chart.

Assessment for Learning

See that the students can read and say the names of days of the week. The students should also know the meanings of rows and columns of a table, and be able to tell the number of rows and the number of column for the shown calendar table.

Lesson 12 Skip Counting by 2s, 5s and 10s

Objectives

Skip count up to 30 by 2s ,5s and 10s.

Materials

Number line up to 30 (from the earlier lessons)
Counters or linking cubes
Chart pictures showing a triple 10-frame completely filled with dots

> Maths Note
>
> Skip counting is a helpful skill in counting greater numbers of items more efficiently. This skill is also useful later on when students work on multiplication.

Tell the students: **Today we will learn how to count objects in different ways.** Provide pairs or groups of the students with about 30 items each such as linking cubes or counters. Ask them to count how many they have. Go around and see how they count; they would most probably be counting by 1s. See that they do it properly such as separating an item from the group each time they count.

Ask 5 students to come and stand in front of the class facing the class. Ask the rest of the students: **How many students are standing here? How many eyes are here?** (Referring to the eyes of the students standing) **How do you know?** Have someone count the eyes of the 5 students one by one. Ask the 5 students to raise both their hands and fingers. Ask the rest: **How many fingers are raised?** Have someone count the individual fingers in sequence of all the 5 students. Ask: **Can we count the number of fingers of our 5 standing friends in a different way?** Encourage the students to suggest. Then demonstrate how to count the fingers by 5: **How many fingers are there on one hand? On the next hand? On the third hand?...** Then count by 5s as you tap on each of the raised hands to 30, and then to 50 as there are 5 students. Have all the students, including the students standing, practice counting by 5s to 50 a few times using the hands of the students standing. Tell the students to take their seats.

Ask another group of 5 students to come and stand in the front. Have them raise their hands and fingers as in the earlier case. Ask the rest how many fingers there are. Have the student count the fingers in 5s. After that, ask: **How many fingers does each of us have in total?** Then demonstrate counting by 10, as you tap on each student or move them aside one by one. Practice counting by 10s to 50 a few times with all the students.

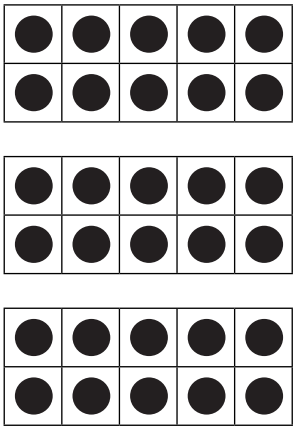
Have the 5 students still standing, and ask: **How many eyes are there in total here?** See if the students can count by 2s. If not, demonstrate counting by 2s. Practice counting in 2s a few more times to 30. It may be helpful to have students stand up each time so that counting by 2s will end up with 15 students standing to represent the total of 30 eyes.

Ask the students to count their counters or cubes in 2s and 5s. Go around and help the ones still requiring help. It might also be useful to show how to physically make groups of 2 or 5 while counting.

Put up the chart showing the pictures of the triple 10-frame. Ask: **What number do these frames show? Or, how many dots are there in these three 10-frames? How will you count the dots?** Encourage the students to count by 5s and 10s. In counting by 5s, point to each individual row of

the 10-frames. In counting by 10s, point to each 10-frame. You could also practise counting by 2s by considering and point to each column in each of the 10-frames (or each row if you turn the 10-frames on their sides).

A triple 10-frame



> Assessment for Learning
>
> See that the students can use proper counting techniques when counting (e.g., one and only one counting word is used for each item, and the last counting word said is the number of items. Now that the students also know the number zero, which comes before 1 on the number line, ensure that they do not use it in counting objects)

Ask the following questions: **Is it faster to count by 1s or by 2s? Why?**

Extension

Start with three complete 10-frames, as shown above, using counters. Remove one 10-frame at a time to count backward from 30 by 10s. Remove one row of counters at a time to count backward from 30 by 5s. Then repeat the process except remove one column of counters each time to count backward by 2s.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner. What is even more important is the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 1 NUMBERS TO 30

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*								
		Count forward to 30, and backward from 10.	Compare quantities or numbers and say which is more, less, or the same.	Describe a number in relation to 5, 10, and 20.	Locate a number 10 30 on a number line.	Use ordinal numbers to 10^{th}.	Represent numbers to 30 on 10-frames.	Read and write numerals to 30.	Describe numbers more than 10 as "number of 10s and some more".	Use skip counting by 2s, 5s, and 10s
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: ____ Section: ____

CHAPTER 1 NUMBERS TO 30

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using the Interview-based Performance Task.)*

Task and Interview prompts	**Key concepts & skills to look for**
Present the student with a collection of 26 linking cubes. Have a triple 10-frame and a number line nearby. Ask: **How many cubes do you think are here? How would you know how many there really are?** (Have the student count by 1s, 2s, and 5s) Have the student write down the number on a piece of paper. **Show this number on the triple 10-frame.** **Can you describe this number in terms of 20?** **How many more cubes would you need to make it to 30? Show 26 on this number line. What number comes right after 26? Right before 26? Which number is more – 25 or 26? Why?** **Show me a number which is a bit more than 20.** **Show me a number which is much less than 20. Why do you think so?**	*The student is able to :* - Make reasonable estimate. - Use counting techniques - Use skip-counting by 2s and 5s. - Represent numbers on 10-frames. - Relate and describe a number in terms of 20. - Write the numeral for a number. - Locate numbers on number line. - Explain why a number is more or less than another. - Demonstrate number sense. - Communicate thinking clearly.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 1

CA marks from Chapter 1 (Marks out of 10): _____

CHAPTER 2 SORTING AND PATTERNING

Chapter Overview

What is a pattern? When some things repeat over and over again, a pattern is created. When things are structured in a certain way that is predictable, they form a pattern. Patterns abound in nature. For example: the cyclic changes of the seasons; the cycle of day and night; the waxing and waning of the moon during the course of the month; the fixed position of the Northern Star - all exhibit patterns in nature. These patterns are apparent. Some patterns in nature are not easily discernible, if not studied. For instance, the number of petals in flowers, the arrangement of seeds in sunflowers and pinecones, the appearance of the outer skin of a pineapple and the spiraling line of a snail's shell all share a common pattern. Our number system has many patterns embedded in it.

Pattern discovery is a very useful mathematical skill. It leads to establishing relationships between and among events. In fact, discovering patterns and explaining how and why the patterns behave the way they do is a central aspect of studying mathematics. As such, children in the lower classes are given exposure and experiences in recognizing and making patterns. This study and understanding of patterns will be reinforced throughout experiences in other areas of mathematics. An understanding of patterns will help children in making sense on the working of the number system, including place value concepts, naming of numbers and the basic number operations.

For children to be able to recognize, extend, and create patterns, they need to first recognize pattern rules. Pattern rules are usually based on some single attribute of the items under consideration. In order to do that, they have to know the attributes and characteristics of things. So, before children do activities with patterns, they learn to identify and describe the attributes of things. Then they learn to sort the objects based on attributes. This chapter reviews and builds upon describing objects, sorting objects and making simple repeating patterns that they learnt in Class PP, and then moves to further their learning and experience in these areas.

This chapter has 8 lessons as detailed in the Table of Contents. The use of concrete materials for almost all the lesson activities will be critical in the effective teaching and learning of the concepts and skills in this chapter, as in all of the other chapters.

Basic Principles about Sorting and Patterning

- Attributes of objects are things pertaining to the objects such as their colour, shape, size, use, sound and position. Characteristics are specific examples of those attributes. For example, an item might be red with respect to the attribute of colour; red is characteristic of that item.
- Sorting is the physical arrangement of items that go together.
- Patterns underlie mathematical concepts and patterns abound in nature.
- Patterns are based on attributes that repeat in a predictable way.
- To create patterns, objects are sorted by whether or not they display a particular attribute.
- There are many ways to describe a pattern, but any description needs to refer, in some way, to how the attribute repeats.
- If only some elements of a pattern are shown, there is more than one way to extend it. This is why students must be able to explain their reason for extending a pattern and teachers must be open to being surprised as to the pattern that is being seen by a student.
- A pattern rule is a clear statement of how a pattern starts and continues.
- The translation of a pattern into a different form is a way to describe a pattern.

Chapter Goals

- Describe objects in terms of their attributes such as colour, shape, size, use, number and behaviour.
- Sort objects/shapes and tell the sorting rules.
- Recognise and describe simple repeating and simple growing patterns.
- Describe and extend simple repeating and simple growing shape and number patterns.
- Translate simple repeating patterns.
- Create simple patterns.

Maths Words

Different, same, sort, sorting rule, group, attribute, pattern, pattern rule, translate.

Lesson 1 Describing Objects

Objectives

Describe some common objects in terms of their attributes.

Materials

Linking cubes, counters, pebbles, pencils, crayons, chalk boxes, 3-D geometrical shapes, pattern blocks, balls, marbles, leaves, long sticks, short sticks, cans, bottles and containers

Have a collection of the above materials ready. Tell the students: **Today we are going to talk about or describe some of the things we see around, including ourselves.** First, model describing yourself, by telling about yourself to the students such as who you are, how you look, what you are wearing, and where you are from. Then, encourage some students, or all of them if the class size is not big, to tell about themselves one by one.

Then, tell: **We will be describing the different objects**. Model describing an object or two from the collection using their attributes such as colour, shape, size and behaviour (whether the object will roll or slide if you give it a push on a plane). Then, distribute an object each to a pair of groups of students. Have them discuss in groups for a while before describing the object to the class by saying at least three things about their object. Each member of the group should say at least one thing about the object. If the students seem to struggle, you can prompt them by asking questions such as: **What colour is it? Is it big or small? If you touch it, what does it feel like – smooth or rough? If you push it, will it roll or slide? What does it look like? Is it heavy or light? What do we use it for? Will it bounce if you drop it on the floor? What is it made up of?**

Maths Note

In order to be able to create patterns, students have to notice attributes and characteristics of shapes. Attributes are qualities or features like colour, size, shape, and use. Characteristics are specific examples of those attributes. For example, an item might be red with respect to the attribute of colour; red is a characteristic of that item.

One way to help students to focus on attributes to describe objects is to compare and contrast two items. The objects that students are asked to describe should be things they meet in their everyday world and not necessarily just mathematical objects.

Extensions

It would be appropriate and beneficial at this point to carry out the following activities found in Chapter 1 of the Teacher's Guide for Class PP:

Activity 6: Tell Me the Object (page 9)
Activity 7: Pass Around (page 10)

Assessment for Learning

See that the students are able to describe an object in terms of at least some of the attributes such as the object's colour, size, shape, name, use, behaviour under certain action or the material with which it is made.

Objectives

Lesson 2 Sorting Objects

Sort 3-D objects based on a variety of simple attributes including shape, colour, position, material of which an object is made, sound, etc.
Tell the sorting rules used in sorting the objects.

Materials

All the objects used in the previous lesson (Linking cubes, counters, pebbles, pencils, crayons, chalk boxes, 3-D geometrical shapes, pattern blocks, balls, marbles, leaves, long sticks, short sticks, cans, bottles and containers)

Call a mix of boys and girls in front of the class. Say: **Here, we have some students.** Then without saying anything, make them stand in two separate groups of boys and girls, and ask: **What have I done to these students?** Say that you have sorted them into boys and girls. See if you can put the boys and girls together and re-sort them into two groups (for example, students wearing shoes with laces and shoes with buckles or those wearing spectacles and those not wearing spectacles) and ask the students how you have sorted them this time.

Provide pairs or small groups of students with a collection of materials each, and ask them to sort the objects into two groups. It would be better if you already have the objects for each group in plastic bags or containers. The collection of objects for the groups could vary in such a way that it would be easier for the students to sort the objects according to their attributes. While students work on sorting objects, go around and ask: **How did you decide to sort? What is the same about the objects in this group? Is it based on colour/shape/size/use? To which groups will this belong?** Provide help to those struggling. Once all groups have finished, invite the students to visit other groups and encourage them to ask questions of one another on their sorting and sorting rules.

Set out a group of about 4 pattern blocks, all made of the same materials (e.g., all made of rubber) and of the same colour (e.g., yellow). To this group add a piece of another pattern block of a different colour (e.g., blue), but of the same material. Then add a (yellow) linking cube. Display the collection for all the students to see, and tell: **One of the objects does not belong in the group. Which object does not belong in this group?** More than one answer is valid for this question. Encourage the students to explain the reasoning behind their choice of the object.

Maths Note

Sorting underlies the idea of patterns, for in patterns we look for the repetition of certain attributes in a predictable way. Sorting is also fundamental to work with number, shape and measure and will be revisited in those units. Often people distinguish sorting from classifying in this way. Sorting is the physical arrangement of items that go together. Classifying is what we do when we "name" items, but do not necessarily put them together. For example, observing that an item is or is not a chair is a way of classifying items, but putting chairs in one group separated from a group of tables is sorting.

Assessment for Learning

See that the students can describe their rules for the sortings they have done. Also make the students realize that an object could belong to more than one group depending on their sorting rules.

Extensions

It would be appropriate and beneficial at this point to carry out the following activities found in Chapter 1 of the Teacher's Guide for Class PP:

Activity 3: A Sorting Game (page 15)
Activity 2: Guess My Sorting Rule (page 19)
Activity 3: What Doesn't Belong (page 20)

Lesson 3 Making and Describing Colour Patterns

Objectives

Recognise, describe and make repeating patterns based on colour.

Materials

Linking cubes in various colours
Pattern blocks

Call 3 boys and 3 girls to the front of the class and make them stand facing the class by alternating boys and girls. Ask the class: **Is this line of students a pattern? Why do you think so? If I call one of you to stand here, who should I be calling – a boy or a girl?** Invite a few more students to come and extend the line of students. Tell the students that they will be making patterns by using colours.

Use linking cubes in two different colours to make an AB colour pattern as you have the students observe how you make it. **Is this a pattern? How do you know that this is a pattern? What colours are repeating? What two colours are repeating again and again?** Explain the repeating part of the pattern to the student. Then make an ABB pattern, and repeat asking and explaining similarly. Replace one or two of the cubes with patterns blocks of the same colour. Tell the students: **I am going to replace this cube with this (triangular block). Is this still a pattern? Why do you think so?** Explain that when it is a colour pattern, shapes and materials do not matter.

Provide pairs or individual students with adequate numbers of linking cubes and pattern blocks. They should be provided the materials in two colours initially. Ask them to make their own colour patterns. As they work, go around and engage them by asking them to describe their patterns. Challenge them to make at least one other pattern using the same materials. Invite the students to visit others and ask questions of one another about their patterns.

Maths Note

A repeating pattern is one in which a part of the pattern, called the core, repeats over and over again. This lesson focuses on making simple repeating patterns based on the attribute of colour. Patterns with shapes will be focused upon in the chapters dealing with 2-D Shapes and 3-D Shapes. Simple repeating colour patterns with cores of the form AB, AAB, ABB, ABBA, ABC should be explored in this lesson, although you will not be using the letter codes yet.

Assessment for Learning

Ensure that the students are able to describe their patterns. They should also be able to identify the repeating part or the core of their pattern.

Lesson 4 Making and Describing Repeating Number Patterns

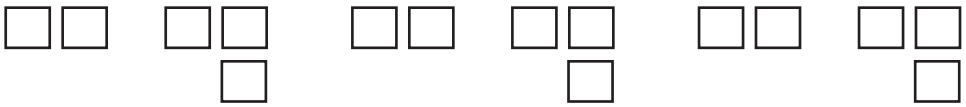
Objectives

Recognise, create and describe repeating number patterns.

Materials

Counters (or linking cubes or pebbles) and toothpicks

Make 6 sets with counters (or cubes) as shown below so that each set is clearly away from the next; invite the students to observe the sets. Tell that each is a set of counters and ask if they can see a pattern with the sets.



Prompt the students by asking: **How many sets are there? What are the sets made up of? How many cubes are there in the 1st set? How many are there in the 2nd set? How many in the 3rd set? How many in the 4th set?** And so on. **Can someone come here and make a set here** (pointing at a space after the 6th set)? Have another student make one more set in line after that. **So is this a pattern now? So what kind of a pattern is this?** Make the students realize that it is a number pattern (2 3 2 3 2 3 …). Draw the sets on the board and write the numbers for the sets below each of them. Change the arrangement of the items in the set (e.g., as shown below), and ask if it is still the same number pattern. Ask what numbers are repeating over and over again in the pattern.

Distribute linking cubes, counters and toothpicks to different pairs or small groups of students, and ask them to make simple repeating number patterns. As they work, go around and help those who struggle. Engage the students by asking question such as: **What makes that a pattern? What numbers are repeating over and over again in your pattern? Can you write down the numbers for me?** After all the groups have finished, invite the students to visit others and ask each other questions about the patterns they have made.

Maths Note

The focus of this lesson is on simple repeating number patterns. A repeating pattern is one in which a part of the pattern, called the core, repeats over and over again. For example, 1 2 2 1 2 2 1 2 2 … is a repeating number pattern. The core of the pattern in this pattern is 1 2 2. Students should use concrete materials representing numbers rather than simply using symbolic numerals in the initial stage to make their number patterns.

Assessment for Learning

Ensure that the students can describe their pattern. Ensure also that they can tell the repeating part of their patterns.

Lesson 5 Making and Describing Simple Growing Number Patterns

Objectives

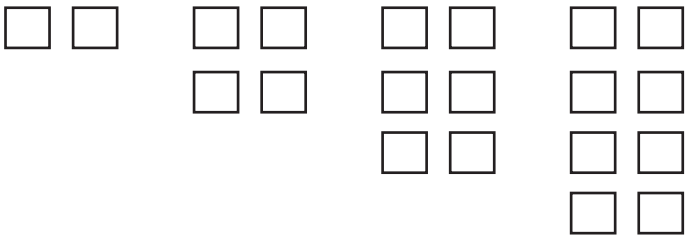
Recognise, create and describe simple growing number patterns.

Materials

Counters (or linking cubes or pebbles) and toothpicks

(Note: You will need plenty of materials as the patterns are growing. Otherwise, fewer groups with more people in each may be required.)

Make 4 sets with counters (or cubes) as shown below, so that each set is clearly away from the next; invite the students to observe the sets. Tell that each is a set of counters and ask if they can see a pattern with the sets.



Prompt the students by asking: **How many sets are there? What are the sets made up of? How many cubes are there in the 1st set? How many are there in the 2nd set? How many in the 3rd set? How many in the 4th set? How many counters do you think will be there if I make the 5th set? Can someone come here and make the next set?** Have another student make one more set in line after that. **Is this a pattern now? So what kind of a pattern is this?** Make the students realize that it is a number pattern (2 4 6 8 10 …). Draw pictures of the sets on the board, and write the numbers for the sets below each of them. Ask: **Is any number repeating in this pattern? What is happening to the numbers?** Explain that in this pattern, the numbers are becoming bigger and bigger, or that they are growing. The growth is constant with each set gettign bigger by 2. Tell that such a pattern is called a **growing pattern**.

Distribute linking cubes, counters and toothpicks to different pairs or small groups of students and ask all of them to make simple growing number patterns, based on the number that you write on the board as, 1 3 5 7.

Then, ask them to make and show a growing number pattern of their own. As they work, go around and help those who struggle. Engage the students by asking questions such as: **What makes that a pattern? What numbers are repeating over and over again in your pattern? Can you write down the numbers for me?** After all the groups have finished, invite the students to visit others and ask each other questions on the patterns they have made.

Maths Note

In this lesson, the students are exposed to simple growing patterns. A growing pattern is one in which there is no repetition of a core, unlike the one in the case of a repeating pattern, but each successive item is getting bigger by a regular amount. For example, 1 2 2 1 2 2 … is a repeating pattern, in which the repeating core is 1 2 2; whereas 2 4 6 8 10 … is a simple growing pattern in which each number increases by 2.
The students should still be using counters to help them create their patterns rather than simply using symbolic numerals.

Assessment for Learning

Ensure that the students can describe their pattern and tell how their pattern is growing.

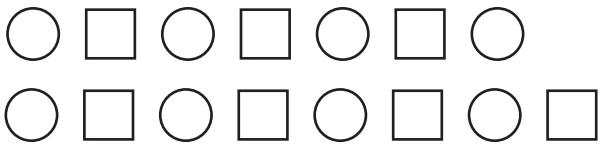
Lesson 6 Extending Patterns

Objectives

Continue a pattern that is already started after recognising the pattern structure.

Maths Note

Many students struggle more with extending a pattern if the part of the pattern that is provided stops in the middle of the core. For example, many students struggle more with extending the first pattern than the second one.



Because the students have had some experience with extending patterns in Class PP, there should be a balance of the two types of situations presented to them as above.

In addition, it is important to realize the students cannot extend a pattern until they recognize the pattern, so a first step is always to ask what the pattern is.

Keep in mind that unless a pattern rule is provided and the student is told the structure of the pattern, there are many correct ways to extend it. The students should not be penalized for inventing a different, but reasonable, rule from what the teacher intended.

Materials

Small square pieces of paper in 2 or 3 different colours (about 15 sheets of each colour)
Newsprint papers
Glue stick

Prepare the coloured pieces of paper, as mentioned above, in advance. Put up a newsprint paper on the wall. Post the coloured papers in a repeating pattern, using glue. As you post the papers, say the colours aloud: **red, red, blue, red, red, blue,…** Encourage students to join you in saying the names of the colours. After posting about 6 papers, ask: **Is this a pattern? How do you know? What part repeats over and over again? Let's check.** Then ask: **What colour could be pasted next?** Listen to their suggestions and then paste it. Ask: A**nd then, the next?** Invite some volunteers to come forward and post the papers one by one up to whatever extent you may want to go. Once enough papers have been posted, chant the colour names from the beginning to the end of the pattern.

Tell the students to close their eyes and remain that way until you tell them to open their eyes. Remove a paper from the pattern. Tell them to open their eyes and say: **One colour is missing from the pattern. What colour do you think is missing from the pattern? Why do you think that? How do you know?** Reveal the missing colour after you have listened to several predictions.

Make a different pattern using the same coloured papers. Take the students through a similar process. For extending the pattern, ask the students who did not come forward earlier to post the papers.

Then, write the following repeating number pattern on the board. Ask the students if it is a pattern and if so, why and what part is repeating. Then, have a few students come forward to extend the pattern, while the others will see if it is correctly done.

3 3 6 3 3 6 3 3 6 ….

Then write the following simple growing number pattern on the board and ask the students similarly. You may want to extend it up to 20, by having one student write one number at a time.

2 4 6 8 …..

Then write the following letter pattern on the board and repeat the process.

A B C A B C A B C …

After the above letter pattern has been extended to an adequate length, ask the student to close their eyes for some time while you rub off a letter or two in between. When they open their eyes, say that some letters are missing, and ask them to identify the letters. Ask why them why they think those letters are missing.

Assessment for Learning

See that the students can identify the core in the case of repeating patterns and that they can extend the patterns.

Extensions

It would be fun, appropriate and worthwhile to carry out the following activity found in the Teacher's Guide for Class PP:

Activity 2: Keep the Pattern Going (page 136)

Lesson 7 Translating Patterns

Objectives

Translate simple colour, shape and number patterns using letter codes.

Materials

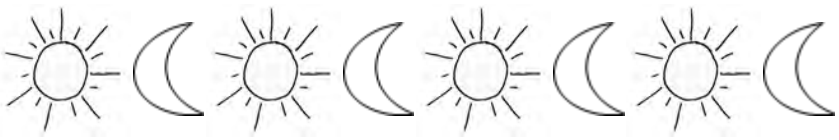
Colour pattern on chart paper (red, red, blue, ...)
Shape pattern on chart paper (circle, circle, triangle, ...)

Display a colour pattern first, and ask: **What type of pattern is this? Is it a growing pattern or a repeating pattern? What part of the pattern is repeating again and again? How many items are there in the repeating part?**

Then put up the shape pattern right below the colour pattern and ask similar questions as above:

Focus the students' attention on the repeating part or the core of each pattern. Ask them what is similar about the two repeating parts. Make them realize that they repeat in the same way and that these two patterns are actually the same in how they would continue. Then, introduce letter codes such as AAB for these two patterns. Say that the above colour pattern is the translation of the shape pattern and vice versa. Say that both these patterns are AAB repeating patterns.

Then put up the following AB pattern:



Ask the students to first describe this pattern. Ask: **What type of pattern is this pattern? What is the repeating part, or the core of the pattern? If we think of the sun as A, and the moon as B, how can we describe this pattern using A and B. How is this pattern different from the colour**

Maths Note

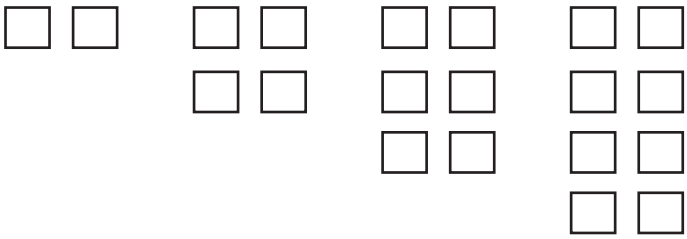
The mathematics of pattern focuses on the structure of the pattern, not the actual items. A pattern like triangle, circle, triangle, circle, triangle, circle, ... is structurally the same as a pattern like red, blue, red, blue, red, blue, ...

One way to help children focus on the pattern structure is to have them show the same pattern in a different way. So red, red, blue, red, red, blue, red, red, blue, ... is called a translation of the pattern triangle, triangle, circle, triangle, triangle, circle, triangle, triangle, circle, ... They are both AAB patterns, if we use letter coding. It would benefit the students to compare patterns before they begin to translate them; this is likely to help them focus on a pattern structure.

pattern above? Is this pattern a translation of the colour pattern? Is it a translation of the circle, circle, triangle pattern above? Ask the students to create a translation of this pattern by drawing using two colours in their notebook. As they work, go around and help them. Once every one is done, ask them to translate or make another AB pattern in their notebooks by drawing two simple shapes. Again go around and help them. Once everyone is finished, encourage the students to visit and ask questions to one another on the patterns they have made.

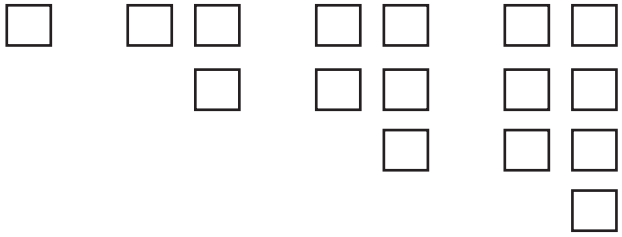
Extension

Post a growing pattern as shown below.



Ask: **Is this a pattern? What type of pattern is this? Is it a repeating pattern, or a growing pattern? Can you describe it using numbers? What are the numbers for this pattern then? Why is it called a growing pattern? What will be the next number?**

Then post the following growing pattern:



Ask: **Is this a pattern? What type of pattern is this? Can you describe it using numbers? What will be the next number? Why is this a growing pattern? What is the same about these two patterns**? **What is different about these two patterns?**

Challenge the students to make a growing number pattern.

Assessment for Learning

Ensure that the students can describe and compare the repeating part or the core of a pattern with that of another and say whether the two have the same or different structure by using letter codes. Ensure also that the students can understand and use the word **translation** in this case.

Lesson 8 Creating Patterns

Objectives

Create relatively simple repeating patterns and simple increasing patterns.

Materials

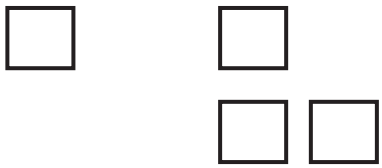
Linking cubes, counters, pebbles, toothpicks, leaves, crayons, pencils, cut-out shapes, 3-D geometrical shapes etc

Make the above collection of materials available to the students. Ask the students, in pairs, to create a repeating pattern first. As they work, help them by asking them questions such as: **Tell me about your pattern. What type of a pattern is that? What part is repeating in you pattern? Can you describe your pattern in terms of letters? Can you translate your pattern or make another pattern having the repeating part as (ABB)?** After everyone has finished making one or two patterns, encourage the students to visit and ask each other questions on the patterns they have made.

Then ask the students to make a simple growing pattern with objects. As they work, go around to help and to ask questions such as: **Tell me about your growing pattern? What makes it a growing pattern? Can you write the numbers for the items or sets of your pattern?**

Can you make another growing pattern with numbers?

Start a pattern as given below:



Have the students to represent the above two sets by numbers. Ask them to continue the pattern. Some students may see it as a repeating pattern as 1, 3, 1, 3, 1, 3, ... Some students may see it as a growing pattern such as 1, 3, 5, 7, 9, ... Some students may continue this pattern in yet another way such as 1, 3, 4, 1, 3, 4, ... or 1, 3, 6, 10, ...

Maths Note

Students should be encouraged to describe the pattern that they create. This ensures that they really understand what a pattern is. They should also be encouraged to use a variety of different attributes, but particularly number, shape and colour, on which to base their patterns and a variety of structures, for example, not all AB patterns. It may be necessary to encourage students to show enough of the pattern to make it evident. Many students might just show a couple of items; although it may be clear to them how they intend to continue the pattern, it may not be clear to others.

Assessment for Learning

Ensure that the students can describe their patterns, as well as translate them using letter codes for the repeating patterns. Make the students realize that it is important to show enough of the pattern, at least to 3 items, as it may not be clear to others how the pattern should continue even though it may be clear to them.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner. What is even more important is the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 2 SORTING AND PATTERNING

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*					
		Describe some common objects in terms of their attributes such as colour, size, shape, use, and behavior.	Sort objects and tell the sorting rule.	Recognise, extend, and create simple repeating patterns.	Recognise, extend, and create simple growing patterns.	Translate simple repeating patterns.	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: ____ Section: ____

CHAPTER 2 SORTING AND PATTERNING

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using the Interview-based Performance Task.)*

Task and Interview prompts	**Key concepts and skills to look for**
Have a collection of about 20 linking cubes in various colours, a packet of paper clips, a packet of crayons, a packet of toothpicks and counters. Say/ask: **Make a pattern using any of these objects. Tell me about your pattern. What is repeating in your pattern (if it is a repeating pattern)? Can you describe your pattern in terms of A and B? Make another pattern having the repeating part as (AB/ABB/AAB/...).** **Mix these objects, and sort them into two groups. What is your sorting rule, or why did you put all these together?** **Make a simple growing pattern with numbers by writing them here** (provide a sheet of paper)**. How are the numbers increasing in your pattern?**	*The student is able to:* - Make or create a simple repeating pattern. - Describe the pattern, in terms of the repeating part. - Translate or describe the pattern in terms of letter codes. - Translate the pattern into another pattern. - Sort objects. - Describe the sorting rule. - Make a simple growing pattern with numbers. - Describe the growing pattern.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 2

CA marks from Chapter 2 (Marks out of 10): _____

CHAPTER 3 INTRODUCTION TO ADDITION AND SUBTRACTION

Chapter Overview

Ideas of addition have been very informally integrated with the number concepts in Class PP. This chapter introduces both addition and subtraction formally to the students. Addition and subtraction both lead to a change in quantity. Addition leads to an increase in a quantity and subtraction lead to a decrease in a quantity. Addition and subtraction are intrinsically related.

There are basically two situations where addition is involved. One is active, where some objects join a set and, as a result, the number of objects in the set is increased and we determine the total number of items in the set. The other situation is called static addition where a whole is made up of two or more parts. Similarly, there are basically two situations where subtraction is involved. One is called active, where some objects from a set are removed, or separated and, as a result, the number of objects in the set is decreased and we determine how many is left in the set. The other situation is static, where we compare two sets, and determine which set has more items and by how many more. It is important to expose the students to all these situations of addition and subtraction. The students should also realize the inter-related nature of these situations within addition, within subtraction and between addition and subtraction.

The concepts of and experience with addition and subtraction will further deepen the understanding of number concepts in the students. The main approach espoused for teaching addition and subtraction in this chapter is the use of story-telling. The students will be first exposed to many simple situations or short stories, involving small numbers, where they will be asked to determine the change or result in the numbers at the end. Then gradually the students will relate each of these situations as addition stories or subtraction stories, and start to use the addition and subtraction language and symbolism. The students will also be asked to come up with simple stories involving addition and subtraction. For both the active addition and the active subtraction, the stories should have 3 distinct parts – a number at the beginning, an action in the middle and a number at the end. The students should identify a story as an addition story, if the number at the end is more than the number at the beginning of the story; and a subtraction a story if the number at the end is less or fewer than the number at the start of the story. Modeling the stories or situations through the use of concrete materials is essential for the students to really understand addition and subtraction at this stage.

This chapter has 7 lessons as detailed in the Table of Contents.

Basic Principles About Addition and Subtraction

- Addition and subtraction both involve changes in quantity. Addition leads to an increase in a quantity, and subtraction leads to a decrease in a quantity.
- Addition and subtraction are intrinsically related. For example, if a + b = c, then c – a = b, and c – b = a.
- An addition can be either active or static. Similarly, subtraction can be active or static.
- An equation is a statement of balance. It simply indicates that the quantity on one side balances, or is an alternate representation for, the quantity on the other side.

Chapter Goals

- Describe simple addition situations or narrate simple addition stories using objects.
- Describe simple subtraction situations or narrate simple subtraction stories using objects.

- Represent addition situations using numbers, and + and = signs.
- Represent subtraction situations using numbers, and – and = signs.
- Create simple addition and subtraction stories from number expressions such as 3 + 4 = 7 or 5 – 2 = 3.

Maths Words

Add, plus, join, addition, subtract, minus, take away, subtraction, total, whole, addition phrase, subtraction phrase.

Lesson 1 Modeling Addition and Subtraction Situations

Objectives

Experience situations where quantity in a situation changes as the result of some action, and tell whether the number increased or decreased and how many there are at the end.
Compare numbers and use terms like more, less, fewer.

Materials

Chart paper
Duct tapes
Cut-out pictures of deer
Counters or linking cubes

Maths Note

The students should be focusing on whether numbers increase or decrease in a given situation. This will be associated with addition and subtraction in the later lessons, but not in this lesson. The focus of this lesson is in providing the initial experience of simply thinking about whether the result is more or less than the initial number or quantity. Various situations involving both the increase in and decrease in the numbers should be explored in this lesson.

On a chart paper, draw a picture of a meadow with forest in the background and a stream visible in it at the periphery. Display the chart picture. Place 3 cut-out deer in the meadow. Ask the students questions related to the picture, such as: **What do you see in this picture?** Introduce and explain the words like meadow, forest, stream, mountain and deer. Then tell them that you are going to tell them a story: **Today, I am going to tell you a story. This story has 3 parts – a beginning, middle and an end. Three deer have come to eat grass in this meadow. This is the beginning of the story. They eat grass and play here. They are having fun and enjoying the day. After some time, two more deer come to join them.** Put two more cut-out pictures of deer in the meadow. **This is the middle of the story. All these deer now eat grass and play here in this meadow. This is the end of my story.** Ask questions like: **Are there more or fewer deer now than in the beginning of the story? How many deer do we see now? How many deer did we see in the beginning? How many joined them in the middle? How many deer are there at the end?**

Tell another story. **I am going to tell you another story. This story also has 3 parts – a beginning, middle and an end. Six deer are eating grass in this meadow. Begin wiht pictures of 6 deer in the meadow. This is the beginning of the story. It is a hot day. The sun is shining bright. Two deer are thirsty, so they go out in search of water. This is the middle of the story. Can you help them find water?** Take out 2 deer from the meadow. **These friends are not thirsty and they remain in the meadow. This is the end of my story.** Ask: **Are there more or fewer deer now than in the beginning of the story? How many deer do we see now? How many deer did we see in the beginning? How many left the meadow in the middle? How many deer are there at the end?**

Distribute about 12 counters and a sheet of blank paper to each student. If the class size is large, the counters and the papers could be distributed to pairs of students. Ask them to place the paper on their desk and think of it as a meadow and the counters as deer. Tell them similar stories of deer joining and leaving the meadow. Have them represent the number of deer during each part of each story. For example: **This story begins with 10 deer eating grass in the meadow. Show me 10 deer with your counters. Then, after some time, 5 deer leave the meadow. Can you all show me**

5 deer leaving the group? How many deer are left in the meadow? Are there more or fewer deer now? Have the students represent or model the stories you tell a few more times, each time varying the number of deer at the start and the action in the middle wityh some more deer joining or leaving the group. Make sure that in one of the stories, all the deer leave the meadow, because they sense some dogs coming, and ask the number of deer at the end. This brings in the use of 0 as a number in the story.

Encourage the students to tell similar stories to each other in pairs. Have one student tell a story and the other student to model it with counters. As they do that, go around and see that the students are able to tell the numbers at the beginning of their story, tell the action that happens in the story and the number at the end of their story.

At the end, ask questions such as: **How does the number of deer change when some more join a group? If you start with 5 deer, what could happen to make the number change? If you start with 10 deer at the beginning of your story and it became fewer deer at the end, what might have happened in the middle? If you started with 4 deer at the beginning and there are no deer at the end, what could have happened? What happens in the middle of the story, if the number of deer is more at the end? What happens in the middle, if the number of deer becomes fewer at the end?**

Assessment for Learning

Ensure that all the students can follow through your story and model the number at each stage of the story with counters.

Lesson 2 Introducing Addition

Objectives

Model addition stories or situations involving joining actions with concrete materials.
Represent addition stories or situations with number sentences.

Materials

Counters or snap cubes
Dice
Notebooks and pencils

Have 2 students come to the front and write 2 on the board. Ask 3 more students to join them. As you do this, write + 3 on the board. Tell the students that + is called **plus sign** and that it tells that you are going to be adding (more people to) the original group and the 3 tells how many are being added. Then ask: **How many students are there now?** Ask the students to go back to their seats. Then ask 5 students to come to the front. Ask: **What number should I be writing on the board? I am going to ask 2 of you to come and join this group. What should I be writing here on the board?** After having two more students join the group**: How many students are here now?**

Referring to the number phrase 5 + 2, explain that 5 is the number of students in the beginning, + is the act of joining or adding and 2 is the number of students that joined. Ask: **How many students are there at the end? Or, how many students are there altogether.** Then introduce the class to the = sign and write the number 7 after it. Explain that 5 + 2 = 7 means 5 and 2 is 7. Ask: **How can we be sure that 5 and 2 is 7?**

Distribute about 15 counters or snap cubes to the student, either individually or in pairs. Tell that you are going to tell them a story and that they are going to represent the numbers with the counters as you tell the stories and also write the numbers in their notebooks. For example: **Four deer are grazing in a meadow. Show the four deer with counters. Write the number 4 in your notebook. 2 more deer come to join them. How many counters should you add? What should you write after 4 in your notebook? Now how many deer are there? What should you write after 2?** Ensure that all can model the story with counters as well as write the number sentence, 4 + 2 = 6. Ask: **How do you know that 4 and 2 is 6?** See what strategies the students use to confirm that 4 and 2 is 6 – some students might count all the 6 counters one by one; some will count on from 4 as 4, 5, 6.

Tell a few more addition stories, using different contexts and numbers, but following the same structure as above. Have the students represent them both with counters and number sentences each time. Some examples could be:

Two dogs are playing on the path. Three more come to join them.

Pema has three pencils. His father gave him one more pencil.

Maths Note

This lesson introduces addition to the students using **active** or **joining** situations, where there are initially **a** items and then **b** items are added on to the set. Student are introduced to the + sign as the action of joining. Story problems, as carried out in the earlier lesson, should be continued in this lesson. The students should associate the number before the plus sign (+) to the initial value and the number after the plus sign (+) to the number that joined. Adequate time should be spent on determining the number at the end verbally, as a result of the joining action, before the equal sign (=) is introduced. Students then associate the number after the equal sign (=) as being number at the end of a story.

Ten people are travelling in a bus. Five more got into the bus on the way.

I ate five momos. I was still hungry. So I ate five more momos.

Three birds are sitting on a branch. Two more birds come flying to sit with them on the branch.

Ensure that in one of the stories, no object joins or is added to the initial group. For example: **Three rats are eating a piece of cheese. No rats came to join them and they finished eating the cheese by themselves.** See if the students can model this with counters and also write the number sentence as:
3 + 0 = 3.

After all the students can follow the stories and represent them with counters and number sentences, reproduce a number sentence they have written on the board. For example: 3 + 1 = 4. Explain that + is called plus sign, and that = is called equals sign. Explain what the + and the = signs mean. Ask what each of the numbers mean – the number before the + sign, the number after the + sign, and the number after the = sign. Ask: **Is the number after the = sign more than any of the numbers before the = sign? Why do you think is that happening? When is the number after the = sign the same?** (This connects with the example of adding 0)

Encourage the students to tell similar stories to each other in pairs. Have one student tell a story and the other student model it with counters, as well as writing the number sentence. As they do that, go around and see that the students are able to tell the numbers at the beginning of their story, tell the action that happens in the story and the numbers at the end of their story.

Assessment for Learning

See that the students can follow the stories and model the numbers at each stage with counters, as well as write the number sentences. You may have to check this at every stage and go clearly and slowly in the beginning.

Extension

Give 12 counters, a die, and a small container to each pair of students. Tell them to think of the counters as fish and the container as a pond. One student rolls the die, and puts into their pond some fish as per the number on the die and writes the number down on a paper or notebook. Then the other student rolls the die to determine how many fish to put in the pond. The second student then writes an addition phrase (for example, 4 + 5) by continuing with the number written by the first student. Then together they complete the number sentence by determining the total number of fish in the pond. They take out all the fish from the pond and repeat the game. They take turns as the first roller of the die.

Lesson 3 Part-Part-Whole Addition

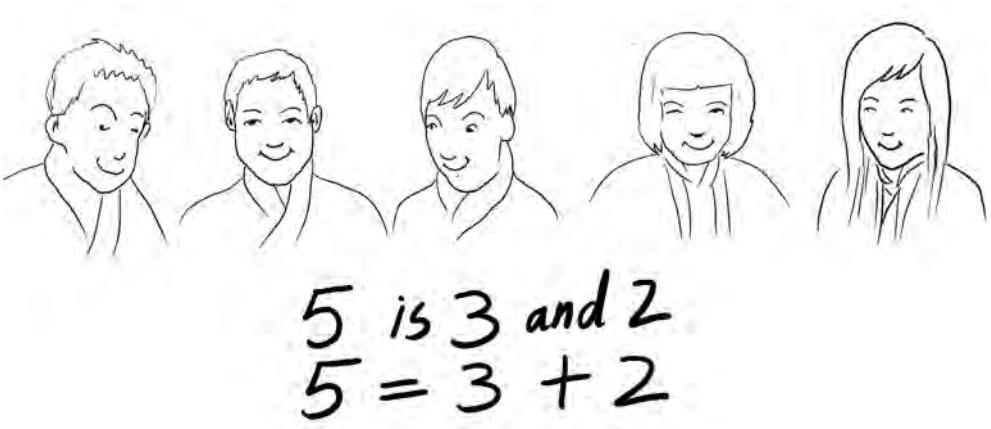
Objectives

Recognize that a number expression involving the addition symbol can be used to provide an alternate representation for a number.

Materials

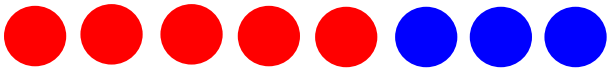
Linking cubes in different colours
Counters in two colours
Sticks

Have 3 boys and 2 girls come to the front. Ask: **How many students are here? How many boys are here? How many girls are here?** Ask the students to take their seats. Then write on the board:



Show the students a bunch of sticks in which 2 are long and 4 are short. Ask: **How many sticks are here? Are they all of the same length? How many are long sticks? How many are short sticks?** Then draw them on the board and write the number sentence as 6 = 4 + 2. Explain what each number means as well as the + sign as "and".

Show the students a set of counters in two colours. For example, 5 red ones and 3 blue ones all mixed up. Ask: **How many counters do you think there are? How can we know how many there are? How many red counters are here? How many blue counters are here?** Draw the 5 red counters and 3 blue counters on the board or on a newsprint paper and write the number sentence, 8 = 5 + 3.



Referring to the number sentences written on the board, explain that 5 + 3 (5 plus 3) is another name for 8; 3 + 2 (3 plus 2) is another name for 5; 4 + 2 (four plus 2) is another name for 6.

Maths Note

Although many adding situations are active, where one amount is joined to an existing initial amount, addition can also describe "static" situations. These are often called **part-part-whole** situations; the two parts can be added to give the name for the whole. For example, in a group of 4 counters, there might be 2 red ones and 2 green ones, so we can write 4 = 2 + 2. The 2 + 2 is actually another name for 4. The children can think of the plus sign (+) as meaning "and", and the equal sign(=) as "is" or "the same as".
Different situations where a whole is made up of two parts should be presented to the students. In each situation, point out how you could imagine that there was originally one group and the other group joined to make a total, so that a + sign makes sense to describe the situation. For example, in a group of 4 boys and 1 girl, there are 5 children; if the boys had been there first and then the girl joined later, we would write 4 + 1; we can think of 4 + 1 as another name for 5.
Although only one lesson is designed for the part-part-whole addition, this lesson might need to be extended over several days to deal with many combinations.

You may then ask the student to copy the drawings and the corresponding number sentences in their notebooks. As they work on their drawing and writing, go around and help them do it properly. The focus of this activity is to be placed on the students' understanding of the two parts of a whole rather than neatness of their drawings.

Distribute 7 to 15 snap cubes in varying numbers of two colours to pairs of students. Ask the students to make a train with their snap cubes such that cubes of one colour are snapped together before joining them with those of the other colour. Then, ask the students to represent their train with number sentences. For example, the pair who got 9 cubes with 6 red cubes and 3 yellow cubes could show the train as below and write the number sentence as 9 = 6 + 3. As the students work, have them describe their trains and number sentences. Help those who are struggling with the task. Then have the students draw and colour their trains in their notebooks, as well as writing the number sentences below or beside their drawings.

9 = 6 + 3

Assessment for Learning

See that the students can describe their drawing and the number sentences, especially that the numbers joined by + represent another name for the whole.

After all are done, engage the students with questions such as: **What addition name would you write for 5 counters if there are 3 green and 2 blue counters? Why? What is another name for 7? How could you show me that?**

Extension

Present the following problem to the students to solve individually:

> **Dorji has 10 counters. Some are large and some are small. There are more large ones than small ones. What counters could Dorji have? Draw a picture of Dorji's counters.**

After the students have solved it, encourage them to share or present to the class or groups how each has done. Make them realize that this problem has more than one solution.

It is also suggested that you revisit some of the examples in the lesson to see that the number sentences could be written another way. The trains are easiest to see. For instance, the yellow cubes could have been placed ahead of the red cubes in the above diagram. The corresponding number sentence would become 9 = 3 + 6. This can be done in a later class, or it may arise through the discussion in a lesson.

Lesson 4 Creating Addition Stories

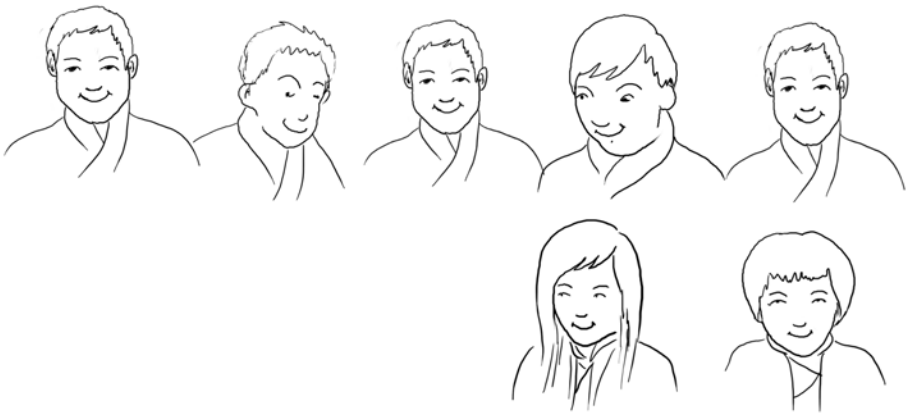
Objectives

Create and solve story problems involving addition of small numbers

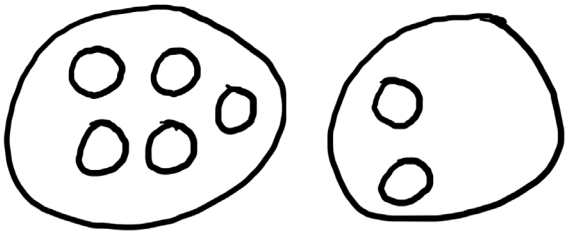
Materials

Counters
Addition phrases written on pieces of paper

Begin with an addition expression on the board, e.g. 5 + 2. Then model how to create a story to go with that expression. For example: **There were 5 boys. 2 girls joined them. How many are there now?** Show the students how you might illustrate the story. You could draw the pictures of boys and girls or could just draw counters to represent them. Then write the number sentence, 5 + 2 = 7. Explain what each part of the number expression mean, including each number, the + sign and the = sign.



5 + 2 = 7



5 + 2 = 7

Maths Note

The stories the students create might involve joining or might be part-part-whole situations. This reinforces the notion that the + sign is used in both of these circumstances. In fact, we should prompt the students to create both types of story situations. Mathematically the two situations are the same. The students should realize this fact ultimately.

Tell another story based on the same addition expression, 5+2, this time involving a part-part-whole situation. For example**: (Krishna) has 7 pencils. 5 of the pencils are short and 2 are new and long. I am going to show how to represent the story on the board.** Illustrate this story by drawing the pictures of pencils and also using counters. Then write the number sentence, 7 = 5 + 2. Explain each part of the number sentence.

Provide counters to pairs of students. Give each pair of students 3 to 4 different addition expressions to tell a story about. Have them represent their stories using the counters, as well as by drawing in their notebooks. Their pictures might show real things, such as people, animals, books, pencils, or fruits or instead just show circles for counters. Regardless of how the pictures look, the important thing is that the students should be prepared to tell a story for each addition phrase. Also have them write the complete number sentence indicating the total number at the end (if the story is about a joining situation) or the start (if the story is about a part-part-whole situation). Make sure that the students recognize each part of their number expressions and number sentences.

Make sure the expression you provide to the students use only numbers that add to no more than 10. For example:

8 + 2	2 + 3	5 + 5
8 + 1	2 + 4	5 + 0
7 + 2	1 + 2	3 + 1
7 + 3	4 + 4	1 + 1
7 + 1	3 + 3	5 + 1
6 + 4	2 + 2	5 + 4
6 + 2	2 + 5	5 + 2
6 + 0	2 + 7	4 + 3

Have the students share their pictures and their stories. Ask questions such as: **Why did you start with (4)? How many joined? Which of the stories show another name for (5)? How are these (two) stories the same? Is the number at the end more or less than the number you started with?**

Assessment for Learning

See if the students appropriately represent the first and the second addend, starting with the first quantity and then adding the second quantity. See if their pictures match the required expressions. See if the students use appropriate language, for example, there were … and … and this many altogether (or in all, or in total) at the end. Also check if the total is correct, and ask if they can determine the total correctly.

Lesson 5 Introducing Subtraction

Objectives

Model subtraction stories or situations involving removal or taking away actions with concrete materials.
Represent subtraction stories or situations with number sentences.

Materials

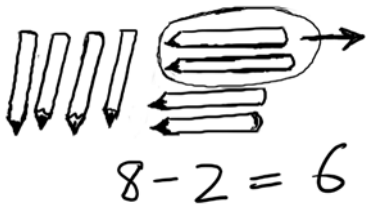
Counters or snap cubes

Hold up 8 pencils and ask: **How many pencils do I have in my hand?** Remove 2 pencils and place them down, so that the student can see. Ask: **Are there more pencils or fewer pencils now, in my hand? How many pencils are left? How do you know? Is there another way you could say that there are 6 left?**

Show how you could model the story with counters by putting out 8 counters, taking away 2 and counting what is left. Have the students follow along as you do this.

Again show the 8 pencils and write 8 on the board. Then tell you are going to remove 2 of them and write the minus sign (–) after 8. Explain that – is called minus sign indicates a taling away action as in removing something. Remove 2 pencils and write 2 after the – sign. Then ask how many pencils are left. Then write the = sign and write 6, which is the number of pencils left.

Referring to the number sentence 8 – 2 = 6, explain that 8 is the number in the beginning, – is the act of removing or taking away, 2 is the number of pencils removed, and 6 is the number of pencils left at the end. You could also model the story by drawing as shown below:



Distribute about 15 counters or snap cubes to the students, either individually or in pairs. Tell that you are going to tell them a story, and that they are going to represent the numbers with the counters as you tell the stories and also write the numbers in their notebooks. For example (using the previous pictures used in lesson 1): **Five deer are grazing in a meadow. Show the 5 deer with counters. Write the number 5 in your notebook. It is a hot day. Three deer leave the meadow in search of water. How many deer are left? Show me what you did with your counters. What should you write after 5 in your notebook?** Ensure that all the students can model the story with counters as well as write the

Maths Note

The students have had some informal experience with subtraction in Lesson 1. This lesson introduces subtraction quite formally with the use of subtraction language and symbolism such as minus, subtract, and minus sign (-). Terms like minuend, subtrahend and difference are not yet introduced.
Similar to introducing addition as an active situation, where some more items are added or joined to a set, subtraction is introduced as an active situation. Students find it easier to understand subtraction as an act of removing or taking away some items from a set and determining the amount of itme left in the set. The students learn that **a** – **b** means there were **a** items in a set and **b** items were removed. As a result of the removing action, the students should realize that there will be fewer items in the set at the end. Later on, in the following lessons, the student will deal with the other meaning of subtraction, as a comparison of numbers of items between two sets. The students should be actively involved in the subtraction, by ways of acting out or modeling the subtraction.

Even though only one lesson is designed for teaching subtraction as removing items from a set, it should be extended over several days.

number sentence, 5 – 3 = 2. Ask: **How do you know that 5 minus 3 is 2?**

Tell a few more subtraction stories, using different contexts and numbers, but following the same structure as above, and have the students represent them both with counters and number sentences each time. Some examples could be:

There are 3 yaks in a field. 2 yaks go away. How many yaks are left now?

Ten birds are sitting on a branch. Eight birds fly away. How many birds are left now?

Ten people are travelling in a bus. Five get off the bus. How many people are still in the bus?

Dorji's father gave him 7 momos. Dorji was not very hungry. So he ate only 3 momos. How many momos are left?

Ensure that in one of the stories, all the objects or animals leave the set, so that nothing is left. For example: **Seven dogs waited at the door of a house expecting some food. There was no food coming. So they all left the place.** See if the students can model this with counters, and also write the number sentence as: 7 – 7 = 0.

After all the students can follow the stories by representing with counters and writing the number sentences, reproduce a number sentence they have written on the board. For example: 7 – 3 = 4. Ask what each of the number and signs could mean? Also ask: **Is the number after the = sign more than or less than the number at the beginning of the story?** Ask them to check this with their number sentences, and ask: **Why do you think that is happening?**

Encourage the students to tell similar stories to each other in pairs. Have one student tell a story and the other student models it with counters, as well as writes the number sentences. As they do that, go around and see that the students are able to tell the numbers at the beginning of their story, tell the action that happens in the story and the number at the end of their story.

Assessment for Learning

See if the students can appropriately model the subtraction stories with their counters. See if they can count appropriately to find how many are left. See also that they can write the number sentences correctly and explain them relating to the stories.

Extension

Provice 10 counters, 1 die, and 1 small container to each pari of students. Tell them to think of the counters as fish and the container as a pond. Put all the 10 fish in the pond. One student rolls a die and takes out some fish as per the number on the die. He/she then writes the subtraction phrase 10 – 6, if the number on the die was 6. The second student should tell how many fish are left in the pond. Then the second student should complete the subtraction sentence stated by the first student as 10 – 6 = 4. The fish are put back in the pond. Next the second student should roll the die, take out that many fish, and start the subtraction phrase. The other student should determine how many fish are left and complete the subtraction sentence. The students can continue the game by alternating their roles.

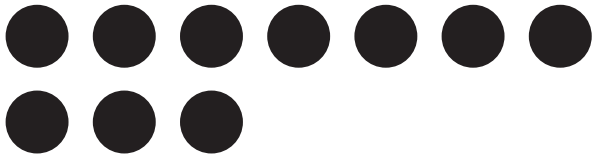
Lesson 6 Subtraction as Comparison

Objectives

Compare two sets and determine how much more a set has than the other set.
Recognize that we write a – b to mean "how much more is a than b" and be able to use that meaning to determine a difference.
Model and represent the comparison of two sets with subtraction sentences.

Maths Note

The students have already learned that subtraction is used to describe the removal of items. For example, 7 – 3 means that you start with 7, remove 3 and want to know how many itmes are left. They must now recognize that subtraction can be used in other situations as well. For example, 7 – 3 can also mean how much more is 7 than 3. It is important to relate those two meanings. Here is a model that could help. To determine how much more 7 is than 3, line the quantities up and match them.



The excess is the part of the 7 that would result from **taking away** the 3 counters that have matches. This helps the students to see how the comparison and take away meanings of subtraction are related. Notice that for a take away problem for 7 – 3, we only put out 7 items and remove 3. But for a comparison problem for 7 – 3, we actually put out 10 items: the 7 for the first set and the 3 for the other set. This can be confusing to the students if the concepts are taught as rules, but the students tend to use the appropriate model if allowed to represent the problem with counters however they wish.

Even though only one lesson is designed for teaching subtraction as a comparison, it should be extended over several days to deal with many situations.

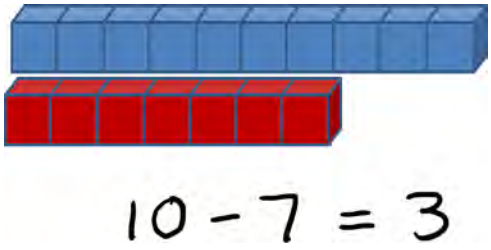
Materials

Counters and snap cubes

Call 6 girls and 4 boys to the front of the class. Ask: **Do we have more boys or more girls here? How many more girls than boys are there? How do you know? How will you show that there are 2 more girls than boys?** See how the students explain this. If the students do not suggest matching, show how to pair up a boy with a girl and the girls left without pairs tells how many more girls are compared to the boys. Then write the number sentence 6 – 4 = 2. Explain that we use subtraction to compare the numbers in two groups or sets. Explain that here 6 means the number of girls, 4 means the number of boys and 2 means the number of girls more than the number of boys.

Show a set of about 10 blue snap cubes alongside a set of about 7 red snap cubes. The cubes should not be linked yet. Ask: **Do I have more red cubes or more blue cubes? How many more blue cubes than red**

cubes do you think are there? How will we find that out? Encourage the students to come up with strategies of comparing and finding out the extra number of blue cubes. You could simply count and pair up the red cubes with the blue cubes and find out how many blue cubes are left over without red cubes to pair up. You could make a train of blue cubes and another train of red cubes. Stand them side-by-side, compare their lengths and count the blue cubes in its train beyond the length of the red train. Then write the number sentence, 10 – 7 = 3, on the board. Explain that we are again using subtraction to compare the number of objects in two sets. Explain what each number in this number sentence means.



Provide snap cubes or counters in two colours to pairs or small groups of students. Ask them to sort the counters or cubes they have by colours and compare the numbers. Have them write the subtraction sentences for their comparisons. As they work, go around and have them describe their sets and the subtraction sentence.

Have the students model or represent situations or stories you tell them with counters first and then have them write appropriate subtraction sentences. For example, you could tell:

Sonam has 6 dogs. Show me 6 dogs with counters. Sandeep has 5 dogs. Show me Sandeep's dogs. Who has more dogs? How many more dogs does Sonam have than Sandeep? How do you know? Write a subtraction sentence to show this situation. What does 6 tell? What does 5 tell? What does 1 tell?

Repeat similarly with a few more stories such as:

There are 5 spoons and 7 forks on a table. How many more forks are there than spoons?

Eight students like apple. Four students like mango. How many more students like apple than mango?

Assessment for Learning

See that the students can represent each situation appropriately with counters and then compare the two sets appropriately. See also that the students can write and describe the subtraction sentences correctly.

Extension

Provide 12 counters, 1 die and 1 small container to each pair of students. Tell them to think of the counters as fish and the container as a pond. Put all of the 12 fish in the pond. One student rolls the die and takes out some fish as per the number on the die. Then the other student does the same. The two students compare the number of their fish and determines who has more fish and by how many. Then together they write a complete subtraction sentence. Ask them to describe their subtraction sentence. The students put back thier fish in the pond, and repaet the game again.

Lesson 7 Creating Subtraction Stories

Objectives

Create and solve story problems involving subtraction with small numbers.

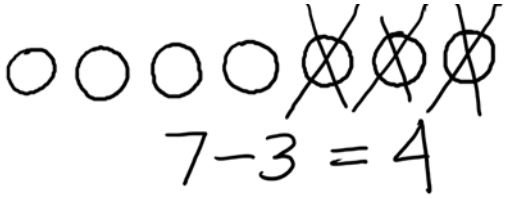
Materials

Subtraction phrases written on pieces of paper
Counters or snap cubes

Begin with a subtraction expression on the board, e.g. 7 – 3. Then model how to create a story to go with that expression. For example: **There were seven birds seated on a branch. Three of them flew away. How many birds are left?** Show the students how you might illustrate the story. You could draw the pictures of birds or you could just draw counters to represent them. Then write the number sentence, 7 – 3 = 4. Explain what each part of the number expression means, including each number, the – sign and the = sign.

Maths Note

The stories the students create might mostly involve taking away; this could be eating something, removing something, people or animals leaving, etc. Make sure that they determine what is left to solve the problem in each case. The stories they create might also involve comparing the number of items in two sets. Make sure that they determine how much more a set has than another to solve the problem.



Tell another story based on the same subtraction expression, 7 – 3, this time involving a comparison situation. For example**: Tenzin has 7 apples. Jigme has 3 apples. How many more apples does Tenzin have than Jigme?.** Illustrate this story by drawing the pictures of apples in two sets and also using counters in two sets. Then write the subtraction sentence,

7 – 3 = 4. Explain each part of the number sentence.

Tenzin's apples

Jigme's apples

Provide counters to pairs of students. Give each pair of students 3 or 4 different subtraction phrases to tell a story about. Have them represent their stories using the counters, as well as by drawing in their notebooks. Their pictures might show real things, such as people, animals, books, pencils, or instead just show circles for counters. Regardless of how the pictures look, the important thing is that the students should be prepared to tell a story for each subtraction phrase. Also have them write the complete number sentence indicating the number at the end (if the story is about a take away). Make sure that the students recognise each part of their number expressions and number sentences.

Make sure that the expressions you provide to the students use only numbers that are not more than 10. For example:

8 – 2	3 – 2	5 – 5
8 – 1	4 – 2	5 – 0
7 – 2	2 – 1	3 – 1
7 – 3	4 – 4	9 – 8
7 – 1	3 – 3	5 – 1
6 – 4	2 – 2	5 – 4
6 – 2	5 – 2	10 – 9
6 – 0	10 – 7	4 – 3

Have the students share their pictures and stories. Ask questions such as: **Why did you start with (4)? How many are left? That story is like a take away story. How could we tell that story as a comparison?** (The idea is to have one subtraction sentence telling two different stories.)

Assessment for Learning

See if the students can appropriately represent the numbers in the subtraction expressions or see if their pictures match the required expressions. See if the students use appropriate language to describe the situations. Also check if the difference or the number at the end is correct.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the Chapter Checklist. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner. What is even more important is the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 3 INTRODUCTION TO ADDITION AND SUBTRACTION

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*					
		Model and describe addition situations using objects.	Model and describe subtraction situations using objects.	Represent addition stories with addition number sentences.	Represent subtraction stories with subtraction number sentences.	Create simple addition and subtraction sentences from number expressions.	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Name of the Student: _____ Roll no.: ____ Section: ____

CHAPTER 3 INTRODUCTION TO ADDITION AND SUBTRACTION

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using the Interview-based Performance Task.)*

Task and Interview prompts	Key concepts and skills to look for
Bring a sheet of paper, painted blue, and some counters. Tell that the paper is a pond, and the counters are fish. Tell an addition story, and ask the student to model it using counters: **7 fish are swimming in this pond. 2 more fish join them. Now how many fish are there?** Have the student write an addition sentence, and describe it. Then tell a subtraction story, and have the student model it: **So there are 9 fish swimming in the pond. A bad man comes and catches 5 fish from the pond. Are there more fish now or less fish now? How many fish are left?** Have the student write a subtraction number sentence for this situation and describe it. Present an addition number phrase (e.g. 5 + 2). Ask the student to create a story for it. Ask him to tell the number at the end. Present a subtraction number phrase (e.g. 6 – 4). Ask the student to create a story for it. Ask him to tell the number at the end.	*The student is able to:* - Model addition situation/story using objects. - Write addition number sentence for an addition story. - Describe addition number sentence. - Model subtraction situation/story using objects. - Write subtraction number sentence. - Describe subtraction number sentence. - Create simple addition story for an addition phrase - Solve an addition phrase, or find the total for it. - Create a simple subtraction story for a subtraction phrase. - Solve a subtraction phrase, or find the difference for it.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 3

CA marks from Chapter 3 (Marks out of 10): _____

CHAPTER 4 LENGTH AND AREA

Chapter Overview

The length of an object is the measure of how long it is from one end to the other. In other words, length is the same as distance.

Measurements such as height, width, depth and distance around objects are all measurements of length.

Area is the amount of surface a shape covers. It is a 2-dimensional measure, whereas length is a one-dimensional measure.

The students have had some experiences with ideas and measurement of length in Class PP. This chapter will consolidate and build further on their prior knowledge and experience with the concept of length. The students will be exposed to the concept of area for the first time.

The focus of the chapter is on exploring the concepts of length and area informally. The students will compare lengths, measure lengths using non-standard units, compare areas, and measure areas using non-standard units.

Measurement is really about comparison – comparison of how much one feature of an object is as compared to the same feature of another thing. So in measurement, whether it is length, area, mass or capacity, we have to make use of numbers. This way, a chapter like this has the power of consolidating and furthering the students' concept of numbers.

This chapter has 6 lessons as detailed in the Table of Contents.

Basic Principles about Measuring Length and Area

- The length of an object is the measure of how long it is.
- Height is simply length considered vertically from a plane rather than horizontally on a plane.
- Area of a shape is the amount of surface it covers.
- Any individual item might have more of a measure than a second item, but less of a measure than a third item (e.g., A might be longer than B but shorter than C).
- Any measurement comparison can be stated in two different ways (e.g., A is more than B or B is less than A.
- Lengths and areas can be compared both directly and indirectly, using a third item.
- Tools or units of measuring length or area should be appropriate to the contexts.

Chapter Goals

- Compare lengths directly and indirectly.
- Use comparative terms like *longer, shorter, taller, longest, tallest* and *shortest*.
- Measure lengths (including heights and distance around) using non-standard units.
- Compare areas directly and indirectly.
- Measure areas using non-standard units.

Maths Words

Length, distance, distance around, height, measure, unit, area, rectangle

Lesson 1 Comparing Straight Lengths

Objectives

Compare lengths directly and arrange objects in order by length.
Use terms for length comparison such as longer, shorter, and about the same length.

Materials

A marker pen, a pencil which is about the same length as the marker pen, a crayon and a long stick (about half a metre)
A bag containing small sticks of varying lengths (the number of sticks in the bag should be slightly more than the number of students in the class)

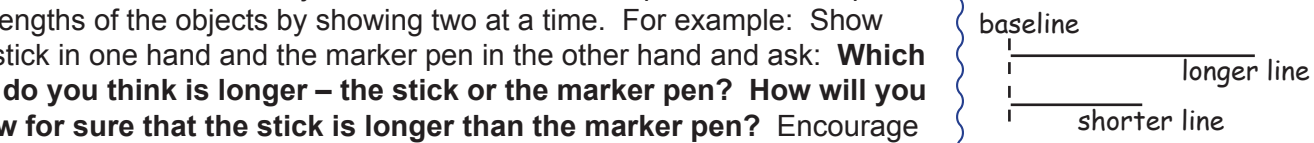
Show the four objects, as mentioned above, to the students to see if they can tell the names of the objects. Ask the students to predict and compare the lengths of the objects by showing two at a time. For example: Show the stick in one hand and the marker pen in the other hand and ask: **Which one do you think is longer – the stick or the marker pen? How will you know for sure that the stick is longer than the marker pen?** Encourage the students to tell how to compare the two lengths. Ensure that they know how to align the two objects at a common base line to compare and that the one that extend farther away is the longer one. **This stick is longer. Which is shorter then?** Continue the predicting and comparing the lengths in pairs. Make deliberate mistakes of showing the shorter object as longer by not starting from a common base line when comparing the lengths. Sometimes have a student do the comparison, while others watch to see if he or she does it correctly. Ensure that you compare the marker pen and the pencil, and that the students realize that these two things are **about the same length.** Ask: **Which is the shortest among these 4 things? Which is the longest?** Introduce a few more objects in the above set and ask the students to order them by length from the shortest to the longest on a table.

Explain to the students that we are talking about the length of an object when we are talking about how long or short the object is. The purpose of the above activity is to revise the terms used in comparing lengths such as *longer than, shorter than, about the same length, longest and shortest* for the students, since they would have had a similar experience in Class PP. Ensure that all the students can use these terms in comparing two or more lengths.

Have the students each take a stick out of the bag of sticks and stand in a circle. Take a stick yourself and join the students in the cirlce. Have the students watch you as you ask and take the stick from the student standing to your right. With the students still watching, compare the length of your stick with that of the student's and say: **My stick is shorter (or longer) than your stick.** Give back the stick to the student. Then pass your stick to the student on your left and have him or her to compare the lengths of the two sticks and say which is longer or shorter. The student then passes his or her stick to the person to his or her left, and the process continues until the student to your right has his or her turn. After each pass, have the students clap their hands once to say they agree.

Maths Note

When comparing the length of two objects directly, it is critical to line up the objects at a common baseline or a common starting line. The length that extends farther is the longer one, as shown below.



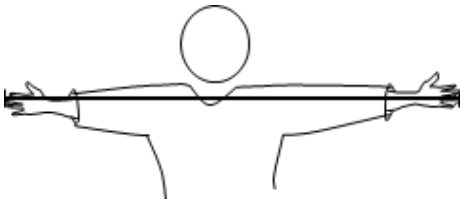
To build measurement sense, it is important to encourage the students to predict which of two lengths will be longer (or shorter) and then test their predictions. It is important that students recognize that any length can be longer than some lengths but shorter than others.

Assessment for Learning

See that the student uses the correct way of comparing lengths by starting from a common base line. See that they can use the terms appropriately in talking about the length comparisons.

Extension

Make a **hand span** by stretching out your thumb and the middle finger. Show how it is done to the students and explain that the length from the tip of your thumb to the tip of the middle finger is called **hand span**. Have all the students do the same. Hand span is called *tho* in Dzongkha.



You could also show and explain what an **arm span** is. An arm span is the length from the tip of the middle finger of one hand to the tip of the middle finger of the other hand when the arms are stretched sideways. Arm span is called *dhom* in dzongkha.

Demonstrate how to compare the length of an object to your hand span. This could be done by aligning one end of the object with the tip of the thumb and comparing the other end of the object against the tip of the stretched out middle finger. If the object exceeds the tip of the middle finger, then the object is longer than your hand span. If the middle finger exceeds the object, the hand span is longer than the object. If the end of the object and the tip of the middle finger match, then the object is about the same length as the hand span. Have the students try it against some objects they have with them such as pencils, geometrical boxes, and books. Then ask the students to compare the lengths of different objects in the classroom against their own hand span, and have them record the comparisons in the table provided in their Student Activity Book on page ___, which is as shown below. They could draw the pictures of objects or write the name of the objects in the appropriate columns. Help the students as they compare the lengths of objects with their hand spans and as they record in the activity book.

Shorter than my hand span	About the same length as my hand span	Longer than my hand span

Lesson 2 Comparing the Distance Around Objects With Their Heights

Objectives

Compare lengths or distances around objects with their lengths or height.

Materials

String or ribbon
Scissors
Cylindrical objects such as tin cans, cups, plastic bottles, marker pens
Rectangular prisms such as chalk boxes, geometrical boxes, soap cases

Have a collection of objects such as mentioned above. Explain to the students that when we have objects standing upright, the distance from the bottom end to the top end is called height. Compare the heights of some of the objects in the collection by standing them on a table and use terms like *taller, shorter* and *tallest*. Talk about the heights of poles, trees, and buildings to elaborate on this.

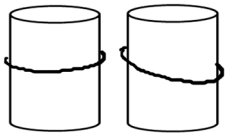
Pick up a can, and say: **Which one do you think would be longer – the height of this can, or the length around it?** Demonstrate each length with an appropriate gesture as you describe. Encourage the students to predict which one will be longer. Then ask: **How can we compare the height of this can with the distance around it?** Encourage the students to make suggestions. Then make a model of the distance around the can by wrapping a string around it and cutting it off once you have made a complete round without any overlap. Also explain that you have to maintain the string at the same height around the can as you wrap it. Then compare the string with the height of the can. Describe the relationship between the two lengths as: **The distance around the can is (longer) than the height of the can.** Then have the students predict and compare the distances around with the heights for a few more objects.

A simple but pratical way to compare the *distance around* with the *height* of an object is to compare each with your your hand span. To measure teh distance around an object, simply wrap your hand around it.

Provide some objects, strings, and scissors to the students, in pairs or small groups. Have them predict and then compare the distances around with the heights of the objects. Have them then record their findings in their Student Activity Book on page number ___. Help them get along with the task. The groups could exchange the objects once they finish with them. As you circulate and interact with the students, see that they can make a model of the distance around the objects properly, by wrapping the string properly around the objects. Also help them use the terms like longer than, shorter than and as long as appropriately.

Maths Note

Measuring around objects is quite different from measuring straight lengths. To measure a straight length, you start at one end of the object, but to measure around an object, you can start at any point as long as you come back to that point. As well, it is important to maintain the same "height" from the base of the object as you are measuring around.



Yes No

Through experience of actually measuring around objects, such as using thread, and comparing with straight lengths, students will realize, with surprise, that the length around an object is usually much longer than what it appears to be. This is not always apparent if left to perspective alone. This is because we can't see all around an object at a glance.

Compare the distance around with the height of the objects and write **longer than**, **shorter than**, or **as long as** appropriately in the space provided.

Draw your objects here	
	The distance around is ..... the height.
	The distance around is ..... the height.
	The distance around is ..... the height.
	The distance around is ..... the height.
	The distance around is ..... the height.
	The distance around is ..... the height.

Assessment for Learning

See that the students can make a model of the distance around an object with strings properly, by wrapping the string around the same height, and cutting it or marking it with no overlap. See that the students can use appropriate language or terms such as longer than, shorter than and as long as, in comparing two lengths.

Extension

Have the students make two blocks of 6 cubes as shown here. Let them predict which of the two blocks would have longer length around. Ask for the reasons for their predictions. Then ask them to check that out with strings.

Repeat the process for the two 8-cube blocks. See if the students can come to an understanding that, two different shapes with the same number of cubes have different lengths around and that it is the longer shape of the two that also has the longer length around.

Lesson 3 Measuring Length

Objectives

Measure lengths, including heights and distance around objects using non-standard units.

Materials

Snap cubes
Strings
Scissors
Papers and pencils

Tell the students: **We have been comparing lengths to find out which is longer, which is shorter and which is taller. We have also compared the distances around objects with their heights. Today, we will learn how to measure different lengths using snap cubes**. Demonstrate how to measure an object, for example, a pencil with snap cubes. Make sure that you explain and show how to line up the end of the starting unit of snap cube with the end of the pencil. Express the length of pencil as: **This pencil is (6) cubes long.** Have the student repeat the sentence after you. Demonstrate measuring two more items, for example, a piece of string and the height of a bottle. Ask the students to predict how long the objects will be, in terms of cubes, before actually measuring. Express the lengths in terms of cubes. In the case of the bottle, say: **This bottle is (11) cubes tall. Or, the height of this bottle is (11) cubes.** Have the students repeat the sentences.

Provide the students with snap cubes and make them measure their pencils or geometrical boxes. As they work, help them where needed. Have them express the lengths of their objects appropriately. Ask: **How long is your pencil? Why do you say it is (3) cubes long? How did you measure it? Is your pencil a little more than 4 cubes?** It is very likely that you will meet pencils which are not exactly so many cubes long. For example, a pencil might be between 4 and 5 cubes long. This is good because in reality things do not come in exact cuts. In such a situation, have the student realize and express appropriately, such as: **My pencil is a little more than 4 cubes.**

After all have done their measuring, ask questions such as: **Who has a pencil that is 5 cubes long? Who has a pencil that is 2 cubes long? 3 cubes long? 4 cubes long? 10 cubes long? 15 cubes long? 1 cube long? Who has a pencil that is a little more than 4 cubes long? A little less than 5 cubes long? Who has a pencil that is longer than 4 cubes? Who has a pencil that is shorter than 4 cubes?**

Then provide pairs or small groups of students with some solid objects such as bottles, cans, rectangular prism, strings and scissors. Ask them to measure the distances around and the lengths of the objects. Do not forget to have them predict the lengths before they actually measure the lengths of the objects. Then have them compare the two lengths (distance around and the length/height) for an object: **How long is the distance around this**

Maths Note

This will be the students' first experience using units to measure length. Units should be simple everyday materials. The best units are ones that link together, such as linking cubes or paper clip chains. In this way, students do not have difficulty lining up units without leaving gaps. The length is described in terms of the number of units used. For example, the stick below is 6 cubes long.

It is important for the students to realize that the first unit must be matched to one end of the length being measured and that the units be equal sized. Some lengths can be measured directly by aligning the units with them. Some lengths, such as the distance around a round object cannot be directly measured using the units. In such a case, the students can make a model, or represent the distance around by cutting a string to it and then use the units to measure the length of the string.

Even though only one lesson has been designed for measuring length, it should be extended over several days to deal with many situations.

bottle? How long is the height of the bottle? Which is longer – the height of the bottle or the distance around the bottle? Why do you say that? By how much is the (distance around) longer than the (height)? Provide some more opportunities to measure various lengths and get them to express appropriately each time.

Extension

Challenge the students to measure their hand span with linking cubes: **I want you to measure your hand span and tell me how long it is in cubes. Can you do that? How can you measure your hand span with cubes?** Encourage the students to describe how they intend to measure their hand span, and let them measure. Then have them express the measurement, such as: **My hand span is (5) cubes long.**

The students could directly measure their hand spans by placing their stretched hands over a set of linked cubes. Another way to measure a hand span is to first trace it on paper, and then measuring its length with snap cubes.

Demonstrate tracing hand span on paper for the students to make theirs. This could be done by placing your left hand stretched from thumb to middle finger face down on the paper and tracing along the outline of the fingers. After that, draw a straight line from the tip of the thumb to the tip of the middle finger. Label it as: **My hand span**. After all are done, encourage them to compare their hand span with those of others. Ask questions such as: **Who has the longest hand span? Who has a hand span that is 6 cubes long? Who has a hand span that is longer than 7 cubes? Who has a hand span that is shorter than 7 cubes?**

Then have the students trace their foot by removing their shoes and socks. You might have to do it yourself too. Repeat the process as done with the hand span. Do not forget to ask the students to first estimate the length of their foot before actually measuring it. Also ask: **Who has a foot that is shorter than your hand span?** Ask them to compare the two lengths. Tell the students to take care of the model of their hand span and foot, as these will be used in the next lesson.

Then have the students measure other parts of their body in terms of cubes such as: The distance around their calves, distance around their wrist and the length of their cubit. Have them then record their measurements in the table in the Student Activity Book on page number __. Do not forget to ask the students to first estimate how long each length will be before they actually measure it.

Assessment for Learning

See that the students can make a reasonable prediction of the lengths before actually measuring them. See that they can express the lengths of each item using appropriate expressions such as: This bottle is (6) cubes long; My pencil is a little over 3 cubes long; My eraser is a little less than 1 cube long; etc.

Measuring with Linking Cubes

What I Measured	My Estimate	My Measurement
Hand span		
Foot		
Distance around calf		
Distance around wrist		
Cubit		
Pencil		
Notebook		

Lesson 4 Measuring Length Using Different Units

Objectives

Recognize that the same object can be measured using a variety of different units and realize that it is useful to choose an appropriate unit.
Estimate a length in terms of the chosen unit, measure it and compare with other lengths.

Materials

Linking cubes, tooth picks, paper clips, models of hand span and models of foot (made during the previous lesson)

Maths Note

Students need to measure the same object with different units in order to develop the notion that a unit is arbitrary - later it might be centimetres or metres that they use; for now, it could be a variety of non-standard units. This will be an opportunity to begin to see how the use of a smaller unit results in a greater number and vice versa and so they would probably want to choose a unit that results in a "nice-size" number.

Ask the students to have their hand span model in front of them. Ask each to describe how long it is with cubes. Say, for example: **Earlier (or yesterday), we measured some lengths with linking cubes. My hand span was 8 cubes long. How long was your hand span?** Wait for them to describe their hand spans. Then ask: **If you measure your hand span with these (toothpicks), will it show more numbers or less numbers than the number of cubes? Why do you think so? How many toothpicks long do you think your hand span will be?** When the students have the models of their foot with them, say: **You have measured your foot with cubes. You have recorded that in your Activity Book. How long is your foot?** Get the students to refer to their recording in the Student Activity Book and respond to your question appropriately. **How long do you think will your foot be if we use these tookpicks? Will it show greater (more) number or smaller (less) number than the cubes?**

Explain that the objects we use to measure a length is called a unit. So cubes, toothpicks, paper clips, foot and hand spans are different units for measuring length in this case.

Have the students measure their body parts, as in the case of the previous lesson, using first the tookpicks and then using paper clips and record the results in their Activity Book on page number ___. They would have to transfer the measurement in cubes from the previous activity sheet.

Measuring length using different units

What I Measured	Length using linking cubes	Length using toothpicks	Length using paper clips
Hand span			
Foot			
Distance around calf			
Distance around wrist			
Cubit			
Pencil			
Notebook			

After all are done, ask: **For each of the lengths, which unit shows the smallest number? Which unit shows the greatest (or biggest) number? Why do you think that happens?** Have the students look at their recording sheet. **What is the smallest number on your recording sheet? What is the biggest (or the greatest) number on your recording sheet?**

Assessment for Learning

See that the students know how to measure each length using each of the units, so that they line up the units without leaving gaps and that they align the lengths and the units from a common base line. See also that the students can describe the lengths appropriately using terms like: **My foot is 7 cubes long. My foot is 6 clips long. Etc.**

Extension

Have the students measure lengths of objects in the classroom such as the heights of tables, height of the door, lengths of table tops, books and the lower edge of the chalk board using linking cubes and paper clips in groups. After they are done, ask them which lengths are difficult to measure and which were easy to measure. Ask why it was difficult, for instance measuring the height of the door with cubes or with paper clips. Then ask: **Would it be easier to measure the height of the door with the model of a foot? Why might it be easier? If you measure the height of the door with the foot, would it need as many feet as the cubes or the paper clips? Why would that be?** Then ask the students to measure the following lengths by choosing their own units of measurement from their foot, hand span, cubes and paper clips. Ask them to work in pairs or small groups. Have them record their measurement in their Activity Book on page __.

Measuring length using appropriate units

What I Measured	My measurement (Write the measurement using the unit you chose)
The height of the door	
The height of the table	
The lower edge of the chalk board	
The length of my pencil	
My height	
The length of the duster	

Assessment for Learning

See that the students can choose appropriate units for each of the lengths. More than one unit could be appropriate for measuring a particular length. Also see that they can describe the lengths appropriately using the units chosen.

Help the students with their measuring tasks. Ask why they chose the unit they were using for measuring each length.

Lesson 5 Comparing Areas

Objectives

Understand what an area is (as the amount of surface).
Compare two areas directly without using units.

Materials

Two cut out circles, marked A and B with A bigger than B
Two cut out rectangles – marked A and B with B bigger than A
Two rectangles – marked C and D
Sets of 3 rectangles where two of the rectangles have the same area and the third one has a different area.

> **Maths Note**
>
> Area is the measure of the 2-dimensional expanse of an object - the space on a flat surface that a shape covers. In this lesson, the students compare two areas directly by putting one area on top of the other. Sometimes, if a shape is made of paper, it can be cut into pieces that can be rearranged to fit on top of a second shape, to compare their areas.

Tell the students: **Today we will be comparing areas.** Say and show that the area of the table top is bigger than the area of a book; the area of the floor is greater or bigger than that of the chalk board. The area of the assembly ground is bigger than the area of the classroom floor. Explain that the area is how large a surface is.

Show the cutout circles, and ask: **What is the name of this shape? Can you see this letter A here? Let us call this Circle A. I have another circle here. What shall we call this circle? Which circle is bigger? Which circle has bigger area? How can we show that circle A has bigger area than circle B.** Encourage the students to make suggestions. Following up with their suggestions, put one circle on top of the other to compare their areas, where circle B will be shown to be clearly smaller in area.

Repeat the above procedure with the rectangles marked A and B; ask the students to predict which rectangle will have a bigger area, and comparing the areas by placing one rectangle over the other. You could ask a student to do the direct comparison.

Now show the rectangles marked C and D. The two rectangles should look different but have the same area. You could use the following dimension, without actually writing the dimensions.

Ask: **Which rectangle do you think has more area? How many of you think rectangle C has more area than D? How many of you think the rectangle D has more area than C? How will we know?** It will be quite

difficult to know which is bigger simply by placing one on top of the other. You could then fold the longer rectangle in halves, the fold line being at the middle of the longer edge; cut it along the fold line and then superimpose the two halves on the square rectangle. The students should see this being done. Ask: **Did I change the area of the long rectangle?** Explain that you have changed the shape of the long rectangle, but the total area is the same. So the two rectangles have the same area.

Provide pairs or groups of students with a set of three rectangles. You could make the rectangles on different coloured chart papers, so that it helps in identifying and talking about them. Two of the rectangles should have the same area and the third one a different area. You could use the following dimensions for the two rectangles having the same area: 10 cm by 8 cm; and 20 cm by 4 cm. Make the third rectangle bigger in area than this for some sets and smaller than this area for other sets. Tell that two of the rectangles have the same area and the third one a different area. Ask the student to find out which two rectangles have the same area. Have scissors if the students require them. As they work, go around and ask: **How will we find out which rectangles have the same area? Is the area of the third rectangle more than or less than the area of these two rectangle in your group?**

Assessment for Learning

See that the students can appreciate that changing the shape of a 2-D shape does not change its area, as long as the cut pieces are joined without overlaps or gaps.

Lesson 6 Measuring Areas With Non-standard Units

Objectives

Measure area with non-standard equal-size units.
Compare areas after measuring with non-standard units.

Materials

Pattern blocks
2-D shapes on page number ___ in the Student Activity Book
Playing cards

Tell the students: **Today we will be learning how to measure areas using smaller shapes.** Choose an appropriate area to measure using a Student Activity Book as the unit. The area to be measured should be such that it will be covered nicely with a whole number of units. It would be nice if a table fit this rule. Then you could demonstrate covering the table top with the books, and say: **The area of this table top is 8 books because 8 books cover it completely.** If none of the tables in the classroom fulfills this rule, you could have a chart paper measured, ensuring in advance that a whole number of books cover it nicely. Tell that the book is called the **unit** of area measurement in this case.

Then have the students predict how many books will cover a tabletop that you indicate. Then cover the table top with books, and express its area using appropriate language, such as: **The area of this table top is a little more than 8 books** (if the case is so). Tell that the book is called the **unit** of area measurement in this case too.

Show a playing card, and ask: **How many cards do you think will cover this book?** After the students have guessed, cover the book with the cards, and count the number of cards. Say: **The area of this book is (12) cards.** Explain that the card is the unit of area measurement in this case.

Introduce the pattern blocks to the students. The individual pattern blocks are the hexagon, the trapezoid, the rhombus, the triangle and the rectangle. The focus in this lesson is not to know the names of the block, but it will be good if the students know the name. Explain that they will be using these pattern blocks as units to measure the areas of some shapes in the Activity Book. Then demonstrate how to measure a shape in the Student Activity Book on page number __. Choose a shape, then choose a pattern block as your unit, explaining to the student at the same time. Have the students estimate, or guess, how many of your unit will cover your shape. You could say your own estimate, for example, **I think 10 triangles will cover this shape**. Then cover the shape with your unit. Count the units. Express the area as: **The area of this shape is (12) triangle. My estimate was a little less, but not very much less. It was a good estimate!**

Then ask the students to carry out the activity in their Activity Book. Provide them with the pattern blocks.

Maths Note

Because it is often difficult to compare area directly and because cutting up one shape to fit on top of another is both cumbersome and sometimes not even possible, students are motivated to use non-standard units to measure area.

It is important for the students to realize that while using smaller shapes, as units to cover the bigger shapes, the units should be lined up without leaving gaps between the units or making overlaps.

The students should, after a few experiences with measuring with a unit, predict how many units it will take to measure the area of a 2-D shape, before actually covering the shape to measure its area. Like in numbers and length measurements, estimation is a useful skill to gain area sense.

In using the non-standard units to measure the area of a shape, they may not always fit exactly within the boundary of the shape. In such cases, the area should be expressed as 'a little less than', or ' a little more than' the number of units used as may be appropriate. For example, "the area of this rectangle is a little more than 8 triangle", or "the area of this rectangle is a little less than 3 trapezoids".

As they carry out the activity, go around and provide help where needed. Ask questions such as: **Why did you choose this unit? What do you think will happen if you choose this block as your unit? Could you have chosen another block to cover this area? Will the number be more or less with the new block? Why would that be?**

Measure the areas of three different shapes by using different units of your choice. You should first choose a unit for each shape, make your estimate, and then cover the shape with your unit to measure its area. Draw the picture of your shape.

	My unit (Draw the picture): .....
	My estimate: .....
	My measurement: .....
	My unit (Draw the picture): .....
	My estimate: .....
	My measurement: .....
	My unit (Draw the picture): .....
	My estimate: .....
	My measurement: .....

Assessment for Learning

See that the students know that the smaller shape that we use to cover or measure the area of a larger shape is called unit. See that they can express the area of a shape in terms of the unit they have chosen.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening, and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner. What is even more important is the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 4 LENGTH AND AREA

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*						
		Compare lengths and use comparative terms like longer, shorter, and taller.	Use the correct technique of comparing lengths by using a common base line.	Select appropriate non-standard units for measuring lengths.	Express lengths in terms of the chosen units.	Estimate and measure area in terms of the chosen non-standard units.	Compare areas.	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: ____ Section: ____

CHAPTER 4 LENGTH AND AREA

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using Interview-based Performance Task.)*

Task and Interview prompts	**Key concepts and skills to look for**
Have ready 2 sticks of different lengths (for example, of about 6 cm and 8 cm), a piece of string (about 15 cm long), a cylindrical can and some linking cubes. Give the student sticks and ask: **Which stick is longer? How do you know it is longer? Which one is shorter then? Show me a length which is shorter than the shorter stick. Show me an object which is longer than the longer stick.** Ask the student to predict the length of the long stick: **How long do you think will this stick be if you measure by cubes? Can you measure it with cubes and tell me how long it is?** Give the student the string, and ask: **Which one do you think is longer – this string or the distance around this can?** Prepare a 6 cm x 6 cm rectangle and a circle whose radius is 3 cm, so that its area is smaller that of the rectangle. Have some linking cubes and pattern blocks nearby. Ask: **Which shape do you think has more area – the circle or the rectangle? How would you know? About how many cubes would cover this rectangle? Cover the rectangle with cubes. So what is the area of the rectangle? If you cover the rectangle with these trapezoids, would it show bigger number or smaller number for its area? Why do you think so?**	*The student is able to :* - Compare lengths and use terms like longer, and shorter. - Make reasonable estimates of length. - Measure a length correctly using a non-standard unit. - Express a length in terms of a non-standard unit. - Measure the length around a round object. - Compare areas. - Make a reasonable prediction of area in terms of a chosen non-standard unit. - Measure areas using non-standard units. - Express the area of a shape in terms of the chosen non-standard unit. - Recognise that a bigger unit will show a smaller number for the same area.
Comments and Marks Strengths: Areas of Need: Follow up Steps: **Teacher's Signature and date:**	

Summary of the Summative Assessment for Chapter 4
CA mark from Chapter 4 (Mark out of 10): _____

CHAPTER 5 3-D SHAPES

Chapter Overview

Geometry is the study of shapes, both 2-Dimensional and 3-Dimensional – their features like sizes, positions, orientations; relationships among the various features of a shape; effects on the position and orientation of shapes due to certain transformations applied to them. 2-D shapes are flat and can be drawn on paper. 3-D shapes are solid shapes and occupy space. You can draw diagrams of 3-D shapes on paper, but these diagrams only show the view from one perspective.

This chapter deals with the basic 3-D geometric shapes: sphere, cylinder, prism, cone and pyramid. The focus of the chapter is on the students actually exploring these shapes or objects physically, and describing their shape features, besides identifying these shapes by their names. The students have had some experiences exploring these shapes in Class PP. This chapter will extend the students' prior experience and knowledge with regard to 3-D shapes. These geometrical concepts are continued in Chapter 7, which deals in a similar manner with some basic 2-D shapes. It makes sense to offer the exploration of the 3-D shapes before we work with the 2-D shapes, as it is much more practical for the students to actually play with 3-D shapes than with the 2-D shapes, which, strictly speaking, cannot be handled like a solid object. And also since the basic 2-D shapes like circles, triangles and rectangles appear as faces of these 3-D shapes the students study in this chapter, it would prove easier to relate from the 3-D shapes later on.

This chapter has 6 lessons as detailed in the Table of Contents.

Basic Principles about 3-D Shapes

- In order to distinguish between objects, students must focus on attributes of the objects whether it is for the purpose of identifying them, sorting them or building with them.
- Some attributes of a 3-D object relate to the object as a whole, but some focus on parts of the object.
- It is often useful to think of shapes in terms of their component parts.
- By building with objects, properties of those objects become more readily apparent.

Chapter Goals

- Name 3-D shapes such as cones, pyramids (rectangular and triangular), cylinders, prisms (rectangular and triangular), cubes and spheres.
- Describe the shape feature and properties of 3-D shapes.
- Sort 3-D objects based on their features and properties.
- Make models of 3-D shapes.
- Build structures with 3-D shapes and informally understand the concepts of stability and balance.

Maths Words

Cone, pyramid, cylinder, prism, cube, sphere, face, edge, corner, circle, rectangle, triangle

Lesson 1 Identifying and Describing 3-D Shapes

Objectives

Identify or name 3-D shapes (cylinder, prisms, cube, cone, pyramid and sphere).
Describe properties and shape features of 3-D shapes.

Maths Note

Most of the 3-D shapes presented in this chapter should be quite familiar to the students through the experiences provided in class PP. The students have had some experience exploring and talking about these shapes in class PP. Two new shapes are being introduced this time. They are pyramids and cubes. As indicated by the lesson objectives above, the emphasis of the lesson is on students identifying the names of the shapes and describing their properties and shape features. Therefore, the students are not expected to learn the mathematical definitions of these shapes. However, for the understanding and clarity on the part of the adults and teachers, some broad definitions are provided below.

A **cylinder** is a 3-D shape with two congruent and parallel circular bases which are joined by a curved surface.

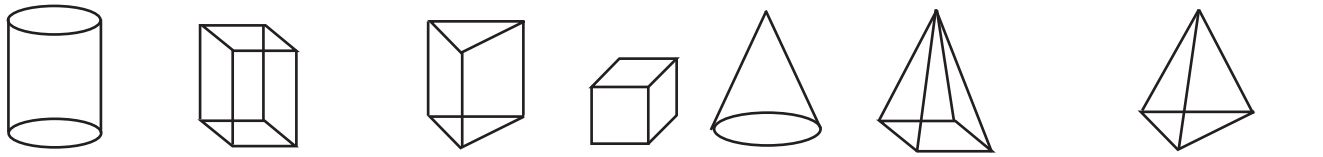
A **prism** is a 3-D shape with two congruent and parallel polygonal bases which are joined by rectangular faces. Prisms are named according to the shape of their bases.

A **cube** is a special rectangular prism that has 6 congruent faces.

A **cone** is a 3-D shape with one circular base and an apex joined by a curved surface.

A **pyramid** is a 3-D shape with one base that is a polygon and triangular faces which join at a point called an apex. Pyramids are named according to the shape of their bases.

A **sphere** is a 3-D shape closed by a curved surface such that every point on the surface is equidistant from the centre.



Cylinder Rectangular prism Triangular prism Cube Cone Rectangular pyramid Triangular pyramid

Materials

3-D geometric shape models for cylinder, rectangular prism, cone, pyramid, and sphere
Circular counters, dice, linking cubes
Common objects such as balls, boxes, cans, tubes, straws, improvised cones and pyramids
Collection of pictures and photographs of objects which are essentially the above 3-D shapes
Drawings of the above 3-D shapes on a chart paper
Index cards with the names of the above 6 3-D shapes written on individually

Display the models of the 3-D shapes for cones, pyramids, cylinders, rectangular prism and cubes on a table. Keep the collection of the common objects as mentioned above a little aside from the models. Pick up and show the 3-D models one by one and see if the students can name them. After that, have all the students say the names of each 3-D shape after you as you show them one at a time. Ensure that every student can say the names clearly with correct pronunciation. You could tell the students that these are called 3-D shapes, but this may not really be required at this point of time.

Then have the students identify each of the 3-D shapes from the collection of the common objects. Ask questions such as: **Can you see a sphere in that collection of things?** Have a student go and bring a sphere to the table. Ask the student to describe the shape he or she picked up. You can prompt the students to describe: **What other names have you heard for this shape? How does it feel like when you hold it? What does it look like? Will it roll or will it slide? Will it sit still? How many ways can you put it down so that it sit still?** Continue the process for all the shape until all the objects have been moved from the initial place to the new place.

Ask each student or pair of students to pick up an object from the collection. Ask the students to sort themselves into groups as per the shapes they took. Ask them to discuss the properties and shape feature of the 3-D shapes they have got in their groups. As they discuss go around and help them with their discussion and descriptions. Prompt with questions like: **How does this shape look? Will it roll or slide if you push it on the floor? Will it both roll and slide on the floor? Will it sit still? Does it have faces (flat surface)? Does it have curved surfaces? How will you describe this shape to someone who cannot see it but can hear you?**

3-D Shapes		
Cylinder		
Prism		
Cube		
Cone		
Pyramid		
Sphere		

Put up a chart as shown here to record the key words describing each of the shapes. Pass around a shape to at least 5 students, and have them each describe the shape in one way. As they describe, record the key words on the chart. Write the shape features and the properties or the behaviours of the shapes in the second column, as these are the main distinguishing descriptions of the shapes. You may write the unimportant descriptions that the students provide such as colours and materials in the third column of the table. Focus their attention on the descriptors in the second column by bringing them out and emphasizing on even after completing the recording on the chart.

Put up the pictures and photographs of the 3-D shapes that you might have collected from magazines and other used books by pasting them on a chart paper and have the students identify them. Try to use pictures where the objects appear in different orientations and with different backgrounds. You could ask students to pick up one of the shapes and hold it in a way that it looks similar to the picture.

Encourage the students to talk about how the shapes are alike and different and what features they use to recognize them.

Assessment for Learning

See that the students can name and say the name of the shapes correctly. See also that they can describe each 3-D shape adequately in terms of their shape features such as whether a shape is curvy all over, where it has flat faces and how many, whether it has corners, whether it will roll or slide or both slide and roll, and what does it look like in terms of common objects.

Lesson 2 Prisms and Pyramids

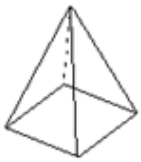
Objectives

Recognise and describe the similarities between prisms and pyramids
Distinguish between a rectangular prism and a triangular prism.
Distinguish between a rectangular pyramid and a triangular pyramid.

Materials

Models of rectangular prisms, triangular prisms, rectangular pyramids and triangular pyramids
(Besides the 3-D geometrical models, you may have to improvise these models with papers, woods or modeling clay and dough. The triangular prism can be improved by stacking and binding the triangular pattern blocks).

triangular pyramid



rectangular pyramid

triangular prism

rectangular prism

Have a collection of a model each for rectangular prism, triangular prism, rectangular pyramid and triangular pyramid. Show these 4 models to the students. Have the students identify the prisms and pyramids from the models: **Which of these shapes are prisms? Which are pyramids? Why do you say these are pyramids? And why do you say these are prisms?** Encourage the students to describe what they think of why a shape is called a pyramid.

Explain with a model that a pyramid has a face (a flat surface) as its base on one end, and a pointed end opposite the base. The pointed end is called *apex*. The apex can also be considered as a corner. The faces joining the base and the apex are all triangles.

Explain with a model that a prism has two bases. That means it can stand on its base or on its head, and it looks the same both ways. The two bases are same shape. The faces joining all the two bases are all rectangles.

Then focus their attention on the two types of pyramids, the rectangular and triangular pyramids. You might not say their names yet. You could distribute

Maths Note

Prisms and pyramids are named according to the shape of their bases. Even though there are many types of prisms and pyramids, we will be focusing only on rectangular prisms, triangular prisms, rectangular pyramids and triangular pyramids. One reason for this is the students can already identify the 2-D shapes rectangles and triangles from class PP and therefore can appreciate the naming of these shapes as such.

The students will look closely at the shape features of pyramids and prisms and describe the similarities and differences between them.

the models to the students to observe and compare the two shapes. Ask them to look at them and tell what is similar and what is different about the two pyramids. You might need to prompt them by asking: **How are the two pyramids the same?** Listen to how they describe the similarities. **How are they different? Show me the base of this pyramid. What is the shape of the base? How many triangles are there joining the base to the apex?** Repeat similarly for the other pyramid. Explain the names for the two pyramids.

Engage the students similarly as above with the two types of prisms, explaining at the end the names and the naming of these shapes based on their bases.

Then with the help of the students, record the numbers for the various parts of each shape in the table on a chart prepared as shown below. Make sure to explain what a face is, what a corner is and what an edge is on the shapes. The students would need to actually feel the shapes to help them count each part of a shape.

Assessment for Learning

Ensure that the students can: describe the similarities and differences between prisms and pyramids; name the above shape appropriately; and count properly the various parts of the shapes. If the students face difficulty in keeping track while counting the faces, corners and edges, you could have them mark the parts counted with chalk marks or by sticking some sticky note pads or duct-tape.

3-D Shape	Number of edges	Number of corners	Number of triangular faces	Number of rectangular faces
Triangular Pyramid				
Rectangular Pyramid				
Triangular Prism				
Rectangular Prism				

Extension

Provide the students with the models for the various 3-D shapes. Have them observe and feel the shapes. Together, record the numbers for the parts for each of the shapes in a chart table as shown below:

3-D shapes and their parts

3-D Shapes	Number of rectangular faces	Number of triangular faces	Number of circular faces	Number of edges	Number of corners
Rectangular Prism					
Cube					
Triangular Prism					
Cone					
Triangular Pyramid					
Rectangular Pyramid					
Cylinder					
Sphere					

Lesson 3 Developing Visual Memory

Objectives

Visualize shapes in mind after the shapes have been seen.

Materials

Models of the 3-D shapes

Display three or four 3-D shapes in a particular order on the table. For example:

Have the students look at the shapes for a while. Ask them to close their eyes for a moment. Remove a shape and hide it. Ask them to open their eyes and have them tell what shape is missing. Ask them to describe how the missing shape was laid or positioned. Repeat this exercise for a few more times, displaying different shapes and removing different shapes each time.

Again display 3 shapes. Have them close their eyes. Ask them to visualize or remember the shapes in their minds including the position of them relative to each other. Remove all the shapes. When they open their eyes, have them first describe and then have them replace the shapes in their original order. Ask questions like: **Which shape was here at the left side? Which shape was next to it? How was the cylinder placed – was it upright like this, or was it resting on its curved side?** Have a student recreate the placement of the shapes in their original positions, while others will note to confirm it. Repeat this exercise a few more times. You could increase the number of shapes to about 6 shapes, so that the range of objects to visualize is increased gradually.

> **Maths Note**
>
> Visualization is an important aspect of geometry. Students need to be able to see a shape in their mind sometimes because the shape is simply not present and other times because it is efficient to be able to mentally manipulate an item to learn more about it. After having a visual picture in the mind, either intuitively or through practice that the students are able to draw 3-D shapes without having the models or images in front of them.

Extension

Have the students practise drawing or sketching the 3-D shapes in their note books. Such a sketching exercise has many benefits. It would consolidate the students' visualization ability of the shapes; it would improve their artistic perspective; it would help develop their fine psychomotor skills; it would consolidate their observation and understanding of the features and properties of the shapes. You might have to teach them how to sketch each of the shapes. It would be important to show and draw the shapes from a particular perspective or viewing direction consistently. For further ideas on this, you could refer to Chapter 4 of Class PP.

> **Assessment for Learning**
>
> See that the students can name the missing shapes and describe the position and orientation of them in their original placements.

Objectives

Lesson 4 Sorting 3-D Shapes

Sort 3-D shapes based on shapes and properties.
Describe the sorting rules.

Materials

A good collection of 3-D shapes (in the form of manufactured models, improvised models and common objects).

Have a group of about 10 objects on your table, so that all the students can see them. Tell: **I am going to sort these shapes.** Sort them into two groups silently while you have the students watch the sorting. For example, you could use all the shapes having at least 1 triangular face in one group and the rest in another group. Ask the students to tell your sorting rule.

Provide about 5 to 8 shapes to the students in pairs or small groups. Ask them to sort the shapes into 2 groups. But before they start sorting, tell them about the kinds of rules or criteria to use for their sorting. Say that they should sort using criteria involving the terminology and aspects of shape learned earlier in the Chapter. It would be good for you to say that one can also sort by colour, but that they will not do that this day.(Otherwise the students may choose criteria for sorting that are not what you would hope for).

As they work, go around and ask questions like: **What is same about the shapes in the set? Would this shape also go in here? Why is that shape not in this set?**

Then invite the students to visit each other and guess each other's sorting rules. If the guessers guess the sorting rule of a group, the group members confirm it, otherwise the others can keep telling their guesses. Ask the students to put back the shapes together and sort them in another way. Encourage the students to ask each other questions about their sortings.

Maths Note

Physically putting shapes or objects into sets or groups as per certain criteria or rules is called sorting. Identifying shapes as cylinders or cones as per a given definition is called classification. Classification is more advanced and formal compared to sorting. When the students sort objects, they can show what they understand about how to describe, compare and identify shapes.

Assessment for Learning

See that the students can explain clearly their sorting rules and that they can sort a group of shapes in more than one way.

Lesson 5 Creating 3-D Shapes

Objectives

Create models of familiar 3-D shapes.

Materials

Modeling clay
Dough (You could prepare adequate amount of play dough in case clay is not available. You could make the dough by adding some amount of salt and cooking oil to the flour in the process of kneading the dough)
Some planks or empty tables
Models of 3-D shapes (Prisms, pyramids, cylinders, cones, cubes, spheres)

Take the students to a proper place – it could be in the classroom if the class size is small, or outside in a ground. Each student should have access to adequate space of a table or some planks. Have the student make various 3-D shapes with clay or dough. They should have the model in front of them to look at and refer to. The shapes they are creating should be in front of them. It is important to elicit from the students the names of the shapes and to have them discuss how the shapes are alike and different. This will get them thinking about the properties of the shapes. You should engage yourself also in making the shapes along with the students. As the students work or are completing their creations, engage them with questions like: **What shape is this? Why did you make it that way? What does it look like to you? What does it feel like? Does your shape have flat faces? Where are they? What are they? What was the easiest part of making your shape? What was the hardest part?**

> **Maths Note**
>
> As students build shapes, they will become more attentive to and familiar with shape properties.

In asking the students questions such as ablve, it would be good to ask students to share their strategies to make shapes. It is very likely that different students will have different strategies. Encourage students to try following their classmates' strategies even if they liked the strategy they used first. The point is more than learning better strategies. Rather, when telling their strategies they will be referring to characteristics of the shape, especially if the you ask for clarification while referring to those aspects of the shape.

> **Assessment for Learning**
>
> See that the students can name and describe their shapes.

You could ask each student to make at least 4 shapes. You could prepare some index cards with the names of the shapes. Have the students label their shapes with the index cards. They could write and attach their own names on the shapes they made. The shapes could be allowed to dry and stored at a proper place for future use.

You could congratulate the students for their beautiful creations, although perfection of the shapes they made should not be the emphasis.

Lesson 6 Building Structures with 3-D Shapes

Objectives

Build towers using a variety of 3-D shapes.
Describe the properties of the 3-D Shapes in relation to building the towers.

Materials

Collection of 3-D shapes for each student, including the shapes the students created in the earlier lesson.

Distribute various 3-D shapes to each student or to pairs of students. They should also be using the shapes they created in the previous lesson. Make sure that the shapes they created are now dried and stable in form.

Tell the students: **Today we will be building towers using 3-D shapes.** Ask the students, either individually or in pairs to make a tower by stacking one shape on top of the other. As they work go around and see how they do. Ask questions like: **Why did you put that big rectangular prism on the bottom, and not in the middle or top? Why didn't you place the cylinder on its curved side? Why is the cone on the top? Tell me the names of all the shapes you have used in your tower.**

Once all have made their towers, invite the students to visit each other. Encourage them to ask each other questions similar to those you have asked them in groups or individually. Ask the students to observe all the towers and ask: **Who has built the tallest tower? Who has built the shortest tower? Why could not you build a tower taller than this? Whose tower do you think would be strong? Which towers will topple at a slight disturbance, like wind? Why do you think so?**

Have the students dismantle their towers. Have them build towers again, this time following your instruction**: I want you to build a tower each following my instruction. First, place a large rectangular prism as the base of your tower. If you don't have a rectangular prism, use your cylinder. How will you place your cylinder? Why not like this horizontally? Next, stack a sphere as your second block in your tower.** See how the students react to this instruction. And ask why they think that it is not a good idea.

Next, ask the students to come up with rules (or suggestions) for making a good tower. For every rule that a student suggests, ask the other students if they agree with the rule. If they disagree, they should demonstrate with the shapes why the rule does not work or how the rule is missing information. Ask for rules about each shape: cylinder, prisms, pyramids cones. If they have trouble making rules, ask them questions as clues – for example, can you use a cone in a tower?

You could draw their attention to real structures such as *chortens, dzongs* and buildings of how they are constructed for stability. You could even demonstrate how we gain balance and stability when we stand with our legs spread rather than with legs close to each other. That is why when we spread or legs and swat a bit when we lift heavy things.

Maths Note

In building structures, students are likely to attend to attributes of shapes that relate to "rolling" and "stacking". For example, they begin to notice that a shape that rolls can be a problem in the middle of a tower. Or they notice that balance needs to be considered when placing a larger shape on top of a smaller one. So students informally learn the concepts of stability required in building structures. Building a structure by following teacher instruction is another way to assess students' ability to name shapes. For example, a teacher could say: **Put a cylinder on the bottom** and would be able to see whether students can identify cylinders.

Assessment for Learning

See that the students can understand the effects of the properties of the shapes in building their towers and that the base of a structure needs to be broad for its stability.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening, and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that ach student's learning progress is assessed in a systematic manner. What is even more important is the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 5 3-D SHAPES

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*					
		Name 3-D shapes such as cones, pyramids, cylinders, prisms, cubes and spheres.	Describe the shape feature and properties of 3-D shapes.	Sort 3-D objects based on shapes features and properties	Make models of 3-D shapes.	Identify 3-D shapes in the environment	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: ____ Section: ____

CHAPTER 5 3-D SHAPES

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for the marking scheme while using the Interview-based Performance Task.)*

Task and Interview prompts	**Key concepts and skills to look for**
Have a collection of familiar 3-D shapes. For example 2 shapes each of sphere, cone, two types of pyramids, and two types of prisms and a cube. Tell/Ask the student: **Sort these shapes into two groups. What was your sorting rule? Or, why did you put all these shapes together and the others not with them? Which shapes here are called prisms? What can you tell me about the shape of a pyramid? Show me a thing in the classroom that is like a rectangular prism. Which shape here will only slide and not roll?**	*The student is able to:* - Sort shapes. - Describe the sorting rule. - Name the 3-D shapes. - Describe the shape features of 3-D shapes. - Associate the properties of 3-D shapes with their shape. - Identify some familiar 3-D shapes in the environment.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 5

CA marks from Chapter 5 (Marks out of 10): _____

CHAPTER 6 NUMBERS TO 100

Chapter Overview

The students have learned numbers up to 30 so far. This chapter will extend the students' understanding and skills with numbers up to the number 100. The students will learn to count and say the number words in correct order from 1 to 100 and write the numbers in numerals and in words to 100. The emphasis will, however, be to enable achievement of these skills while developing conceptual understanding of the numbers up to 100. The main strategies used in this chapter for the students to gain conceptual understanding of numbers beyond 10 and up to 100 include providing opportunities to represent quantities with numbers, to represent numbers with objects and diagrams, to use groups of tens to count and represent numbers, and to represent and talk about numbers as groups of tens and some more. The use of 10-frames, counters and 100-charts, along with strategies such as counting by 10s and estimating quantities in 10s will be crucial in this conceptual development of numbers in the students. Thinking of and representing numbers to 100 in terms of 10s and 1s is the basis for children's understanding of the place value of the number system later on. The number 10 and its multiples to 100 are also benchmark numbers which will be useful for the students with addition and subtraction problems.

This chapter has 7 lessons as detailed in the Table of Contents.

Basic Principles about Numbers up to 100

- Numbers tell how many or how much.
- It does not matter in which order we count, the number in the set does not change.
- In counting, one and only one number is said for each object, and the last number spoken tells how many.
- To understand what a number means, students must experience and create many representations for the number.
- We write numbers using a place-value system not only to be efficient but also to provide benchmarks against which to compare numbers.
- Relating numbers to benchmark numbers, such as 10 and its multiples, helps us compare them, gives meaning to those numbers and supports subsequent work in addition and subtraction.
- Tools such as 10-frames, number lines and 100-charts help highlight patterns in the number sequence and compare numbers to familiar benchmarks.

Chapter Goals

- Count orally in correct order up to 100.
- Write the numerals for all the numbers up to 100
- Write the numbers in words up to 100.
- Count items grouped in 10s (tens).
- Group large quantities in tens and describe the quantities as groups of tens and ones.
- Represent 100 as groups of tens on a 100-Chart.
- Rename 100 in terms of groups of tens using addition sentences.
- Identify patterns on a 100-chart.

Maths Words

10-frames, tens, ones, 100-chart, rows, columns, patterns, estimate, count

Lesson 1 Grouping and Counting by 10s

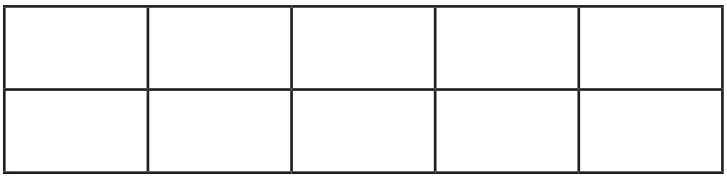
Objectives

Count orally in correct sequence up to 100.
Group and count objects between from 10 to 100 by 10s.

Materials

Counters, 10-frame mats, an empty tin container

A 10 frame



Have over than a 100 counters in front of you. Scoop a handful of them and drop them one by one into an empty container. Say the counting words, **one, two, three, ...** Have the students say the counting words with you. After you have finished the counters in your hand, ask: **How many counters have I dropped in this tin? Let us drop some more.** Scoop another handful of counters and drop them one by one. Have the students count with you forward from the last number. Continue this way until 100.

Chant the counting rhymes with the students by 1s to 100 a few more times as you make a light tapping sound on the desk or clap your hands. This is quite simply to develop saying the counting rhyme fluently by the students. This may not necessarily develop number sense in the student by itself, but it is a useful skill.

Then focus attention back to the counters in the container. Ask: **How many counters are in here?** Empty the container to display the 100 counters on a table and say: **This amount is 100 counters. How do we know that?** Have the students explain how they know there are 100 counters. Then scoop about 30 counters from the set of 100 counters and place them separately nearby, and ask: **How many counters do you think are here in this group?** Have the students guess. **Why do you think it will be (25)?** Write the estimated numbers that the students give on the board. **How can we find out how many counters are here for sure?** The students may suggest counting the counters. Have a volunteer do the counting, while the others watch to confirm. Write the number after completing the counting, and discuss the accuracy of the estimates. Then tell the students that you are not really sure if the student counted properly, and so you offer to count again. This time have the students watch, as you count the counters one by one. Deliberately make a few mistakes in your counting, either by skipping a number in the middle, for example, one, two, three, … fifteen, seventeen, eighteen, or sometimes, drop or pull two counters for a number said. See if the students can spot the mistakes you make.

Maths Note

Grouping in 10s makes counting more efficient. For example, if 23 items are randomly scattered on a table, it is cumbersome to count them and mistakes are often made. On the other hand, if 2 groups of 10 and 3 more are shown, it becomes quite easy to count. Grouping by 10s is also the first tool in understanding the place value system, a system we use because it greatly simplifies calculations. The students have had some experience counting by 10s or skip counting by 10s to number 30 in chapter 1. They will practise counting by 10s further up to 100 in this lesson.

The point of this above exercise is that, when we count a large quantity by 1s, it is not very efficient. It is cumbersome, and we could make mistakes in the process. So explain to the students that we can use 10-frames to help us count better and more accurately.

Show the 10-frame mats which you could find in Reproducible section of the Student Activity Book. Ask: **How many 10-frames can you see on this page? How many counters can you place in a 10-frame?** Then place the counters on the 10-frames by filling them completely one by one. Model filling the 10-frames by placing the counters starting from the left and going right in the first row and then doing the same with the second row. Once you are done filling the 10-frames, ask: **So how many counters are there?** See if the students go for counting by 1s or if they can count by 10s. If the students don't realize to count by 10s, ask**: How many counters are there in a completely filled up 10-frame? How many 10-frames are filled?** Count the completely filled up 10-frames, and say: **There are (3) tens, and some more.** Then model how to count as **10, 20, 30, 31, 32, 33, 34** (if there are 34 counters)

Provide each pair or small group of students a 10-frame mat. They could use the 10-frame mats in their Activity Book. Have a student from each group scoop a handful of counters from the stock you present to them and spill the counters on their table. Ask each student in the group to estimate the number of counters and record them on a piece of paper. Then have them place the counters on their 10-frames, to determine the number of counters. As they work, go around and see if they are filling up the 10-frames properly, and if they are counting by 10s properly. Ask: **How close were your estimates?** Have the students practise estimating and using the 10-frames to help them find the numbers by placing the counters back in the stock and scooping with one hand or two hands.

At the end, ask the students: **If you see two 10-frames filled up completely and 6 more counter, how many counters is it? What is the number, if five 10-frames are completely filled with no more counters left? What could be the number if six 10-frames are completely filled with some more counters left? Which one is faster to count – counting by tens or counting by ones? What is the number if nine 10-frames are filled with no more counters left? If I have 52 counters, how many 10-frames will be filled completely? And, how many more counters will be left?**

Then practise chanting by 10s up to 100 with the students: Say: **Let us practise counting by tens: 10, 20, 30, 40, …, 80, 90, 100.** This should be practised informally over several days.

Assessment for Learning

See that the students can use 10-frame mats to count objects by tens.

Extension

Give each pair of students 10 counters. Encourage them to get an idea as to how full their hands feel when holding the 10 counters. Now place a larger group of counters in front of them and have them estimate the total number of counters by using their hands as the measures rather than counting. This can be extended later to filling a hand with counters and then filling all of the hands in a group. The counting should be done afterwards orally or using 10-frames to check the accuracy of the estimates.

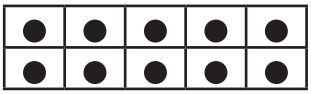
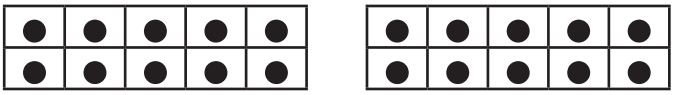
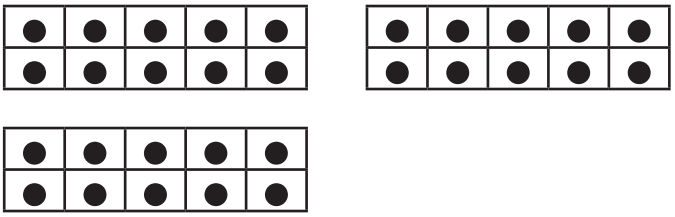
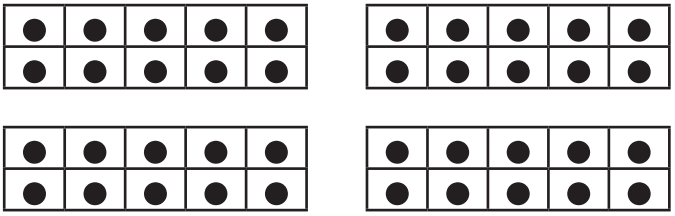
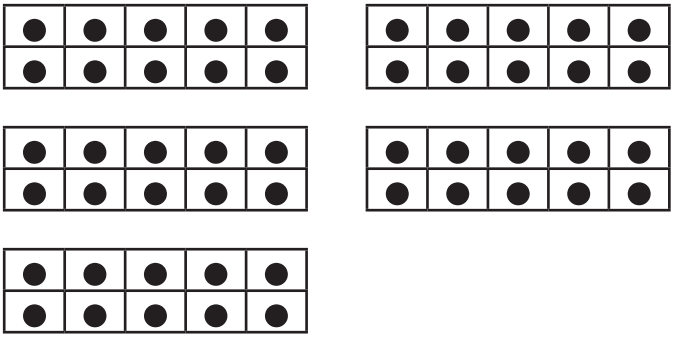
Lesson 2 Representing Tens

Objectives

Represent the multiples of 10 up to 100 in both the numerals and the number words.

Materials

Reproduction of the Activity on page numbers 63 and 64 of the Student Activity Book in chart papers.
Marker pen

	Numeral	Number Word
	10	Ten
		
		
		
		

Prepare the above charts in advance. Put up the charts on the board. Referring to different groups of the 10-frames, ask: **How many counters can you see in these 10-frames? How do you know that? Did you count one by one or did you count in 10s? How many counters are there in one 10-frame?** Model how to count the numbers by 10s in each group of 10-frames. For example, pointing to the group of 10-frames showing 50, say: **We know each 10-frame has 10 counters, so for this group there are is 10, 20, 30, 40, 50 counters. There are five tens and 5 tens are 50.** Have the students tell similarly for other groups of 10-frames. Once you have taken the students through all representations of the multiples of ten to 100, explain that today they will learn how to write these numbers. Then model and explain how to write the numerals in sequence starting from 10 on the charts. Have the students write the numerals in their own Activity Book. As they write, go around and see that they are writing the numbers properly. After all have finished writing, have them look at the numerals and ask: **What pattern do you see in the numbers we have written? What is the same about all these numbers?** Ask some students to write the numbers on the board. For example: **Who would want to come and write the number 30 on the board?** Have the others confirm it. Repeat this for all the other tens numbers to 100.

Then explain that they will learn to write the numbers in words. Model and explain how the numbers are written in words by writing at the designated places on the charts. After you have written the numbers in words, have the students read aloud in unison from the chart. You might want to spell out the words. Then have the students copy the words in their own Activity Book. As they write, go around and see that they are writing the words properly.

Even though only one lesson is designed for writing the numbers in numerals and words, you might have to provide practice exercises to the students over the next several days until each student can write the number words comfortably. Subsequently you might also want some students to come forward and write the numbers in word on the board.

Maths Note

10-frames are useful to help introduce the numbers, 20, 30, 40,... to 100. These special numbers are the ones that fill 10-frames exactly. Students should notice the pattern in the numerals of these numbers as all of these numbers end in 0. The numbers in the tens place from 10 to 90 increase by 1. Also, help the students notice the common ending part of the numbers in the word forms, as twen**ty**, thir**ty**, for**ty**, ..., ninety, except for ten and hundred.

Assessment for Learning

Ensure that the students have written the number words with correct spellings.

Lesson 3 Representing 100 as Combinations of 10s

Objectives

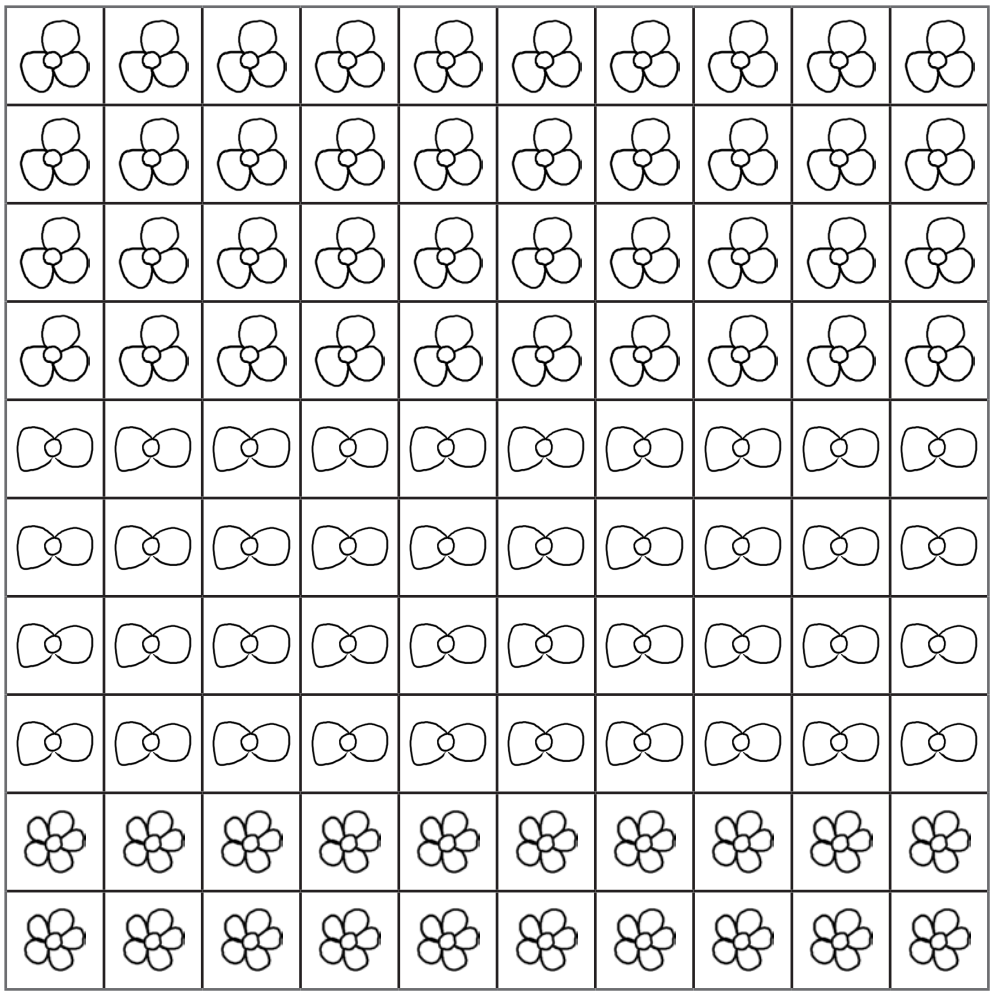
Recognize that 100 can be made up of groups of 10 in different ways.

Materials

Reproduction of the 100 flowers as shown below on chart paper
Some real flowers (If possible bring flowers having 2, 3 and 5 petals)
Student Activity Books

Maths Note

In order to prepare for the use of the 100-chart, which is very important for developing meaning for numbers to 100, students can represent 100 in rows of 10 in different combinations. For example, they can view 100 as 60 + 40 or 30 + 70, and talk of it in terms of 6 tens and 4 tens or 3 tens and 7 tens.



Display the chart reproduction of the above diagram. Tell the students that this table contains flowers and ask: **How many flowers do you think are here? How can we find out?** Listen to what the students suggest. **Should we count all the flowers one by one?** You might start counting from the left of the first row and proceeding rightward as: **one, two, three,... ten**. Have the students join you in counting. Then move to the second row and again proceed left to right as **eleven, twelve, thirteen, …, twenty**. Then move to the third row and continue similarly until you get to **thirty.** Then stop and ask: **Do we really need to count all the way to the last? How many flowers are there in each row? Can we then count by 10s?**

Then count by tens, as 10, 20, 30, 40, ….90, 100, as you point to each row from top to bottom. **So how many flowers are there?**

Explain that this is called a 100-chart. Explain the meanings of rows and columns and that there are 10 rows and 10 columns in a 100-chart.

Show and explain the parts of the flower called petals. The petal is the part of a flower that makes the flower beautiful to see and touch. Petals are colourful and attract insects to the flowers. Explain that flowers have different numbers of petals. Some flowes have only 2 petals, while others will have more petals. Draw their attention to the flowers of different numbers of petals on the chart. **How many flowers have 3 petals?** Have them count the flowers with 3 petals in groups of 10s as: **Let us count them, 10, 20, 30, 40, that is 4 groups of tens or4 tens**. **How many flowers have 2 petals? Let us count them, 10, 20, 30, 40, again that is 4 tens. How many flowers have 2 petals?** Have the students count and say the number. **How many flowers are there in total?** Write 100 = 40 + 40 + 20. Explain what each of these numbers indicates.

If possible, put up another 100-chart, showing some rows, say, 6, coloured in red and the remaining 4 coloured in green, and ask: **How many rows are red? How many small rectangles are there in each row? So how many rectangles are red? How many rectangles are blue? How many rectangles are there altogether in the chart?** Then write 100 = 60 + 40. Explain what each of these numbers means.

Then have the students do the relevant activities in their Activity Books. As they work, go around and help them where needed.

Assessment for Learning

Ensure that the students can count by 10s and can understand the combinations of 10s that make up 100.

Lesson 4 Making a 100-chart

Objectives

Record the numerals up to 100 on a 100-chart.
Observe or identify and describe patterns on a 100-chart.

Materials

An empty 100-chart on chart paper
Marker pen
Student Activity Book

Maths Note

Filling in a 100-chart helps the students focus on our number system and develop a better understanding of it. By starting at the top of the chart and systematically going down the chart, the students begin to see the patterns in the place value system (for example how going down a column the ones digit does not change, but the tens digit increases by one).

Prepare in advance an empty 100-chart on a chart paper. Put it up on the board. Explain that it is called a 100 chart. Show and count the rows and columns. Tell: **We are going to make the 100-chart together by filling it with numbers from 1 to 100.**

Start by writing the numbers from 1 to 30 on the chart. These are the numbers with which students are familiar. Then you can fill in the numbers in the right hand column down to 100 since these are now familiar to them too.

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
									40
									50
									60
									70
									80
									90
									100

Have the students look for patterns to help them predict how to fill in other numbers on the table and together fill in all of the missing numbers. You could have some students volunteer or ask one to come up to the board and write a complete row or column on the chart, while others watch to confirm.

Once the 100-chart has been filled in, invite the students to look at it and find patterns. Say: **This 100-chart has many patterns in it. I can see many patterns in it. Can you see and show a pattern?** If the students are not forthcoming with it, say: **Look at the last column or the 10th column downward from 10 to 100. What do you notice in the numbers?** (The numbers on the right are all 0; they are all tens numbers). **Similarly, what is common or same with all the numbers in the 9th column? How about the numbers in a row? Etc.**

Then ask questions such as: **What number is below 21? Why do you think it is that? What number is to the right of 31? Why do you think that? What number is above 65? Why do you think it is that? What number is before 100? What number comes after 9? What number comes after 10?**

Have the students then make a 100-chart in their own Activity Books. As they work on it, go around to provide help where needed. Make sure that they write the numbers properly and legibly.

Assessment for Learning

See that the students can recognize and describe some of the number patterns they see in the 100-chart.

Lesson 5 Using a 100-chart

Objectives

Use patterns on a 100-chart to give clues about a number.

Materials

100-chart on chart paper made in the previous lesson
Student Activity Books
Sticky note pads
Counters

Use the 100-chart put up on the wall made in the previous lesson. Cover a number, for example, **26** on the chart with a sticky note pad. Ask: **What number do you think is hidden by this sticky note pad?** Show a note pad, if you have indeed used one, and explain why it is called a note pad, and a sticky note pad. Ask: **How do you know the hidden number is 26?** Prompt them to describe 26 in terms of its position, such as: It comes after 25; it is between 25 and 27; it is below 16; it should be above 36. Reveal 26 by taking out the sticky note pad. Congratulate the students on their brilliance!

Maths Note

Asking students to focus on features of where a number sits on a 100-chart helps students better understand our number system.

Ask the students to close their eyes for a moment. Hide a number, say 52. Have them open their eyes and look at the chart. Explain to the students that this time, they will not say the number straight away. But instead, they will say something true about the hidden number, such as what number is above it, what number is below it, what number is before and after it, in which row it is, etc. In other words they will give all the possible clues about the number, and only at the end they will say the number. Practise hiding and describing the hidden numbers for a few more times or until the students become comfortable with it.

Have the students open their Activity Book on page __ where they have made their 100-Chart. Provide them counters to cover their numbers. Have them play in pairs. One partner cover a number on his or her chart and give clues about his or her hidden number. The other partner guesses the number. The partners then take turns. As they work, go around and see that they have understood the rule of the game and doing it properly. Help the ones in need to get started.

Assessment for Learning

See that the students can describe a number in terms of its position on the chart using the neighbouring numbers as references.

At the end, draw their attention and ask questions such as:

> **What is a good clue for 38? What is a clue that would work for all three of these numbers: 22, 23, and 24? Where is 60 on the chart? Which numbers are greater than 60? Which numbers are less than 60? Which number comes just before 60? What number is 3 less than 60? What number is 10 more than 60? 20 more than 60?**

Lesson 6 Representing 2-digit Numbers

Objectives

Model/represent numbers between 10 and 100, or 2-digit numbers, by using concrete materials in groups of tens and ones.
Interpret the 2-digit numbers as groups of 10s and 1s.

Materials

Linking cubes
Toothpicks and rubber bands (for the activity in Extension 1)

Show the students about 34 linking cubes in loose and ask: **How many cubes do you think are here?** Listen to and write their estimates on the board. **How can we find out how many there are?** You might count the cubes together with the students by 1s. Write the number on the board. Discuss how close each estimate was. Ask a few students to come forward and link the cubes to make trains. Then link all the short trains to form a long train of 34 cubes. Tell that you are breaking the long train into trains of 10 cubes. Break loose the extra cubes. Explain that you now have 3 trains of 10 cubes and 4 cubes more. Tell them each train can be called a 10. So we have 3 tens, and 4 ones. That makes 10, 20, 30, 31, 32, 33, 34. So explain that 34 is the same as 3 tens and 4 ones. Have the students say: **34 is 3 tens and 4 ones.** Have them explain why it is so. You might write the sentence, **34 is 3 tens and 4 ones**, as well as **34 = 30 + 4** on the board.

Ask pairs or groups of students to come and take at least 2 handfuls of linking cubes. Once they are at their tables, ask them to first estimate the quantity individually and write down their estimates. Then ask them to snap the cubes into trains of 10 cubes. Tell them to keep the extra cubes in loose. Then let them count in 10s and 1s to determine the quantity and write down the number. Have the students compare the number with their estimates to see how close each estimate came to the actual amount. As they work, visit the groups and ask: **How many cubes have you got? That is how many tens and how many ones? Can you count your cubes for me? Can you describe your number (which is 57) as groups of tens and ones?** Then have them write the number sentences as you did on the board. Let the students make groups of tens and ones by giving them various numbers of cubes, and have them write to express the amounts in terms of 10s and 1s until all of them become comfortable with the expressions and ideas of seeing a number in terms of 10s and 1s.

At the end, have a discussion with all the students based on questions such as:

If we use cubes to represent 38, how many 10s will we have? How many loose cubes will be there? How can we write a number sentence for 38?

How is 46 different from 64?

What does 29 mean? How many tens? How many ones? If we add

Maths Note

The students have worked with multiples of 10 and have been introduced to all of the numbers between 10 and 100 on the 100-chart, but now they will start to think of those numbers as groups of tens + left over ones. This is another step toward gaining understanding of the place value system. Students write the symbols for numbers that are modeled and they look at a number written symbolically and say what it represents.

Assessment for Learning

Ensure that the students can represent a number between 10 and 100 with cubes and express them in terms of 10s and 1s. Even though only one lesson has been designed for this concept the idea and practices of this lesson might need to be continued over the next several days.

one more cube to 29 cubes, how many 10s will we have?

A number is made up of 8 tens and 2 ones. What is the number?

There are 5 groups of 10 cubes and some left over. What might be the number?

How could you represent 42?

Extension 1

Representing 2-digit numbers as **tens** and **ones** with the help of linking cubes is proven to be an effective tool. But the essential idea is not dependent on the linking cubes. Therefore, to deepen the understanding the actual concept of seeing a number as groups of **tens** and **ones** should also be taught using other relevant tools tools. Another effective tool is to use uniform sized sticks. Toothpicks would work well here.

Demonstrate representing 34 as 3 tens and 4 ones with snap cubes as in the lesson above, by making 3 trains/groups of 10 and 4 loose ones. Then explain that we could also use toothpick to represent the number 34. Count 34 toothpicks. Then group them into 10 toothpicks. Bundle the groups of 10 toothpicks together with a rubber band. Leave the loose ones without bundling. Ask: **How many toothpicks are there in one bundle? How many bundles are there? How many loose toothpicks are here? How can we count how many toothpicks we have here?** Begin with counting by 10s as: **10, 20, 30, 31, 32, 33 and 34. We have 34 toothpicks.**

Distribute various amounts of toothpicks and rubber bands to pairs or small groups of students. Ask them to first estimate the quantity. Then ask them to determine the number by putting the sticks into groups of 10s, leaving the extra ones loose. As they work, go around to each group and ask: **How many bundles of toothpicks have you got? How many loose ones? Can you count how many sticks you have for me? So what is 45? How many 10s, and how many 1s? Can you write 45 as an addition sentence for me?**

Extension 2

Teach the students how to write each of the numbers from 10 to 100 in words. The students have already learnt writing the numbers in word forms up to 20 in chapter 1. They have also the had opportunity to write in words the numbers in 10s, such as 10, 20, 30, …100 earlier in this chapter. Now they will learn to write all the numbers from one to 100 in their word forms. As a convention, two digit numbers after twenty are written with a hyphen between the groups of tens and ones. For example, **twenty-one, twenty-two, twenty-three, …, ninety-seven, ninety-eight, ninety-nine.** The exceptions are the multiples of ten such as thirty or fifty.

You might need to provide opportunities for the students to practise and gain mastery with spelling in writing the numbers in words over the next several days.

Lesson 7 Comparing Numbers up to 100 on a Number Line

Objectives

Make a number line showing numbers up to 100.
Compare numbers using a number line.

Materials

Strips of chart papers
Marker pens
Rulers or straight edges

Make a thick horizontal line, about 2 metres long, on strips of chart papers joined together. Mark the lines with short vertical lines at regular intervals of about 15 cm in length, as shown below:

Put up the chart on the board at a height level the students can reach. Ask: **What do you think this is? Have you seen something like this before? Today we are going to make a number line together using numbers from 0 to 100.**

Write the numbers 0, 10, 20, and 30 below the vertical lines from the left. Have the students predict what numbers to write under each vertical line from 30 to 100. Explain that the space between each of these numbers in 10s is the same. Then ask: **Where should the number 25 be placed?** Explain that 25 should be placed in the middle of 20 and 30 and write it there. Ask: **Where should we place the number 21? Why should it be closer to 20 than 25?** Similarly, ask and write some more numbers on the number line. After the number line has been filled with some more numbers (it is not necessary to write and show all of the numbers from 0 to 100 on it), ask question such as:

Where does 48 go? Why does it go there?
Which is greater – 51 or 55? How can you tell this on the number line?

Explain that the number on the right is greater than a number on the left on the number line.

Which is greater – 20 or 30? Which is lesser then – 20 or 30?
What is the greatest number on this number line? Why is that?
What is the smallest number on this number line? Why is that?

Maths Note

A number line is an effective tool to help students compare numbers. It is also used as a tool and strategy to teach and solve addition, subtraction and multiplication problems later. The students have had some experience making and using number lines showing smaller ranges of number both in Class PP as well as in Chapter 1 of this class. In this lesson, they will extend the number line to include numbers up to 100.

Assessment for Learning

See that the students can tell where a number should be placed on a number line. Also ensure that the students realize that the number on the right is greater and can express that when comparing two numbers using the number line.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening, and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner. What is even more importantis the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 6 NUMBERS TO 100

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*					
		Group large quantities in 10s, and count in 10s and 1s.	Express 100 as various combinations of groups of 10s.	Represent numbers between 10 and 100 with models in groups of 10s and 1s.	Express 2-digit numbers as a combination of groups of 10s and 1s.	Compare numbers on number line.	Write the numerals and numbers in words for the numbers up to 100.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: ____ Section: ____

CHAPTER 6 NUMBERS TO 100

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using Interview-based Performance Task.)*

Task and Interview prompts	**Key concepts and skills to look for**
Present the student with a group of about 45 loose snap cubes. Ask: **How many cubes do you think are here? How can you find out? Can you count by 1s? Can you make trains of 10 cubes, and count them? How many 10s are there? How many ones are there? Can you write (45) with an addition sentence?** Show the student as 100-chart. Ask: **Where is 45 in the chart? What number is above 45? Below 45? Which row is of the chart is 45 in? What number is 2 more than 45? Tell me three numbers that are less than 45.**	*The student is able to:* - Make reasonable estimate of quantities. - Count large numbers by 1s. - Group and count items by 10s and 1s. - Express a 2-digit number as groups of 10s and 1s. - Identify numbers on 100-chart. - Compare numbers and tell which is greater and which is lesser. - Describe the position of a number on the 100-chart. - Justify why a number is greater or lesser using 100-chart.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 6

CA marks from Chapter 6 (Marks out of 10): _____

CHAPTER 7 2-D SHAPES

Chapter Overview

Geometry is the study of shapes, both 2-Dimensional and 3-Dimensional – their features like sizes, positions, orientations; relationships among the various features of a shape; effects on the position and orientation of shapes due to certain transformations applied to them. 2-D shapes are flat and can be drawn on paper. 3-D shapes are solid shapes and occupy space. You can draw diagrams of 3-D shapes on paper, but these diagrams only show the view from one perspective.

This chapter deals with some basic 2-D geometric shapes. The students have had some experience exploring some basic 2-D shapes such as circles, triangles, and rectangles in Class PP as well as from exploring some 3-D shapes earlier in this class. This chapter will extend the students' exposure to a few more 2-D shapes such as rhombus, trapezoid and hexagon. The students will look at the shape features and properties of these shapes and describe them. They will compare and describe the similarities and differences among these shapes. They will realize that these 2-D shapes appear as the faces of the 3-D shapes they had explored in the earlier chapter. Student will also explore reflection symmetry with these basic shapes. The experience with reflection symmetry also helps the students understand the idea of halves. In sorting 2-D shapes according to various rules, the student will apply their knowledge about the properties and features of the 2-D shapes.

This chapter has 7 lessons as detailed in the Table of Contents.

Basic Principles about 2-D Shapes

- In order to distinguish between shapes, students must focus on attributes of the shapes whether it is for the purpose of identifying them, sorting them, or building with them.
- Some attributes of a 2-D object relate to the object as a whole, but some focus on parts of the object.
- It is often useful to think of shapes in terms of their component parts.
- By making the shapes, properties of those shapes become more readily apparent.

Chapter Goals

- Identify and name 2-D shapes such as a circle, a triangle, a rectangle, a rhombus, a trapezoid and a hexagon.
- Understand the 2-D shapes are flat shapes and relate them to the faces of 3-D shapes.
- Describe properties of 2-D Shapes.
- Sort 2-D shapes according to certain sorting rules.
- Recognize and create symmetrical shapes

Maths Words

2-D shapes, flat shape, face, side, edge, corner, circle, rectangle, triangle, rhombus, trapezoid, hexagon, sort, symmetrical shape, pattern

Lesson 1 Identifying and Describing 2-D Shapes

Objectives

Identify and name 2-D shapes (Circle, triangle, rectangle, rhombus, trapezoid, hexagon).
Observe and describe these shapes in terms of their sides and corners.
Compare and describe similarities and differences between two 2-D shapes.

Materials

Models of 3-D shapes (cones, cylinders, pyramids, rectangular prism, triangular prisms)
Pattern block (triangular blocks, trapezoidal blocks, rhomboidal blocks, hexagonal blocks)
Linking cubes
Chart paper with labelled drawings of circles, triangles, rectangles, rhombuses. trapezoids and hexagons.
Chart containing the table for recording the number of edges and corners for shapes.

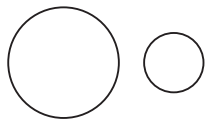
Maths Note

The students have had some experience exploring shapes like circle, triangle and rectangle in Class PP. They will revisit looking at the shape features of these shapes, and extend to a few more 2-D shapes, namely rhombus, trapezoid and hexagon. Since all these shapes appear as the faces of the familiar 3-D shapes and pattern blocks that the students are familiar with, it would be convenient to relate and introduce these 2-D shapes as faces of these 3-D shapes.

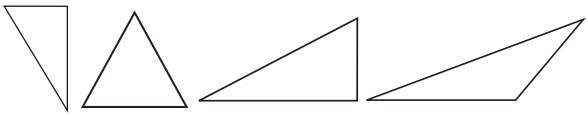
Students at this point in their development do not need to understand all the properties of these new shapes, but will quite simply look at and record the number of sides and corners for each of these shapes, and compare them on the basis of these.

Distribute a model or two of the 3-D shapes to the students individually or in pairs. Have them focus on the flat faces of the shapes. Ask: **Who has a shape that has a circle on it as its face? Show your shape. What is the name of the shape? How many circles are there on it? Whose shape has triangles on it? How many triangles are there? Who has a shape that has rectangles as a face on it? What is the name of the shape?**

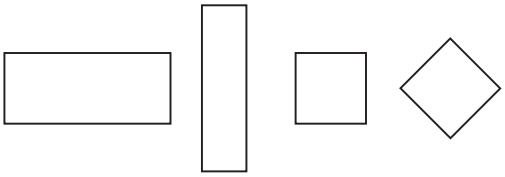
Put up the chart containing the drawings of the circles, triangles and rectangles on the board and have them read the labels. The shapes and their names should be familiar to the students.



circles



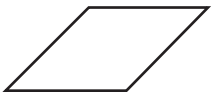
triangles



rectangles

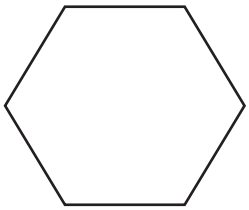
Then distribute the above mentioned pattern blocks (rhomboidal blocks, trapezoidal blocks and hexagonal blocks) to each student. Ask them what each of the shapes might be called. If they are not able to come up with generic names for these shapes, remind them that all these shapes have two bases which are the same. The bases are joined by rectangles. These shapes are prisms. Then have them focus on the shapes of the bases. Ask

if they are triangles or rectangles. Then introduce the faces of the bases as **rhombus, trapezoid and hexagon.** Have all the students say the names correctly. Then put up the chart containing the shapes with labels for rhombus, trapezoid and hexagon. Have the students read aloud the three names.



rhombus

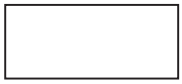
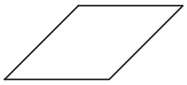
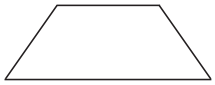
trapezoid



hexagon

Explain that all these shapes are flat and that they are like the faces of some of the solid shape they learned in Chapter 5. This is where the distinction between 2-D and 3-D should be made very explicitly. Bring some 3-D shapes, such as prisms, pyramids and cylinders, and explain that they are called 3-D shapes. And, explain that the flat shapes that you posted as above such as triangles, rectangles, and hexagons are called 2-D shapes. They are not solid objects like the 3-D shapes.

Next, tell them: **We are going to look at how many edges and corner each of these shapes has.** Explain what an edge is and what a corner is.

2-D Shapes	**Number of straight edges**	**Number of corners**
Triangle 		
Circle 		
Rectangle 		
Rhombus 		
Trapezoid 		
Hexagon 		

Have them focus their attention on the rhombus and rectangle, and ask: **What is same about the rectangle and the rhombus? (Both have 4 edges and 4 corners). How are they different? Describe how each of them looks. Can you see a shape that is like a rectangle in the classroom? Can you see anything like a rhombus in the classroom?** Similarly, have them observe and compare a rectangle with a trapezoid. Have them compare a circle with the rest of the shapes. The circle is the only shape that has no straight edge, it has a curved edge all round, while all the other shapes have straight edges and no curved edges. The circle also does not have any corners, while the others have more than one corner.

Assessment for Learning

See that the students can tell the number of edges and corners by looking at the shapes.

Lesson 2 Making 2-D Shapes

Objectives

Trace 2-D shapes around the faces of 3-D shape models.
Sketch 2-D shapes.

Materials

Models of the 3-D shapes (cones, prisms, pyramids, cylinders, cubes)
Pattern blocks (triangular blocks, rhomboidal blocks, trapezoidal blocks and hexagonal blocks – in fact these are all prisms too)

Distribute the above models and blocks to the students. Have them trace around the faces of various 3-D shapes with a pencil in their note books. As they work on it, go around and help them. Ensure that each student has traced all the shapes, and encourage them to trace various sizes of triangles, rectangles and circles using various 3-D shapes. Students should exchange the 3-D shapes once they have finished tracing from the shapes they got.

After the students have traced an adequate number of shapes, have them identify and label each of their shapes. The spelling would be on the charts put up during the earlier lesson. After that, ask questions such as: **Who has traced many triangles? Who has traced only 1 hexagon? Who has more than 3 circles? Who has traced a triangle like this?** - Draw a triangle with a corner pointing down on the floor. **Who has traced a trapezoid like this?** – Draw a trapezoid with the parallel sides going vertically. **Who has traced a rectangle like this?** – draw a rectangle with a corner pointing down on the floor. Have the student trace these shapes as you have just drawn in their note books and have them label the shapes. This should make them realize that a shape remains the same regardless of its orientation and position.

Then encourage the students to draw or sketch the shapes using free hand drawing or using certain straight edges, such as rulers to help them draw the lines.

Maths Note

Making and drawing the 2-D shapes makes the shape features more familiar to the students, besides developing their psychomotor skills. Having the student draw the 2-D shapes through tracing and sketching and then having them label each of their drawings will also make them remember the names of the shapes with their spellings.

Assessment for Learning

See that the students realize that a shape can be turned or drawn in any position. See also that they can read and write the names of the shapes.

Extension 1 Making 2-D Shapes on Geoboards

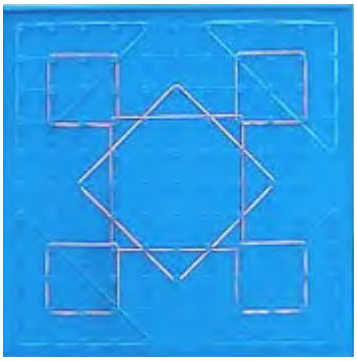
Provide each student or pairs of students with a geoboard and rubber bands in different colours. Let them experiment making various shapes with it for some time. As they work, go around and ask them what they made or are making. Encourage them to share and explain their shapes with their neighbours. Have them copy each other's shapes.

After some time, you could direct them to make specific shapes on their geoboards.

> **Make a shape with 3 straight sides. What is this shape called? Did everyone get the same triangle? Who has the biggest triangle? Who has the smallest one?**
> **Make a rectangle. Make a very long rectangle. Make a rectangle**

which has all the 4 sides the same. Make a very small rectangle. Make a hexagon. Make a rhombus. Make a trapezoid. Make a circle.

At the end, ask: **Which shapes were easy to make on the geo-board? Which shapes were difficult to make? Which shape was not possible to make on the geoboard?**



Extension 2 Making Shapes with Yarns

Take the students to an open space. Ask them to form into groups of 4. Provide each group with a long piece of yarn or string of about 6 meters long.

Let them join the two ends of the string by making a knot. Have the groups form a rectangle with the string by positioning themselves at corners. Have them form a different rectangle by adjusting their positions.

Then have the students form various shapes of their choices. Visit each group. Have them describe their shapes, tell the names of the shapes they made, and how many they have to stand to make each shape.

Lesson 3 Identifying Symmetry

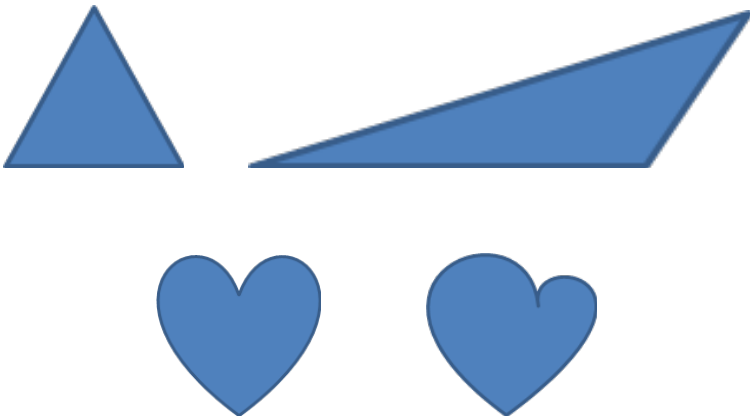
Objectives

Recognize shapes with reflection symmetry.

Materials

Two shapes which have symmetry
Two shapes which do not have symmetry
Student Activity Books
Scissors

Have cutouts of the following shapes, each big enough for demonstration in the class: an equilateral or isosceles triangle, a scalene triangle, and heart shape which is symmetrical and a heart shape which is not symmetrical.



Fold the equilateral triangle so that one half fits exactly on the other half. Have the students observe you do that as you say: **I am folding this triangle like this. This half of the triangle fits exactly on to this half. The two halves are same in shape and size. How do I know that the two halves are the same in size and shape?** Pick up the scalene triangle, and say: **Now I am going to see if I can fold this triangle so that two parts are the same.** Have the students see that it does not work out that way for the second triangle. Tell that the first triangle is symmetrical and the second triangle is not symmetrical. Explain that if you can fold a shape so that one part fits exactly on the other part, the shape is symmetrical, otherwise it is not. Explain that each part of a symmetrical shape is a half of the shape. Test the symmetry with the two heart shapes with the students.

Then show a sheet of rectangular paper, and ask: **Do you think this shape is symmetrical? How can we test that?** Follow up on their suggestions. Show a paper which is torn haphazardly from a side, and ask: **Do you think his paper is symmetrical? How do you know?**

Have the students cut out the shapes from their Student Activity Book on pages ___. Provide scissors and help in cutting them out. Have them sort

Maths Note

Shapes with reflection symmetry (also called line symmetry or mirror symmetry) have the property that they can be folded in half so that one half falls exactly on top of the other. This is an important property of shapes since so many shapes in our world are symmetric.
At this stage, the shapes should mostly be made out of paper so that the students can find a fold line to test for symmetry. They should realize that each side of the shape is half of the shape.
They might look for real objects that have symmetry, but they will have to use visual cues rather than a formal test.

into shapes that have symmetry and shape that do not have symmetry. As they work or sort, ask them to show how a shape is symmetrical and how a shape is not symmetrical: **How can you tell that this shape is symmetrical?**

At the end ask: **Do you think all the rectangles are symmetrical? Why do you think so? Do you think all the triangles will be symmetrical? Why do you think so?**

Explain that in nature many things are symmetrical. For example, our face and body are symmetrical along the line that goes vertically down the middle of the face. Open the palms of both the hands and show the palms together so that the little fingers are next to each other. The shape of the two hands taken together are symmetrical because if you clap the hands, they will fall exactly on each other.

Assessment for Learning

See that the students can describe why and how a shape is symmetrical folding and showing that one half fits exactly onto the other half.

Extension

Show the symmetrical shapes that you have used earlier such as the symmetrical triangles and symmetrical heart. Explain that the fold line that makes one part of the shape fall exactly on to the other is called the line of symmetry.

To develop the idea of the line of symmetry more, you could have some more shapes that are symmetrical but without the fold showing (i.e. made without using the folding technique). Ask the students to identify the line of symmetry (i.e. where the fold would have been to make the shape like this).

Lesson 4 Creating Symmetrical Shapes

Objectives

Create simple symmetrical shapes.

Materials

Plain sheets of papers
Scissors

Fold a plain sheet of paper in half and then cut out a small "window",

For example,

Ask students to predict what they will see when they unfold the shape.

Unfold the paper, and ask: **Is this shape symmetrical? How do you know that this shape (referring to the overall shape from both sides of the fold line) is symmetrical?** Explain that the line that divides a symmetrical shape into its two halves is called the line of symmetry.

Provide each student with at least three plain sheets of papers. Provide scissors in groups. Have them fold the papers and create many different symmetrical shapes. Some examples of what they might cut out are shown:

As the students work, go around and help (some may need support to get started) and ask questions such as: **How can you tell if the shape really has symmetry? How do you know this is half the shape? How do you know that this shape is not symmetrical** (using a non-symmetrical shape)**? Show me the line of symmetry for this shape.**

Extension

Provide the students with sheets of paper and scissors as above. Ask them to fold their papers, and ask them how to cut out the hals side to make some specifi shapes. For example: **How do you cut out the half side so that you get a heart when you unfold the paper? How do you cut out the half to get a rectangle when you unfold? Are there more than one way to make a rectangle this way? …**

Maths Note

Students should understand that they can fold a piece of paper, draw a shape on one side of the fold, cut it out while the paper is folded and end up with a symmetrical shape. They can also use visual cues to create a symmetrical shape.

Assessment for Learning

See that the students can describe the shapes they have created. Also have them explain how the shapes are symmetrical.

Lesson 5 Dividing Shapes to Create New Shapes

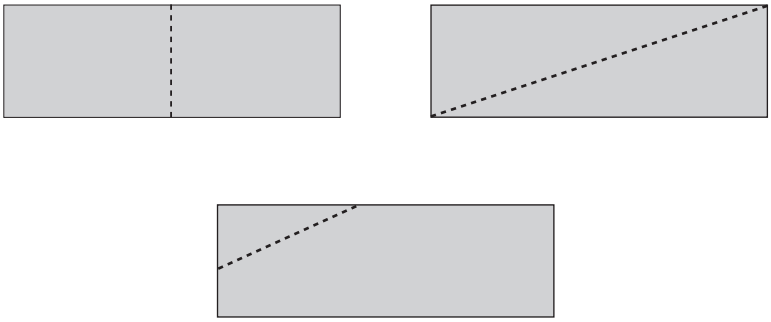
Objectives

Observe small shapes within larger shapes.
Cut a 2-D shape to create other familiar 2-D shapes.

Materials

Plain sheets of papers
Scissors

Begin with a paper rectangle and ask: **If I cut this rectangle down the centre like this, what shapes will I get?** Then cut it. **How many rectangles do we have now?** Then ask them how to cut the rectangle to make two triangles. After creating the two triangles, ask: **Which triangle do you think is larger? Which triangle has more area? How can we compare the areas of the two triangles?** Ask them how you might create a trapezoid out of the rectangle. Cut the rectangle into three pieces in a way that you create two small triangles and a trapezoid. Ask: **Which of these shapes is the largest – the triangle or the trapezoid? How can we compare the area of these shapes?**



Distribute rectangular sheets of plain paper to individual students. Make scissors accessible to the students. Have them create many smaller shapes such as triangles, smaller rectangles and trapezoids. Challenge them to create hexagons and rhombuses too.

Distribute hexagonal and trapezoidal pattern blocks. Have them trace around them to make hexagons and trapezoids. Have them cut out these shapes. Have them cut and create other smaller shapes out of these shapes. As they work, ask: **Can you create two trapezoids from one trapezoid by cutting through it once? Can you create two smaller hexagons by cutting once through a hexagon?**

Maths Note

An important idea in geometry is that shapes can be divided to create other shapes. This is used in many situations in maths to help relate one situation to another. Students should realize that the shapes created by cutting from a large shape have a smaller area as compared to the original shape.

Assessment for Learning

See that the students can describe and identify the shapes they have created out of other shapes. See also that they can compare the area of the shapes and tell which shape has more or less area.

Lesson 6 Combining Shapes

Objectives

Combine or join two shapes and identify the resulting shapes.

Materials

Cutout shapes of two identical rectangles
Cutout shapes of two identical right triangles
Pattern blocks such as the triangular blocks, rhomboidal blocks, trapezoidal blocks and hexagonal blocks

Have the cutouts of the identical rectangle and triangles ready. Show a rectangle and ask what shape it is. Show another rectangle and ask the same. Ask: **If we join these two rectangles side by side like this, what bigger shape will we get? Is there another way to join them? What shape will we get then?**

Then show the two triangles and ask: **If we join these two triangles, what bigger shape will we get?** Follow up on what the students suggest. **What other bigger shape can you get, if you join these two triangles?** We will get a rectangle and a bigger triangle as shown below:

Provide the students with the various pattern blocks and have them experiment joining the shapes to form other shapes. Have them trace around the individual blocks and then have them trace around the larger resulting shapes out of joining the smaller shapes. Ask questions such as: **What shapes could you make by joining two trapezoids? What shape did you get when you joined two triangles? What shape did you get when you joined three triangles? Can you make a hexagon by joining many small triangles? How many triangles are needed to make a hexagon?**

Encourage the students to join different blocks to see what shapes they get. For example, joining a rhombus with a trianle will form a trapezoid. Ask questions such as: **Has anyone joined a rhombus and a triangle? What shape will you get if you joined a rhombus and a triangle?**

Infact, it is not necessary that students try to get only the known shapes from the combinations. Students might join the shorter side of a rectangle to the middle of the longer side of one – making a T. Such ideas from the students should be praised too.

Maths Note

Students will have many opportunities to explore this idea as they move on to later classes. At this point in time, they should experiment by putting together only familiar and identical shapes to see what they can create. Pattern blocks are especially useful for this. For example, you could join two triangles to create a rhombus, two trapezoids to create a hexagon and even three triangles to create a trapezoid.

Assessment for Learning

See that the students can properly align or join two shapes to create another shape and that they can name the shapes.

Lesson 7 Sorting 2-D Shapes

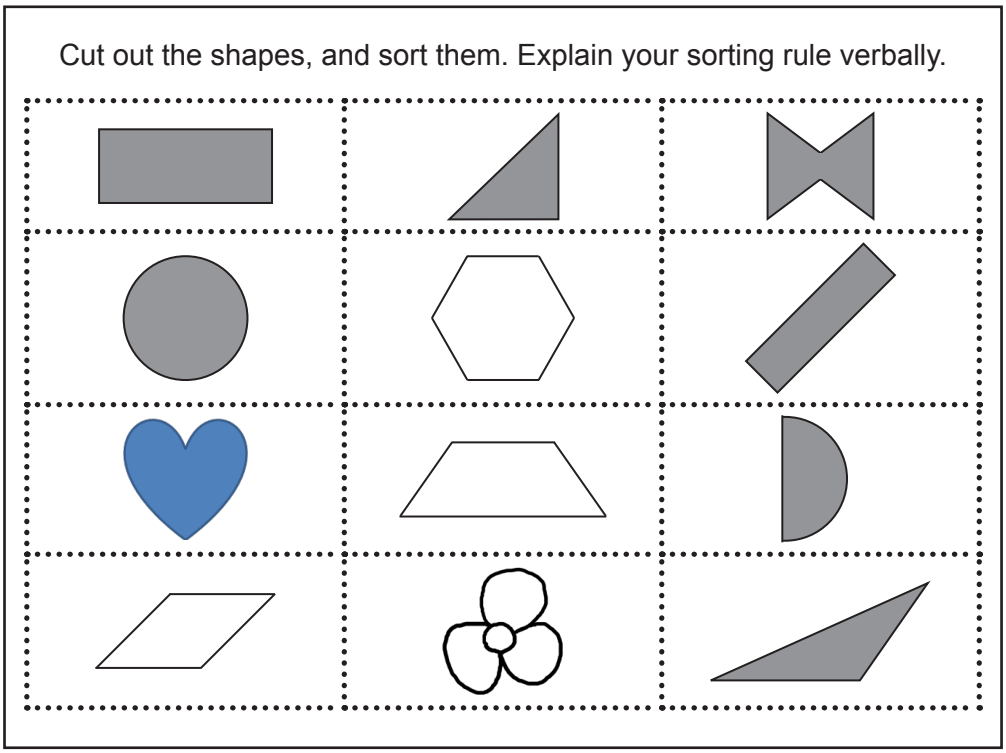
Objectives

Sort and resort 2-D shapes.
Describe the sorting rule.

Materials

Student Activity Books to cut out 2-D shapes for each student
Scissors

Have the students cut out the 2-D shapes from their Activity Book on page ___. Provide scissors and assistance to the students with the cuttings where needed.



Ask the students to sort the shapes into sets. As they work, go around to each student and ask: **How did you sort? What is same about all the shapes in this set? What is your sorting rule?**

You could have the students look at each other's sorted sets and try to describe the sorting rule used by their classmates.

Encourage the students to sort the shapes in more than one way: **Can you put back all the shapes together and sort it in another way?**

Maths Note

Sorting activities provide opportunities for the students to focus on the shape features and attributes of the shapes. The students should be provided with a mixture of both familiar and unfamiliar shapes, as the sorting will be based on the attributes and not the names of the shapes.

Assessment for Learning

See that the students can describe their sorting rule for each of the sorting they have done.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening, and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner. What is even more important is the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 7 2-D SHAPES

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*					
		identify and name 2-D shapes (circle, triangles, rectangles, rhombuses, trapezoids, and hexagons)	Relate the 2-D shapes as the flat faces of the 3-D shapes.	Count and record the number of edges and corners for the 2-D shapes.	Sort and re-sort 2-D shapes according to a sorting rule.	Recognise shapes with symmetry, and explain why a shape is symmetrical.	Divide and combine shapes to create other shapes.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: ____ Section: ____

CHAPTER 7 2-D SHAPES

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using the Interview-based Performance Task.)*

Task and Interview prompts	**Key concepts and skills to look for**
Have a collection of cutout 2-D shapes such as various sizes and shapes of rectangle, triangles, circles, rhombuses, trapezoid, and hexagons. Ask: **Can you show me a hexagon? A rectangle? Another rectangle? A rhombus?** Show a trapezoid, and ask: **How many corners does this shape have? How many edges does it have? Pick up a shape which is not a trapezoid, but has 4 edges. Show me a shape which is symmetrical. How do you know that it is symmetrical? Where is the line of symmetry? How is this circle different from many of these other shapes? What can you tell me about a triangle?** Show a rhombus and a trapezoid, and ask: **How are these two shapes the same? How are they different?**	*The student is able to :* - Identify and name the 2-Shapes. - Count and tell the number of edges and corners for a shape. - Recognize shapes with symmetry. - Explain why a shape is symmetrical. - Recognise a line of symmetry. - Compare and describe how two shapes are the same and how they are different.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 7

CA mark from Chapter 7 (Mark out of 10): _____

CHAPTER 8 ADDITION AND SUBTRACTION STRATEGIES

Chapter Overview

The students were introduced to addition and subtraction earlier this year in chapter 3. They used addition and subtraction to represent simple story problems and created simple stories for simple addition and subtraction sentences. They enacted and modeled the addition and subtraction situations with concrete materials. This chapter will build on the students' experience and understanding of addition and subtraction. They will continue to model addition and subtraction situations by representations with concrete materials. At the same time, they will learn to develop and use certain basic strategies for simplifying addition and subtraction such as counting on and counting back using number lines or doing them mentally, making 10s to add or subtract and using facts for doubles. Besides these strategies, the students should be encouraged to develop and use their own strategies to add and subtract. The numbers used for addition and subtraction problems in this chapter should be fairly small, as the emphasis is place on concepts and strategies of addition and subtraction rather than on the ability to compute difficult numbers. As in the case with all the other chapters, the students should be encouraged and provided opportunities to share and describe their thinking on the solution strategies.

This chapter has 7 lessons as detailed in the Table of Contents.

Basic Principles about Addition and Subtraction Strategies

- Addition and subtraction both involve changes in quantity.
- Addition involves combining. The combining can be "active", where some objects join other objects, or static where a whole is made up of two parts.
- Subtraction can involve removal, separation, comparison or determining a missing addend.
- Addition and subtraction are related. In any situation involving an addition, there is an equivalent subtraction situation and vice versa.
- To add numbers, you can count on from either number. To subtract numbers, you can count back from the greater number or count on from the lesser number.
- Any addition or subtraction fact can be related to another addition or subtraction fact. Often using a combination for 10 or a "double" fact is useful.
- Numbers (two or more) can be added in any order.
- Addition and subtraction undo each other. For this reason, any subtraction can be solved using a related addition.

Chapter Goals

- Use counting on and counting back to solve addition and subtraction problems.
- Use facts for 10 to simplify addition and subtraction.
- Use double facts to simplify addition and subtraction.
- Use commutative and associative principles in addition.
- Add more than two numbers.

Maths Words

Add, addition sentence, sum, subtract, subtraction sentence, difference, double, facts, 10-frame

Lesson 1 Counting On and Counting Back

Objectives

Use counting on or counting back to determine sums or differences.

Materials

A number line showing numbers to at least 20 on chart paper
Marbles or counters
A container (eg. a tin can)
Dice
Number lines showing numbers to 20 on strips of paper

Tell a simple story. For example: **I have 10 marbles. I want to keep them in this can** (drop the marbles in it in such a way that the students know the number). **My brother took out 3 marbles to play** (Take out 3 marbles). **How many marbles do you think are still in the can? How can you be sure? Follow up on their suggestions. Is this an addition story or a subtraction story? Try to write a subtraction sentence for this story.** If the students are not able to suggest, probe them by asking: **What was the number at the start? Then what happened to it? What was the number at the end? Is the number at the end more or less than at the start?** Write the subtraction sentence on the board as: 10 – 3 = 7. Explain what each number and each symbol means.

Continue the story as: **My brother won some marbles during the play with his friends. So he is putting back some marbles in the can** (drop in 5 marbles). **How many marbles are there in the can now? How can we check this? Is this an addition story or a subtraction story? How can we write an addition sentence for this second part of the story?** With suggestions from the students, write the addition sentences as: 7 + 5 = 12. Explain what each number and the symbol means in this sentecne.

Then explain that we can solve addition and subtraction problems, or find the number at the end of addition and subtraction stories using a number line. Demonstrate 7 + 5 = 12 on a number line by starting at 7 and then counting forward 5 from 7 to end up at 12. Explain that we count on or count forward, and the number reached is the solution (or the number at the end of the story). Then demonstrate solving 10 – 3 by starting at 10 and counting back 3 as 9, 8, 7 and ending at 7. Explain that for subtraction, we count back from the starting number.

Tell that we can solve any addition and subtraction problem using a number line. If it is an addition problem, we count on or count forward. If it is a subtraction problem, we usually count back as this is most natural in 'take away' situations. Comparision may lead to counting on or matching strategies being used instead, as with how many more marbles does Penjor have than Sonam or how much more is 8 than 5.

Tell that they will play a game to write addition and subtraction sentences. Provide a die and a number line to each pair of students. Tell teh students to imagine that each pair of them have 15 marbles in a can. Ask one of the

Maths Note

The students have already learned how to count on or back with or without the help of a number line. They now should connect this to addition and subtraction. If they count on, they add; if they count back, they subtract. The use of a number line should be employed in this lesson. Some students might not feel the need to use a number line to count on and count back from a number to arrive at a sum or a difference after some time, but some will continue to rely on it for a long time.
In this lesson, the students will be required to solve both addition and subtraction problems within the context of a game with the help of a number line.

Since only one lesson has been designed for using counting on and counting back as a strategy for addition and subtraction, the experience with this strategy should be extended over the next several days. The basic ideas of addition and subtraction are contained in this strategy.

partners to roll the die to take out some marbles as per the number on the die and determine the numbers of marbles left in the can with the helpf of number line. For example, if the die showed 3, ask the students to start at 15 and count back 3 - **14, 13 and 12** on the number line. So there are 12 marbles left in the can. Ask the students to write the subtraction sentence as **15 – 3 = 12**. They could write the sentence jointly on a paper or individually in their own notebooks. Then proceed to have the second player roll the die to add some marble to the can. If the second player rolled 6, they should start at 12 on the number line and count on or count forward 6 - **13, 14, 15, 16, 17, and 18**. The number of marbles now is 18. The students then write the addition sentence as **12 + 6 = 18.** The first player will then roll the die to count back and write the subtraction sentence. Next the second player will again roll the die to count forward from the last number and then write the addition sentence. So the game will continue in this way.

As the students play the game, go around ensuring that they understand each situation as either addition or subtraction, and write the appropriate number sentences. See that they know how to count on and back using the number lines.

After the students have played and written enough appropriate addition and subtraction sentences, draw their attention and ask questions like:

How will you solve 9 + 4 on the number line? On what number should you start? Should you count on or count back from 9? Why? How many should you count on from 9? What is the number at the end of counting on? So, what number sentence will you write?

How will you model 12 – 7 on the number line? On what number should you start? Should you count on or count back from 12? Why? How many should you count back from 12? What is the number at the end of counting back? What number sentence will you write?

In your game, when was your result, or the number after the equals sign (=) less than what you started with? When was it greater?

Assessment for Learning

See that the students can understand each situation as an addition or a subtraction situation, and then represent it with appropriate number sentences. Be aware that students could also model 7 – 3 by starting at 7, going back to 3 and counting the length of the arrow (or going up from 3 to 7) instead of what is shown above.

Lesson 2 Facts for 10

Objectives

Become familiar with the number combinations for 10.

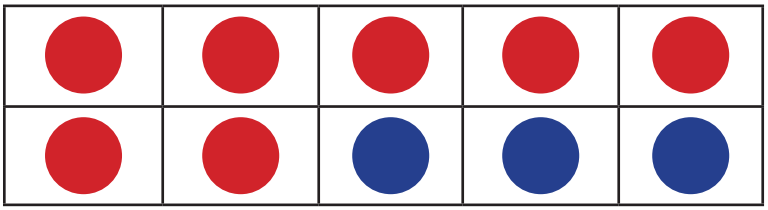
Materials

Counters in two colours
10-frames

Show the students a 10-frame filled completely with counters in one colour. Ask: **How many counters are here?** Then change one of the counters with a different coloured counter, and ask: **How many counters are there now? What has changed now? What has remained the same?** The colour of one counter has changed, but the total number of counters is still the same. So, we can say that 10 is 9 and 1 and write the number sentence 10 = 9 + 1. Next, replace 2 more counters with a different colour, and ask what 10 might be this time, and write the number sentence as either 10 = 7 + 3 or 10 = 3 + 7.

Maths Note

10 is an important number in our place value system. If students become comfortable with sums for 10, it will be much easier for them to deal with facts later for sums greater than 10. It will especially help them in doing mental calculations involving addition and subtraction.



10 = 7 + 3

Provide pairs or small groups of students with counters in two colours (10 of each colour), a 10-frame and ask them to determine all the different combinations that make 10. They could use the 10-frames in their Activity Books. Have them write all the possible addition sentences in their notebooks. As they work, go around ensuring that they are appropriately representing the different combinations of the two colours making 10 with the addition sentences. Ask them to explain what each of the numbers and the symbols in their addition sentences mean.

At the end, draw their attention and write the following addition sentences with the help of the students:

10 = 9 + 1

10 = 8 + 2

10 = 7 + 3

10 = 6 + 4

10 = 5 + 5

10 = 4 + ___

10 = ___ + 7

10 = ___ + ___

10 = 0 + 10

Have the students tell the pattens they see in the above addtion sentences.

You should also demonstrate how each sentence above is true by using the **counting on** strategy learned in the previous lesson. For example, with teh sentence 10 = 9 + 1, start at 9 and count on 1 more to end at the number 10 on a number line. Similarly, for 10 = 1 + 9, start at 1 and count forward 9 to land at the number 10 on a number line. Let them realize that 1 + 9 and 9 + 1 give the same result.

Explain that each sentence above is an addition fact for 10. We can also say that the combinations that give 10 are the other number names for 10. Tell that understanding and remembering these combinations for 10 will be useful in adding bigger numbers later on. Ask questions like:

Suppose two numbers add to 10. If one of them is 6, what do you know about the other number? How do you know?

Suppose two numbers add to 10. If one of them is less than 5, what do you know about the other number? How do you know?

What values could you use to make this true: ___ + ___ = 10?

Assessment for Learning

See that the students can understand and explain how addition sentences for 10 are true using either the counters with a 10-frame or a number line, or both.

Lesson 3 Adding by Making 10

Objectives

Begin to use the knowledge about facts for 10 to help solve "teen facts". In other words, begin to use facts for 10 to help solve additions of two single digit numbers resulting in a sum greater than 10 such as 8 + 6 = 14.

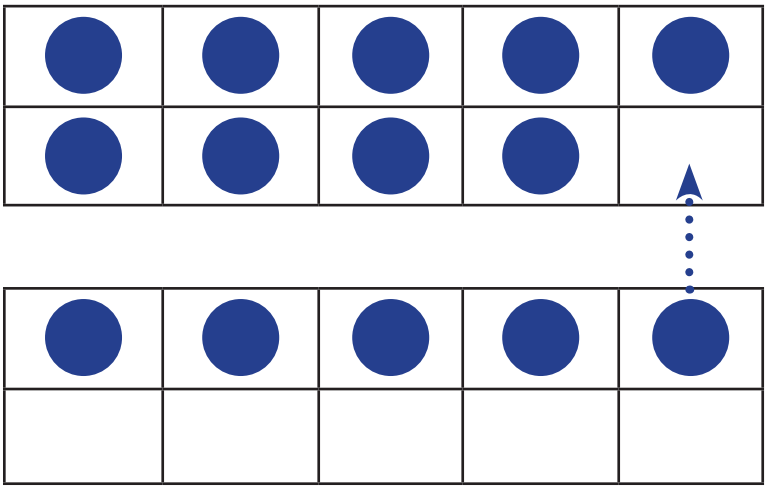
Materials

Double 10-frames
Counters

Write the addition phrase, 9 + 5, on the board and ask what the **sum** might be. Explain the meaning of the sum as the result of addition. Follow up on the students' suggestions by asking questions such as: **How do you know that the sum is 14? Did you use counting on or counting forward from 9 to get to 14? Did you use a number line? Can you tell me how you did that? Did you use any way other than a number line to count forward? Did anyone use your fingers to count forward from 9 like this – 9, 10, 11, 12, 13 14?** Raise 5 fingers one by one as you count on from 9 to 14.

Tell that the above strategy of counting forward with the help of or without the help of number lines and fingers is very good. Tell that we can also use the fact for 10 to add such numbers. Explain that for 9 + 5, we could first take away 1 from 5 and add it on to 9, so that 9 becomes 10. Now we have 10 and 4 to add. The sum of 10 and 4 is 14. Some students might have difficulty seeing that. Explain it with the help of counters and a double 10-frame.

Represent 9 on a 10-frame. Represent 5 on another 10-frame. Say you are going to add 9 and 5. Move 1 counter from the second 10-frame to the first 10-frame. Now the students can see that they have one full 10-frame with 10 counters and an additional 4 counters on the second 10-frame. That is 1 ten and 4 ones, which is 14. So explain that 9 + 5 = 14.



Maths Note

"Teen facts" are facts where the sum of single digit numbers is greater than 10. These seem to be the more difficult facts for students to recall. Students should first be shown how easy it is to add a single digit number to 10. For example, 10 + 5 is 15 since 15 means 1 ten and 5 more; 10 + 8 = 18 since 18 means 1 ten and 8 more. To add two numbers where the sum is greater than 10, students might use what they know about sums for 10. For example, to add 8 + 6, students might take 2 from 6 and add to 8 to make 10, and then add 4 to 10 to get 14. The students would benefit by using two 10-frames with this strategy in the beginning to understand visually.

Ask the students what the sum for 8 + 7 might be. The student might solve it using counting on from 8 to get to 15 on a number line. Acknowledge that as correct. Then explain it by first taking away 2 from 7 (and adding it to 8 to make) 10 and then combining 10 and 5 to get the sum as 15 with the help of the 10-frames. (Since 7 and 8 are close, you may wish to have students tell you how this could be done starting with 7 and taking 3 away from 8 as another method).

Provide the students with double 10-frames and counters and have them solve various addition problems such as the following:

9 + 3

9+ 4

9 + 5

9 + 6

9 + 7

9 + 8

9 + 9

8 + 8, 8 + 3, 7 + 6, 7 + 9, 7 + 4, etc.

Towards the end, ask questions such as:

When you added 8 + 3, was it easier to move counters from the group of 8 or from the group of 3? Why?

How much less is 9 + 5 than 10 + 5?

How is knowing 7 + 3 = 10 useful in adding 7 + 5?

Even though only one lesson has been designed for this strategy, the students should be encouraged to use the strategy in future addition problems as and when appropriate. In addition, the other strategies such as counting on should also be used together. As they develop, the students will develop their own preferences, ways and strategies.

Lesson 4 Subtracting from 10

Objectives

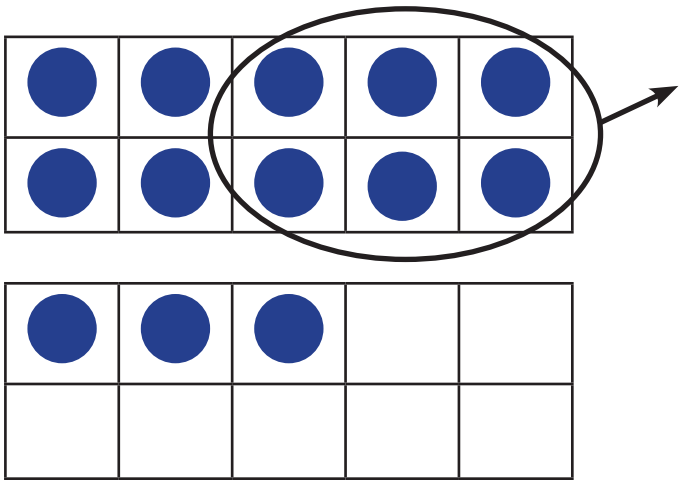
Begin to use the knowledge about facts for 10 to help solve subtraction problems when a single digit number is subtracted from a teen number, such as 13 – 8.

Materials

Double 10-frames
Counters

Write the subtraction phrase 13 – 6 on the board, and ask: **What do you think will be the difference for 13 minus 6?** Explain the meaning of the word **difference** as the result we get from subtraction. Follow up on the solution the students suggest: **How do you know the difference is 7? What strategy did you use to find it? Did you use a number line to count back from 13 to 6? Did anyone use a different strategy such as counting on from 6 to 13?**

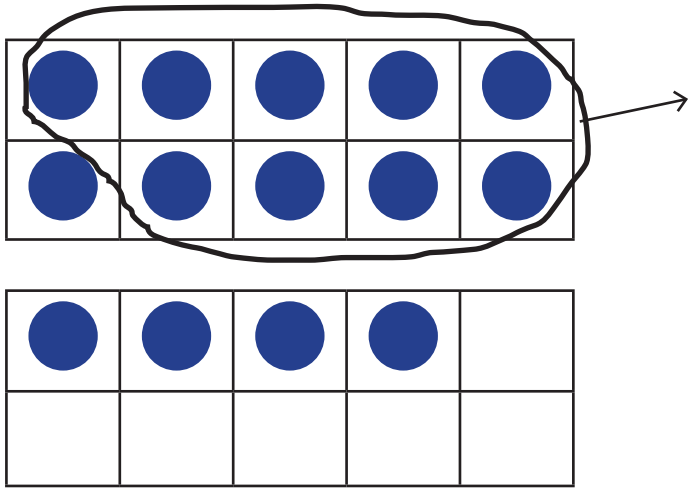
Tell that it is perfectly right to use such strategies. Tell: **Today we will learn to use the facts for 10 to help in our subtraction problems**. Explain that to solve 13 – 6, we could first think of 10 – 6 to get 4 and then add 4 to 3 to get 7. This could be explained clearly using 10-frames. First represent 13 on a double 10-frame. Then take away or remove 6 counters from fully filled 10-frame, leaving 4 to add to the 3 for a result of 7, as shown below.



Maths Note

To solve a problem like 13 – 6, students might think about the question 10 – 6 and then add 3. This is easier for them if they are already comfortable with the facts for 10.
The students should be presented with a variety of problems where they subtract a single digit number from a teen number and where the result is a single digit number. The use of 10-frames and counters would be helpful to explain the process of such a subtraction strategy.

Ask the students what the difference for 14 – 9 might be. The studentsmight solve it using counting back from 14 to get to 5 on a number line. Acknowledge that as correct. Then explain that we could solve this by first solving 10 – 9 to get 1 and then add 1 to 4 to get a result of 5 at the end. Use the 10-frames to show this visually.



Provide the students with double 10-frames and counters and have them solve various subtraction problems such as the following:

13 – 8, 14 – 5, 14 – 7, 14 – 9, 11 – 4, 11 – 5, 11 – 6, 11 – 7, 16 – 7, etc.

As they work with the subtraction problems, go around and help them understand and do the representations appropriately. Towards the end, ask questions such as:

What is the difference for 13 – 8? Why is 13 – 8 three more than 10 – 8?
What is 10 – 6? How do you know?
How might you calculate 15 – 7?

Although only one lesson has been designed for this strategy of subtraction, the students should be encouraged to use this over the next several days in relevant subtraction situations.

Lesson 5 Double Facts

Objectives

Learn the double facts for numbers from 1 to 10.

Materials

Drawings of a snail, a cat, a beetle, a spider and a lady bug

Write the addition phrase 5 + 5 on the board and ask the students what the **sum** for this addition might be? Ask them to explain how the sum is 10. Ask if they used counting on or counting forward; if they used a number line, or if they used a 10-frame, if they used facts to 10 or any other strategy such as counting on using fingers to work out the sum. These are all valid strategies and the students should be encouraged to use a variety of them. Then write the addition sentence, 5 + 5 = 10 on the board. Then write the addition phrase 4 + 4 on the board and ask them what the sum might be. Follow up on their suggestions as in the case with 5 + 5. Then with their help write the following addition sentences:

5 + 5 = 10

4 + 4 = 8

3 + 3 = 6

2 + 2 = 4

1 + 1 = 2

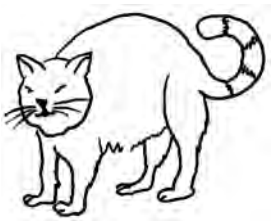
Have them observe the addends in each case. Explain that when we add two numbers which are the same or when we add a number to itself to get a sum, it is called a **double fact.** Explain the meaning of the word double as something repeating or appearing two times. Have them look at the above addition sentence once more to find some pattern there. Ask: **If you look at the sums from the bottom, how are they increasing? Do you see it is like counting forward by 2s? What do you think will be the sum for 6 plus 6? Then the sum for 7 plus 7? 8 plus 8? 9 plus 9? 10 plus 10? Then write the addition sentences or the double facts for 6, 7, 8, 9 and 10.**

Ask the student to think of something that appears as 5 and 5. Listen to their suggestions. Probe them to think of what appears as 5 and 5 on our body. Then ask them to think of something that appears as 1 and 1 making 2 on our body. Then put up the drawings of the following pictures on a chart, and ask: **What double facts do you see in each of these pictures? What number is repeating two times in each picture?** Follow up on their suggestions, and write a double fact under each picture. For example, the snail is showing 2 of its antennae as 1 and 1, and the cat is showing 2 front legs and 2 back legs as the double fact for 2 and 2.

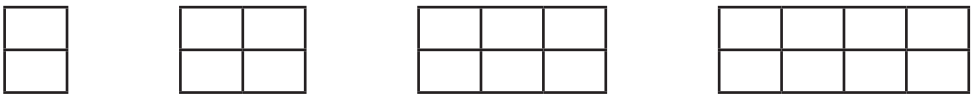
Maths Note

Research shows that students seem to have less difficulty recalling the double facts (6 + 6, 7 + 7, etc.) than many other facts. It is important for them to have an opportunity to learn these facts so that later they can use them to help learn other facts. The students should gradually learn to commit the double facts to memory.

What double fact do you see in each animal?

a snail  1 + 1 = 2	a cat  2 + 2 = 4
a beetle 	a spider 
a ladybug 	

Explain that the double facts can be modeled or represented by two equal rows as shown below: Have them sketch the representation for the double facts for 6, 7, 8, 9 and 10.



1 + 1 = 2 2 + 2 = 4 3 + 3 = 6 4 + 4 = 8

Towards the end, ask questions such as:

What is 6 + 6?
Why is 6 + 6 two more than 5 + 5?
When you add a number to itself, how do you know the sum is not 11?

Assessment for Learning

This lesson is quite simply an extension of the addition of two numbers. These additions are special in the sense that they add a number onto itself. See that the students can explain how they determine each sum for these double facts. The students should be asked and encouraged to familiarize themselves with these double facts over the next several days.

Lesson 6 Using the Commutative Principle of Addition

Objectives

Realize that addition can be done in any order and use this principle in adding two numbers.

Materials

Snap cube in two colours

Make a train of snap cubes such that there are 7 green cubes in sequence with 3 red cubes, as shown below:

Ask**: How many cubes are there? How many green cubes are there? How many red cubes are there? How can we write an addition sentence for this?** Follow up on the suggestions the students give, which likely will include 7 + 3 = 10. Have them describe what each number and symbol in the sentence means. You could even have the cubes drawn and coloured on a chart paper with the number sentence written below it. Then turn the direction of the train and present it to the students as:

Ask: **What have I done with the train? Has anything changed about it? How can we write an addition sentence for this train?** Write the equation as, 3 + 7 = 10. Have the students observe and describe the differences and the similarities between the two addition sentences. Explain that with addition, it does not matter in which order you add the numbers, the sum will be the same. You could say this is called the **commutative property** of addition, but this is not necessary at this stage, as long as the students understand that the the sum is the same regardless of the order.

Ask the students, how they would find the sum for 9 + 2, using a counting on strategy. Ask them how they would add 2 + 9 using the counting on strategy. Have them realize that, while they could count on 9 numbers starting at 2 to get to a sum of 11, it would be much easier and quicker to count on 2 numbers from 9 to arrive at the sum of 11. Then have the students find the sum for the following addition problems and have them describe how they added the numbers:

9 + 3, 3 + 9, 15 + 2, 2 + 15, 3 + 17, 5 + 9, 5 + 10, 8 + 10, etc.

Toward the end, ask questions such as: **How much is 3 + 9? How could you count on to figure it out? How much is 8 + 7? How do you know?**

Maths Note

The commutative principle of addition says that two numbers can be added in any order without affecting the sum. This realization is useful for the students to simplify their addition. For example, most students find it easier to calculate 9 + 2 than 2 + 9 since they count on 2 from 9 which is easier than counting on 9 from 2.

Assessment for Learning

See that the students clearly understand the commutative property of addition by applying it in various addition problems. For example, in finding the sum for 3 + 16; see whether the students count on 3 steps from 16 to arrive at 19 quickly, rather than counting on 16 steps from 3 to reach the sum of 19. The latter approach is, by the way, not wrong but rather inefficient.

Lesson 7 Adding More Than Two Numbers

Objectives

Add three or more single-digit numbers.
Use the Commutative Property of Addition.
Use the Associative Principles in addition of more than two numbers.

Materials

Snap cubes in three or more colours
Number line

Make a train of snap cubes such as the one shown below. You could also draw a similar one on paper showing the colours for the cubes and put it up for the students to see.

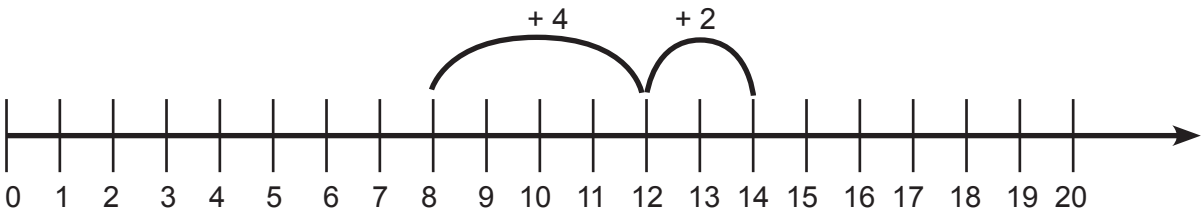
Ask the students: **How many cubes do you think are there in this train? How do you know how many are there?** Follow up on their suggestions. **How can you write an addition sentence for this train?** After hearing the suggestions, write the addition sentence for this train as 8 + 4 + 2 = 14 on the board. Have the students describe what each of the numbers and symbols in this sentence means. Ask what difference they notice from all the addition sentences they have seen so far, the difference being that they are adding 3 numbers for the first time here.

Ask the students how they would find the sum for the phrase, 8 + 4 + 2, if it is not represented by the above colours (so that they would not have the cubes to count for the sum). Follow up on their suggestions. Explain that you could use the counting on strategy for finding the sum with the help of a number line as shown below.

Maths Note

Many strategies that will help students learn addition and subtraction facts involve using more than two numbers at a time. For this reason, it is important for students to be comfortable with working with more than two addends. Further, students should employ their knowledge of the Commutative Property of addition as well as the Associative Property to simplify their addition. The Associative Property says that if you add the three numbers **a**, **b**, and **c**, you can first add **a** + **b** and then add **c** to the sum or you can add **a** to the sum of **b** + **c**.

The students should also use other known facts such as combining to 10 to simplify their addition, where appropriate.



Then ask them how they might add 8 + 4 + 2 using the fact for 10 and the commutative property. Here you could explain that they could first add 8 with 2 to get 10 and then add 10 with 4 to get 14 as the sum. The third method would be to simply add in the given order as 8 + 4 to get 12 and then as 12 + 2 to get the final sum of 14. Then have the students find the sums for the following addition problems:

4 + 4 + 2

5 + 5 + 6

5 + 6 + 5

8 + 7 + 2

1 + 7 + 9

1 + 2 + 3 + 9

As they work on the problems individually, go around and ask what strategies they are using to add. Encourage the students to use the known facts such as the facts for 10 and the double facts, as well as the commutative and associative principles to simplify their addition. Some students might continue to add in the given order using the counting on strategy which will be fine as long as they are comfortable doing that.

Toward the end, ask some questions like:

Suppose you are adding 3 + 5 + 8. Where would you start? Why would you start there?

How do you know the sum of 4 + 4 + 8 will be more than 10?

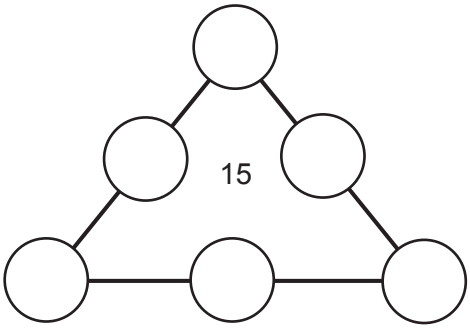
What three numbers could you add so the sum is 7?

Assessment for Learning

See that the students can find the sums for each of the addition problems and that they can use and describe the strategy used for each problem.

Extension

Ask the students to come up with different combinations of 3 numbers that all add to the same amount. For example, the students can look for numbers to fill in the circles so that the three numbers on all three sides each add to 15. You may wish to model this first with a total like 12, and the whole class working together to complete the diagram. Repeat this for other numbers such as 12, 13, 14, 16 and 18.



Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening, and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner.What is even more important is the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 8 ADDITION AND SUBTRACTION STRATEGIES

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*				
		Use counting on and counting back to solve addition and subtraction problems.	Make facts for 10.	Use facts for 10 to simplify addition and subtraction problems.	Use commutative and associative principles in addition.	Add more than three single digit numbers.
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: ____ Section: ____

CHAPTER 8 ADDITION AND SUBTRACTION STRATEGIES

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using the Interview-based Performance Task.)*

Task and Interview prompts	Key concepts and skills to look for
Have a number line and some counters ready. Present an addition problem (e.g. 8 + 5) to the student, and ask: **What will be the sum of 8 and 5? How do you know that? Write the addition sentence for this addition problem.** See if the student uses any of the strategies learnt in the chapter, such as counting on with or without using a number line, facts for 10, and double facts. If the student has used only one of these strategies on his or her own, ask to use another appropriate strategy. Have the student solve another addition problem involving more than two single digit numbers, e.g., 5 + 7 + 5. Have the student describe or explain how he or she solved it. See if he or she uses counting on, facts for 10, or commutative principles. Present the student with a subtraction problem, e.g., 13 – 5. Ask: **What will be the difference for this subtraction problem?** Have the student describe how he or she solved the problem. See if he or she uses counting back on a number line or facts for 10 to solve it. **Can you model/show what happened in this subtraction problem with these cubes?**	*The student is able to:* - Solve an addition problem involving two numbers using an appropriate strategy. - Describe the solution strategy used. - Solve the addition problem using an alternative strategy. - Solve addition problem involving more than two single digit numbers. - Solve a subtraction problem. - Describe the solution strategy used for the subtraction. - Model the subtraction with concrete materials.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 8

CA marks from Chapter 8 (Marks out of 10): _____

CHAPTER 9 DATA AND PROBABILITY

Chapter Overview

What is data? Data is a collection of facts or opinions. Data may be collected for a purpose through a planned design or may already be available. We use data to extract understanding and meaning out of it; to predict future events under similar situations; to confirm certain assumptions and to help make decisions.

Data is collected through various means, such as observations and recording, interviews, questionnaires, polls and surveys. After data has been collected, it has to be organized and presented in certain manners and forms, for the purpose of data analysis. So, data management is basically about sorting data. Graphs are powerful data displays since visual displays are easy to interpret very quickly.

Probability is the study of the chances of something happening. It is about predicting an event occurring in the future. Generally, we base most of our predictions on the pattern of what has already happened within the available data. Therefore, it makes sense to study Data Management and Probability together.

The students have had some experience with collection of simple data, making simple concrete and picture column graphs, interpreting simple column graphs, performing simple experiments and recording the results and predicting future events using the language of probability. This chapter will extend and deepen the students' experience and understanding of data management and probability in similar areas as mentioned here. In terms of the data presentation, the students will now create bar graphs as an extension of and progression from making concrete and picture column graphs. The students will also start to use tally marks as a way of collecting and recording data.

This chapter has 8 lessons as detailed in the Table of Contents.

Basic Principles about Data and Probability

- There are different ways to collect data.
- Data is collected for various purposes.
- To collect data, we should create appropriate questions and choose appropriate ways to gather them.
- Once the data has been collected, there are always different ways to sort or organize the data, depending on the type of data and the purpose for its collection.
- Once the data is organized and displayed, it can be analysed to look for patterns and to draw inferences.
- Graphs are powerful data displays since visual displays are easy to interpret quickly.
- Probability is about predicting the chances of an event occurring.
- We use data to predict the likelihood or chances of something happening in future.
- Although you can predict the likelihood of an event, you can you can never be certain what will happen.

Chapter Goals

- Formulate very simple questions requiring yes or no responses.
- Record or keep track of data by using tally marks.

- Create and interpret concrete and picture column graphs for the data collected.
- Create and interpret simple bar graphs.
- Relate and use probability language with actual events.
- Perform and collect data from simple experiments.

Maths Words

Data, column graphs, bar graphs, graphing mat, title of the graph, label, always, never, sometimes, possible, impossible, predict

Lesson 1 Collecting Data

Objectives

Develop simple questions requiring a 'yes' or 'no' response.
Collect data using the questions developed and discuss the data collected.

Materials

Chart paper
Marker pen
Blank sheets of paper
Glue or sellotape

Write a simple question requiring a 'yes' or 'no' response from the students (e.g., **Do you have a sister?**) on a chart and put up the chart on the board. Explain that in English, both *ashim* and *num/sim* are called sisters. Ask the question to each student, and record the responses by drawing a small circle for each answer, as shown below:

Do you have a sister?

Yes - ○○○○○○○○○○○○

No - ○○○○○○○○○○

After everyone has been asked and the data is recorded, ask: **Do all of us have a sister? How do you know that some of us don't have a sister? Are there more of us or fewer of us who have a sister? How do you know that?** Write the number on the chart after the circles. **How many of us do you think have a sister? How will we know?** Write the number on the chart after the circles. **How many of us don't have a sister? If I ask you this question tomorrow, will the answers change? Why? If I ask you this question next week, will your answers change? Why? If I ask you this question after 5 years, will your answers change? Why do you think so? If I asked this question to the students of class II, will I get the same type of answers as we see on the chart there? Why?**

Write another question on the chart and ask the students. For example: **Did you drink suja this morning?** You might need to use an appropriate question in place of this one, depending on the social condition of your school. This time, record the yes or no responses by a continuous tally mark as shown below:

Did you drink suja this morning?

Yes - |||||||

No - ||||||||||

Maths Note

Collecting data is an important life skill. Students need to develop their ability to think out how data is best collected and then organized. An easy start is to have them develop questions that can be answered by a yes or no; this will make the organization of the data much easier for students. They then think about what might happen if they asked the same question to a different group or asked the question to the same group at a different point in time.

Special Note

It would be good to include your own answer in the data.

Also, one should be aware, when setting such questions, about the students' recent experiences and change the question if need be. For example, if a student recently lost a sister (the sister died) it would be better to ask about brothers. This principle should be carried throughout the chapter.

After the data has been gathered, conduct a discussion by asking appropriate questions similar to the ones asked above for the previous activity.

You might like to carry out the following activity in the next session if the above activities already took a long time.

Provide the students with a blank sheet of paper each. Explain that each student (if the class size is small) or pairs of students (if the class size is large) should think of and come up with a simple question requiring a yes or no response from the friends in the class. Discuss with each student (or the pairs of student) what he or she has in mind to ask others. Help them with framing and writing down their question on the sheet of papers provided. Some suggested questions that you could help the students with are:

Do you have a brother?
Do you have cats at home?
Do you like cats?
Do you like suja?
Do you like chilli in your curry?
Do you like momos?
Are you the eldest child?
Are you the youngest child?
Do you like to come to school?
Do you brush your teeth every morning?
Did you watch TV yesterday?
Did you take a bath today?
Did you go to the town last Sunday?
Did you fight or quarrel with someone today?

Ask the students how they would be recording the responses – whether they would like to draw small circles or draw small lines for each response they get from their friends. You could have the students put up their data on the walls. Encourage them to talk about their data.

Hold relevant discussions after each presentation. For example, after a student's presentation with brushing the teeth, you could delve into the values of brushing teeth regularly every morning and every evening. Ask relevant questions like: **Do you think your data will change if you ask this same question after next week? Why do you think that way?**

Assessment for Learning

See that the students have understood their questions and know how to record the data. Also, observe whether the students are able to describe their data. The students may need a lot of support and encouragement in presenting and talking about their data.

At the end of this lesson it would probably be good to ask students what they found hard to do in collecting data and counting. If they do not say they had a hard time counting their tick marks, ask them if they miscounted. This would help set up the next lesson. In fact, you could could tell students in response to this problem that the next lesson will develop a strategy for helping with that problem.

Lesson 2 Recording Data by Tallying

Objectives

Record or keep track of data by using a tally.

Materials

Blank sheets of paper

Explain to the students that today we will learn how to keep track of the data we collect by tallying. Tell that first you will show them how to do that. Write and ask the same question you asked in the first lesson. This time use a tally to record the yes and no responses.

Do you have a sister?

Yes - 𝍸 𝍸 |||

No - 𝍸 𝍸

Compare the data with the one collected in the first lesson for the same question. If the same number of students is present in the class as in the previous lesson, the data should be practically the same. If the two data are different, ask what might have caused it.

Provide the students with a sheet of blank paper. Have the students write the same question that they wrote in the earlier lesson. Have them ask the same questions they asked earlier. This time have them record their data by tallying. After all have finished collecting their data, encourage them to present their data to the class. They could talk on what their question is, and how many said yes to their questions and how many said no. This would be a good opportunity to see if the data has changed for their question between the last time and this time. Ask how the responses for the same question could have changed, especially for questions such as, **Did you fight or quarrel with someone today?**

Make some tallies on the board, and ask: **How many does this tally show? How does tally make it easy for you to tell the number for each answer?**

Maths Note

Tallies are an organized way to count. Generally, we tally by counting by 5s. As we record the number of times an event occurs, we draw a stick. Once there are 5 sticks, the 5th stick is drawn in a different orientation and then a new group is started. It then becomes easier to count the total number since we can count by 5s. For example, to show 13, someone would tally like this:

𝍸 𝍸 |||

Assessment for Learning

See that the students can count in 5s using the tally. See that the students can understand why the data collected for some questions could change if asked at different times even if it is asked to the same group of people.

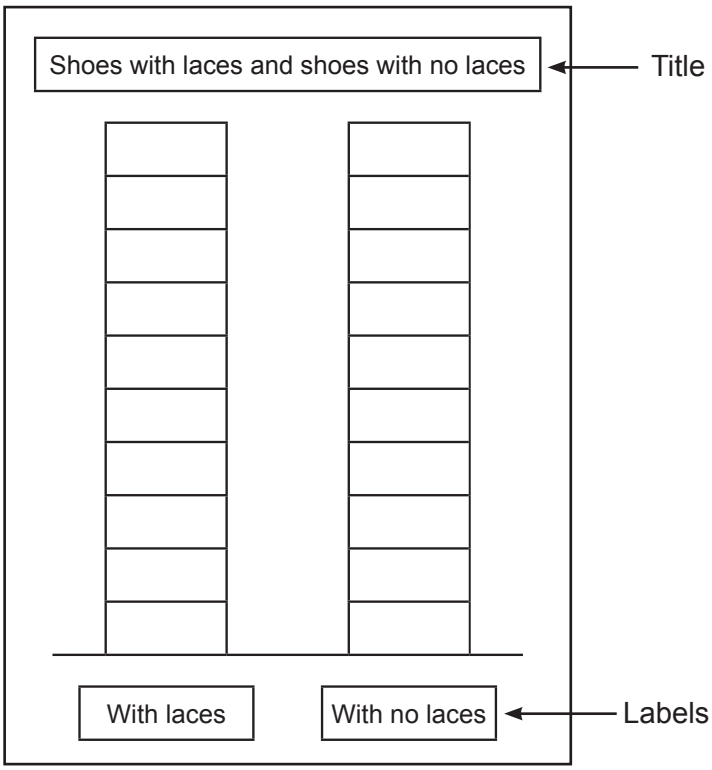
Lesson 3 Creating Concrete Graphs with Actual Objects

Objectives

Create and interpret a 2-column concrete graph using actual items.

Materials

A floor graphing mat with equally spaced rectangular spaces in each column (the floor mat can be used for other concrete graph activities, later)
Labels for the graphs on paper
Titles for the graphs on paper



In advance, prepare a floor graphing mat as shown here on chart papers. Prepare also the labels and the title for the graph on strips of paper.

Ask all the students to take off one shoe and pile the shoes in a corner of the class. If the class size is big, you might need to divide the students into two or more groups in order to accomodate the shoes on the graphing mat. Pick up a shoe with laces and tell that it is a shoe with laces. Ask a student to show another shoe with lace. Then pick up a shoe without laces and tell them that it is a shoe with no laces. Ask: **Do you think there are more shoes with laces than shoes with no laces?** Listen to their guesses. Then ask: **How could we find out which one is more?** Listen to their suggestions.

Tell them that we could make a graph of the shoes to compare the two types of shoes. Place the graphing mat on the floor. Place the labels (laces and no laces) and the title at the appropriate places on the graphing mat. Explain the terms columns, title and labels. Place the shoes one by one at the

Maths Note

Visual displays of information make it easier for us to quickly ascertain information. It is for this reason that we use graphs.
Students should begin their graphing experiences using concrete items.

Concrete graphing is actually the same thing as sorting with the added feature of ensuring a common starting point and maintaining one-to-one correspondence in the organization of the objects.

It is important to use a common starting line, titles and labels for all the graphs you create including concrete graphs.

Although only one lesson has been designed, creating concrete graphs should be extended over the next several days to deal with many situations.

appropriate places on the graphing mat. After the concrete graph has been created, ask: **Are there more shoes with laces or shoes with no laces? Can you tell how many more shoes are there with (laces) than (with no laces)? When is it easier to compare the two types of shoes – when they are all mixed up or when they are arranged in a graph like this?**

Ask the students to wear their shoes. Tell the students that we can also make a graph with people. And that is exactly what they would be making. Place the labels on the floor. Ask all the students wearing shoes with laces to stand and make a line. Ask the other students to make another line. Ensure that the two lines start at the same baseline, and that the students are in one to one correspondence. Relate the interpretation of the lines with that of the shoe graph.

Assessment for Learning

See if the student can use the proper language of comparison. For example, can the students understand and say that there are more shoes with laces than shoes without laces?

Extensions

As mentioned in the Maths Note above, the students should be provided with many more opportunities to create concrete graphs to deal with various situations. This experience will serve as the foundation for creating bar graphs later on. The following are some of the situations suggested to help students make more concrete graphs:

Make various 2-Column concrete graphs with the students for the following situations: In each case, do not forget to make and use titles and labels made on strips of papers for the graphs. Also do not forget to interpret and discuss the information present in the graphs.

Girls wearing earrings with girls not wearing earrings

Girls with long hair with girls with short hair

Boys who would prefer to play archery with boys who would prefer to play football

Students who are right-handed with students who are left-handed

Students who come from different villages (in case of a community schools)

Students for their favourite pet animals such as cats, dogs, fish, etc. (You could ask students what their pet animals they have to add to the list)

Lesson 4 Creating Concrete Graphs with Representations

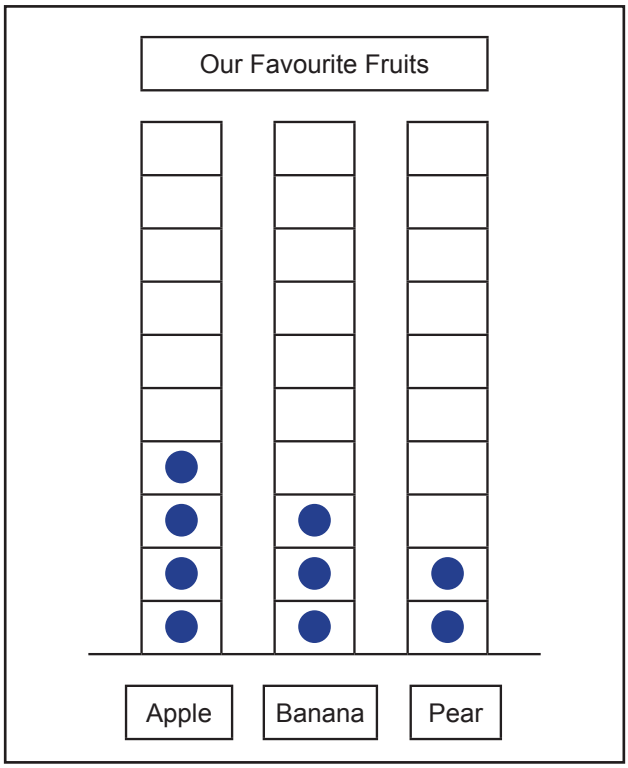
Objectives

Create and interpret 2-column and 3-column concrete graphs using representative objects.

Materials

Counters
A 3-column Graphing mat
Appropriate title and labels written on strips of paper

In advance, prepare a 3-column graphing mat on a newsprint paper as shown here. Tell the students: T**oday we will be making a graph about the the fruits each one of us like.** If possible, bring three fruit items such as apple, banana and pear. The fruits mentioned here are used only as examples. Place the graphing mat on a table or at a convenient place with the counters nearby. Tell that you have three fruits with you today and that each one of them can have a share of a fruit, but they will have to express their choice of the fruit. They will choose their fruit by coming forward and placing a counter in an appropriate column of the graph. You might have to be the first to do that for demonstration purpose. But more importantly, this demonstrates you as an equal participant with the students in the activity which would be intuitively appreciated by the students.



Maths Note

Once students have had some experience with concrete graphs, they can see how they can use representations of those items to create the graphs, simply for convenience. For example, it is not always convenient and practical to make graphs with people, or actual objects such as fruits. So, we use concrete objects such as counters to represent the actual items. It is important for students to understand what the counters represent – for example, does each counter represent a person or a fruit?

It is still important to use appropriate titles and labels for each of the graphs created.

After that, interpret the graph with the students. Ask questions like: **What does this graph tell? How many of us like apples? How many of us like bananas? How many of us like peach? Which of these three fruits is liked by most of us?**

Now show the students the fruits you have. Ask for suggestions how you should divide the fruits. Then cut the fruits and distribute them to the students.

Extension

You could have the students create similar graphs with the students' preferences or choices of their snacks, pets, sports, colours, days, subjects, etc.

Assessment for Learning

Listen to the students discuss the graph. Do they use comparative language to describe the relationship among the groups? Do they use the words like more, less or fewer, most, labels, and columns? Are they correclty identifying what is being represented?

Lesson 5 Creating Picture Graphs

Objectives

Create simple picture graphs to create a visual display of information that is sorted into categories.

Materials

A newsprint paper
Marker pen
Uniform sized paper sheets (about 10 cm by 10 cm)
Glue
Crayons

In advance, prepare uniform sized sheets of paper for each student, as mentioned above. Hold a brief discussion about the different types of fruits the students know and the value of fruits in terms of the vital food content the fruits provide like the vitamins, minerals and roughage. Ask the students to then draw a picture of one fruit that they like the most.

Provide the uniform sized papers to the student for the drawing. As they work on their drawing, go around and help them where needed. Make a note of how many different types of fruits are being drawn. This will help in the amount of space required with the newsprint paper for the columns of the graphs you will have to ready. Also make the required labels for the columns and the title for the graph on strips of paper. The titel for this graph would be: **Our Favourite Fruits.** The labels would be: **Apple, Banana, Pear, ...**

Put up a newsprint paper and draw a base line on it for the graph. Paste the title and the labels on the graphing mat as shown on the next page. After all the students have finished drawing, ask them to come up one by one and paste their drawings on the graphing mat. Help them with the glueing. Ensure that the uniform sized papers are lined up so that there is a one to one correspondence of the different fruits. Have the students talk about their favourite fruit to the class and why they like the fruit, where it is found, when it is available, etc.

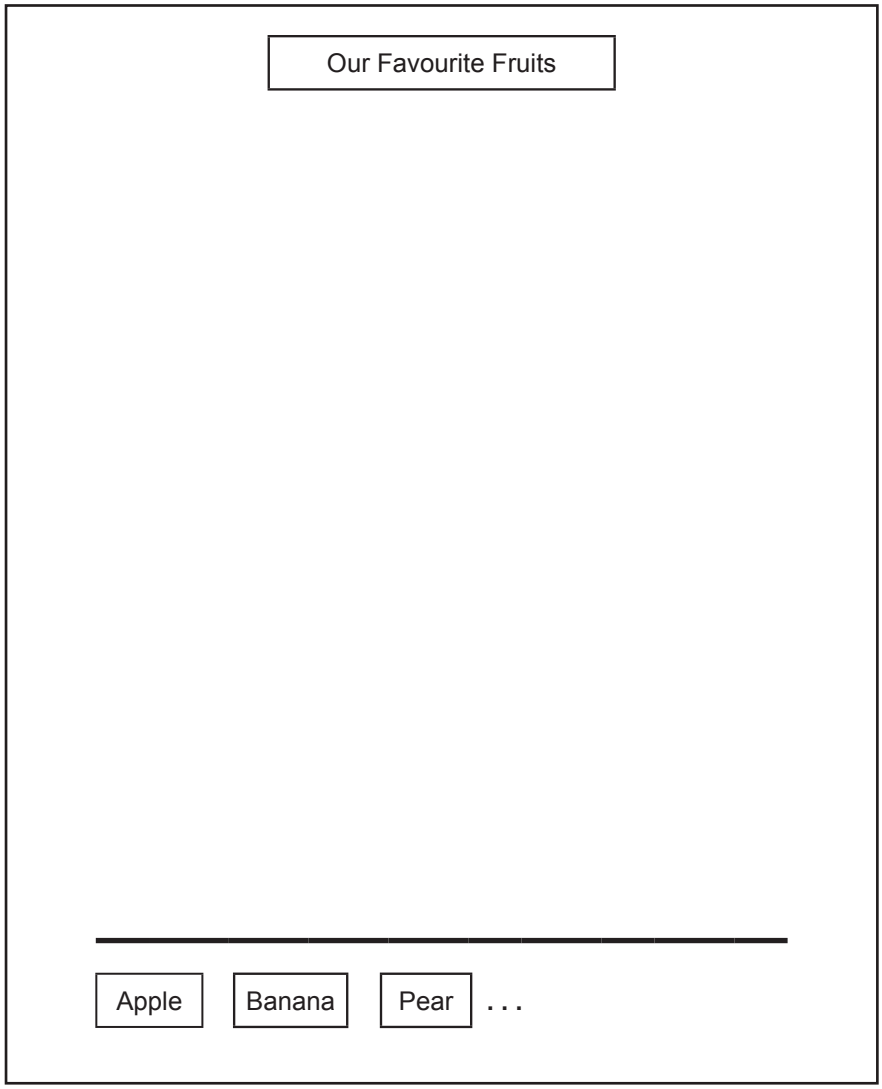
After the graph is completed, hold appropriate discussions based on the following questions:

What are we trying to find out? What is the graph about? What does this one banana (or whichever fruit) on the graph represent? Does it represent a real banana or a person who likes bananas? Write the title of the graph as **Our Favourite Fruits. What does the graph tell us? Which fruit is liked by most of us? Which fruit is liked by only a few of us?**

Explain that this is called a picture graph. Ask them why this might be called a picture graph.

Maths Note

The next stage of graphing is the picture graphs. Students draw pictures to represent the concrete items in the categories being compared. It is important that students see that the pictures need to be lined up in one-to-one correspondence, just as was the case with the concrete graph. Initially, it is helpful to provide uniform sized pieces of paper on which students can draw their pictures. Later this may not be required but students need to se that they still must keep the one-to-one correspondence in mind.



Assessment for Learning

See that the students are able to talk about their favourite fruit, either during the whole class discussion or on one-to-one interactions with you when you go around as they work on their drawings. You might notice that some students worry too much about the quality of their drawing. Your emphasis should not be on clean and good drawings, as much as it is on the concepts.

Extension

Make a picture graph about the students' favourite sports, taking the students through a similar process as above. Talk about the different types of sports and the benefits of playing sports for our health and even for careers in the future. Each child would draw a picture to show either the equipment used or perhaps a picture of themselves playing the sport.

Lesson 6 Creating Bar Graphs

Objectives

Create and interpret simple bar graphs.

Materials

Chart sized grid papers or grids made on newsprint paper
Crayons
Student Activity Book for the grid papers for the students

> **Maths Note**
>
> The next stage of graphing, after picture graphs, is the bar graphs. In this situation, students colour squares on grid paper to represent the items in the categories being compared. Graphs can be either horizontal or vertical, although we might start with vertical graphs initially. Normally the bars are separated by one or more squares.

Remind students that so far we have made three types of graphs to compare two or more things at the same time. The first type of graph the students made earlier is called the **Concrete Graphs** where they arranged actual objects like people, shoes, pebbles and seed. The second type of graph they made is called the **Concrete Graph with Representations**, in which they used counters to represent actual objects. The third type is called **Picture Graphs**, where they used pictures instead of actual objects or counters. Tell that today they will be making another type of graph called a **Bar Graph.** Explain that we can make a bar graph for any of the data we have already collected, and that we will choose to make a bar graph for the same data we used for making the picture graph for their favourite fruits in the previous lesson.

Put up the chart paper with the square grids you prepared in advance. Tell that we are going to make a bar graph for our favourite fruits. Tell that we need to have the title of the graph and the labels for the bars, and write them at appropriate places on the graph. Read the information for each favourite fruit from the picture graph created in the previous lesson. Ask: **How many of us said that apple is our favourite fruit? How many said that banana is your favourite fruit? How many said peach is your favourite fruit?...** Write the numbers for each fruit as shown below, for example:

Apple – 7

Banana – 9

Pineapple – 3

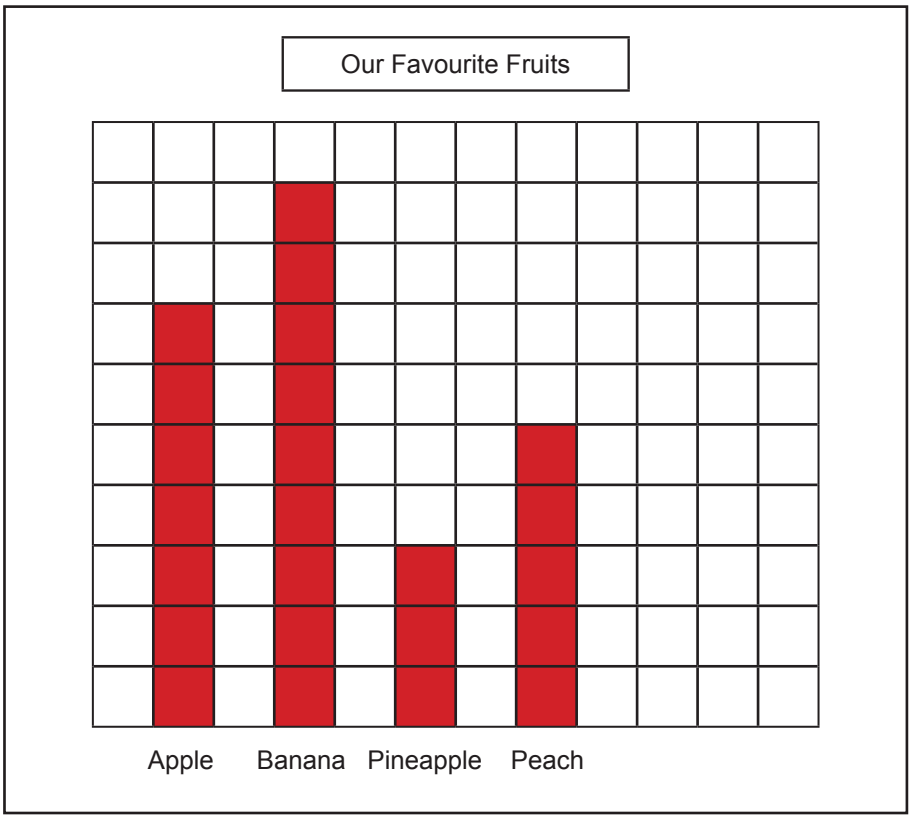
Peach – 5

...

...

...

Then make the bar graph with this information, colouring a square of the grid for each number.



After that interpret the graph together by asking questions such as: **What is the title of this graph? How many fruits are our favourite fruits? How many people have said that their favourite fruit is peach? What do the bars tell us? What does the longest bar tell us? What does the shortest bar tell us? Can you add and find out how many people told about their favourite fruits from this graph?** Have the students compare the difference between the picture graph and the bar graph for the same data on the favourite fruits.

Then have the students make a bar graph in their Activity Book on pages __. Explain the data to them first.

Assessment for Learning

See that the students can read the information from the bar graph, and describe what is the same and what is different between the bar graphs and picture graphs.

Lesson 7 Predicting Likelihood

Objectives

Use the language of probability (impossible, possible and certain) to predict future events.

Materials

*The words **certain, possible** and **impossible** written on separate index cards*

Ask the students questions like: **Do you think you will come to school tomorrow? Do you think that the King will visit your school next week? Do you think it will be a sunny day tomorrow? Do you think you will see a white crow? Do you think the sun will not go behind the mountain this evening? Do you think you will sleep tonight?** Encourage the students to respond to each of these questions and ask follow up questions for their responses such as: **Why do you think so? How do you know that …. ?**

Explain to the students that all the questions asked were about the possibility something happening in the future and then that they told about what they thought might happen with each question. They said whether they thought something will happen, for example, that they know they will sleep tonight; something will not happen, like they will not see a white crow; and that something may or may not happen, like it may be or may not be a sunny day tomorrow. Explain that when we talk about something happening in the future, there are three possibilities or situations. Write these terms on the board and explain each: **Will happen**, **Will not happen**, **May happen or may not happen**. Then explain that when we think something will happen in the future, we say that something is **certain**; when we think something will not happen, we say it is **impossible**; and when we think something may or may not happen, we say it is **possible.** Have the student say these three words aloud in unison as you point to their written forms on the board or the charts.

Tell the students: **I will say a sentence about something happening in the future. After listening to what I say, you will then say one of these three words – say certain, if you think that will happen; say impossible, if you think that will not or cannot happen; and say possible, if you think it may happen or it may not happen.** Make statements such as the following. For each response you get for the students, ask why they gave the response they gave. Sometimes you might hear different response from the students. Encourage the students to give reasons behind their responses. If you hear more than one answer, make sure to hear explanations for each answer you heard.

- **All of you will come to school tomorrow.**
- **All of you will sleep tonight.**
- **There will be class on the next Sunday.**
- **His Majesty the King will come to our school next week.**

Maths Note

Probability is the study of the chances of something happening. It is about predicting an event occurring in the future. Generally, we base most of our predictions on the pattern of what has already happened within the available data. We can predict the occurrence of an event in the future in three ways: If we are sure that an event will take place in the future, then we say it is **certain**; if we are not so sure that an event will take place, then we say it is **possible;** and if we are sure that an event will not take place in a future, then we say it is **impossible**. Theoretically we cannot know absolutely about any future event. That is why it is only a prediction. The students should be able to talk about whether they think something will happen, not happen or might happen based on their familiar knowledge and situation, and use the above three terms in predicting the future events.

- **We will see some white crows outside today.**
- **Some of you will grow as tall as me by next year when you are in class 2.**
- **The Sun will rise tomorrow.**
- **There will be snow fall here during the winter.**
- **If I put a stone in the water, it will sink.**
- **If I put a stone in the water, it will not sink.**
- **One day you will fly in the Druk Air.**

Ask the students to think and create a statement about something in the future. Have them say the statement to the class for which others will respond with one of these three terms - **certain, possible and impossible**. The students can also play this in pairs where one partner says a statement and the other responds with an appropriate term. They then switch their roles.

Assessment for Learning

See that the students can give their own reasons for the terms they choose for each of the statements made about a future event. This would confirm whether they are using the appropriate terms for what they were thinking with each statement.

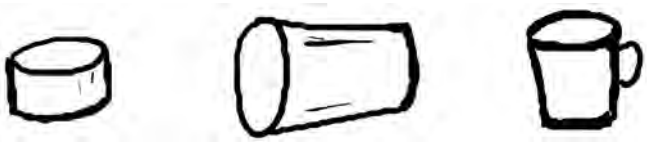
Lesson 8 Collecting Data From an Experiment

Objectives

Perform and record data from simple experiments.
Predict a future event related to an experiment.

Materials

Various bottle tops
Plastic cups and tumblers
Small tin cans and bamboo cans



Have the students stand in circle in an open space. Toss a bottle top or one of the open containers on the floor and have them see how it landed. Toss it a few more times to see its landing position. Explain that an object can land in three possible ways – with the open side facing down, with the open side facing up, and with the open side facing sideways. Divide the class into pairs or small groups of students. Distribute to each group a container such as a bottle top, tumblers, cups or cans and a blank sheet of paper each. Tell them that they will perform a simple experiment of tossing their objects and record the results of how they land.

The experiment stops when each member in the groups has tossed 10 times. Go around and see how they have decided to record the results of the tossing. See if they talk about using tallies to keep record of the results or other ways to do that.

After all the groups have done the experiment and recorded their results, ask them to interpret the results. Ask the following questions in groups:

How did your object land most of the time? If you toss it again, how do you think it will land? Why do you think that it will likely land that way? Let the students toss the cap and see how the cap landed. If it confirmed their prediction, ask: **Will it again land like this? Do you think it will always land like this? Is it possible to land in another position like this, if you toss again? Do you think it might land like this (**Show a position which will be impossible)? **Is this possible, certain, impossible? Can you say landing with the open side facing down is certain or a possible if you toss again?**

Encourage the students to visit other groups and ask each other questions about their experiments.

Extension

You could also have the students perform and record data of the results for an experiment involving tossing coins or dice in groups, then discuss the results and have them predict future results of an event.

Maths Note

Although each data collection situation is a new one and there is no way to guarantee that what happens on one occasion will happen again, it is likely that by examining one set of responses, students will be able to predict what might happen in another similar situation. Students get a better understanding of probability if they conduct simple experiments and observe the results. For example, if they roll a die many times, they start to get a sense that each number is equally likely to be rolled. In the experiments suggested in this lesson, the students should look for patterns in the data collected from the experiment and predict the outcome for a future event. In the process of interpreting the data and making predictions create situations for them to use the probability terms.

Assessment for Learning

See that the students can use the probability terms such as certain, possible and impossible in the context of predicting the experimental results with reasons.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening, and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner. What is even more important isthe opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 9 DATA AND PROBABILITY

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*						
		Formulate simple questions requiring yes/no response.	Use tally to keep track of data.	Create and interpret concrete and picture column graphs.	Create and interpret bar graphs.	Relate and use probability terms for future events.	Perform and record data from simple experiments.	Use experimental results to predict future likely results in the experiment.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

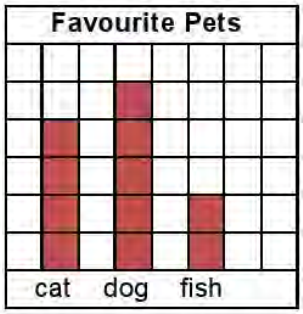
The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: _____ Section: ____

CHAPTER 9 DATA AND PROBABILITY

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using the Interview-based Performance Task.)*

Task and Interview prompts	**Key concepts and skills to look for**
Prepare a bar graph like the one shown here. Explain to the student that the graph shows the favourite pet of some students. Ask: **What is the name of this graph? How many students said their favourite pet is cat? Which animal is the favourite pet of most students? Beside cats and dogs, what other animal is a pet of these students? How many students told about their pet animals? What is the title of this graph? What are the labels of this graph?**  Show the student 10 green and 3 red snap cubes. Put these cubes into a feely bag and mix them thoroughly. Ask: **If you draw out a cube, what colour do you think it will be? Why? If you put it back and draw another one, what colour might it be? I will say a sentence related to drawing out a cube from this bag, and you have to say one of these three words – *possible, certain, and impossible.* Are you ready? If I put my hand without looking in, I will draw out a green cube. What word do you say? Next, I will draw out a red cube. What would you say? Why? Next, I will draw out a white cube. What do you say for this? Why?**	*The student is able to :* - Identify a bar graph - Identify the titles and labels of the graph. - Read the information from the graph. - Compare the data on the graph. - Predict the likelihood of drawing out a particular cube. - Use the appropriate term for predication an event in an experiment, and justify the prediction.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 9

CA marks from Chapter 9 (Marks out of 10): _____

CHAPTER 10 MASS, CAPACITY AND TIME

Chapter Overview

What is mass? The mass of an object is the amount of matter that the object contains. Weight is the amount of gravitational pull or force that is exerted on an object. The weight of an object is directly proportional to its mass. Which means, the more the mass of an object, the greater will be the gravitational force exerted on it by the Earth, if the object is on the Earth. Sometimes, people use mass and weight interchangeably. But strictly speaking, they are not the same. The mass of an object does not change whether it is on the Earth or on the Moon. But its weight will be just about one sixth on the surface of the Moon when compared with its weight on the Earth. Mass is a measurable attribute of objects. The students have had some experience comparing the mass of different objects and have used terms such as *heavy, heavier, light and lightest* in class PP. In this chapter, the students will continue to compare the mass of objects and use the related terms. They should now extend to measure the mass of different objects using non-standard units and start to use the term mass for the attribute of how heavy or light an object is.

What is capacity? Capacity of a container is the amount of something it can hold. The students have had some experience comparing the capacity of different containers, and used terms such as *holds more, holds less and holds about the same* in class PP. In this chapter, the students will continue to compare the capacities of containers and use the related terms. On top of these, they will measure the capacity of containers using non-standard units and start to use the term capacity for the attribute of a container describing how much it holds.

The idea of time is basically about how long an event takes. Unlike mass, capacity, length and area, it is not an attribute of an object. But time shares a commonality with these attributes of objects in that it is measurable. In this chapter, the students will carry out activities to get a feel of the concept of time as how long it takes for an event to happen. They will also learn to tell time to the hour.

Measurement is really about comparison. In comparing, we make use of numbers. As such, a measurement chapter like this has the power of consolidating and furthering the students' concept of numbers. In particular, the students also learn the concept of ½ within the context of mass, area and length.

This chapter has 8 lessons as detailed in the Table of Contents.

Basic Principles about Mass, Capacity and Time

- The definition of a measurement is based on the process for comparing one measure to another similar measure.
- Any measurement comparison can be stated in two different ways (e.g., A is heavier than B or B is less heavy than A.
- Any individual item might have more of a measure than a second item, but less of the measure than a third item (e.g., A might be heavier than B but lighter than C).
- Whether one object has more or less mass than another is independent of their shape or size.
- Any container might have more capacity than a second container, but less capacity than a third container (e.g. A could hold more than B but hold less than C)
- Mass, capacity and time can be compared both directly and indirectly, using a third item or event.
- The measurement of time is not so much about reading clocks (although that is a useful skill) as about how long an event takes or its duration.

Chapter Goals

- Compare the masses of objects using a pan balance and use terms like heavier, lighter, heaviest and lightest.
- Measure the mass of an object using a common balance and a non-standard unit.
- Compare the capacities of containers and describe using terms like holds more and holds less.
- Measure the capacity of a container using a non-standard unit.
- Describe and represent one-half (½) as one of the two equal parts of a whole within the context of measurements such as mass, capacity, area, line and time.
- Sequence events in logical order.
- Tell time to the hour and half-hour.

Maths Words

Mass, heavier, lighter, capacity, holds more, holds less, unit, time, duration, hour, half

Lesson 1 Comparing Masses

Objectives

Predict and compare the masses of two objects using a pan balance.
Describe the heavier object as having more mass than the lighter one.

Materials

Pan balances (about 1 for each group of students)
Various objects suitable for comparing masses on pan balances by the students

Review the idea of heaviness of objects with the students. Pick up something light, e.g. a pencil, and ask: **Is this pencil heavy? If it is not heavy, then what is it? Can you tell me or show me an object that is heavier than this pencil? What would be lighter than a pencil?**

Show a block of stone and a block of dry wood which is about the same size as the stone, and ask: **Which one do you think is heavier – the stone or the wood? If you think the stone is heavier, then which one is lighter? How will you know that the book is really heavier than the wood?** Follow up on their suggestions. They might suggest holding and feeling the items in hand.

Then show a pan balance and explain that the *scale* will remain horizontal when nothing is put on the two *pans.* Ask them what will happen to the pans when the stone is placed on one pan and the wood is placed on the other pan. Place the items on the pans and explain that the item which makes the pan go down is the heavier one. Have the students say that the stone is heavier than the wood. Explain that the heavier object has **more mass** and the lighter object has **less mass**. Explain the term **mass** as how heavy something is.

Provide a pan balance and two items of different masses to each group of students. Have them first predict which item will be heavier and which item will be lighter by just feeling their masses. Then ask them to compare the masses using the pan balance. As they work, go around and ask the group members questions such as: **How do you know that the (book) is heavier than the (pen)? If the (book) is heavier than the (pen), what is lighter than the book? So, which of the two objects has more mass? Which has less mass? Why do you say the book has more mass than the pen?** Use the term **mass** in your language consciously and have the students use it too, when you talk about the heaviness of objects. Distribute a third item to each of the groups and have them compare its mass with the other two objects. Have them, then, order the three objects by mass.

After all the groups have compared their items, show two identical containers, e.g. two chalk boxes with different amounts of contents. The items could also be two crayon packets. Ask: **Do you think these two boxes will have the same mass? If they have the same mass, how will the pan balance look like when I put each box on a pan? Shall we check?** Place the boxes on the pan and see what happens. Ask: **Now,**

Maths Note

Mass may be difficult for students since it is not visual. Items may be bigger, but not heavier. It all depends on the material out of which the item is constructed. Students must feel an item to determine its mass.

To compare the masses of three items, A, B and C, students could compare all possible pairs or might realize that as soon as they know that A is heavier than B and B is heavier than C, automatically A is heavier than C.

If an item is put on each side of the balance and one tilts the balance down, that item is heavier.

which box is heavier? Which box has more mass? This just shows that objects may look the same but might have different masses.

Ask questions such as: **When you compare the masses of two objects, which object makes the pan of a pan balance go down? Can you tell just by looking at something whether it is heavy or light? Suppose an (elephant) is heavier than a (crocodile), what is lighter than the elephant? Who do you think has more mass – I or (Jigme)? How will you know that?**

Assessment for Learning

See that the students can understand and describe that if, an object is heavier than another object, then the first object has more mass than the second object.

Lesson 2 Measuring Mass With Non-standard Units

Objectives

Measure mass with non-standard equal-size units.

Materials

Pan balances
Snap cubes (to be used as unit of measuring mass)
Coins or something that is not too heavy nor too light and that comes in uniform size and mass (to be used as another unit of measuring mass)
Objects to measure such as books, cans, stones and some fruits

Maths Note

This will be the students' first experience using units to measure mass. Units should be simple everyday materials which come in uniform size and mass such as linking cubes and identical coins. They should be neither too light nor too heavy for the items being measured.

Tell the students: **Today we will measure the mass of some objects using snap cubes.** Have the students observe as you measure the mass of a book. First, set a pan balance ready by first checking if the two pans balance without any objects. Make this known to the students. Place an object, say a book on one pan. Then put snap cubes one by one on the other pan until the cubes balance the book. Say: **The cubes now balance the book. The book and the cubes have the same mass.** Count the cubes, and say: **The mass of this book is (23) cubes. The mass of the book is 23 cubes because it takes 23 cubes to balance the book.** Have the students say the last two sentences aloud after you.

Provide a pan balance, an object whose mass is to be measured, and some snap cubes to each group of students. Ask the students to first predict the mass of the object in terms of the cubes. **How many cubes do you think it will take to balance your object? What do you think will be the mass of your object?** Help the students predict and say their estimate appropriately such as: **I think the mass of my object will be (10) cubes.** Have each student make an estimate of the mass and write it down in thier notebooks. Then the students measure the mass using their pan balance and the cubes. Have the students then record their measurement. Have them describe the mass of their object appropriately, e.g; T**he mass of this (apple) is (17) cubes.** They could then see how close thier estimate is to the actual mass. Explain that the cubes are used as the **units** for measuring mass here.

Assessment for Learning

See that the students can hold or use the pan balance properly to measure the masses. Also have the students describe the mass of an object appropriately when it took them more than a certain number of units but less than the next number to balance.

Then provide another unit of measuring mass such as coins. Have the student first estimate the mass of their object, this time in terms of the coins. As in the earlier case with cubes, have them write down their estimates. Then have them measure the mass of the object using coins. Then have them describe the mass of their object appropriately such as: **The mass of this (apple) is (11) coins.** If the object required between two numbers of coins, which could well happen, then have them describe the mass as: **The mass of this (apple) is between 11 and 12 coins.** Explain that this time the unit for measuring mass is coins.

Have the students realize that it took more snap cubes than coins to balance the same object with each group. Have them explain how this might have happened. Ask: **Has it taken more or fewer coins than the cubes to balance your object? What might be the reason for this? Why did it take more cubes than coins to balance your object? So, which is heavier – a coin or a snap cube?**

Lesson 3 Comparing Capacities

Objectives

Predict and compare which of two containers holds more.
Understand and describe that the container which holds more as having greater capacity than the container which holds less.

Materials

A bucket of water
Jugs and funnels
A sack of rice (or wheat, barley, buckwheat, and maize)
Various containers such as bottles and cans
Bangchungs, tsamkhus, dres and Phuetas (a dre and a phueta are the traditional units of measuring the amounts of grains in Bhutan; a bangchung is a traditional eating bowl made from a special bamboo; and a tsamkhu is a cloth container used for containing cereals and food stuff like zaw, kabche and seep.)

Have the various containers as mentioned above. The water and the rice are to be used as the contents for the containers. The jugs and the funnels will help in pouring the water into the bottles. Where possible, both the water and the rice should be used to compare the capacities of the containers. That would be possible with containers such as plastic and tin cans, but not with *banchung and tsamkhus.*

Take the students to a convenient ground outside the classroom. Pick up two containers such as two different cans. Ask: **Which one of these two cans do you think will hold more? Why do you think so? Which one will hold less then? How will we know?** Follow up on their suggestions. You might fill one container full with rice. Then pour the rice from it into the second container. Then together determine which of the two holds more. Say: **This holds (tin can) more than this (plastic can). What did they hold? We can also say this can has a larger capacity than this can.** Explain the meaning of the word capacity as the amount a container can hold and have the students say the sentence aloud, so that it will make them comfortable to say later on. Ask**: If this can has larger/more capacity then, which can has smaller/less capacity? Why do we say this has a larger capacity than this one?** Tell that we used rice to compare the capacities, or to compare which holds more and which holds less. Ask the students if we could use some other things to compare the capacities. Then demonstrate comparing the capacities with water. Ask if we could use water with all the containers such as *tsamkhus,* and ask why. Similarly, ask if we could fill containers like bottles with rice with convenience.

Divide the class into pairs or small groups. Provide each group with two containers. Have them first predict which container has the larger capacity or which container will hold more. Ask questions like: **Which one of these two containers do you think will hold more? Which one do you think has a larger capacity? Why do you think this has a larger capacity? Which one will have a smaller capacity, then? How will you find out? What thing will you use to fill them? Why?** After the students

Maths Note

Capacity describes the maximum amount a container can hold. Students can compare the capacities of two containers directly by pouring the content from one into the other. If when the total amount from the first container is poured into the second container, and if there is still space in the second container, then the second container **holds more** and has **larger capacity** than the first container. Students could also compare the capacities of two containers indirectly by using a third container. Assuming that the third container has a smaller capacity than both the first and the second containers, the content from the third container is first poured into the first container and the amount of space still left in the first container is noted. Then the third container is re-filled to its full after which the content is poured into the second container. If the space still left in the second container is smaller than the space left in the first container, the second container **holds less** and has **smaller capacity** than the first container.
The containers used for comparing the capacities should vary in sizes and shapes. Students should realize that the material they use to fill a container has no bearing on its capacity.

have compared using either water or rice or both, have them describe their findings using a proper sentence. If in a group the students say “This bottle holds less than this tin can**”,** ask them: **So which of the two has a smaller capacity?** If they say, “This can has a larger capacity than this bottle”, ask them: **What makes you say the can has a larger capacity than the bottle?** The point here is to get the students to use the word capacity with understanding. In case two containers hold the same, have them say the capacity of the two containers is the same.

Encourage the students to visit each other’s groups and ask each other similar questions.

Toward the end, ask questions such as:

If you are thirsty and you can choose from these containers filled with juice, which one would you choose? Why?

These two *tsamkhus* are filled with *zaw* and they are for sale in the Sunday market. If they cost you the same amount of money, which one will you buy? Why?

Assessment for Learning

Ensure that the students can compare and describe the capacity of one container with that of another using the term **holds more**, as well as using the term has a **larger capacity**, or relate the term **holds less** with the term has a **smaller capacity**.

Lesson 4 Measuring Capacity with Non-standard Units

Objectives

Measure capacity using simple non-standard units.
Compare the capacities of two containers after measuring.

Materials

A bucket of water
Jugs and funnels
Cups (a cup for each group of students)
A sack of rice (or wheat, barley, buckwheat, and maize)
Various containers such as bottles and cans
Bangchungs, tsamkhus, dres and phuetas
Snap cubes
Marbles

Tell the students: **Today we will measure the capacities of various containers.** Explain that as in the case of measuring mass, area and length, we would need to use units to measure capacity. Briefly review some of the units they had used to measure length, area and mass. For example, ask: **How did we measure mass? What did we use as a unit in measuring mass?** Show an appropriate container, say a circular can, and say: **We are going to measure the capacity of this can with this cup. But before we measure its capacity, I want you to estimate how many cups of water it will hold. So how many cups do you think will fill this bottle?** Have the students give their estimates and record them on the board. **How can we test?** Follow up on their suggestions. You might fill the mug with water and then pour the water from the mug into the bottle repeatedly keeping count of the pouring. You might find out that it took more than 7 cups but less than 8 cups to fill the bottle, in which case you will have to model the sentence appropriately, such as**: It took a little more than 7 cups to fill the bottle. So, the capacity of this can is a little more than 7 cups.** Explain that the mug is the **unit** of measuring capacity here. Ask the students whether we could measure the capacity of the can in terms of the cup in a different way. You could first fill the can with water. Then pour the water into the cup, discard the water from the cup, fill the cup again with the remaining water from the can, and continue until all the water from the cup has been poured. Keep track of the number of times the cup was emptied.

Use an alternative content to measure the same capacity with the same unit. Ask: **Do you think it will show the same number, if we used rice instead of water to measure the capacity of this can using the same cup?** Have the students suggest. Then demonstrate measuring the capacity using rice. You might have to wipe dry both the can and the cup before you put the rice.

Divide the students into pairs or small groups. Provide each group with two containers and a cup each. Tell them they could use either the water or the rice to fill the containers. Have them estimate how many cups (of water or grain) will fill each of their containers. Have them record their estimates. Have them measure the capacity of their containers using the cup as the unit. The students who get *tsamkhus* and *dres* cannot use

> **Maths Note**
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> Students need to use visual reasoning to predict how many units are likely to fill a container and which unit is an appropriate one to use. They should recognize that the unit to be used should be neither too big (which would require partial units) nor too small (which would require simply too many copies of a unit). The measuring of the capacity of a container need not be limited to filling it with water or grains measured by a smaller container as its unit, but it could and should also be measured by filling it with snap cubes or marbles which are equal sized.

water as the content. Ask them why. Have them record the measurement of the capacity of both the containers. As they work, go around to support and ask questions. Ask: **How did you measure the capacity of your (bottle)? Did you pour (water) into it over and over again using the cup? Or, did you first fill the bottle with water and then pour out the water over and over again into the cup? Which of your two containers has a larger capacity? How do you know that? By how many cups is the larger capacity more than the smaller container? If you used this big container, will it show the same number as the cup to measure the capacity of this bottle?**

Toward the end, show the same can you used in the beginning and ask: **What was the capacity of this can? How many cups did it take to fill it?** You could measure it once with the cup as the unit and using rice to fill, saying: **Let us measure the capacity of this can once more. So what is the capacity of this can? Have the students say the capacity as: The capacity of the can is (a little more than 7) cups.** Explain that we could also measure the capacity of the containers using snap cubes. Then the unit will be the snap cubes and not the cup anymore. Demonstrate filling up the can with snap cubes. Half way through the filling with snap cubes, ask: **How many snap cubes do you think will fill this can?** Have them estimate and record the various estimates on the board. Ask: **Do you think it will show a greater number or a smaller number if the capacity of this can is measured using snap cubes? Why?** Then continue filling until the can is full. Have the students express the capacity in terms of snap cubes. Have them compare the number of cubes it took to fill the can with their estimates. Ask: **Now if we use marbles, instead of cubes, will it show a greater/bigger number or a smaller number for the capacity of this can? Why?**

Assessment for Learning

See that the students can use appropriate language to express the measurement of the various capacities of containers, such as: "The capacity of this (bottle) is 7 cups/a little more than 7 cups/ a little less than 8 cups."

Extension

Bring two container of different capacities. For example, a large can can a a smaller can. Measure the capacity of two containers. For example, by filling them with rice using cups. Dump the contents out of the larger container and pour the contents from the smaller into the larger. Then ask the students how many cups of rice they would have to add to fill up the larger container. (This activity links subtraction with capacity)

Lesson 5 Defining Half

Objectives

Recognise and describe half as one of the two equal parts of a whole.
Represent half by the number ½.

Materials

Threads, and marker pens
Various cutouts of 2-D shapes which can be folded into two equal parts such as rectangles, circles, equilateral triangles (all the 3 sides same), isosceles triangles (2 sides same), regular trapezoids, regular hexagons, and symmetrical heart shapes.

Maths Note

Now that the students are familiar with measuring length, capacity, mass and area, they can use all of those concepts to gain a fuller understanding of the fraction $\frac{1}{2}$. $\frac{1}{2}$ describes a situation where a whole is divided into two equal measures; each part is a half. The students should experience the concept of $\frac{1}{2}$ as one of the two equal lengths, areas, and masses.

Have the above materials ready in advance. Provide each student or pairs of students with a piece of string or thread. The pieces of strings need not be of the same length. They could be from a few centimetres to about 2 metres in length. Have the students fold their strings into two equal parts. First ask them how they might make the strings into two equal parts. You could also do the same yourself. The students could join the two ends and then stretch out the string. Have them mark the middle of the string. Explain that they have just made their string into two equal parts and that each part is called a half. Demonstrate that with your own string by saying: **This is my full string** (show from end to end of your stretched out string). **This is my half string** (show from one end to the middle of the string where you made a mark earlier). Have every student show and describe similarly to the class. After all have had the opportunity, ask: **How many halves are there in one full string?** Have two students show their halves to the class, and referring to their halves, ask: **(Pema's) half string is shorter than (Dema's) half string. Why is that?**

Provide each student with a cutout of a 2-D shape. The shapes could be various sizes and shapes of rectangles, various sizes of equilateral triangles, various sizes of isosceles triangles, various sizes of circles, regular trapezoids (you could trace around the trapezoidal pattern block on blank sheets of paper and cut them out), regular hexagon (you could trace this around hexagonal pattern block and cut out the shape), and a few other shapes such as heart shapes which could be folded to make two equal parts. Ask the students how they might make their shapes into two equal parts. Listen to their suggestions, which would be folding the shape in the middle so that one part fits exactly onto the other part. Have a shape for yourself too, for example a rhombus. As the students work, go around and see that all are doing the folding correctly. Ask them whether they could fold up their shape in another way. Once you have seen that everyone has done it, show and say: **This is my shape. Would anyone like to help me tell the name of my shape? It is a rhombus. This is my whole shape** (refer to whole of the shape). **This is half of it** (refer to the one half portion of it). **How many halves can you see in my shape?** Have the students show and describe their whole shapes and the halves in a similar manner. You might have to model it once more without the questions in between. For example, say: **I will say once more about my shape and half of it. I want**

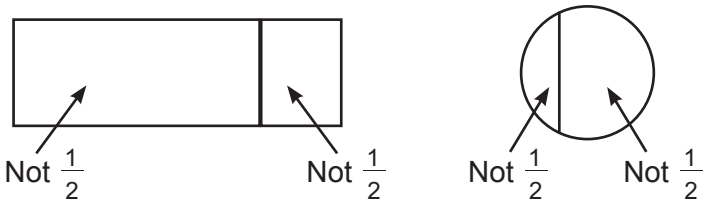
you to say the same with your shape to the class. If you don't know the name of your shape, don't worry, we will help you. Here I go: This is my whole shape. This is half of it. Then have the students describe their shape in turns.

Have the students focus their attention to you. Draw the picture of your shape on the board, and say: **This is my whole shape**. Draw the fold line, and say: **This line is the fold line. Where are the halves?** Write the numeral $\frac{1}{2}$ on the half parts of the drawing. Explain that in maths, we write half as $\frac{1}{2}$ with the number 1 on the top and 2 on the bottom separated by a line.

Have the student write $\frac{1}{2}$ on both the sides of their fold line on their shapes. Have them then draw the picture of their shapes in their note books, and indicate the halves of the shapes with $\frac{1}{2}$. Afterward, encourage the students to draw the shapes of their friends which are not the same as theirs and indicate the halves of the shapes with the fraction.

Towards the end, draw their attention to you. Show a piece of string. Have them observe as you fold it into two unequal parts. Mark the bend point on the string with a marker pen. Ask: **What Have I done? I have made two parts to this string – one part is from this end to this mark, the other part is from this mark to the other end. Is this part half of the string? Listen to what the students say. Why is this not a half?** The point of this exercise is to make the students realize that for a part to be half, it should be equal to the other half. The two halves should be equal.

Similarly, have the students observe as you fold a circle into two clearly unequal parts, and say: **I have divided this circle into two parts. Are the two parts halves? Why are they not halves?** Then draw a few shapes as shown below and explain that each is not divided into halves. You might want the students to copy this in their note books.



Assessment for Learning

Ensure that the students realize that the two halves of a whole should be equal, whether it is length of a line or area of a shape.

Extension

Materials: *A sack of rice (or wheat, barley, buckwheat, maize), plastic bags, and pan balances*

Have the above materials ready. Divide the students into pairs or small groups. Provide each group with a pan balance, some amount of rice in a plastic bag or a container, and have them divide their rice into two equal parts. Ask the students what each of the two equal parts should be called.

Lesson 6 Sequencing Events

Objectives

Consider events in some context and sequence them in terms of their occurrence.

Materials

Pictures about the events in lord Buddha's life (if possible, either in the form of a drawing on a chart or in the form illustrations in a book)

Tell the student that you are going to tell a story to them and begin: **Today, I am going to tell you a simple story. The story is on Lord Buddha's life.**

There was a country called Kapilavastu in India. The King of that country was called King Suddhodhana and the Queen was called Mahamaya. One night, Queen Mahamaya had a dream. In her dream, she saw a huge white elephant with six tusks from heaven entering her body. Can you imagine that – an elephant entering your body? But, instead of feeling pain, the queen felt happiness all over. So the queen was pregnant with a baby. Many months had then passed. The queen felt like visiting her parents who lived in a faraway place from the palace. So, the King asked her to go to visit her parents. On the way to her parents' place, the Queen gave birth to her baby at a park called Lumbini. The baby was a boy. Everyone felt joy and happiness at the birth of the boy. The whole world was filled with happiness and joy. The boy was named Siddhartha. The Queen and her newly born baby boy were brought back to the palace immediately.

Price Siddhartha grew to be a healthy, strong and handsome young man. He had everything he wished and wanted. Later, he married a beautiful woman who gave birth to a son. But, Prince Siddhartha, somehow began to be unhappy. He saw that some people were rich while others were poor. Some people were handsome and beautiful while others were ugly. He saw that animals such as horses and oxen were suffering a great deal carrying loads and pulling ploughs and carts for people. He saw that people were getting old and sick. And finally, he saw that everyone had to die one day. Those were all painful for everyone. His mind was filled with all these questions and he wanted to understand why and how all these things happened. Then one night, he left the palace to seek the answers. He left his palace, his country, his father, his wife and his dear son. He then became a simple monk. He now had nothing - no home, no servants, no wife and no son. He studied with other monks and begged for his food. He meditated for 6 years without eating anything much. And, finally, one early morning, he understood everything. Now he knew everything that is to be known. He became enlightened. Siddhartha, the prince turned monk became the Buddha. Buddha is someone who knows everything. The Buddha did not go back to live in his palace. He taught people how to be enlightened and happy like himself. Many

Maths Note

As an introduction to the concept of time, it helps students to consider events in a story or events that happen to them in a day or over their life and sequence them in terms of the order in which they occurred. This is not really measurement of time, but is certainly related to time.
This is also an opportunity to review what the students know about the days, months and seasons, especially if a calendar is available for the students to use.

This lesson begins with a short story as narrated here. The story itself is not mathematical, but it has the benefit of offering other values. Its connection to mathematics is in asking the students to recall and sequence the events in the order of their occurrence. The choice of this story was quite simply for an example, and as such, you could use an alternative story.

people who followed his teaching also became enlightened like him. He taught for a long time until he became old. Finally, at the age of 80, the Buddha died. Everybody has to die one day.

Have the students recount the major events in the story in order, by using probing questions such as: **What happens first in the story? How did Queen Mahamaya become pregnant? What happens then? What happened after that? What happened before that? Did Siddhartha become enlightened before he married? Why did Buddha die?**

Encourage some students to share, in the class, some of the things that happened in their lives so far. You might have to model as an example – some of the things that have happened in your own life so far, such as sharing where you were born, the stages in your student-life, becoming a teacher, marrying, having a family, and your present life.

Extensions

Each of the following extension activities is important, and might take several days to carry out. The students might have already learnt the names of the months, seasons and days as well as their characteristic in EVS and English. Even so, it would be beneficial to revise them in the context of mathematics by way of associating those with the orders of their occurrences, by asking questions such as: **What is the first month? What is the second month? What is the 10th month?**

1. Divide the class into three groups. Have the students in the first group tell what each one of them did from the time they woke up till they arrived in the school. Encourage them to describe in order of the things they did such as washing their face, doing the nature's duty, eating breakfast, dressing up in the school uniform, and arriving at school. The order of things could differ from student to student. Have the second group of students describe things that they did or things that have happened to them from the time of their arrival at the school to now. Have the students in the third group tell what each one of them intend to do from now till the time they go to bed in the evening.

   Then ask the students to think and describe what they normally do for the whole day on Sundays. Have them draw pictures, in order, from morning to evening of what they normally do on Sundays. Some students could care too much about the quality of their pictures and as such show signs of worry unnecessarily. Support them that their drawings are fine. You could display their drawing on the wall and have them explain it to the class.

2. Teach the students that there are 12 months in a year. A calendar would be very useful for this. Explain that the 12 months follow a specific order from January to December. The students should be able to read, write and tell the names of the 12 months in sequence. Also explain the 4 seasons in the year. The seasons occur in the order of spring, summer autumn and winter. Explain the main features of each season in Bhutan such as it is cold and dry in winter; it snows in higher places; the schools have the winter vacation. Similarly, discuss the main features associated with the other seasons.

3. Teach the students the names of the days of the week. As in the case with months and seasons above, the students should be able to read, write and tell the names of the 7 days. Discuss the main events associated with each of the days in the life of the students by asking questions like: **On what day do you not have to come to school? On what day do you go to the library? When is your HPE day? What day is today?**

Lesson 7 Comparing Time

Objectives

Predict and compare the duration of various activities.

Materials

Two plastic bottles of different sizes such a mineral water bottle and a small juice bottle
A bucket of water

Take the students outside to a play-ground. Have all the students stand at one end of the ground. Ask**: If I ask (Purna) to run and (Karchung) to walk from here to the other end of the ground now, who will reach first? Who will take less time to cover the same distance? Why? Who will take more time? Why? Shall we test that?** Have (Purna) run and (Karchung) walk while the rest of the class will confirm their prediction.

Divide the students into small groups of 3 to 4. Make a start line at one end of the ground and a finish at the other end. Have the students compete in a brisk walk race. Ask the group members of a group to stand in line at the start line and the rest of the class at the finish line. At your signal, the group members will start their brisk walk toward the finish line. Once the race for the first group is completed, discuss the race by asking: **Who finished the race first? Who took the shortest time to complete the distance? Who took the longest time? Did it happen that two people took the same amount of time?** Then have the remaining groups do the race in turns. After each race, hold similar discussion.

Back in the classroom fill two bottles of different capacities but the same sized opening with water. Ask: **Which bottle will take less time to empty the water if we turn them upside down at the same time?** Follow up on their prediction and test it. Then ask: **What can we do within the time it will take for the water to empty from this bottle** (Referring to the larger bottle)**?** Ask probing questions such as: **During the time it takes to empty the water from this bottle, can we go to the town and come back? Why? Can we finish eating an apple? Why? Then what can we do that will not take as long as this bottle emptying? Can we finish counting to 20? Shall we try that?** Fill the bottle with water and have everyone counting from 1 to 20 as you empty turn the bottle upside down for the water to pour out. Try various activities that will take both less time and more time as compared to the time taken by the bottle to empty.

Ask the students how long they think it will take to travel to various places from the school. Ask of situations where the students will be required to talk of the time it will take in terms of days, half-days and hours. The places should be known to the students. For example: **How long do you think it will take to walk from the school to the town? Would that be a longer time than to walk home from school for you?**

Maths Note

There are many ways to measure time that do not involve using clocks. Time can be compared by starting two events simultaneously and seeing which is completed first. Or two events can be compared, in duration, to a third event. For example, if it takes less time to sweep a room than to listen to a particular song and more time to brush your teeth than it takes to listen to that same song, you know it takes longer to brush your teeth than sweep the room.
This lesson provides the students with an intuitive understanding of how long it takes for an event in comparison to other events.

Extension

Materials: *Balls, marbles, twigs, erasers, pebbles, seed*

Show the students a ball and a marble. Ask: **If I drop this big ball and this small marble at the same time, which one do you think will hit the floor first? Why do you think so? Shall we try?** Have the students stand in a semi-circle and drop the ball and the marble from a height at the same time. Have them observe and tell which hit the floor first. You could drop the two from your hand. Alternatively, you could push the two items from the edge of a table with edge of a book or using a long straight stick. You could increase the height to drop, for example from the top of a shelf or cupboard. If done properly, you will observe that the two items will hit the floor almost at the same time. In other words, two items will take the same amount of time to reach the ground from a same height. You could even take the students to observe dropping from a suitably high height. You could have the student drop various pairs of objects simultaneously from a same height such as pencils, erasers, pebbles, marbles, chalks, and seeds. All of these things will take more or less the same time to reach the floor or ground if dropped from the same height. However, the students should also experiment and notice that if a paper and a pebble are dropped at the same time, the paper will take a noticeably longer time to hit the ground. Ask them what the reason could be for this. Later explain that it is due to the air which is making the paper take a longer time to reach the ground.

Lesson 8 Telling and Writing Time to the Hour

Objectives

Tell and write the time to the hour using an analog clock.

Materials

An improvised analog wall clock with movable hour and minute hands

Make analog wall clocks with movable hour hands and minute hands. The minute hand should be longer than the hour hand as in real clocks. Your clock should show the numbers from 1 to 12. A broken wall clock would be good for the purpose, if available. Put up the clock with both the hour and the minute hand pointing to 12.

Ask the students if they know the time that they do certain things such as getting up in the morning, coming to school, lunch time and go-home time from the school.

Explain that today we will learn how to read time from a clock. Explain the numbers, the hour hand and the minute hand. Explain that the minute hand moves faster than the hour hand and that when the minute hand completes making one round from 12 and back to 12, the hour hand will move from 12 to 1; and when the minute hand makes another round from 12 back to 12, the hour hand will move from 1 to 2, and so on. But for the sake of reading time in our case, we will keep the minute hand pointing at 12 all the time. Show the time at 12 o'clock to start with. Say: **This is showing 12 o'clock**. Explain that it would be mid-night at 12 o'clock. Then gradually move the hour hand to 1, and have the students say **1 o'clock**, telling that it would still be night. Then, move the hour hand to each subsequent hours, as you have the students say the time in hours as **__ o'clock**. At 5 o'clock, tell that it would be very early in the morning. Ask if anyone gets up at 5 o'clock. Then at 6 o'clock, tell that it would be about the time many of us would get up. Similarly, have the students tell the appropriate time to hour, as you point the hour hand to each number. Relate each hour with some events that would normally happen for all around the hour. For example, it might be interval time at 10 o'clock; it might be lunch time at 12 o'clock; it might be go-home time at 3 o'clock for the students; it might get dark at 6 o'clock. The students might wonder that you said earlier it would be mid night at 12 o'clock, and later you also said that it is lunch time at 12 o'clock. Explain that in a day and a night, the clock's hour hand makes two rounds. So in one day and one night, there are 2 sets of 12 hours making a total of 24 hours.

Toward the end, point the hour hand at various numbers and ask the students to tell the time. For example, point the hour hand at 4 and ask: **What time does the clock show?** The students should be telling the time as: **It is 4 o'clock**; or **the clock is showing 4 o'clock.** Ask: **What would you be doing at 4 o'clock?** Some students would be thinking of 4 o'clock in the early morning, while some might be thinking of it as in the afternoon. It is valid to think in both the ways since we are not teaching the concept of a.m. and p.m. at this stage.

> Maths Note
>
> Telling time is an important life skill. Although we now often tell time using digital clocks, students will still find it valuable to learn to tell time using clocks with faces (analog clocks) as well.
>
> At this early stage, time would only be told to the hour.

Have the students come to the front and move the hour hand to show the time you tell. For example: **(Wangmo) show us 11 o'clock**. Ask the rest to confirm what Wangmo did. Provide such opportunity to rest of the students.

Draw the following diagrams on the board or on a chart paper and write the time under each. Explain how it is written for each. Have the students then copy the diagrams and the writing of the time in their notebooks.

Assessment for Learning

Ensure that the students can read the clock and tell the time to an hour as **___ o'clock**.

2 o'clock

3 o'clock

6 o'clock

9 o'clock

11 o'clock

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson under the heading called Assessment for Learning. In addition, you should use a formative assessment tool called the **Chapter Checklist**. Prepare the Formative Assessment Recording Sheet for the chapter as shown below. You should look for evidence in each student, throughout the teaching of the chapter, that he or she has understood the key concepts and can perform the key mathematical skills by ways of observing, listening, and asking probing questions. Accordingly, keep the records for each student by putting a mark, such as a tick mark, for each of the chapter goals once you are convinced that the student has achieved them. You could also keep relevant anecdotal records.

Using the Chapter Checklist purposefully will give you the benefit of ensuring that each student's learning progress is assessed in a systematic manner. What is even more important is the opportunity it will provide you to help each student along in achieving the chapter goals. Since this is meant as a formative assessment tool, you will not be giving any mark to the students by using it. However, investing time in carrying out this assessment technique will contribute positively in the students being able to do well in the summative assessments, including the examinations.

Formative Assessment Recording Sheet (For Class 1)

CHAPTER 10 MASS, CAPACITY AND TIME

Chapter Checklist *(Look for evidence throughout the chapter that the student has understood the key concepts and can perform the key skills.)*

Student Name		**Chapter Goals** *(The student is able to):*						
		Predict and compare masses, and use terms like heavier than, lighter than, has more mass, has less mass.	Measure mass of the objects using a pan balance and non-standard units.	Compare capacities directly, and use terms like has more capacity (or holds more), has less capacity (or holds less).	Measure capacity of a container using non-standard units.	Recognise and describe ½ as one of the two equal parts of measure such as area, length and mass.	Compare time or duration between two events, and say which will take more/less time.	Read a clock, and tell and write time to the hour.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Summative Assessment

As explained in the Introduction to the Teacher's Guide, the student's learning in each chapter will be measured primarily through the use of an assessment method called the **Interview-based Performance Task**. The primary purpose of this assessment is to thoroughly assess the level of understanding of the students in terms of the key concepts and skills as required in the chapter. It provides an opportunity for the students to display their understanding by ways of telling, describing, showing, and demonstrating in a non-threatening environment.

One of the beauties of this assessment method is that it allows you to teach and clarify things even as you are assessing the students. The fact that you have to provide marks to the students through the use of Interview-based Performance Tasks should be considered a secondary purpose.

The Summative Assessment Recording Sheet (shown on the next page) is included in the Student Activity Book for your use with each student. Please refer to the Introduction to the Guide for details on the marking scheme.

Summative Assessment Recording Sheet (For Class 1)

Student Name: _____ Roll no.: ____ Section: ____

CHAPTER 10 MASS, CAPACITY AND TIME

Interview-based Performance Task *(Please refer the Introduction to the Teacher's Guide for Class 1 for the marking scheme while using the Interview-based Performance Task.)*

Task and Interview prompts	**Key concepts and skills to look for**
Bring 1 Kg of suger (or salt, or dalda), a pan balance, and Student Activity Books. Ask: **Which one do you think is heavier – this packet of sugar or this Book? How would you test that? So which has more mass, the book or the packet of sugar? Can you balance the sugar with these books on the balance? So what is the mass of the sugar in terms of the book?** Have some rice, a *phorb* (or a small cup), and two cans. Give the two cans to the students, and ask: **Which one do you think has more capacity? Which one will hold less? How will you find out? Referring to one of the can, ask: How may *phorbs* of rice do you think will fill this can? Have the student write the estimate down. How will you check that? So what is the capacity of this can in terms of this *phorb*?** Show the picture of a clock showing the time to an hour. Ask: **What time does this clock show?** Have the student write the time on a piece of paper.	*The student is able to:* - Predict the masses of two objects, and use the terms heavier than and lighter than. - Compare the masses of two objects using a pan balance. - Measure the mass of an object using a non-standard unit, and express it appropriately. - Predict and compare the capacities of two containers. - Make a reasonable estimate of the capacity of a container in terms of a non-standard unit. - Measure the capacity of a container in terms of a non-standard unit and express it appropriately. - Read and tell the time to the hour. - Write the time to the hour properly using the format __ o'clock.

Comments and Marks

Strengths:

Areas of Need:

Follow up Steps:

Teacher's Signature and Date:

Summary of the Summative Assessment for Chapter 10

CA marks from Chapter 10 (Marks out of 10): _____