Understanding Mathematics

Teacher's Guide for Class PP

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

Telephone: +975-2-332885/332880
Toll Free: 1850
Website: www.education.gov.bt

ISBN: 978-99936-0-366-5 First Edition 2010
Second Edition 2011
Reprint 2024

ACKNOWLEDGMENT

Advice and Direction
Sangay Zam, Secretary, Ministry of Education
Tshewang Tandin, Director General, Department of School Education, Ministry of Education
Yangka, Director (Academic Affairs), Royal University of Bhutan
Kinga Dakpa, Chief Curriculum Officer, DCRD, Ministry of Education

Concept and Writing
Karma Yeshey, DCRD

Content Blue Print
Dr. Marian Small, Professor Emerita and Dean Emerita, University of New Brunswick, Canada

Review and Editing
Dr. John Grant McLoughlin, University of New Brunswick, Canada
Dr. David Wagner, University of New Brunswick, Canada
Dr. Marian Small, Professor Emerita and Dean Emerita, University of New Brunswick, Canada

Proofreading
Dorji Thinley, Paro College of Education
David Harding, Khangkhu MSS

Photograph
Choyzang Dupjur, DCRD

Design and Layout
Karma Wangmo, DCRD

CONTENTS

MINISTER

ROYAL GOVERNMENT OF BHUTAN
ཞེས་རིག་ལྷན་ཁག།
MINISTRY OF EDUCATION
THIMPHU : BHUTAN

Cultivating the Grace of Our Mind

ཞེས་རིག

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!

Telephone : (00975) - 2 - 323825 / 325431 Fax : (00975) - 2 - 326424

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 to mathematics teaching generally 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 (2002-2007, 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 books
- 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 is crucial key 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 a par with the international standards, the framework was developed with technical assistance from an international consultant. The standards in the framework were 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, and 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 introduction 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 to12 were developed with technical assistance from a team of renowned international authors and mathematics educators. The new mathematics curriculum for Classes 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 Teachers' Guides and Student Activity Books. Effective use of these documents will help to achieve the objective outlined in the School Mathematics Curriculum Framework PP-12.

The mathematice contents appropriate for Class PP to achieve the standards set in the School Mathematics Curriculum Framework PP-12 are logically sequenced and elaborated upon through the chapters and lessons in this Teacher's Guide. The lessons activities 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 book as they teach and urge them 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 PP. 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 PP. For example, contents on Time, Money, and formal teaching of operations like addition and subtraction have been taken out. Some contents have been down sized as compared to the previous curriculum. For example, students now learn numbers only up to 10 in Class PP.

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.

Reprint 2024

- 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 application of skills.

THE DESIGN OF THE TEACHER'S GUIDE FOR CLASS PP

The Teacher's Guide for Class PP contains 11 chapters as detailed in the table of contents, to teach the curriculum for Class PP. The curriculum for PP, as it appears in the School Mathematics Curriculum Framework PP-12, is presented in the book right after this introduction. Each chapter of the Guide has the following features:

- Chapter Overview
- Lessons
- Chapter Assessment

Chapter Overview

The Chapter Overview describes the mathematical background to each chapter. It talks about the general pedagogical aspects related with teaching the chapter.It also talks about how the chapter is sequenced in terms of the lessons within it. 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 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.

Initial Assessment
The initial assessment provides ideas to informally assess students' readiness level before starting the lessons of the chapter formally. It may not be necessary to carry out all the ideas presented under this sections at one time at the beginning of the chapter; some of them may be better used before teaching

the subsequent lessons of the chapter after the first lesson. Please make that choice, as maybe relevant, as you go through the chapter lessons.

Lessons

Each chapter is divided into lessons. As can be seen from the table of contents, the chapters have lessons ranging from 2 to 5. Each lesson has the following subsections.

Lesson Goals

A goal or two pertaining to the lesson are stated here.

Relevant Maths Issues

This section talks about specific mathematical backgrounds and issues related to the lesson, including some of the common mathematical misconceptions that students could have, and how to avoid them. It will also talk about how the lesson could be best taught. It also provides some essential questions that should be asked during the course of the lesson activities.

Activities

Each lesson in the chapters consists of several activities. These activities are designed in logical sequence to provide the students with essential knowledge and experience of mathematics so that they achieve the goals set for the lesson and the chapter. 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. Each activity has the following subparts.

Objective

One or two objectives specific to the activity are stated here.

Materials

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

Activity Description

This section describes how the activity may be carried out. 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.

Maths Note

This alerts the teacher to certain key ideas and concepts that should be considered or brought out during the activity. It also mentions the benefits of the activity.

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 activity.

Variation/Extension

This offers a variation or an alternative to the activity, either in terms of the materials to use or the manner of carrying it out. Oftentimes, what is offered under this section will be an enhancement of or extension to the activity, for which the title will then be Extension. It would be worth trying out the variation/ extension activities.

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, both formally and informally. Young 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 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 lesson activities. 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 **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 work, 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 book 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 black board 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 view points 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

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.

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.

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.

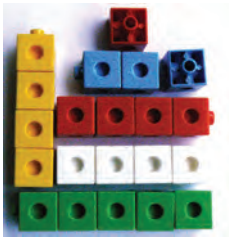
Students will be reluctant to communicate unless the environment is risk-free. In other words, if students believe that they will be reprimanded or made to feel bad if they say the wrong thing, they will be reluctant to communicate. Instead, show your students that good thinking grows out of clarifying 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, and some of them are even necessary. The following materials should be made available in the classroom for the proper teaching and learning of mathematics in Class PP.

Snap cubes



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

Pattern blocks

A set of pattern blocks consists of six 3-D shapes with the shape of the bases as a hexagon, a trapezium, a square, a rhombus, an equilateral triangle and a diamond (shaped rhombus), as shown here. The pattern blocks may be made of wood, plastic, and 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 1, 4, 7, 9 and 10.

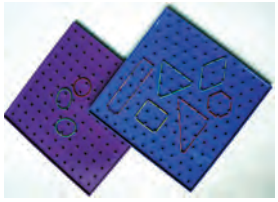
Counters

Counters are simply, and normally, circular disc shaped roughly the size of a normal coin. Counters may be made of wood or plastic, and are coloured. Counters can be substituted by other items in uniform size and shape like snap cubes or pattern blocks for their intended uses. Counters are required especially for chapters 1, 2, 5, 6, 7, and 10. Counters could also be easily improvised using stiff paper or plastic materials.

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), and a sphere. About 3 to 4 such sets would be required for a class of about 30 students. These shapes are required especially for chapters 1, 4, 7 and 9. They could also be made or improvised in the school.

Geo-boards



Geo-boards are required for students to make different 2-D shapes in chapter 9. Geo-boards can be made or improvised in the school.

Student Activity Book

The Teacher's Guide for Class PP 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 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 paper – about 70 sheets to last for a year
Chart paper – about 30 to last for a year
Duct tape – about 5 rolls to last for a year
Sellotape – about 3 rolls to last for a year
Glue (preferably glue sticks) – about 3 for a year
Crayons – a packet for each student
Paper (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 PP

The Summative Assessment in Class PP is to be done through the following two means.

- Interview-based Performance Task
- 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 advance 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 referrede to as **Continuous Assessment**.

Ready-made formats for the Interview-based Performance Task are provided for each chapter for each student, as **Summative Assessment Recording Sheets**. They are inserted in the Student's 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.

For every chapter, there is at least an Interview-based Performance Task. A few of the chapters have two such tasks depending on their nature. A student's performance in each task is to be marked out of a total of 10 marks. Which means if a chapter has two tasks, the chapter will be worth 20 marks. It is intended that at least one Performance Task for each chapter will be done with each student.

As it will be clear from the formats in the **Summative Assessment Recording Sheet**, 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.

Reprint 2024

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 can perform 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 requires providing opportunities to teach even when a student is being assessed.

Annual Examination

The will be no half-yearly examination for Class PP students in Mathematics from 2011. However, Class PP students will be required to write their annual examination. The question paper should be set out of 20 marks, with a writing time of up to 1 hour. The questions or instructions should be simple, direct, appropriate, and easy to understand requiring minimal writing on the part of the students covering all the chapters. 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 Assessment will then be used to generate the Student Progress Report card. The split of weighting between the Continuous Assessment (CA) and the Annual Examination for the whole year will be as given below:

	Term I	Term II
Continuous Assessment (CA) (Interview-based Performance Task)	30%	50%
Annual Examination		20%

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 be converted to be out of 50%, for entering in the Student Progress Report card, giving a total of 80% for the CA for the entire year. The 20% for the Annual Examination is straight forward matter, as the examination would be set for the maximum mark of 20.

Reprint 2024

CHAPTER 1 SORTING AND PATTERNING

Chapter Overview

What is a pattern? When some things repeat over and over again, there is a pattern. When things are structured in a certain way that is predictable, it is 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 spiralling line of a snail's shell all share a common pattern. Our number system has many patterns embedded in it too.

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 quintessential aspect of studying mathematics. As such, children in the lower classes are given exposure and experience in recognizing and making patterns clearly. This study and understanding of patterns will be reinforced through an integrated manner in other areas of mathematics. An understanding of patterns will help children in understanding the working of the number system, including place value concepts, number naming system, 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 attributes of the items under consideration. And 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 has 5 lessons as detailed in the table of contents. Concepts and experiences with patterns are developed further in chapters 7 and 12.

In this introductory chapter, children will be required to mostly talk, describe, demonstrate, act out and use physical models or real objects. The teacher will need to encourage, guide and demonstrate all of these. Additionally, the teacher will have to invest considerable time in teaching children the Basic English Language.

Basic Principles about Sorting and Patterning

- Patterns are based on attributes that repeat in a predictable way.
- Every pattern is based on considering some attribute(s) of the items in the pattern, so students must be able to sort objects to identify objects with the desired attribute(s).
- 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.
- Attributes of objects are things pertaining to the objects such as their colour, shape, size, use, sound, 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

Chapter Goals

- Identify, name and describe attributes of things.
- Sort 3-D objects/things based on single attributes.
- Identify simple repeating patterns.

Maths Words

Different, same, pattern, sort, group, attribute

Initial Assessment

Show students a common object like a book, (or a pencil, a stone, a pebble etc.) and ask them to describe the item. Have them tell what the object is, what its colour is, how it looks, its use, how it feels like, etc. Understandably children will not be able to say in English, so other languages should be accepted to talk about the thing at this point in time.

See if they can sort things in two groups when given a collection of things. The things could be a few books, pencils, erasers, bottles, plates, spoons and forks. Encourage children to explain what they did and why or how they did the sorting of the things.

Make a simple (ABABAB) sound pattern (e.g., clap, snap, clap, snap, clap, snap; cough, tap on the desk, cough, tap on the desk, cough, tap on the desk) and see if children can copy it. Rhythmic movements of the hand(s) can also be used.

Lesson 1 Describing Attributes

Lesson Goal

Identify and describe objects according to various attributes.

Relevant Maths Issues

In order to be able to create patterns, students have to notice attributes and characteristics of objects. Attributes of an object are things like colour, shape, size, mass, sound, position, its use, the material it is made of, etc. 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.

The objects that students should be describing should be things they see and use in their everyday world and not necessarily just mathematical objects. These might include items of food, school supplies, pebbles, etc.

Encourage students to tell as many things as they can about what they see. For example, if they are looking at a banana, they might focus on how big it is, its colour, what it feels like, when they would eat it, etc.

One way to help students focus on attributes is to compare and contrast two items. For example, if they are comparing a piece of paper and a pencil, they could compare the colour, what the two items are used for, how wide they are, etc.

It is essential to ask questions similar to the following during the process of the lesson activities.

What colour is it?
How would you describe what it looks like to someone else?
Is it big or small? Why do you think so?
If you touch it, what does it feel like?
How are these the same?
How are these different?

The following activities have been designed to help you teach the lesson. Please feel free to modify, adapt, or create your own activities.

Activity 1 Names of the Common Objects

Objective
Know and tell the names of some of the common objects.

Materials
Some common objects such as pencil, paper, chalk, crayons, sticks, stones, book, ball, pen, leaves, bottles and cups.

Maths Note
This activity will introduce the students to the names of some of the common objects around them. Although it is not necessary to know the name of an object to describe it, it helps in talking about the object. Besides, this activity will familiarise the students with the objects and their features, and build the basic vocabulary that will help them to describe the features of the objects.

Activity Description
Have a collection of the objects you are going to introduce ready in a container (like pencils, books, bottles, balls, a fruit item or two, a few leaves, chalk, etc.). You may want to limit the number to about 7 objects

You may introduce yourself first, as: **I am Madam (Dawa Dema). I am your teacher. I love you all. I wear a kira.** Encourage students to volunteer to tell a few things about themselves. After a few students have done that, say: **Now I want to introduce you to the names of some things.** Take out and show an object (pencil) and say: **Do you know this? What is this? This is a pencil. Does anyone have a pencil with you? Hold your pencil up… These are all pencils. What do we use pencils for? We use a pencil to write in our books** – demonstrate the act of writing with a pencil on a book or a paper. **A pencil is made of wood and carbon** – show the wooden part and the carbon part of the pencil. Ask all the children to say, **this is a pencil,** when you show them a pencil. Then ask a few children individually if they can say the same. Keep the object on the table.

Similarly, repeat the procedure for other objects. Talk about the features or attributes of the object under consideration like its shape, colour, mass, use, and materials with which it is made.

To help remember names, put back all the objects in the container. Ask a child to come forward and take out an object: **Who would like to come here and help me take out a (banana)? Is this a banana that (Pema) has taken out? What can you say about it?** Talk about only one attribute at a time. The child puts back the object in the container. Repeat this with other objects and with other children volunteers or the ones you choose to ask.

Assessment for Learning
Is every child able to say the names of the objects confidently and correctly? Are children also able to describe one or two attributes of each of these objects? You may have to encourage and support the children with their language and expressions.

Variation
Introduce the children to the names of classroom objects including furniture such as tables, chairs, cupboards, windows, window panes, glasses, doors, chalk boards. The activity above should also be repeated in some forms on the following days, so that children know the names of the common objects.

Reprint 2024

Activity 2 Names of Colours

Objective
Recognise and say the names of colours.

Materials
Objects in different colours of black, white, red, blue, green and yellow (or other colour)
Samples of common colours including different colours of paper and/or different colours of cloth pieces

Maths Note
Colour is an important attribute of objects. Every object comes with a colour. Knowing and identifying the colours of the objects helps in describing the objects. It helps in the communication of ideas. The attribute of colour of the objects is used in the sorting the objects, for example, all the red objects are grouped together regardless of their shapes and sizes. The attribute of colour is also used to form patterns. In fact this activity has the concept of sorting already embedded in it, as you will see.

Activity Description
Take some common objects which are in different colours of black, white, red, blue, green and yellow in a container. For example, red chillies, white chillies, and green chillies; white papers and some papers in different colours like red or blue (you could colour them too); balloons in different colours; or even chalks in assorted colours. You could also use pattern blocks and crayons.

Show an object from the container maybe a paper, and ask: **What is this?** Show another paper of a different colour and ask: **What is this?** Each time wait for the answer, and provide appropriate reinforcement and acknowledgement. Say: **These are all papers, but they are of different colours. This one is white, this one is red, and this one is green.** Encourage children to say the names of the three colours after you as you show and say the colours.

Now show another object you have in the container in at least two colours, say a red chilli and ask: **What is this?** Then show a white chilli and ask, **what is this?** Then show a green chilli and ask, **what is this?** Each time wait for the answer, and provide appropriate reinforcement and acknowledgement. Say: **Yes these are all chillies. This one is red chilli, this one is white chilli and this one is green chilli,** as you show them. Ask children to repeat after you the names of the colours that go with the different chillies.

Repeat the procedure for a few of the other things you have in your container.

Put up on the Maths Wall samples of colours with their labels. The wall display should be at a level where students can reach and point. The colour samples could be either painted on a chart, or they could be cutout pieces of clothes or paper in different colours. Label the colour samples. Then invite students to say the names of the colours after you as you point to the colours on the wall display.

Assessment for Learning
See that every student is able to say the names and colours of the objects correctly.

Invite a student to come and take out an (white) object from the set of objects you have in your container. Ask the rest of the class to say if the pick was correct or not. If the pick was incorrect, the student should be given a second try. Similarly, invite some more students to do the same for other colours.

Invite the attention of the students to the colour samples on the wall display. Ask students to say the name of the colour as you point to each sample.

Activity 3 Colour Hunt

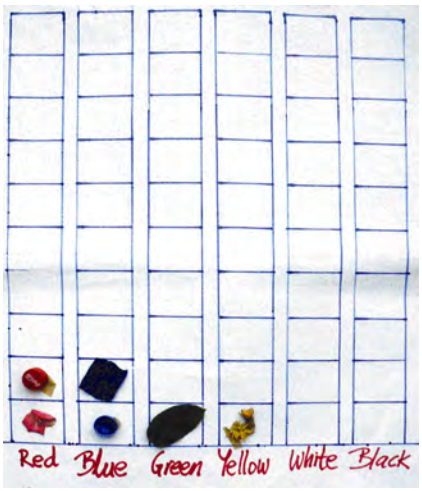
Objective
Identify colours in the environment.

Materials
One or two chart or newsprint papers
Glue or sellotapes
Scissors
Marker pens

Maths Note
This activity has sorting and graphing embedded in it, although students do not need to know them as such. Discussion based on the colour graph would promote reasoning and communication.

Activity description
Revise and reinforce the students' ability to recognise and say the name of the colours from the previous activity.

Say something like: **There are colours all around us. Colours make our world bright and beautiful. Flowers are beautiful because they have bright and nice colour combinations. They catch our attention and give us a good feeling inside. Aren't you happy when you see flowers? Our own body is coloured. Some parts of our body are white, and some are black. The clothes we wear have many colours. There are colours in the classroom. There are colours out in nature. Today let us find some colours. First, let us see if we can find some colours on our body. Where do we find a white colour on our body?**



Look around the classroom – wall, windows, furniture, and things in the classroom for the 6 colours already discussed. Point to something (red), and ask children to tell the name of the colour. For example, point to the wall and ask: **What colour is this?** Point to the black (or green) board, and ask: **What colour is this?**

Divide the students in groups of 2 to 4 depending on the class size. Instruct the group members that they should go together and talk within the group. Take the students outside of the classroom and have them collect two things that have any of the colours they know. The things the students can collect could be pieces of papers in different colours, leaves, flowers, cloth pieces, wrappers etc. The things they collect should be no larger than the size of a note book. After each group has collected two things, bring them back to the classroom.

Back in the classroom, have a chart as shown. Paste the things on the chart at the appropriate places to make a column graph. You would need to cut the things to make them suitable for pasting on the chart. Applaud the students for their great collection. You may also take the help of the students in making the graph. Students need not know that it is a graph yet.

Assessment for Learning
See that students have understood the instruction in collecting the things from outside. You could check their understanding and help them as they are in the process of their collection outside the classroom.

Based on the graph, ask and discuss about: **What colour have we collected the most? What colour have we collected the least? Why do you think we have collected (green) the most?**
If you look out in the open, what colour do you see the most? (Invite students to look outside, at the hills and forest.) **If you look up in the sky, what colour do you see?** (Invite students to look up at the sky.)

Reprint 2024

Activity 4 Materials with which an Object is made

Objective

Recognise and tell the names of the materials with which an object is made.

Materials

A few plastic bottles
A few glass bottles
Metal bottle tops like the ones on soda bottles
Plastic bottle tops like the ones on plastic bottles
A rubber ball, some marbles, pencils and marker pens

Activity Description

Show a collection of bottles to the class. Ask: **What are these?** (These are all bottles)
What do we use bottles for? (We use bottles to carry water, juice, milk, etc.)
How do they look? Can you describe the shape of a bottle?
Take up a bottle and describe its shape as you demonstrate its shape features: **This bottle is long. It is round. It is smooth – no bumps and sharp edges. It has one opening – through which we can pour in or out water or juice. It has a bottle top or a cap. It will roll on the floor if you place it like this and push. What will it do if you push it like this? Can you think and tell me of a thing that will roll (like a bottle)? Yes, a ball… do we have a ball here? I have one here.** Demonstrate the rolling action of a ball. Point to the collection of things you have on the table, which includes marbles, pencils, marker pens and ask: **What other things here will roll like this? Yes, marbles will definitely roll. How about the pencil? Will it also roll? It does roll. How about this book?** Try it. It does not!

Maths Note
The material with which an object is made is an attribute of the object. Knowing the different materials that make objects helps the children to describe the objects. This will also help in sorting objects (later on) based on the attribute of materials .

Now pick up a plastic bottle and a glass bottle. Invite students' attention to the two bottles. Say: **These are both bottles. What will happen if I drop this** (indicating the glass one) **on the floor? It will break, and then the pieces can cut us! Do you like it when you are cut? Why? So I will not drop it. This bottle is made of glass. Where do you see glass around here? But can I drop this** (indicating to the plastic one) **bottle?** Drop it. **So we have glass bottles and plastic bottles.** Invite two students to come and sort the bottles based on glass or plastic.

Now take out some bottle tops from the bottles, and tell the students that they are called **bottle tops**. Encourage student to say the name **bottle top**. Show and pass some around to the students. Ask them to feel and identify which of the bottle tops are made of plastic. Then ask them if they know the other material as metal. Tell them that the other material is called **metal.** Invite students to look around and find metals in the classroom.

Assessment for Learning
See that the students can identify and say materials like plastic, metal, glass and wood that make the objects.

Now ask students to take out and examine their pencils. If a student does not have a pencil, he or she can do that jointly with a neighbour. Ask: **What is your pencil made up of? Is it plastic? Is it metal? Is it glass?** Invite students to look around for a material that is the same as that of a pencil, before you tell them that it is made of **wood**.

Variation

Any other things that come in different make of materials like the following could be used to talk about the materials.

Cups and plates made of metals (like copper, steel, aluminium), plastics, and wood
Attribute blocks made of wood, plastic, and rubber

The objects under consideration should be described focusing on some key attributes like shape, size and use before identifying the material with which the object is made. In the process, it would be important to ask even basic questions that would require students to think and reason, rather than just telling everything.

Activity 5 Describing Objects in terms of Attributes

Objective

Describe an object in terms of a minimum of three attributes including colour, shape, use, materials with which it is made, size and mass.

Materials

Pencil, plate, teacher's table

Activity Description

Take one thing at a time. Show it to the students and ask if they can recognise the object. For instance, show a pencil and describe it. **This is a pencil** (name). **It is long** (size). **It is light** (mass). **It is pointed at one end. It is used to write** (use). **It is made of wood and carbon**. Show the students the wooden part and the carbon part, with which a pencil writes.

Now show a ball point pen. Ask if the students can say something about it. Ask the following, if need be: **Is it long (like a pencil)? Is it round (like a pencil)? What is it made of – wood or plastic? Is it heavy? Or light?**

Ask each pair of students to choose an object that is with them or that can be picked up from the classroom. Let them first discuss in pairs and tell three things about their object. Then ask them to tell to the class something about their object. Each member of the pair will have to tell at least one thing about the object. You can help the pairs choose an object. The objects could be books, bags, lunch packs, tables, pens, shoes, marbles, rulers etc. Encourage, support and ask the children to describe things as they discuss in pairs as well as when they describe them to the whole class.

Maths Note

Now that the students know the names of common colours and some materials with which an object is made, they can attempt to describe some of the objects. The objects you ask them or ones they choose to describe should be physically with them. Students will still need your support in the form of asking probing questions like: Is it round or flat? Is it long or short? What is it made of? What do we use it for? Is it heavy or light? What is its colour?

Assessment for Learning

See that children are able to describe an object in terms of its attributes like colour, shape, size, mass, use, and the material from which it is made.

Reprint 2024

Activity 6 Tell Me the Object

Objective
Identify an object based on the description provided.

Materials
Stones, sticks, bottles, erasers, pencils, chalk, a fruit item or two (apple, orange, banana), pattern blocks

Maths Note
In this activity, the teacher describes an object from the collection that all can see according to various attributes. Students identify the object as per the description. Later students can try the same amongst themselves. This activity will further enhance the students' ability to notice features of objects and describe them.

Activity Description
Tell the students that we are going to play a game today. The rule is simple: **I have some things here which you all can see. These are…let me see if you know their names…** encourage students to say the names of the things as you put them on the table one by one. **The rule is: I will describe or say some things about an object. At the end you have to tell me what the object was that I described. OK let us start:**

It is long and straight. It is round. I write with it. What is it? (pencil or pen). Give appropriate acknowledgement and reinforcement to the students, or ask for more hints, in case students do not easily identify the object.

OK... another one: It is rough. It will sink if I put it in water. What is it? (stone/other things in the collection that will satisfy the description).

Invite a student to describe a thing he or she choose from the collection, using three attributes. The rest of the students guess and identify the object. Repeat this with some more students. Help the students to describe the things. You can also play this with smaller groups of students.

Assessment for Learning
See that the students can describe a thing using at least two attributes. See that the students can identify an object matching a description or the clues given.

Variation
Students can play this exclusively with pattern blocks at a later time. You could also try playing this game with objects that are not physically available, but with things that the students would be familiar. For example:
I am thinking of an animal. It likes to sit near a warm place like the oven. It eats rats. What animal was I thinking about?
I am thinking of an animal. It is big. We get our butter and cheese from it. What animal was I thinking about?
I am thinking of a thing that is round like a marble. But it is much bigger than a marble. Tell me what the thing is?

Ask a child to tell the clues of a thing he or she has in mind. The rest of the class can guess. If the clues were not so clear, the child can try again.

Students can also play this in small groups. Objects that can be seen but not moved may be suitable (e.g., trees, windows).

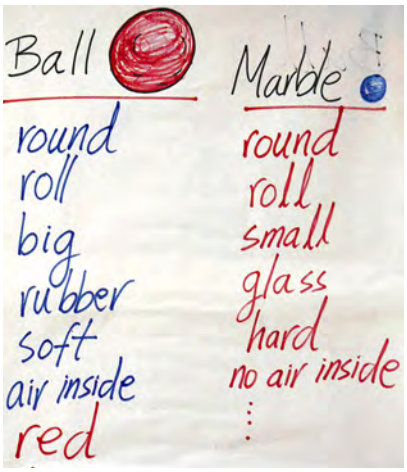
Activity 7 Pass Around

Objective
Compare objects by identifying similarities and differences.

Materials
A marble
A rubber ball, preferably a basketball or one that comes in one colour

Activity Description
Make the students sit or stand in a circle. Pass a ball around, and ask each student to say a word about the ball: **When you get the ball, tell about it using just one word. Let us see how many different words we can think of to describe this ball.** There is no harm in students repeating a word some one has already said. If students show signs of getting stuck, you can give a clue to move on by asking questions such as: **How does it look? How does it feel like when you feel with your hand? What is its colour?...** After the ball has been passed through all, write up the words – it would be better on a chart than the board. You can ask the help of children in remembering the words said.

Repeat with a marble. This time pass the marble in the opposite direction. Record the words on the chart as shown here.



Now look at the words recorded, and ask: **What is the same for the ball and the marble? How are the two different?**

Restate similarities and differences to reinforce vocabulary. For example: **We used the word round for both the marble and the ball. They have the same shape. Their shapes are round…**For the difference: **We used the word glass for the marble, and rubber for the ball. The marble is made of glass, and the ball is made of rubber.**

Variation/Extension
This activity could be done using any two objects having both common features and differences. For example: a pencil and a ball point pen or crayon, or a carrot and a radish, or an apple and an orange. It would be good if you continued the Pass Around activity with these other pairs of objects on the following days.

Maths Note
Comparing and contrasting two objects is a good way to notice and describe the features of objects. Here students talk about how two things are the same and how they are different. Identifying similarities and differences is important for sorting and re-sorting objects. This activity further gives practice to students in describing objects according to various attributes.

Assessment for Learning
See if children are using the attributes of shape, colour, size, material, use, etc in their description of the objects. Continue to use the language you want students to use.

Activity 8 Things with a Common Attribute

Objective

Come up with a group of objects sharing the same characteristics of an attribute.

Materials

A list of descriptive words (e.g., a list created in Activity 7 Pass Around)
Crayons and pencils
Sheets of plain paper the size of one eight of an A4 paper for each student
2 or 3 newsprint papers
Marker pen
Glue/sellotape/duct tape

Maths Note
This activity can be an extension of Activity 7 Pass Around. It has sorting embedded in it.

Activity Description

Revisit the list of descriptive words on the chart that you created during the previous activities – Pass Around. Read aloud a list of descriptive words. On a chart paper, print one of the descriptive words (e.g. green). Ask: **What other things can you think of that are green?** Let the students respond verbally for awhile. Provide each student with a sheet of plain paper about the size of a quarter of an A4 paper. Then have them draw one thing that they think is green onthe paper provided. The thing a student draw could be a thing that is generally green or it may be a green thing that is personal to the child. They can colour their drawing. After every one has drawn, let students come up and paste their drawing on the chart around the descriptive word. Ask the children to describe their drawing.

The above descriptive word was for the attribute of colour. Repeat for a few more attribute words from the list, for example, for a round shape.

Assessment for Learning
As the students describe their drawings, are they able to relate the object they have drawn with the descriptive word provided? And then, are they able to talk about other features of the object they have drawn? Encourage students to do that when they put up their drawings and talk about the objects.

Lesson 2 Sorting Objects

Lesson Goal

Students should be able to sort 3-D objects based on a variety of simple attributes including shape, colour, and the material of which an object is made.

Relevant Maths Issues

Sorting is basic when working with numbers, shapes and measurement. 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.

At this stage, students should sort using only one attribute. For example, they might have a lot of different objects that vary in colour and shape, but they would only sort by colour. They should also be sorting actual objects. Students should be encouraged to physically put together the objects they have sorted into a group. Perhaps a string could be placed around them, but even if this is not done, it is important that the groups of objects that belong together are separated from the other objects.

Some essential questions to ask during the course of the lesson activities are:

Which are red?
Which are long?
Which of these belong together?
Why do they belong together?

The following activities have been designed to help you teach the lesson. Please feel free to modify, adapt, or create your own activities.

Reprint 2024

Activity 1 Sorting Objects by Colour

Objective
Create and describe a group that has a common attribute.

Materials
A collection of objects in two colours: pattern blocks; snap cubes
Yarn or rope (string can be substittuted)

Activity Description
Bring a collection of objects which are in two colours. The collection should preferably be a mixture of pattern blocks in two colours, but of different shapes and sizes.

Put the objects in an open space, where they can be seen by all the students. You may do that on the floor or outside the classroom with students sitting or standing in a circle. Form two large sorting circles using two pieces of yarn or rope. Explain to the students that you will be sorting the objects into two groups.

Pick up a block, maybe a blue one, and say: **This is a blue block. I am going to put it here, in this ring. Here is another blue one, and I am going to put it here. Here is another blue one, so I am going to put it here too. This is a red block. It is not blue. So it does not belong here. I put it in the other ring.** Now pick up a block, and ask: **Here is a red block… where does this go? To which ring does it belong?** Pick up another block, and ask the same questions to decide in which ring to put the block.

Invite individual students to each pick up a block and place it in the appropriate ring, until all the blocks have been grouped away. Ask them to tell how they decided to place the blocks.

When all the blocks have been sorted, pick up one block from a ring and ask: **Why does this block belong here? Or why is it here?** Then pick up a block from the other ring, and ask: **Why does this block not belong in this (the first) ring?**

Variation
This activity could be done using other objects besides the pattern blocks, like buttons, marbles, coloured paper cards, etc.

You could also have the objects in more than two colours, so that students can create more than two groups. Provide more than two rings then.

Maths Note
As explained earlier, students should sort objects by only one attribute at this stage. In this activity, the sorting is based on colour. As students create a group of objects that share a feature, they compare objects and identify similarities and differences. They begin to realize that objects can be similar when you consider one attribute, but different when you consider another attribute.

Assessment for Learning
Ensure that the students are able to see that the sorting was based on colour. If some students have difficulty with that and get mixed up with other attributes like shapes and sizes, try the sorting with identical blocks in terms of size and shape, but of two colours. This could be done with snap cubes in two colours.

Activity 2 Sorting Objects by Shape

Objective

Create and describe a group that has a common attribute.

Materials

A collection of objects in two shapes (e.g., cubes and cylinders: for cubes you can use individual snap cubes, dice, chalk boxes, etc; for cylinders, you can use models of cylinders, cylindrical containers like tin cans, tumblers, or improvise one by rolling stiff rectangular papers and gluing them up)

Yarns or rope (string can be substituted)

Maths Note
This activity is similar to Activity 1, except that here the sorting is based on shape.

Activity Description

Display the collection of objects in an open space visible to all students. Explain that you are going to sort these objects into two groups, but that you will not be bothering about the colours of the objects this time. Place the two hoops ready nearby.

Pick up a block, say a cube and say: **This is a cube. I am going to put it in here, in this ring. Here is another cube, and I am going to put it here too.** Show the cube and ask the students to say "**cube"** after you. **Now this one is not a cube. It is a cylinder. So it does not belong here. I put it in the other ring.** Show the cylinder and ask the students to say "**cylinder"** after you.

Now pick up a block, and ask: **Here is a cube… where does this go? To which ring does it belong?** Pick up another block, and ask the same questions to decide into which hoop the block should be placed.

Invite individual students to each pick up a block and place it in an appropriate ring, until all the blocks have been grouped away. Ask them to tell how they decided in each case.

When all the blocks have been sorted, pick up one block from a ring and ask: **Why does this block belong here? Or why is it here?** Then pick up a block from the other ring and ask: **Why does this block not belong in this (the first) ring?**

Assessment for Learning
See that students can identify and say correctly the words cube and cylinder.

Variation

Invite students to think of a different attribute and suggest a sorting rule for the same collection of objects. It could be sorting based on the materials.

Reprint 2024

Activity 3 A Sorting Game

Objective
Create and describe a group that has a common attribute.

Materials
A set of blue, red, and yellow cards such that each student will have a card.

Maths Note
This game is based on sorting by colour. You can play this game, as well as its variations, as often as you like.

Activity Description
Make the students stand in a circle. Give each student a coloured card. The students should hold the card in hand so that other students can easily see the card.

Make them chant: **Run up the mountain, run, run, run.** The students all run around, along with you. As you are all running, say aloud: **Red cards come to the centre!** At that point, all the students carrying red cards should come to the centre and form a group. They sit or stand still. Ask the rest to continue the chanting and running around. After a while, you shout: **Yellow cards come to the centre!** At that point all the students carrying the yellow cards come to the centre and form another group. The yellow set can sit or stand together and remain still. (It will be clearer if the yellow group does the opposite of the red group so that one of the colours is standing in the centre and the other is seated). The rest of the students then resume their running and chanting: **Run up the mountain, run, run, run.** After a while, you say: **Blue cards form a group!** And they form a group.

Assessment for Learning
See that students can find other members holding the same card.

Variation/Extension
You can play this game using other things and other attributes. For example:

(1) Sets of cards with pictures of cats, dogs, and fish
The wording of the game would then be:

Run up the mountain, run, run, run
All the cats form a group!
All the dogs form a group!
All the fish form a group!

(2) Cut out shapes of triangles, rectangles and circles
The wording of the game would then be:

Run up the mountain, run, run, run
All the triangles form a group!
All the rectangles form a group!
All the circles form a group!

A fun variation is to give the students the cards and replace the wording of the game with a simple instruction: **Find all of the others in your group**. This is definitely better suited to an open outdoor space as the students have to figure out a way of organizing themselves and usually land in several small groups before realizing that there are others with the same attribute in another space. (Do not tell them where to gather as that is the challenge.)

Activity 4 Sorting Objects by Material

Objective

Create and describe a group that has a common attribute.

Materials

A collection of objects which are made up of three different materials like: pattern blocks made of wood; pattern blocks or snap cubes made of plastics; some rubber objects like erasers and balls; some metallic objects like steel cups and plates; and any other suitable materials like plastic bottles, wooden sticks, etc.
Yarns or rope (string may be substituted)

Maths Note
This activity is similar to Activities 1 and 2, except that here the sorting is based on materials and the sorting is done for three groups.

Activity Description

Display the collection of objects in an open space, visible to all students. Explain that you are going to sort these objects into three groups, but that you will not be bothering about the colours or shapes this time. Make three rings nearby using yarn or rope.

Pick up an object, maybe a cube and say: **This is a cube, and it is made of plastic. I am going to put it in here, in this ring. This is a bottle, and it is made up of plastic too, so I am going to put it here.** Pick up a wooden block and say: **Now this one is not plastic; it is made of wood. This does not belong with the plastic things; so I am going to put it in here.** Pick up a pencil, and ask: **where do you think this pencil belongs? A pencil is made of wood, so it belongs here in this hoop.** Continue with some more plastic and wooden objects, placing them in appropriate rings with the help of the students.

Now pick up a metallic object, and ask: **What is this? In which ring do you think it should be put? Is it made of wood? Is it made of plastic? So this does not belong with either of these groups. Let us then put it in a new ring.**

Now pick up an object, and ask: **Here is a _____. Where should we put it? To which of the three rings does it belong?** Pick up another block, and ask the same questions to decide in which ring to put the block.

Invite individual students to each pick up a thing and place it in the appropriate ring, until all the blocks have been grouped away. Ask them to tell how they decided in each case.

Assessment for Learning
See that students can give appropriate responses to the questions. The responses need not be in perfect English, but you should help them say them in simple, short and correct sentences.

When all the things have been sorted, pick up one from a ring and ask: **Why does this block belong here? Or, why is it here?** Then pick up a thing from another ring, and ask: **Why does this block not belong in that other ring? Or, why does this object not belong in this group too?**

Reprint 2024

Activity 5 Sorting Objects Based on a Certain Sorting Rule

Objective

Create and describe groups according to certain sorting rules.

Materials

4 to 5 sets of collections of various objects (the objects could be the ones already used in the previous activities).

Maths Note
This activity allows students to sort objects based on the sorting rule they choose based on any attribute.

Activity Description

Divide the students into 4 or 5 groups. Give each group a set of the assorted objects. Let them discuss, in the groups, and sort the objects into two or more groups. The students should be able to explain how they have created the groups. You can help them in the process.

After all the groups have finished, ask students to observe the work of other groups. Encourage the students to ask the other groups to explain what they did, and what sorting rule they followed. You should ask things like: **What did you do? How did you create this group? What was in your mind when you put all these things here? Why is this object not in that ring?**

Assessment for Learning
Do students ask each other to explain how the sorting was done? Encourage them to do so. How do they respond to each others' questions?

Extension

Groups keep the same set of objects that they have sorted the first time. They are now required to sort them again using a different soritng rule.

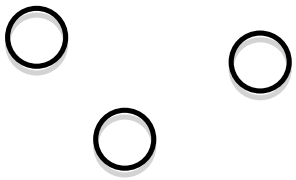
Lesson 3 Recognizing a Sorting Rule

Lesson Goal

Students should be able to determine what rule was used to put a certain group of objects together.

Relevant Maths Issues

In mathematics, we are sorting when we use particular number words or shape words. For example, the number 3 is a way of sorting; it distinguishes groups that have this many (where each dot represents an object) from all other groups.



When we use the word “triangle”, we are sorting closed shapes that have 3 straight sides from all other shapes. It is for this reason that it is important, in mathematics, that students recognize possible “sorting rules”. A sorting rule is just a description of how to decide whether an item is or is not included in a group. For example, if the sorting rule is “red”, then all red items would be collected. You may want to introduce the term “sorting rule”, but this is not essential.

The objects that the students are sorting should continue to be things they meet in their everyday world and not necessarily just mathematical objects. You might sort by colour, e.g. all the blue items, by material, e.g. items made of wood, by physical characteristics, e.g. all the boys, etc. Only one attribute at a time should be used for sorting. A few essential questions like the following should be asked in the process of the lesson activities.

Why do these go together?
Does this belong in the first group or the second one? Why?
Why is ….not in this group?
What other items might go in this group?

Activity 1 Sorting the Students

Objective

Tell the rule used for grouping the students in various ways.

Materials

Students
Yarns (optional)

Maths Note
In this activity groups are either already created or they are created in front of the students. Students then guess and tell the sorting rule used. The sorting rule used should still be based on a single attribute.

Activity Description

Take the students to an open space. Make them stand in a line, whether straight or semi-circle, shoulder to shoulder. Make two big circles (using the yarns). Without saying the rule, pull out a boy and make him stand in one of the circles. Pull another boy and make him join the first boy. Pull a girl and make her stand in the other circle. Pull a boy and send him to the other

Reprint 2024

two boys. Pull two girls and send them to the circle where the first girl was already standing. Repeat this with several other students.

Now ask the remaining boys and girls where they should be going. Ask the students, what might be in your mind for creating the two groups: **What do you think was the rule I used to separate you into two groups?**

After the discussion of the rule, put them all together. Line them up as before. This time sort the students based on the kind of shoes they are wearing: the ones having shoe laces in one group, and the ones wearing shoes without laces into another group. Let them guess and tell the sorting rule.

Next, you could ask student volunteers to sort the rest according to a rule they choose. Say: **would anyone like to play this game on the rest of us. You have to think of a rule in your head, but don't say this to us. Then you can sort us into two groups. We will guess and tell the rule you have used later. Maybe two of you can discuss and do that together.**

Assessment for Learning
See that the students are able to guess and identify or explain the sorting rule used in each variation of the activity.

Encourage students to lead the sorting.

Activity 2 Guess My Rule

Objective
Sort a collection of objects using a sorting rule.
Identify the sorting rule used by others.

Materials
A collection of pattern blocks in different colours, shapes, and materials for each group

Activity Description
Divide the class into groups of 3 to 4 students. Provide each group with a collection of the objects. Within each group, a student sorts the objects into two groups or more based on a rule he or she has in mind. The other students in the group will have to guess and tell the sorting rule. The student who created the group confirms his or her rule if the guess was correct. In case of incorrect guesses, the student gives the others a chance to guess again. Then he or she gets to explain the rule. Then it will be the turn of another member of the group to create the groups, and challenge the others to guess his or her rule.

Maths Note
Here a student creates groups of objects based on a sorting rule he or she has in mind, and asks others to guess it. This is laying a foundation for work with patterns as there is an idea underlying the way things are being organised. Also what looks like a pattern to one person may not appear to be to another (or it may not be the pattern that one sees).

Variation
The **Guess My Rule** activity could be played among students using collections of any other suitable objects like sticks, pencils, erasers etc.

Assessment for Learning
As you go round the groups, see that all the students have understood how to play the game in the group.

Activity 3 What Doesn't Belong?

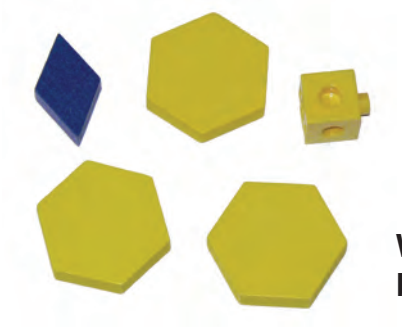
Objective
Identify an object that does not belong in a group.

Materials
A small set of crayons with a pencil in it
A small set of pebbles with a stick in it
A small set of plastic bottles with a glass bottle in it
A small set of green or fresh leaves with a yellow or dried leaf in it
A small set of rectangular blocks with a triangular block in it, from the pattern blocks
A small set of (green) triangular blocks with a (red) triangular block in it
A small set of yellow pattern blocks made of wood, 1 blue block made of wood, and 1 yellow snap-cube.
A tray for each set of objects above

Maths Note
An object not belonging in a group really depends on how one looks at the group, or what common features you are looking for and find in the group. So, as long as the reasoning behind is sound for the choice of the odd object, it should be accepted. So, it is important to have students explain the thinking behind their choices.

Activity Description
Have each of the sets suggested above in different trays. Display the contents of one set to the whole class, and let everyone see it. Say: **One of the things in this set does not belong here. Which one does not belong in the set?** Have children choose the one that doesn't belong in the group. Have children explain their reason.

Next, explain that each group will get a set of objects: **Now I am going to give each group a set of things. Decide on one object which does not belong in the set. You have to explain why you think that the object does not belong in the set.** Provide each group a set on the trays. Go around and talk with the groups, and help them. After everyone in the groups has understood, let the groups pass the set to the next group on their right side, and get a new set of objects from the group on their left. This should continue until every group has got all the sets of objects.



Which object doesn't belong in this set?

Assessment for Learning
See if students are able to identify the object that does not belong in a group. Also see that students are able to explain their thinking behind their choices. In case students are struggling, give them hints such as: **What colour is this? Is it the same colour as the rest? What is this made up of? Is it made of wood like the others here? What shapes are these?**

Variation
You could ask each group to make a set in which one object does not belong. The set is to be made from the objects given to them. The students should be told that they do not have to use all the objects. The set is then passed to another group that has to figure out which object does not belong.

You could also try asking each group to present to the class the group of objects they have and tell the class of their choice of the object that does not belong. The class can then ask them to give the reasoning behind their choice, and the group members explain that.

Reprint 2024

Lesson 4 Identifying Repeating Patterns

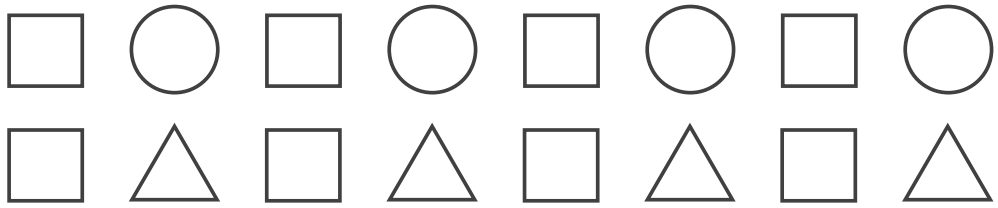
Lesson Goal

Students should be able to look at a simple repeating pattern and identify it.

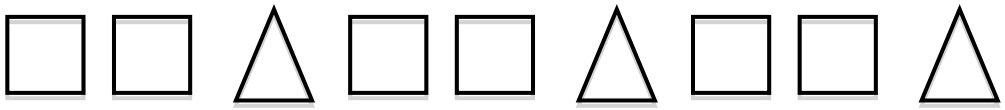
Relevant Maths Issues

Much of mathematics is built on pattern. For example, the fact that numbers alternate between even and odd is a pattern. When students later begin to learn higher numbers, there is a pattern in the way we say numbers: e.g. twen**ty**, twenty-**one**, twenty-**two**,… thir**ty**, thirty-**one**, thirty-**two**,…. Identifying repeating patterns is useful not only in everyday life, but for later success in mathematics.

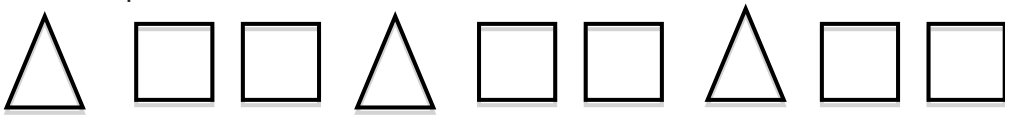
The patterns with which students should deal at this stage should be very simple ones. Although students need not be taught letter codes, you might want to think about these codes to make sure you expose students to a variety of pattern types. For example, we say AB when we mean a pattern where two different items are repeated over and over. Here are two examples of an AB pattern:



An AAB pattern would be one where an item is repeated twice, another item is used and then all three are repeated. For example:



An ABB pattern would be one where an item is shown, another item is repeated twice, and then all three are repeated. For example:



Patterns could also involve four items that repeat, e.g. AABB or ABBB or three different items, e.g. ABC (three items that are different and repeated over and over), etc. The group of items that repeat over and over is called the **core** of the pattern.

The students should probably begin with AB patterns. The students should see full repetitions of the part of the pattern that repeats. It is called the **core** of the pattern. For example, the core in the pattern above is: triangle, square, square.

The following activities have been designed to help teach the lesson. Some of the essential question that should be asked in the course of the lesson activities are:

How do you know this is a pattern?
What part of the pattern repeats?
How do you know that a square comes next?
What would come next? Why?

Activity 1 Patterns or Not Patterns

Objective

Identify a sound and physical action pattern from non patterns.

Activity Description

Have the students see and listen to this: clap, snap, clap, snap, clap, snap, over and over again. As you do this sequence of clapping and snapping, let them join you. Some of them will make mistakes in the beginning, but as you keep doing it, eventually everyone will fall in with the sequence.

Compare that to a more random sound pattern such as: clap, snap, clap, snap, snap, clap, clap, clap, snap, clap, snap, snap, clap, snap, etc. Ask the students to join you with the clapping and snapping. You and the students will realise that they cannot follow any order or pattern this time.

Explain the meaning of a pattern in very simple terms: **When things happen or repeat in an order so that you can see the order and follow it, it is called a pattern. The first type of clapping and snapping, in which all of us could join and do together, was a pattern. Let's do it once more;** clap, snap, clap, snap, clap, snap, …

What is not a pattern? When we can not follow any order in the things happening, it is not a pattern. The second type of clapping I did earlier was not a pattern. Demonstrate it once more, and ask the students to join you in the clapping.

Let us look at some more patterns. First do some simple AB patterns, like: Clap, tap (on the desk), clap, tap, clap, tap, …. Ask the students to join in and continue the pattern until you want them to stop.

You stretch both your hands up in the air, then bring the hands down such that the palms are at shoulders level. Repeat this hand exercise over and over again. As you stretch your hand up, say: **Up**, and as you bring down the hands, say: **Down**. So you do and say: Up, down, up, down, up, down, ... Ask the students to join you. This physical action pattern can be done better with everyone standing. Ask: **Was that a pattern? How was it a pattern?**

Maths Note

To help students get a feel for what a pattern is and what it is not, it would be useful to use physical action or sound patterns. In a repeating pattern, a certain component called the **core***, repeats over and over again. The students should notice the repeating core. It would be better to spend adequate time with the simple AB pattern first before moving on to patterns of the nature AAB, ABB, or other forms.*

Assessment for Learning

See that the students can describe why a certain sequence was a pattern and why a certain sequence was not a pattern. To help the students with their reasoning for calling a sequence a pattern or not, it would be good to discuss the sequence of the actions after each.

Variation

You can invent some more AB patterns with sounds and actions, like: cough, whistle, cough, whistle, …or calling out names, like: blue, yellow, blue, yellow, blue, yellow,…

Or you might bring students up in a line making a pattern where the first student sits, the next one stands, the next one sits, the next one stands, etc.

Encourage students to come up with an AB pattern and demonstrate to the class so that the rest can follow and join in.

Reprint 2024

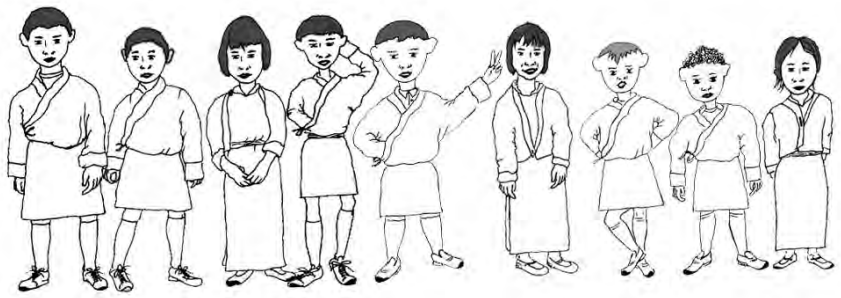
Activity 2 AAB and ABB Patterns

Objective

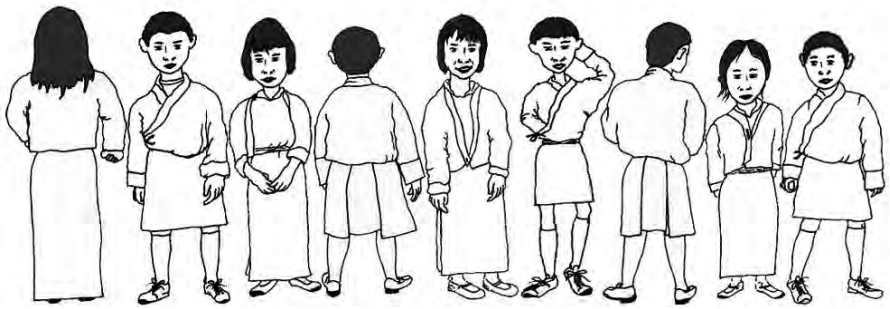
Identify and describe AAB and ABB patterns.

Activity Description

Call two boys and make them stand side by side facing the class. Call a girl and make her stand in the line. Call two more boys to join. Then call one girl to join. Call two boys to join. Call one girl to join. Now ask the class: **Is this line a pattern?** (yes) **Why is it a pattern? What is repeating in this line?** (boy, boy, girl)



Call 9 students to come to the front of the class irrespective of boys and girls. Let them stand in line, maybe height wise and all facing the class first. Then the 1st, the 4th and the 7th students in the line face the blackboard. Now ask: **Is this line a pattern? Why?** Here the core, or the group of things that repeat can be described in more than one way. One way is, "back, front, front" and it repeats. Other ways of seeing and describing the pattern would be, "head, face, face", and it repeats. Yet the third way of seeing this can be: "a pair of heels, a pair of toes, a pair of toes", repeating. Encourage students to describe the pattern in different ways.



Maths Note

After spending adequate time with AB patterns through sounds and physical actions, you could invent some easy AAB, and ABB patterns. You should also encourage the students to come up and lead the class with such patterns. Also insert some random actions which are not patterns and ask the students to decide if they were patterns or not. Do not forget to ask for reasons if a certain sequence is a pattern or is not a pattern. (Remember that someone may see a pattern that is different than others, though valid.)

Assessment for Learning

See that students can describe a pattern in terms of what repeats.

Variation

You can invent some easy ABB or AAB patterns with sounds and physical action. You can also encourage students to come up with a similar pattern that could be made with students, or with sounds or physical actions.

Activity 3 Patterns with Colours

Objective

Identify and describe simple repeating patterns made with colours.
Make simple repeating patterns with colours.

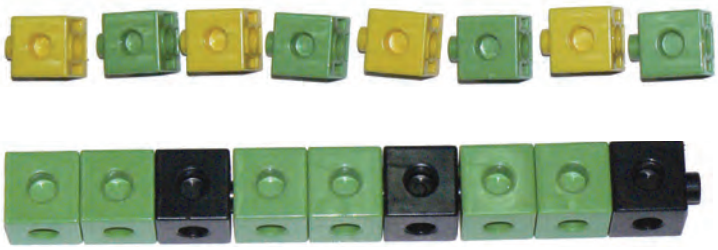
Materials

Linking or snap cubes in various colours, about 6 cubes for each student
Pattern blocks in various colours, about 6 blocks for each student
(Each student will be getting linking cubes in only two colours and pattern blocks in only two colours, not necessarily the same two colours fro each material)

Maths Note
Even though it would be logical to start making the colour patterns using identical shapes and sizes of materials, the focus should be on the colours. Students should realise that shapes and sizes are irrelevant if you are considering only the colours to see the patterns.

Activity Description

Show the linking cubes in two colours to the students. Say: **These are called cubes. They are in fact called linking cubes, because we can link these to one another.** Demonstrate the linking. **I will give them to you after some time, so that you can play with them, make patterns with them, and link them. But first, look here.** Make an AB colour pattern with the cubes with 6 or 8 cubes, so that every one can see them. Just arrange the cubes in line, and do not yet link them together. Ask: **Is this a pattern? How do you know that this is a pattern? Which two colours are repeating?** Stress on the colours. You can now link the cubes.



Then make an AAB colour pattern with the cubes using 9 cubes. Ask: **Is this a pattern? Why? What is repeating?**

Then repeat the process with an ABB colour pattern.

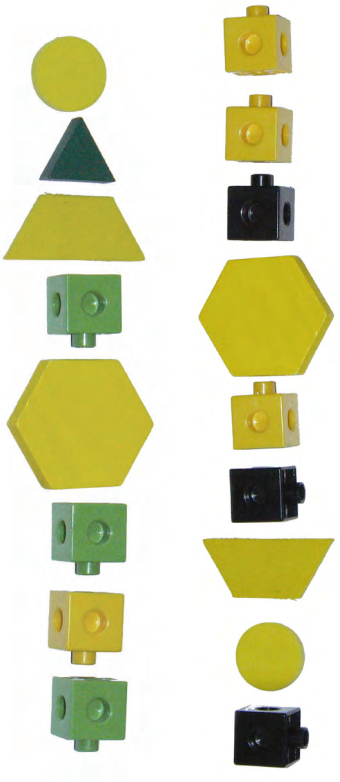
Provide the students with an adequate number of cubes in two different colours. Ask them to make colour patterns. Students can do this in pairs or individually. It is important that they should be able to describe why their pattern is a pattern.

Invite students' attention to an AB colour pattern you would make using not only cubes, but using cubes and pattern blocks. Ask: **Is this still a pattern? Why or why not?** Explain that if we are considering colours, it doesn't matter what shapes and materials we use, it is still a pattern.

Then make an ABB or an AAB colour pattern with different attribute blocks and cubes. Ask similar questions.

Distribute some attribute blocks to the students and ask them to make some more colour patterns using combinations of these blocks.

They should clearly identify which part of a colour combination is repeating. See that the shapes and sizes of the blocks do not fool them in terms of seeing colour patterns.



Assessment for Learning
The students should be able to describe why a pattern is a pattern.

Reprint 2024

Activity 4 Patterns with Shapes

Objective

Identify and describe simple repeating patterns made with shapes.
Make simple repeating patterns with different shapes.

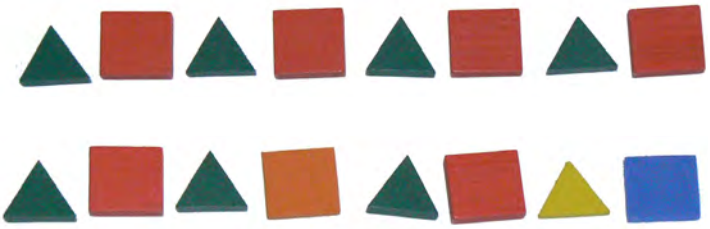
Materials

Sets of pattern blocks made of wood, and sets of pattern blocks made of plastics or rubber
Set of pattern blocks made of paper cut outs (you would have to make these out of some stiff papers)
Other materials such as coins and linking cubes

Maths Note
Even though it would be logical to start making the shape patterns using blocks of the same colour and size, the focus should be on the shapes. So opportunities should be provided for the students to realise that colour, size and materials of the objects do not matter in discovering shape patterns.

Activity Description

Make an AB pattern with two shapes using two kinds of pattern blocks made of the same material, such as triangle, rectangle, ttriangle, rectangle, triangle, rectangle. Display them so that every one can see them. Ask: **Is this a pattern? How do you know that this is a pattern?** Invite students' attention on the attribute of shapes and not the colours. But if some students find a pattern in terms of colour, then it should be accepted as a colour pattern. However, ask them to consider it in terms of shapes to see if it is a pattern.



Next, replace one or two triangles in the pattern with triangles made of rubber or plastics, or with paper-cut triangles, and ask: **Is it still a (shape) pattern? Why? Is it the same shape pattern as the previous one? Why?**

Then make an AAB or an ABB pattern using any two types of pattern blocks. The core has to repeat at least three times with your blocks such as triangle, hexagon, hexagon, triangle, hexagon, hexagon, triangle, hexagon, hexagon. Ask: **Is this is a pattern? How is this a pattern? What is repeating?** Then replace some of the blocks with their paper-cut counter parts, and ask: **Is this still the same pattern? Why?**

Provide the blocks, paper-cut shapes, and other materials like coins and linking cubes to each of the groups. Ask the students to use the objects they have to make shape patterns. As you go around, help the students who need clarification and assistance. Ask the students to explain how and why their arrangement of the shapes is a pattern. Reinforce the identification of the repeating cores.

Assessment for Learning
See that the students are considering only one attribute to decide whether a given arrangement is a pattern or not, in this case the attribute of shape. See that the students can identify the core (what part is repeating).

Once you are satisfied that everyone has made and explained his or her pattern, make an ABC pattern with shapes, and show it to the students, such as a circle, a rectangle, a diamond, a circle, a rectangle, a diamond, a circle, a rectangle, a diamond, and ask: **How about this? Have you seen anything like this so far? Is this a pattern? Why? What part of the pattern is repeating?**

Extension

Ask the students to make an ABC pattern with colours.

Activity 5 Singing Farm Animals

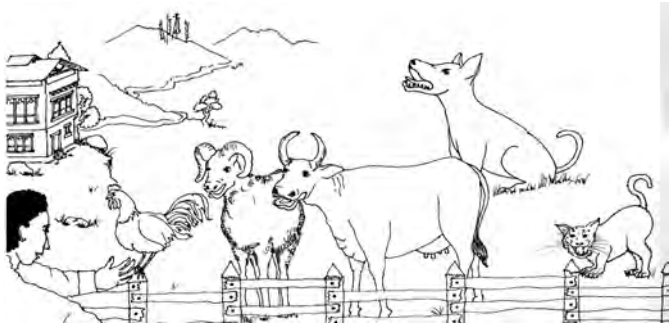
Objective
Identify and reproduce simple repeating sound patterns.

Materials
Chart reproduction of the picture given below – Ap Dorji's Singing Animals

Activity Description
Put up the chart picture you have drawn on the wall. Tell a short story about the picture: Say: **Today I want to tell you a short story. The story is about Ap Dorji and his animals. Ap Dorji is a farmer. He has some animals on the farm – a cow, a sheep, a pig, a dog, a hen, and a cat. All of Ap Dorji's animals can sing. Ap Dorji likes to make his animals sing. All of his animals love to sing. Do you want to hear Ap Dorji's animals singing?**

Maths Note
This activity allows the students to make sound patterns together in a fun way. Also it helps to identify and reproduce sounds of different farm animals. Start with a simple AB pattern first. Over time you can go for AAB, ABB, ABC, or AABB patterns with sounds.

I will be Ap Dorji. Can you act like his farm animals? Let's make a song with two sounds that will repeat over and over again. Which two animals will sing in our first song? OK what sound will (cow) make? And what sound will (pig) make? When I point to the animal on the poster, you sing the animal's sound. If I tap the picture two times, you sing the sound two times.



Now conduct a simple AB sound pattern (e.g., ombaang, maee, ombang, maee, ombang, maee…). Say: **We just made a sound pattern. Sing the two sounds in your head. What animal sounds are repeated over and over again?**

Select two different animals and make other AB sound patterns. Over time, make other types of patterns like AAB, ABB, ABC etc. After each song, discuss what animal sounds are repeated over and over again.

Assessment for Learning
Watch to see that every student is joining in on the singing. Some children may be feeling shy to make the animal sound. They can gently be asked to join the others as the others sing. As the teacher, you may need to lead and sing along with the students. Also see that students are able to identify what animal sounds are repeated over and over in each song, so that they understand it is a pattern.

Variation
This activity can and should be conducted as a game on other days, since the chart will remain on the wall for several days. The following is a variation to this activity.

Invite two or three students to come forward. Use the students' first names to sing a name pattern. For example: Karma, Karma, Tshering, Karma, Karma, Tshering, Karma, Karma, Tshering,…
You can invent a tune based on some songs. Encourage students to come up with some tunes too.

Reprint 2024

Activity 6 Patterns with Various Objects

Objective

Identify and describe simple repeating patterns made with different objects.
Make simple repeating patterns with different objects.

Materials

Pattern blocks in various shapes and materials
Pebbles/stones, leaves, sticks
Pencils, erasers, crayons
Beans, maize seeds

Maths Note
In this activity the patterns made are mostly based on the attribute of materials.

Activity Description

In advance, have the above materials in the class. Make any two patterns with any of the above objects. One such pattern is provided here as an example: leaf, pebble, crayon, leaf, pebble, crayon, leaf, pebble, crayon. Then ask: **Is this a pattern? How is it a pattern? What part is repeating? Is this pattern based on colour? Is this a shape pattern? Is this a sound pattern?**

Make and show another pattern, like, triangle, stick, stick, triangle, stick, stick, triangle, stick, stick, and ask similar questions as above.

Give the students the above objects in the groups, and let them make patterns. The students can show and explain the patterns they have made to others and the rest of the class. Make sure that they are able to describe their patterns. Some students may also make their patterns based on shapes and colours, which should be accepted. Encourgae the students to use the same set of objects to make more than one pattern. That is, after explaining the first pattern, the objects can be set up again in a new pattern, if possible.

Assessment for Learning
Ensure that every child is able to explain his or her pattern in terms of what part is repeating.

Lesson 5 Identifying Patterns in the Environment

Lesson Goal

Students should recognize shape, colour, number, and sound patterns that are around them.

Relevant Maths Issues

The patterns that the students should be looking for should be repeating patterns. Since there are many patterns around, be it human made or by natural, it would be good to expose the students to such patterns.

Activity 1 Pattern Hunt

Objective

Identify and describe simple repeating patterns inside and outside of the classroom.

Activity Description

Bring a piece of a painting or a picture which has a nice repeating pattern, and show it to the students. Ask if they can identify the pattern, and also ask why it is a pattern.

Maths Note
This activity invites the students to look for patterns that are already around them.

Show the students a pattern on a fabric, for example, the designs on your gho or kira. Explain to the students the pattern, and show them what is repeating.

Show the students an example of a pattern you see in the classroom. It may be an arrangement of something, like the furniture, or some design pattern on the floor or walls.

Then take the students outside the classroom and look for patterns in the environment. Ask the students to show you and others if they find any pattern. At each, stop and discuss why it is a pattern.

Assessment for Learning
See whether the students are actively looking to find patterns.

Variation

You can ask students to look for patterns at home. You can ask them to discuss with their parents, and they can bring things with patterns to the class the next day, so that they could show and explain them to the class. The things should be inexpensive ones like pictures from magazines, cloth pieces, etc that they can take care of and take back home.

Reprint 2024

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 1 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 objects according to various attributes.	Compare objects and describe the similarities and differences.	Sort a collection of objects into two or more groups.	Re-sort a collection.	Recognise a sorting rule.	Describe why an object does or does not belong in a set.	Identify simple repeating patterns.	Describe the repeating part in a simple repeating pattern.	Make simple repeating patterns with objects.
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Summative Assessment Recording Sheet (For Class PP)

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

CHAPTER 1 SORTING AND PATTERNING

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

Task and Interview prompts	Key concepts and skills to look for
Task 1 Present the student with a collection of about 10 objects. Have the student to pick up an object, and say: **Tell me everything you can about this object.** You could ask other probing questions like: **Is it heavy/light? Will it roll? etc** Have the student sort the objects into groups. Say: **Sort the objects into two groups. What is same about the objects in this group? And what is same about the objects in the other group? So what sorting rule did you use?** Show an object, and ask the student to which group it would belong. Say: **To which group would this belong? Can I put this with this group? Why? Why can't we put this with this group?** Have the student put the object back together. Ask the student to sort the objects again in a different way than before.	*The student is able to :* - Describe objects using attributes like colour, shape, material, use, mass, behaviour etc. - Sort a collection of objects into groups using a sorting rule. - Describe the sorting rule. - Describe the similarities and differences between object. - Describe why an object does or does not belong in a group. - Re-sort a collection, or sort a collection in more than one way.
Comments and Mark: **Teacher's Signature and Date:**	

Task 2 Present the student with a simple repeating pattern using snap cubes of two colours. Ask: **Is this a pattern? Why or how is it a pattern? What is the part that is repeating in this pattern?** Replace one of the cubes with a different object but having the same colour as the cube. Ask: **Is this still a pattern? Why?** Provide the student with a collection of either cubes in two different colours, or two different shapes, or two different materials, and ask: **Make a simple pattern with these. Why do you think that is a pattern?**	*The student is able to :* - Identify a simple repeating pattern. - Identify and describe the repeating part (or the core) of a pttern. - Recognize that other attributes do not matter when the pattern formed is based on colour. - Make a simple repeating pattern. - Describe the pattern made.
Comments and Mark **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 1

Total CA mark from Chapter 1(Task 1 and Task 2: Mark out of 20): _____

Overall remarks on the student

Strengths:

Areas of Need:

Follow up Steps:

Reprint 2024

CHAPTER 2 NUMBERS TO 5

Chapter Overview

The students will come to class PP with differing knowledge and abilities related to counting. Some may know the counting words, but not how to use them to count objects. Others will not even know the counting words. The way the lessons and activities are introduced and structured in this chapter assumes that the students have minimal knowledge and experience with number and counting. Those students who have already gained relatively advanced knowledge informally from preschool experience will also benefit from going through these sequenced lesson activities.

This chapter introduces the students to the numbers 1 to 5. The number 5 is an important benchmark for the students. The number 10 is another important benchmark, which will be dealth with in chapter 5. Students will explore many arrangements, or representations, of these numbers to build a strong foundation for further work. The activities listed in this chapter also help students develop appropriate vocabulary related to early number, such as *more than, less than,* and *the same*.

This chapter has 5 lessons as detailed in the table of contents. The concepts and experiences with numbers are further developed in chapters 5 and 11.

Basic Principles about Counting and Numbers

- In counting, one, and only one, number is said for each object, and the last number spoken tells how many.
- There is a consistent set of counting words that never changes.
- No matter what is counted, the process for counting remains the same.
- The order in which objects are counted does not matter; the number of objects in the set does not change.
- To understand what a particular number means, students must experience and create many representations for that number.
- Relating numbers to 5 helps students compare numbers, gives meaning to the numbers, and supports subsequent work in addition and subtraction.

Chapter Goals

- Compare small quantities and be able to say which is more, less (or fewer), and the same.
- Sort sets based on the attribute of number.
- Count sets to five.
- Create sets to five and describe their parts.
- Write numerals from 1 to 5.

Maths Words

more than, less than, fewer than, the same, one, two, three, four, five.

Initial Assessment

It is important to learn what knowledge students bring to the unit so that appropriate lesson adjustments can be made. There are many ways to collect initial assessment information.
Several ideas are suggested here.

Ask the students if there are enough of something for some purpose, e.g. are there enough crayons for everyone at the table, or are there enough pieces of paper for all the students at the table.

Have the students create a picture with shapes of different colours and ask if there are more red shapes or blue ones.

Lay out 5 counters and ask the students to count them. Find out if they know the counting words; listen to learn whether they count properly.

Provide counters to the students that are different colours—ask them to show you three counters. Ask them to show you more red counters than blue ones (or other suitable colour comparisons).

If the students are very successful with these tasks, you may want to take that into account as you decide which of the chapter activities to do or which you might want to omit or make more complex.

Lesson 1 Comparing Small Quantities

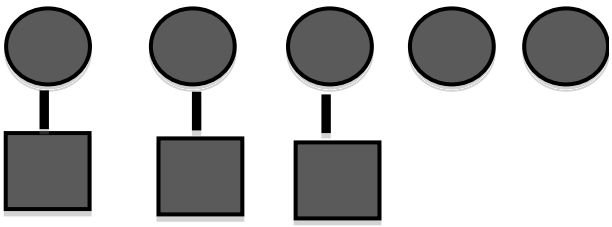
Lesson Goal

The students should be able to observe whether two amounts that are 5 or less are equal, and if unequal, which amount is more or which amount is less.

Relevant Maths Issues

The number 5 is an important benchmark. We know that students can visualize the amounts of 1, 2, 3, 4, and 5 without counting once they become familiar with the words (*one,two, three, four, five*) and symbols (1, 2, 3, 4, 5) and what they represent. Mathematicians call this *subitizing.* It is a valuable skill to develop in the students and will be addressed again in future. But to get a sense of what these numbers mean, the students need to compare groups or sets consisting of 1, 2, 3, 4, or 5 objects with other groups or sets of these numbers.

The initial strategy for the students to compare sets is to match them using one-to-one correspondence rather than counting them. For example, they know that there are more circles than rectangles since when you match them up, there are left-over circles.



Some students will figure this out on their own but other students will need help to come to this understanding.

The students should meet the language “a is *less than* b” as well as “b is *more than* a”. You can also use the terms *fewer than,* or *the same.* Make sure students recognize that if one set is more than another, the second set is less than the first.

A few essential questions that should be asked during the course of the lesson activities are:

How do you know there are more _____ than _____?
How do you know there are the same number of _____ as _____?
How can you find out whether there are more _____ or more _____?

Activity 1 Are There Enough?

Objective
Identify and describe sets with the same, more or fewer objects.
Use the phrase *more than.*

Materials

Activity Description
Set out 2 chairs and bring 3 students to the front of the room. Ask: **Are there enough chairs for the students?** Have students explain how they know there are not enough chairs. Once the students have drawn their conclusions, use the language: **There are more students than chairs.** Let them test their conclusion by having the students try to sit in the chairs.

Then put out a line of 5 chairs. Do not say the number of chairs. Tap 4 students and ask them to come up front. Before they sit down, ask the other students to predict if there are enough chairs and to say how they would test. Say: **Are there enough chairs for these students? How would you know?** Use the language: **There are more chairs than students.**

Change the number of students and the number of chairs repeatedly. Each time, ask: **Are there enough chairs?** Make sure that sometimes there are more chairs than students, and sometimes more students than chairs. Proceed to make an appropriate conclusion, by saying something like this: **There are more _____ than _____.**

Variation
You might also compare the number of boys and girls. For example, bring 5 boys and 4 girls to the front of the class. Ask: **Are there more boys or more girls? How do you know?** Vary the number of boys and girls repeatedly so that sometimes there are more girls and at other times there are more boys. Each time, have the students say: **There are more _____ than _____.**

Other things you could use to compare are:
Number of notebooks to pencils.
Number of books to students.
Number of cups to plates.

Maths Note
One way to help the students compare the size of two small sets is to ask whether there is enough of one thing for some purpose. In this activity, the matches are "natural" and not artificial since students normally do get matched to seats.

Assessment for Learning
Make sure that the students' ability to tell whether there are enough chairs does not depend on how the chairs are arranged. For example, the students might think there are enough chairs if the chairs are close together, but not if they are far apart. For this reason it might be useful to repeat the activity a number of times but change the placement of the chairs.
Watch to see if the students need to physically move things to match them or whether they can match visually. Some students will take longer than others to be able to match visually.

Activity 2 Comparing Sets

Objective
Compare sets when the items are different in size.
Use the phrases *more than*, *less than and the same.*

Materials
8 cutout rectangles, all of which are of the same size and 4 of which are coloured red and 4 are coloured blue
2 large cutout circles, such that the two circles take up more space than 4 rectangles

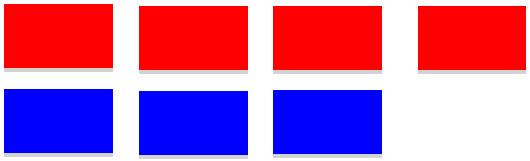
Activity Description

In advance, prepare the 8 cutout rectangles and 2 cut out circles as mentioned above.

Show a rectangle to the students and introduce the shape as: **This shape is called a rectangle. I have some red rectangles and some blue rectangles.** Put down 4 red rectangles and 3 blue rectangles, not arranged in any order, where every one can see. Then ask: **Are there more blue rectangles or more red rectangles?** After the students predict the answer, ask how they can be sure. Encourage them to line up the rectangles to match them one-to-one. Say: **There are more red rectangles than blue rectangles.** The students should say this after you.

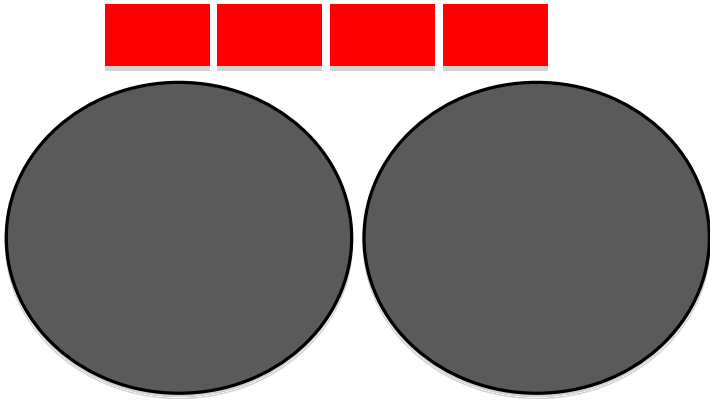
Then ask: **Are there less red rectangles or less blue rectangles?** After the students have predicted and confirmed, say: **There are less blue rectangles than red rectangles.** Have the students to say this after you.

Now add one more blue rectangle, and ask: **Are there less blue rectangles than red rectangles now?** Introduce the term **as many as**. After you and the students have matched one-to-one the two colours, and seen that the one is not less than or more than the other, say: **There are as many blue rectangles as red rectangles.** Have the students say this after you.



Then remove the four blue rectangles and place 2 large cutout circles in their place, such that the 2 circles occupy larger space than the 4 red rectangles.

Ask the students if there are more rectangles or more circles. Ask which there are less of, as well. Make sure the students realize that if there are more rectangles, there are less circles.



Ask why there are more rectangles, even though the circles take up more space.

Repeat the activity using other objects of different sizes where sometimes less of the larger objects, sometimes more of them and sometimes the same number are used. Desks, books, and windows may work. Also, natural objects such as stones and leaves can be used. Remember to always ask one of these questions:

Maths Note

Students sometimes are "tricked" by the size of objects; if the objects are large, they may think there are more than there really are. This activity is designed to ensure that students make a distinction between the attribute of size and the attribute of number. But first we provide the opportunity to compare sets where the objects are the same size.

Special Note

In the Student Activity Book (pages 12 - 16), the activities ask students to compare small sets and write words such as more, less, and the same, as you will notice. However, you may realise that some or all of your students are not yet ready to do the writing, as it is will be fairly in the early part of their year in class PP. While you are encouraged to make the students write these words, you could skip them and make do with children being able to say these comparative words verbally. And then, you might like to revisit these activities towards the later part of the year for the students to do the writing.

Reprint 2024

How do you know there are more _____ than _____?
How do you know there are the same number of _____ as _____?
How can you find out whether there are more _____ or more _____?
If there are more _____, which are there less of? How do you know?

Let the students work in pairs doing the same activity with partners.

Assessment for Learning
Continue to look for the strategies students use to compare—whether they count or whether they use one-to-one matching. Both strategies are useful; eventually we want students to use counting, but not until they are ready.

Activity 3 Building Towers

Objective
Create and describe a set with the same, more or less objects than another set.

Materials
Linking cubes

Activity Description
Provide each student or small group with a set of loose linking cubes or blocks. Make a tower with 5 cubes or blocks, and have the students make the same. Then have them make a tower each which uses fewer cubes than 5. Ask them to say or show how they know the second tower uses fewer blocks. The students should observe that there are different possible responses. Some students might build a tower just slightly shorter (e.g. using 4 blocks) whereas others might build a tower much shorter (e.g. using 1 block).

Set up five possible tower heights, the tallest being made of 5 blocks, in the front of the room so all of the children can see them. Make sure these heights are all represented: 1 block, 2 blocks, 3 blocks, 4 blocks and 5 blocks. Ask the students to choose one of the towers. Then ask them to build a tower with the same number of blocks as that of their choice. Then ask them to choose to build a tower with either more blocks or fewer blocks. Ask individually or in the small groups: **Did you build your last tower with fewer (or less number of) blocks or more blocks? How do you know it has fewer (more) blocks?**

Maths Note
When students are encouraged to create sets with more or less objects than another set, there is not just one correct answer; many responses are possible. This allows for more success for more students. The activity described below helps students to create one-to-one matches as they build towers on the same surface so the relative heights of the towers relate to the relative numbers of blocks used to build them.

Assessment for Learning
Continue to watch whether the students are using counting or one-to-one matching to compare the size of sets. Observe whether the students are more successful in creating sets that are greater as compared to sets that are less; this sometimes happens. If the students struggle creating sets with fewer objects, help them see that if they matched their original set and then took objects away, there would be fewer objects.

Variation
You can use pattern blocks (or other suitable materials), in case of an insufficient number of linking cubes. Make sure that each student or group uses identical pattern blocks (or materials) in terms of size and shape.

Activity 4 Breaking Up a Set

Objective
Create and describe sets with the same, more or less objects.

Materials
Counter or blocks – about 10 for each pair of students

Activity Description
In advance, have ready about 10 counter or blocks for each pair of students.

Call 6 students to the front of the class. Say: **This is a group of students. I am going to break them into two smaller groups.** Then make two students stand separately. Ask: **Which of these two groups has more students? How do you know? Which has less (or fewer) students?**

Send one student from the smaller group to the larger group. Then ask the same questions as above.

Ask if it is possible to have the same number of students in the two groups, and how to do that.

Provide pairs of students with a set of 6 objects (counters or blocks). Ask them to break the set into two smaller sets, and to describe or show you which smaller set has more objects, or less (fewer) objects, or the same number of objects. Ask them how they know that. Where the students have not broken their set into equal numbers of objects, you can ask: **Is it possible to have the same number of blocks in both your sets?**

Repeat the activity using 5 objects (where it is not possible to make two equal groups). Here you will have to take back 1 block from each pair of students, or have them set 1 block aside.

Then have the pairs of students use 2, 3, 4, 5, 6, 7, 8, 9 and 10 blocks one at a time to create two equal sets with each of these. With each set, ask them if they could create two smaller sets each having the same number of blocks.

Then ask them to create two smaller groups with different numbers of counters and tell which group has more and which group has fewer blocks.

Maths Note
Although this activity is designed to allow the students to compare group sizes, it also has the potential to help the students contrast "even" numbers with "odd" numbers, without calling them that.

Assessment for Learning
Continue to watch to see how the students compare quantities. Notice if they use a strategy to keep decreasing one set and increasing another in a regular way to create other combinations of sets or if they start from the whole each time. The first way shows more sophisticated thinking than the second way.

Also see if they notice that once the number of objects in Set A is more than in Set B, that moving objects from Set B to Set A will not change the comparison. This, too, shows a more sophisticated number sense.

Reprint 2024

Lesson 2 Sort Sets Based on Number

Lesson Goal

The students should be able to distinguish between groups with a particular number of items, and groups with a different number of items.

Relevant Maths Issues

In order to really understand what, e.g. 3, is, students need strategies to recognize which arrangements show 3 and which do not. That means showing a lot of sets at the same time, some of which have the same number of items, but others of which do not.

Make sure to have situations where the students see only three sets, two of which have the same number and ask which sets have the same number of things in them. Then provide opportunities for the students to work with other numbers of groups and ask them which show particular numbers, e.g. which show 5. In this lesson we restrict the numbers in the sets to 5 or fewer.

A few essential questions that should be asked in the course of the lesson activities are:

Which two sets show the same amount?
Make a set that has the same amount as this set. How do you know it is the same amount?
Which shows a lot? Which shows less?
Which shows this many (say 4)? How do you know?

Activity 1 What Can an Amount Look Like?

Objective

Recognize alternative arrangements of a quantity.

Materials

Counters – 5 for each student
Half sheets of plain papers – 5 such papers for each student

Maths Note
In order to have confidence that a quantity does not change with physical arrangement, students benefit from rearranging the exact same objects into different arrangements. In this way they are more confident that the number could not have changed.

Activity Description

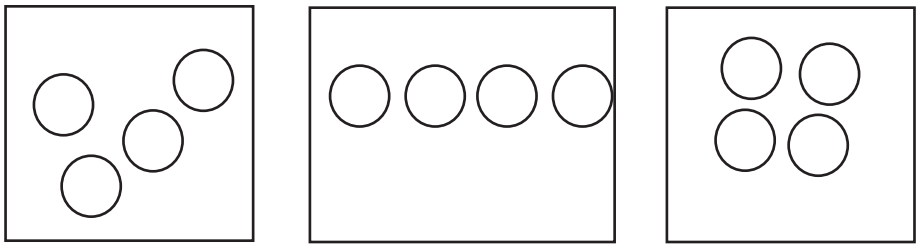
Provide each student with 3 counters and a half sheet of a plain paper.

Ask the students to arrange the counters however they would like and then to draw a picture of their arrangement on the sheet of paper provided. They could place the counters on the sheet of the paper and draw by tracing around the counters. After everyone has drawn their pictures, encourage them to show and compare with each other.

Then post the pictures drawn for 3 counters on the wall. Have them look at all the pictures posted. Stress that all the pictures show the same number of counters, i.e, 3. You should show the 3 counters. At the same time, raise 3 fingers on one hand to show the same number. Ask the students also to raise 3 fingers, always on one hand. You can also show 3 pencils to show the same representation for 3.

Then give the students 1 more counter each so that they all have 4

counters. Also provide them with a half sheet of paper each. Ask them to draw the 4 counters in whatever arrangements they like. Let them first share their drawings. Then post the pictures for 4 counters on the wall, a little away from those drawn for 3. Stress that all these pictures represent 4 counters. Show the 4 counters. Show 4 pencils. Raise and make them raise 4 fingers on one hand. You could also say the number "Four". For 4, the pictures may look like this:



Assessment for Learning
Watch to make sure that the students realize that the number did not change when they rearranged the objects, or that the different arrangement and their drawings for the same amount represent the same amount.

Repeat the activity for 5 counters, 2 counters and then 1 counter in a similar manner.

Activity 2 Which are the same?

Objective
Sort small sets to determine which do or do not have the same number.

Materials
Counters, papers

Activity Description
Set up three sets of counters, each on a different piece of paper so that they are clearly separate groups. A set should not contain more than 5 counters. Two of the sets should have the same number of counters. Explain that each is a group or a set. Say something like: **I have three sets of counters here, one, two and three. Which two sets show the same number of counters? How do you know? Does the other one show more or less? How is that less (more)?**

Maths Note
Before asking students to create sets with a given number, it is helpful to make sure they can distinguish between sets that do have the same number and those that do not.
Allowing the students to create the sets to compare and sort gives students another opportunity to practise creating sets that are more, less or the same.

Repeat with three different sets of counters, again where two have the same number and the third is different. Again, the number of counters in sets should not be more than 5.

Provide about 15 counters to each pair of students. Ask the pairs to play a game, in which one partner makes three sets, two with the same number and one with a different number, and the other figures out which two sets are the same, and which one is different. Then the partner who made the sets asks whether the third set has more or fewer counters. The two partners then change roles.

Assessment for Learning
Observe whether the students simply recognize different arrangements of the same set or whether they use matching one-to-one or counting to compare the sizes. Over time, the students should be able to recognize quickly small quantities even in a wide variety of arrangements.

Reprint 2024

Activity 3 Sorting Sets

Objective
Sort small sets to determine which have the same number.

Materials
Counters
Plain papers

Activity Description
Provide pairs of students with 2, 3, 4 or 5 counters, and a sheet of plain paper. Make sure different pairs of students receive different numbers of counters.

Ask each pair to draw a picture of their counters and bring the picture to the front. Lay out all the pictures, perhaps in two groups if there are many students, and ask the students in each group to arrange the pictures so that the those showing the same number of counters are put in the same pile.

You may also take down some of the pictures you have posted from Activity 1, and mix them up with the current drawings.

After the pictures are arranged in piles of 1, 2, 3, 4 and 5, ask the students which pictures show more and which show less. Then ask if they think that any picture shows *a lot* (or perhaps they think that none of them do).

Show one more set of 3, 4 or 5 and ask the students to make a set with the same number.

Maths Note
The students are using more visualization skills in this activity than in previous ones since they are matching pictures. However, they are still using concrete manipulatives to prove that the indicated sets have the same number.

Comparing the sizes of sets provides additional practice in comparing. Creating another set with the same number provides additional practice in creating sets of a particular size. Asking the students if they believe that any set shows "a lot" encourages them to begin to form a personal notion of what a lot or a little might mean. This will form a foundation for later realizing that this depends on context.

Assessment for Learning
Observe whether the students have difficulty sorting using just pictures or whether they need the counters to help them. Similarly, observe if they use visual cues or concrete objects to make a set with the same number. The goal is to move toward more visual comparisons once the students are ready to do so.

Lesson 3 Counting and Identifying Sets to Five

Lesson Goal

The students should use the counting principles described at the beginning of this number section to be able to identify how many are in a set, up to the number 5.

Relevant Maths Issues

The counting principles listed at the start of this section are very important. Until the students use these principles, they will have difficulty counting correctly. But the students develop the principles not by having them said to them, but through experiences where they observe the teacher using those principles, and through the opportunities provided them to practise the same.

One of the most important things a teacher can do to help the students learn to count is to teach them how to organize what they are counting in order to keep track of what has already been counted and what has not. For example, to count 5 pencils, show the students how you might move pencils that you have counted to the side as you continue counting the rest of the pencils. Some students might count by using their fingers—showing one finger for each number counted. This is a reasonable way to keep track of counting.

It will be very difficult for most students to count unless they have already internalized the number words *one, two, three, four, five, etc.* Help the students see that you say one and only one number as you count each item and that the numbers go up in the number rhyme chant.

It is best not to bring the number 0 up early in the year, if at all.

The students can work with the numbers orally at first. Later they will learn to write the numerals for the numbers from 1 to 5.

Use of a 5-frame, a row of 5 boxes in which the students might put counters to keep track of a count, is very helpful. The 5-frame also helps the children in the visualization of small quantities and comparing small numbers.

Rote counting (i.e. saying one, two, three, four, five, ….) is very different from meaningful counting. The students may be able to rote count but still have difficulty with actually determining how many.

Make sure that the students count items in their everyday world. These might be how many pencils they have, how many students sit beside them, how many teachers are in the room, or how many brothers or sisters they have.

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

Which number tells how many _____ there are?
How many_____ are there?
Show me 4 fingers.
(Count 4 items by saying 1, 2, 4, 5) **What did I do wrong when I counted?**

Reprint 2024

Activity 1 The Counting Order

Objective

Say the counting words in the correct sequence from 1(one) to 5 (five).
Determine the number of objects in a set up to 5 by counting.

Materials

Activity Description

Tell the students that today we will learn how to counts using numbers. Say : **Let us see how many fingers I have on my right hand**. Say the counting words, **one, two, three, four, and five** as you raise the fingers starting from the thumb to the little finger on your right hand. Say: **I have five fingers on my right hand.** Repeat the counting of the fingers on the right hand, bu this time have the students count with you. Do it similarly with the left hand.

Then ask: **How many fingers have I on my left hand? How many fingers did we count on my right hand? Which hand has more fingers?** Listen to the responses from the students.

Have the students first make a fist of their right hand, and then count the fingers on it as they raise them one after another. You could lead the counting. Ask: **So how many fingers do you have on your right hand?** Repeat the counting process with the fingers on the left hand.

Now let us count to see how many eyes we have. As you point and touch each eye with your index finger, say **one, two**. Children do the same to determine that we have two eyes. **How many eyes do I have? How many eyes do you have?**

Now let us see how many hands we have. Raise your right hand and say, **one**. Raise the left hand and say, **two**. Ask the students to do the same. **Do we have any more hands? So how many hand do we have?**

Show with appropriate actions as you say the following: **So we have five fingers on each hand, we have two eyes, and we have two hands.** Have the students say and do similarly with actions. **What two things do you see in the classroom? Show me that? How do you know that it is two?**

How many noses do we have? How many mouths do you have?

Similarly you can count other parts of the body for numbers up to five. Also encourage children to look for things in the classroom that they can see in ones, twos, three, fours, or fives.

Variations

The counting practice with objects up to five should be provided during the following days as much as possible. For example, you can ask children to count and tell how many counters are there in a set you give them; how many students are there in front of the class; how many blue blocks are there in a set. Initially, you should insist children on counting the objects physically.

Maths Note
Saying counting words in sequence is a critical skill in being able to count to determine quantity.
It is important for the students to get comfortable with the counting words one, two, three, four, and five.
This activity uses the counting principles of counting in sequence and recognising the amount in a set as the last number counted.

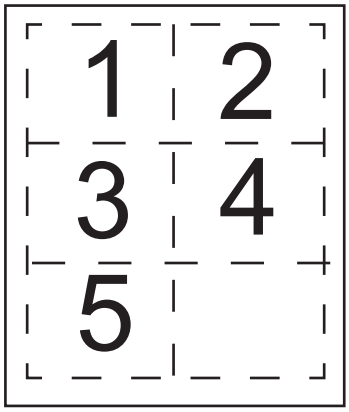
Special Note
This activity is designed to benefit the students by lettnig them know the names of the body parts in the process of learning to count. But, as the teacher, it is extremely important for you to know if any student in the class has any finger missing or any extra finger on their hands or other related physical deformities. If such cases exist in your class, please modify the activity in a suitable manner, or better, do not use it at all. Instead, practise the counting with external objects as suggested in the variation section of this activity.

Assessment for Learning
Observe that students are fluent in reciting the number words from one to five. Also see that they know that the last number word said is the quantity of the objects in the set.

Activity 2 Introduction to the Numerals

Objective
Recognise and relate the numerals 1 to 5 to numbers and quantities.

Materials
Numeral cards from 1 to 5



Activity Description
In advance, prepare large numeral cards with the numerals 1, 2, 3, 4 and 5 on them. You could use the numbers given in the Student's Activity Book on page number ___ to prepare the numeral cards, by cutting them out and pasting them on some stiff papers. If possible laminate them for future use.

Put up your left hand making a fist, and ask the students to do the same. Raise your thumb and say the word, **one.** All the students will be doing and saying the same. As you say one, show the numeral card for one. Then with the thumb still raised, raise you index finger and say, **two**. As you say two put down the card for one, and show the card for two. Continue the process until all the five fingers are raised and the card for five is shown.

1

2

3

4

5

Select 5 students to come to the front, one by one. As each student comes to the front of the class, say the number word and show the numeral cards in sequence up to five.

Do the same again with a different group of 5 students. Repeat several more times. Sometimes you might ask a student to hold up the correct card as you say the number of students currently at the front; other times you might ask a student to say the number as you hold up a numeral card for the number of students currently at the front.

Make sure that the number of students who are at the front always matches the card being shown and the number being said.

Assessment for Learning
Observe how comfortable the students become with reciting the number words in sequence fluently. Also observe how familiar they become with the numerals. Both of these are important mathematical skills.

Variations
If you feel the students are comfortable with counting to five. Try counting backwards with the final groups of five students. Begin with them all at the front and the number five being shown. Have them leave one by one, counting down until only one student is left. (Avoid getting to zero.) This could also be achieved by bringing only four students and the teacher would be the fifth person. Then all students get a chance to be seated and there remains one person at the front.

Reprint 2024

Activity 3 Count to 5

Objective

Use the counting principles to count concrete objects by touching them.

Materials

Counters
Numeral cards from 1 to 5
A container

Activity Description

Bring 4 students to the front of the room. Model how to count: Approach the first student, say **one**, and have the student move over to the side; approach the second student, say **two**, and have that student move over to the side. Repeat until all students have been counted and then say out loud: **Now I know there are 4 students.**

Talk with the students about how moving the students away once you had counted them made sure you didn't count anyone twice or miss anyone (since nobody would be left).

Ask the students if they think there would still be four students if you had counted the students in a different order. Model that counting as well.

Provide pairs of students with different numbers of counters—some should have 1, some 2, some 3, some 4, and some 5. Have the pairs count to say how many they have. Have the students trade counters to count other amounts.

After the students have exchanged their counters and counted to see how many they have presently, ask each pair to come in front and tell the class how many counters they have. Keep a container ready for the children to put back the counters. For example, if a pair has three counters, they say: **We have three counters**, and put the counters in the container one by one as they count, **one, two, three**. As a student drops the counters it should make a dropping sound. Then one of them can pick up the numeral card 3 and shows it to the class.

Repeat this activity with the pairs of students each taking a different number of counters out of the container than they had the first time. You may ask them to all take out a greater number of counters than before (unless they had five counters in which case they would take out fewer). If there is a shortage of counters, it could be that each pair is to choose to take out either one fewer or one greater than the number they had before.

Maths Note
It is important to show the students that you touch each object as you count it and that once an object is counted, you do not count it again. It is also important to show them each of these concepts: that the order of counting is irrelevant, that the number does not change if the counting is done differently, and that the last number said tells how many. Finally, it is important to share techniques for making sure objects are not counted twice or omitted.

Assessment for Learning
Observe whether the students make sure they count each object and say each number word once as they count.

Activity 4 Counting with a Rhyme

Objective
Say the counting words from one to five.
Read and say the rhyme fluently.

Material
Chart size reproduction of the rhyme

Maths Note
This activity will be fun as well as providing a learning opportunity in terms of both Mathematics and the English language.

Activity Description
In advance, write the rhyme given here on a chart paper and display it. Explain to the students that you are going to sing a rhyme together. Read the rhyme from the chart by point at each word clearly once. Then have the students say it after you as you read the rhyme from the chart repeatedly for several times.

Discuss with the students the simple story in this rhyme. Explain the meanings of the words. Stress and show how the pairs of sounds have the same (similar) endings. For example, bees with sees, and hive with five.

Here is a Beehive

Here is the beehive, where are the bees?
Hidden away where nobody sees
Watch and you will see them come out of their hive,
One, two, three, four, five.
Buzz, buzz, buzz, buzz, buzz.

Then say the rhyme aloud without reading from the chart with some tune and action with your hands as indicated below. Have the students do the same with you after your demonstration.

Here is a Beehive

Here is the beehive, where are the bees? *(clench fist)*
Hidden away where nobody sees
Watch and you will see them come out of their hive,
One, two, three, four, five. *(bring out the fingers one after another quickly)*
Buzz, buzz, buzz, buzz, buzz.

Assessment for Learning
See that each student can sing and pronounce the words correctly.

The rhyme can be sung on other days also. And it will be nice if students can by heart (memorise) it and sing it anytime in the future.

Extension
The following is a nice little rhyme that would be especially useful to consolidate the concept of number one. You might like reproduce the rhyme on a chart and sing it in the class.

One Little Flower, One Little Bee

1 little flower,
1 little bee.

1 little blue bird,
up in the tree.

1 little brown bear
smiling at me.

1 is the number
I like to see.

1

Reprint 2024

Activity 5 Look for Amounts in a Picture

Objective

Count small sets (5 or less) of pictures.
Identify the number counted with the correct numeral.

Materials

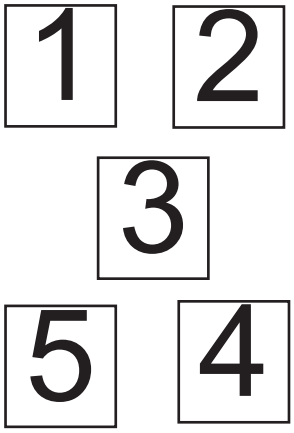
Poster showing the pictures of 5 different animals
Numeral cards from 1 to 5

Activity Description

In advance, prepare a large poster that shows a variety of animals. Make sure there are 5 of some animals, 4 of some animals, 3 of others, 2 of others and 1 of another animal. The animals of the same type do not have to be together in the poster. You can either draw the poster as the one shown here or you might cut out pictures from some old books, magazines, or down loaded from the internet and paste them on a chart.

Maths Note
In this lesson, counting is extended to counting pictures and not just concrete objects.

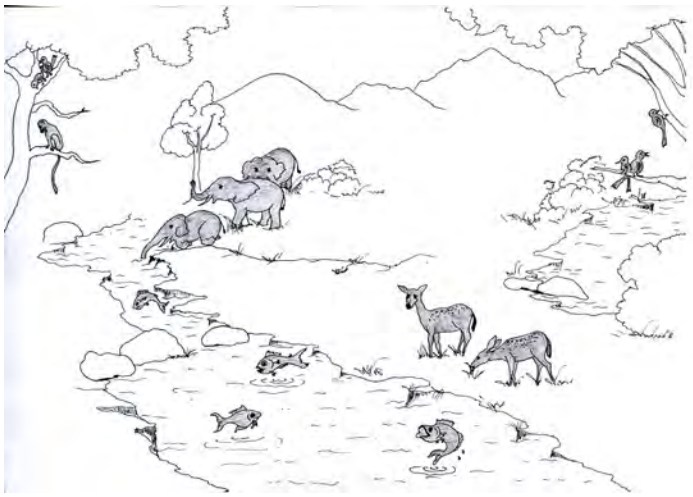
Ask the students to look for the fish. Ask: **How many fish are there? How could we count them?** With the students, count: **1, 2, 3, 4** and say: **There are four fish**. As you count, you may want to put up one finger for each animal you count, modeling for the students the potential to keep track of a count on fingers. Ask the students: **Why did I say 1, 2, 3, 4 and not 1, 2, 4, 5? Suppose I said 1, 2, 4, 5—would there be 5 fish?**



Make sure the students continue to observe your counting technique, counting each picture once and not counting it again once it has been counted. Recount the pictures starting at a different one of the animals to help reinforce that the number does not change if the objects are counted in a different order. If students seem to be having difficulty, you might mark each animal once it is counted, for example with a sticker.

Then ask the students to help you figure out how many of each of the other animals there are.

After determining the number of each animal, ask a student to pick up and show the correct numeral card. Sometimes you test the students by picking up and showing a wrong numeral card. For example, you have counted the number of yaks as four. Pick up the card showing 3, and ask: **Is this four? Does this card show four?**



Assessment for Learning
Observe whether the students find it more difficult to keep track of a count when they cannot move the objects they have already counted. If that is the case, they should continue to count concrete objects they can touch or they should use some method of marking an object once they have counted it. Some students might still not associate the number of animals with just the last number that is said. They might need additional modeling of proper counting.

Activity 6 Find the Animals

Objective
Identify and count sets to 5.
Identify the numeral with the corresponding number up to 5.

Materials
5 small empty containers
Counters
Numeral cards from 1 to 5

Activity Description
Use small containers under which you can hide counters. Pretend with the students that the containers are caves and that animals are sleeping in the caves.

Slide 3 counters under a container and say that there are 3 yaks sleeping in this cave. Slide 1 counter under another container and say there is 1 tiger sleeping in this cave.

Repeat sliding different numbers (5, 4, 2, 1) of counters under other containers, indicating different animal types each time.

See if the students can remember where 3 was by asking them which cave had the 3 yaks. The students check to see if the number is correct by counting the counters under the container. Repeat with other numbers. Also ask questions such as **Where can you find more animals than the 3 yaks?**

Repeat several times.

Each time, a student tells the number of animals under a container, ask the student to pick up and show the correct numeral card.

Maths Note
The students are provided with a different context to practise counting, one they might find engaging. They might enjoy the puzzle of remembering which container held which number of counters.

Assessment for Learning
Watch how comfortably the students count as they check their guess of the numbers. Also see if they can identify the correct numeral card with the numbers comfortably.

Activity 7 How Many Went to Bed?

Objective
Identify, count, and represent sets to 5.

Materials
Numeral cards from 1 to 5 (a set for each pair of students)
Counters (5 for each student)
A metal container

Activity Description
Give each student at least five counters and a situation the counters might be used to represent. For example, the counters might represent children in a family. Tell a story about a family. For example: **There is a family in our village. There are many children in the family. Some of the children like to go to bed soon after dinner. Some of them like to stay late. These many children went to bed to sleep.** At this point, drop several counters (3 or 4 or 5, but not more than 5) one at a time, into the container

Maths Note
The students are using sound as another attribute to help them count. The sounds match the internal sounds someone might make in his or her own head as he or she counts.

Reprint 2024

so that each dropping made a clear dropping sound. **Use your counters to show how many children you think went to bed.** The students show the number of counters they think matches the number you dropped. Ask them: ***How many counters are you showing?*** Empty your container and check that you have the same number. Ask a student to pick up a correct numeral card.

Repeat a few more times. You could also vary the story a little bit. For example, say something like: **In another family, all the children like to go to bed soon after dinner. Let us see how many children are there in this family. They are now going to their bed.** At this point drop the counter. Then ask the students: **Show me with your counters how many children went to bed this time. How many children went to bed?** Ask a student to pick up a correct numeral card.

Then allow pairs of students to repeat the activity on their own, in turn. Give each pair a set of the numeral cards, so that the student who responds can show the numeral card along with the counters and number telling.

Assessment for Learning
Observe whether the students count to themselves as they hear the sound of each counter. If they struggle, you may choose to count aloud with some students as you drop the counters.

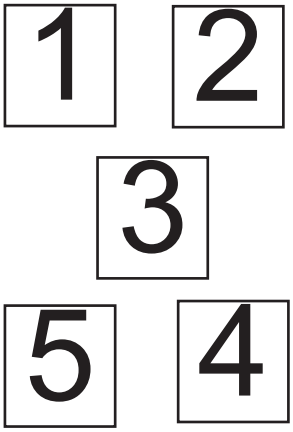
Activity 8 Using a 5-Frame to represent numbers

Objective
Identify, count, and represent sets to 5.

Materials
Numeral cards from 1 to 5
Counters
5-Frames

Maths Note
Use of a 5-frame, a row of 5 boxes in which the students might put counters to keep track of a count, is very helpful. The 5-frame also helps the children in the visualization of small quantities and comparing small numbers.

Activity Description
In advance, prepare a large 5-frame on a chart paper. Show the 5-frame and talk about it to the students. Say something like: This is called a five frame. It has 5 boxes in it. Point to the boxes as you count them **one, two, three, four, five.** Have the students say aloud five frame, by asking: **What is this called? Let us count the number of boxes – one, two, three, four, five. We use a 5-frame to help us count and represent numbers by putting counters in it.**

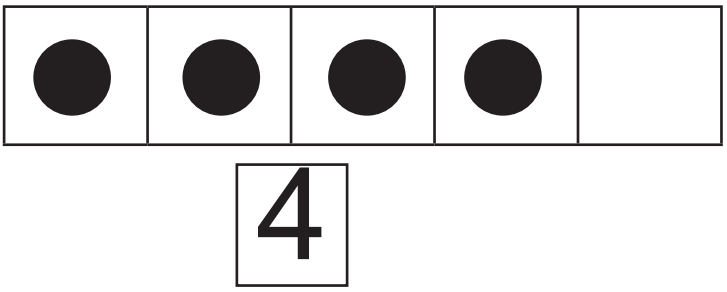


Demonstrate that by filling the 5-frame with 5 counters, counting the counters as you place them in the boxes. Ask: **How many counter are there on the 5-frame?** Then take away 2 counters from it, and ask: **Now how many counters are there on the 5-frame?** Repeat the questions by placing or removing various number of counters from the 5-frame.

Distribute 5 counters to each student. Have the students open their Activity Book on page number ___ for their copy of a 5-frame. Let them fill up their 5-frame with their counters. Then have them remove all the counters.

Show the students a number card, for example 4. Have the students recognize the number, represent it with fingers and counter on a 5-frame. For example: **What is this number? Show this many or 4 with your fingers. Now show 4 counters. Place the 4 counters on your 5-frame.**

Ensure that all the students can place the counters on their 5-frame correctly starting from the left most box. Ask: **How many boxes are filled? How many boxes are empty? How many more counters do you need to fill the 5-frame completely?**



Assessment for Learning
See that the students can represent each of the numbers from 1 to 5 both with rasing fingers on their hand and with counter on a 5-frame. The raising of the fingers should be on only hand. Also ensure that the students can explain the answers related to the counters and the 5-frame such as; how many more counters do you need to fill it up completely? (suppose they have already placed 3 counters on it)

Repeat the above process with showing the numeral card and asking the questions with other numbers from 1 to 5.

Lesson 4 Numeral Writing from 1 to 5

Lesson Goal

The students should start writing the numerals from 1 to 5. They do not have to do this all at once, but over time during the next several days.

Relevant Maths Issues

The purpose of becoming familiar with conventional numerals is to simplify communication between different individuals.

Numeral writing, like numeral recognition and rote counting, is a skill that does not really require understanding of number concepts. Rather it depends much on the children's fine motor control.

In this lesson, we intend to develop skills in numeral writing and recognition while enhancing understanding of the related number concepts.

There are many strategies for helping the students learn to write numerals including having them write the numerals in sand, so they get a feel for the motion that is made, writing the numerals in the air with a teacher (facing in the same direction as the students), tracing, or following arrow directions to create numerals. Although activities in this lesson are designed specifically to help children write the numerals from 1 to 5, the numeral writing opportunities and practices should continue to be provided after the lesson.
A few essential questions that should be asked during the course of the lesson activities are:

What number does (3) show?
Which numerals are made up of only straight lines?
How would you write the numeral (2)?

Reprint 2024

Activity 1 Numeral Writing in the Air

Objective
Recognize and form numerals 1 to 5.

Materials
Numeral cards from 1 to 5

Activity Description
Show the numeral cards from 1 to 5, and ask the students to say the correct number word for each. Also have them show what number or quantity each represents by raising the corresponding number of fingers. For example, when you show the numeral 2, the students should say **two**, and raise two fingers; when you show them the numeral 5, they should say **five**, and raise all the fingers on one hand. Do this for the five numerals.

Explain to the students that today we will learn to form the numerals 1 to 5, first in the air. Invite the students to watch you draw the numerals in the air. Stand with your back to the students and say: **Watch me. I am drawing a number in the air. I start my hand up in the air, go up toward right a bit and bring my hand down in a straight line.** As you describe, do the action with your right hand. **What number did I make?**

After the students have responded, ask them try to make the number 1 in the air. You could demonstrate making 1 again in the air. See that everyone can form the numeral 1 in the air. Then repeat the process for the numbers 2 to 5.

For the number 2, stand with your back to the students and say: **Watch me. I start my right hand up in the air above my head, then go a little higher up towards the right, and then bring it down towards my chest, and then go right in a straight line.** As you describe this, perform the action with your hand. **What number did I make?** Ask the children to perform the same motion.

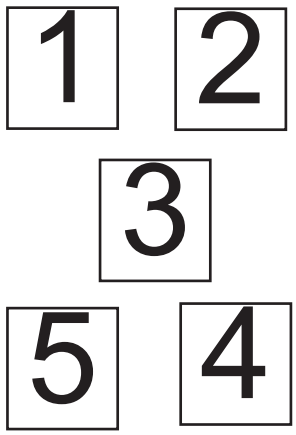
For the number 3, the description would be like: **I start my hand high up above my head, then I go a little higher towards the right and bring it down inward like forming a half circle, and then go outward towards the right and bring it back inward again in the shape of a half circle**.

For the number 4, it would be like: **I start my hand high up in the air, bring it down towards the left in a short straight line and go right in a straight line. Then I take my hand high up again at the starting point and bring it down in a straight line crossing the other line and going far below.**

For 5, it would be like: **I start my hand high up in the air and bring it down in a short straight line, and then make almost a circle going to the right from there. Then I take my hand high up again at the starting point and make a straight line towards the right.**

Extension
The students can practice the numeral formation on the wall with their index finger.

Maths Note
This is the first formal introduction to the children of the writing of numerals. This activity involves describing the shape of the numerals to the students while building confidence in the children to attempt and eventually write the numerals on paper with pencil. It also reinforces what number or quantity each of the numerals from 1 to 5 represents.



Assessment for Learning
Observe that the students can follow the motion of your hand and make the numerals in the air. For some you may have to guide their hand motion literally as you describe it to them. Some students will also benefit by tracing their finger over the printed numeral on the cards.

Activity 2 Numeral Writing on the Sand

Objective
Recognize and write numerals 1-5.

Materials
Trays of sand and/or finely powdered dry soil.

Activity Description
In advance, arrange to have adequate number of trays of sand and/or soil. If possible, a tray for each student would be excellent.

Ask the students to write with their index finger the numerals in the sand. You would have to demonstrate and guide them in small groups and also individually, until each student forms the numerals correctly and confidently. For consistency, employ the number writing techniques as described in Activity 1 above for writing the numerals in air.

Extension
Have the students play a game of writing numerals in pairs. Have one student draw a numeral from 1 to 5 on the back of a partner using the index finger. The one who drew then asks: **What number did I draw on your back?** The other partner then identifies the number. They take turns to write and ask.

Maths Note
The students will benefit both in terms of developing the skills and correct techniques of writing numerals while developing their confidence in eventually writing the numerals on paper with pencil, through the opportunities provided to practise numeral formation on sand and air. This mode of practice is non-threatening to the children, especially the ones who are hesitant, because the wrong and imperfect formation of the numerals can be instantly rubbed off. New attempts can be readily made until one gains confidence and satisfaction with the numerals that appear in written form.

Assessment for Learning
See that the students can write the numerals with the correct techniques.

Activity 3 Numeral Writing with Pencil

Objective
Write the numerals 1 to 5 on paper using pencils.

Materials
Student's Activity Book

Activity Description
Explain the instructions provided in the Student's Activity Book and guide the students in the writing of the numbers 1 to 5, using pencil. Some students will exhibit less fine motor skill development as compared to others. Be patient and encouraging to the students in this regard. Prepare some work sheets to enable the students to practise further. beyond the opportunity provided in the Activity Books. You might also have the students practise writing the numerals in their note books.

The numeral writing practice should be carried out over the next several days.

Assessment for Learning
Take the students through the numeral writings one numeral at a time. Pay close attention to each student as he or she writes each numeral. Guide them manually to form the correct technique of writing each numeral.

Reprint 2024

Lesson 5 Creating Sets to 5 and Describing Parts

Lesson Goal

The students should make up sets of sizes 1, 2, 3, 4 and 5. They should be able to divide the set they create into parts and describe these subparts.

Relevant Maths Issues

In preparation for later work in addition, it is useful to focus the students on the parts that make up a whole. Seeing, for example, that 4 is made up of 2 and 2 will help students later when they are solving 2 + 2. It is important that the students separate the whole into different size parts, e.g. 5 as both 4 and 1 or as 2 and 3. At this point, there is no use of addition signs.

The number 5 is a useful benchmark number for students. It is very helpful if they relate other numbers like 3 and 4 to 5.

You might use small cards with 1, 2, 3, 4 or 5 dots on them in different arrangements. You can hold them up and see if students recognize the total and the parts.
A few essential questions that should be asked during the course of the lesson activities are:

I have 2 pencils. How many more do I need to have 4 pencils?
You are counting and just said the word *three.* How much farther do you have to go to get to 5?
You say 1, 2, 3, 4 to count 4 pencils. How does that show that 2 is less than 4?
Show 5 pencils. Separate them into two parts. How many are in each part?

Activity 1 Show This Many

Objective

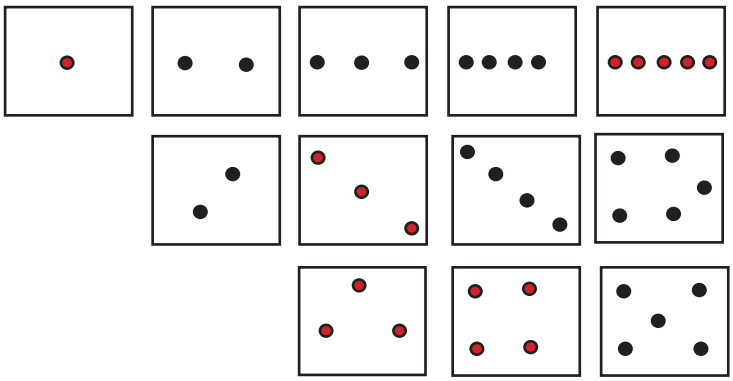
Visualize and represent matching sets.

Materials

Dot cards for numbers 1 to 5 with dots in different arrangements for each number.
Counters (5 counters for each student)

Activity Description

In advance, prepare some dot cards as shown below. There should be various dot cards for each of the numbers from 1 to 5 with dots in different arrangments.



Maths Note
Subitizing is the ability to recognize an amount without actually counting. Research shows that people can naturally subitize small amounts, particularly 1, 2, and 3 and often 4 and 5. Usually the arrangements need to be organized in particular ways for humans to subitize larger amounts. For example, we immediately recognize 6 as two rows of 3 but not if 6 dots are randomly arranged.

It is useful for students to see the typical arrangements on dice for the numbers 1 – 5 among the arrangement of dots you use.

Give each student 5 counters. If there are not enough counters for every student, you could give some of them materials like snap cubes, pebbles and other blocks.

Hold up a dot card (with 1, 2, 3, 4 or 5 dots). Ask the students to put down as many counters as the dot card shows. Indicate that their arrangement does not have to look the same as on the card, but that the number of dots and counters must be the same. You might vary the dot arrangements you show to familiarize students with different arrangements for each quantity.

Assessment for Learning
Observe whether the students need to put their counters out in the same arrangement as on the dot card or whether they realize that any arrangement of the same number is acceptable.

For example, show a dot card for 4, and ask the students to put down that many counters. Then ask how many counters they have put down. Then show another dot card for 4, and ask the same. Then you describe the arrangements of dots on each of the dot cards for 4. If the dots on a card are clearly arranged in two subgroups, for example two lines of 2 to show 4, you might ask: **How many are in this part?** (pointing to the first group of 2**); How many are in this part?** (pointing to the second group of 2)**; How many are there in all?**

Variation
Show a dot card and have the students in pairs make two different arrangements for the same dot card. For example, if the dot card for 3 is shown, one student can put down three counters in any arrangement. The partner must put down the same number of counters in a different arrangement.

Activity 2 Combinations for 4

Objective
Recognize the number 4 as a combination of smaller numbers.

Materials
pencils
counters in 2 different colours
5-frames (available in the Student's Activity Book)

Maths Note
In preparation for later work in addition, it is useful to focus students on the parts that make up a whole. Seeing, for example, that 4 is made up of 2 and 2 will help students later when they are solving 2 + 2. It is important that students separate the whole into different size parts, e.g. 4 as both 3 and 1 or as 2 and 2. At this point, there is no use of addition signs. More importantly, this activity reinforces the number concept of how much 4 is.

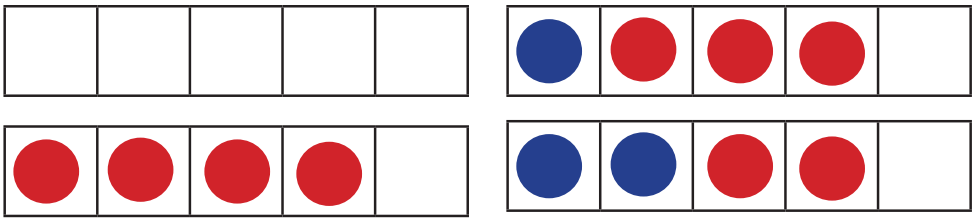
Activity Description
Hold up a set of 4 pencils, 3 in one hand and 1 in the other. Ask: **How many pencils do I have in this hand? How many do I have in this hand? How many do I have altogether?** If the students do not immediately see 4, count the pencils with them, one at a time, saying the numbers 1, 2, 3, 4.

Now hold 2 pencils in one hand and hide 2 in the other hand behind your back. Ask students how many pencils you have in the hand they can see. Tell them you have 4 pencils altogether and ask them to guess the number in your other hand. Reveal the pencils in the other hand as you say **three, four**.

Repeat beginning with 1 pencil in one hand and hiding 3 in the other hand. Point out how you have shown 4 as a combination, first of 2 pencils and 2 more pencils and then as 1 pencil and 3 more pencils.

Reprint 2024

Provide pairs of students with a set of counters in two different colours. There should be about 10 colours of each counter for the pairs. Have them open their Activity Book on page number ___ for the 5-frames. Have them show 4 by placing 4 counters of only one colour on the first 5-frame in the Activity Book. Then have them show 4 with various combinations of the counters in two colours on the subsequent 5-frames. Have them explain how each combination makes 4.



Assessment for Learning
Observe whether students realize that there are different ways of representing numbers in two (or more) parts. This experience is actually foundational and will be better suited to assessment as larger quantities are introduced.

Some students might ask if they can have a group of 4 and a group of none. That would be a good opportunity to introduce the number 0, but it is not essential at this point.

Variation
You can see if the students can recognize numbers like 4 as combinations of more than two groups. For example, 4 can be represented as 1 and 1 and 2.

Activity 3 Combinations for 5

Objective
Recognize the number 5 as a combination of smaller numbers.
Find all the combinations of two numbers that make up 5.

Materials
Counters in two different colours
5-frames (available in the Student's Activity Book)

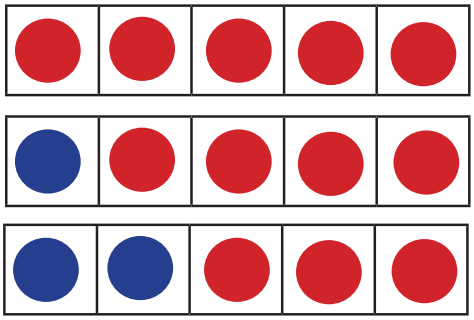
Activity Description
Hold up all five fingers on one hand. Ask the students to count with you to count the number of fingers. Now lower 2 fingers, leaving the other 3 up. Ask: **How many fingers are up? How many are down? How many fingers are on my whole hand?**
Let us count the 3 fingers that are up: 1, 2, 3. How many more numbers will I have to say to get to all 5 fingers?

Provide pairs of students with a set of counters in two different colours. There should be about 10 colours of each counter for the pairs. Have them open their Activity Book on page number ___ for the 5-frames. Have them show 5 by placing 5 counters of only one colour on the first 5-frame. Then have them show 5 with various combinations of the counters in two colours on the subsequent 5-frames. Have them explain how each combination makes 5.

Maths Note
It is important that students separate the whole of 5 into different parts. At this point, there is still no use of addition signs. The number 5 is a useful benchmark number for students. It is very helpful if they relate other numbers like 3 and 4 to 5. By showing 5 as 3 and 2, it is clear that both 3 and 2 are less than 5.

The 5-frame is a useful tool because it helps the students relate numbers to one another. For example, a student thinks of 4 as one less than 5; later the student will think of 6 as one more than 5. It is helpful if the students quickly associate the visual representations of each number on the 5-frame to that number.

Ask questions like: **Is 4 less than 5? How is 4 less than 5? Is 3 less than 5? How is 3 less than 5? How many more counters do you need for 3 to become 5? By how many is 3 less than 5? By how many is 2 less than 5? Etc.**



Have the students draw and colour the different combinations of counters for 5 on their 5-frames in their Activity Book. Have them then write the number sentences below each of the filled 5-frame, such as 4 and 1 is 5, and 3 and 2 is 5.

Some students might ask if they can have a group of 5 and a group of none. That would be a good opportunity to introduce the number 0, but it is not essential at this point.

Assessment for Learning
Observe whether students realize that there are different ways of representing numbers in two (or more) parts. This experience is actually foundational and will be better suited to assessment as larger quantities are introduced. If extended to more than two groups, it should become clear that there will be more possible ways of making 5 than 4.

Variation

You can see if the students can recognize 5 as combinations of more than two groups. For example, ask the students: How can we represent 5 with two different colours of counters? Can we use three different colours of counters to represent 5? Can 5 can be represented as 1 and 1 and 3, or 2 and 2 and 1. Provide counters in three different colours and the 5-frames for the students to show these.

If counters are not easily available, you could use pebbles, buttons, and seeds in their place. In fact, it would be beneficial if you could use these other materials along with the counters so that the students realize that the number concepts are independent of any particular materials.

Activity 4 Rhymes with Numbers

Objective

Sing the rhyme properly.
Understand the meanings/context of the rhymes.
Describe how the 3 bags of wool the sheep has is shared into 3 parts.

Maths Note
This activity will be fun as well as providing a learning opportunity in terms of both Mathematics and the English language.

Materials

Reproduction of the rhyme on a chart paper.

Activity Description

In advance, have the rhyme **Bah, Bah a black sheep** written on a chart paper. Display it on the wall.

Explain to the students that you are going to sing a rhyme together, and lead the rhyme, first by reading from the chart, so that students also learn reading skills, and later without looking at it.

Explain the context of the rhyme, as a conversation between a person and a sheep. Explain the meanings of the words and terms in the rhyme. Then ask questions like: **How many bags of wool does the sheep have? How are the** bags of wool shared? Into how many parts are the bags of wool shared?

Assessment for Learning
See that each student can sing and pronounce the words correctly. See that the students can recognize how the 3 bags have been distributed.

Reprint 2024

Have the students represent the number of bags with counters. Also have them represent the counters on a 5-frame. And have the bags to wool given to each person in the rhyme with a different coloured counter. Finally, have them write a number sentence as: 3 is 1 and 1 and 1.

The rhyme can be sung on other days also. It will be nice if students can learn the rhyme by heart so that it can be sung in future.

Bah, Bah a Black Sheep

Bah, Bah a Black Sheep,
Have you any Wool?

Yes Sir, Yes Sir,
Three Bags full,

One for my Master,
One for my Dame,

One for the little Boy
That lives down the lane.

Variation

Other rhymes can be used to support the activity. One example is the following rhyme that introduces the idea of the change in a number by adding one more. This is a useful concept in the counting forward of numbers. The rhyme could be taught and sung in this lesson as well as on future days. This could be enacted with students playing the roles of the birds.

One Little Bird
One little bird
Sitting on a branch
One more bird
So now there are two

Two little birds
Sitting on a branch
One more bird
So now there are three

Three little birds
Sitting on a branch
One more bird
So now there are four

Four little birds
Sitting on a branch
One more bird
So now there are five

Five little birds, sit and chirp and play
I hope I will not scare them away!

Activity 5 Making Domino Cards

Objective

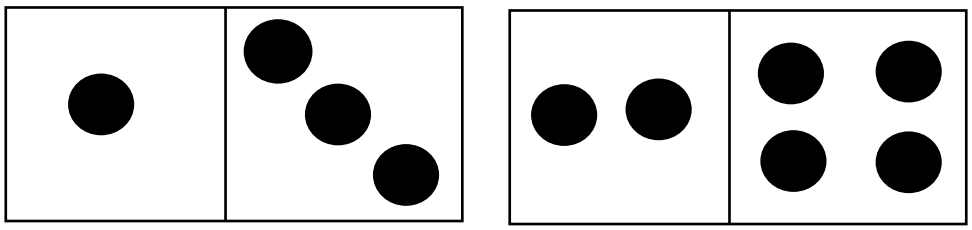
Create sets and count them.
Compare sets to 5.

Materials

Samples of home-made domino cards.
Cards for making dominos (2-4 cards for each student).
Marker pens or crayons for making the dots.

Activity Description

In advance, prepare a few sets of domino cards for students to look at. For example,



Tell the students that the cards are called **domino cards**. Have the students count with you the number of dots on each side.

Provide pre-divided cards without the dots to the student. Provide about 4 cards to each student. Instruct the students to draw dots on the cards to make their own dominos. Tell them that there cannot be more than 5 dots on either half. Each student should create 4 or 5 different dominoes.

Have the students share what they have drawn with each other. Have them tell how many dots are there on each side of their cards. Go around and ask the students questions like: **How many dots are there on this side of your card? Is that more than 5? Is that less than 5? How many dots are there altogether on your card? Is that more than 5? How do you know that?** Listen to how the students respond, and help them appropriately with their responses after listening to them.

Collect the domino cards the students have made for a domino game to play later.

Maths Note

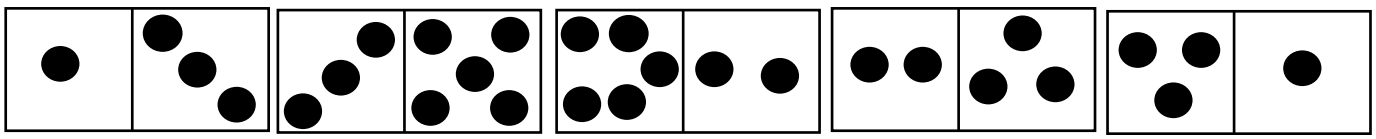
Dominos is a game made of tiles, each with two halves, each half with a number of dots on it. In this activity, students create home-made dominoes. This emphasizes the notion that a whole is made up of parts. Students practise counting and also practise comparisons to 5. They can also play a domino game.

Assessment for Learning

Observe how the students know that amounts are greater than 5—whether they realize that they have counted to 5 and there are still more dots or whether they match 1-1 with a set of 5. Ultimately, we want the students to use counting, but not until they are ready to do that. Observe whether the students count arrangements or whether they simply recognize an arrangement without counting (subitize).

Extension

The students can play a game with domino cards, in pairs or small groups. Distribute 3 to 4 domino cards to each student. A student starts the game by placing one of his or her cards on the table. Then the students place a matching card next to it (i.e., if there are four dots at one end of a domino card, there must be four dots on the domino card placed beside it). The cards placing continues in this way.



Another option is to provide the students with the domino cards to divide into three groups based on the idea of more than 5 dots, less than 5 dots, and 5 dots. Students count the number of dots on an entire card (up to 5) and if there are more than 5 dots, the card is placed in the “more than” pile. If there are less than 5 dots, then the card is placed in the “less than” pile. All remaining cards should have exactly 5 dots. Also, the cards with exactly 5 dots could be used to revisit the earlier activity with combinations of 5.

Reprint 2024

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 2 NUMBERS TO 5

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 small quantities and be able to say which is more, less, the same.	Sort sets based on the attribute of number.	Say the counting words in correct order to 5.	Write the numerals from 1 to 5.	Identify the number of objects in a set.	Describe the numbers from 2 to 5 in terms of their parts.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Summative Assessment Recording Sheet (For Class PP)

Student Name: _____ Roll no.: ____Section: ____

CHAPTER 2 NUMBERS TO 5

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

Task and Interview prompts	Key concepts and skills to look for
Task 1 Have a collection of 4 small pebbles, 4 relatively larger stones, and the numeral cards for 1 to 5 ready. Present the student with the set of 4 small pebbles. Say: **How many pebbles are here? Count the number for me. Show me this many fingers on your hand. Show me the numeral for 4. Write this number here on this paper.** Vary the number of pebbles to 5, 3, 2 and 1, and ask similar questions. Now display the set of 4 small pebbles. Then display a set of 4 relatively large stones next to it. Ask: **Which is more – stone or pebble? How do you know?** Remove 1 or 2 stones from the set. Ask: **Which is more now – pebbles or stones? If the pebbles is more, which is less/fewer?**	*The student is able to:* - Identify the number of objects in a set. - Count using the counting words in correct order. - Identify the correct numerals for the amount in a set. - Write the numerals from 1 to 5. - Recognize that size does not matter in counting. - Compare sets and use the words more, less, the same.
Comments and Mark: **Teacher's Signature and Date:**	

Task 2 Present the student with a 5-frame and a small collection of counters in one colour. Have the student show various numbers from 1 to 5 on the 5-frame, using the counters. **Show me 5 by putting counters on this 5-frame. Show me 3 now. How many more do you need to get to 5? So which is more – 3 or 5? How do you know?** Ask similar questions with other numbers. Show 4 on the 5-frame using counters in one colour. Have the student recognize the number. Then, replace two of the counters by different colour counters. **Is it still 4? But now we have 2 (blue) and 2 (red), so we can say 4 is 2 and 2.** Present different combinations for each of the numbers from 2 to 5 using counters in two colours on the 5-frame, and have the student say the number in terms of its parts each time.	*The student is able to:* - Compare small sets and using words like more, less, the same. - Compare a number to 5, for example how much is 4 less than 5. - Describe a number in terms of its parts.
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 2
Total CA mark from Chapter 2 (Task 1 and Task 2: Mark out of 20): _____
Overall remarks on the student Strengths: Areas of Need: Follow up Steps:

Reprint 2024

CHAPTER 3 LENGTH

Chapter Overview

Measurement is really about comparison – comparison of how much some feature of one thing is as compared to that of another thing More specifically, when you compare a thing with another, you would be comparing or measuring a same attribute of the two things. For example, we can only compare the height of one object with the height of another object. Similarly, we can only compare the mass of the first thing with the mass of the second thing, or the temperature of the first with the temperature of the second. When we say that a line is 5 centimetres long, it should be clear that the length of the line is 5 times as long as a line which is 1 centimeter long. And how long is 1 cm? Likewise, all our measurements, be they length (which includes distance, height, depth), mass, force, temperature, time or duration, value or worth, intensity of light, amount of electricity, area, volume, speed and velocity, angle, quantities etc. are all comparative statements using numbers against some standard unit sizes. In fact, the numbers are a measurement. When we say 3 of something, what that 3 is, is relative to what 1 is. If we consider 2 apples as 1 (unit), then 6 apples would be 3 (units).

In class PP, students explore measurements related to only three attributes of objects. They are the length of objects, the mass of objects, and the capacity of containers. The students do not yet use standard unit measurement sizes for these measurements. They will mostly compare the lengths, masses and capacities of objects. In doing this, they will be using critical mathematical processes like prediction or estimation, problem solving, communication, representation and connection. For connection, the students will use their knowledge and skills of sorting and patterning from chapter 1 and the number concepts from chapter 2 with the measurement ideas.

This chapter focuses on the comparison of lengths of objects. The students are also introduced to the idea that lengths can come in different forms like, a single straight line, straight lines which are zig-zag, and curved lines, which may be of single curve, or of changing curves.

The measurement concepts of Mass and Capacity are continued in chapter 8.

This chapter has 4 lessons as detailed in the table of contents.

Basic Principles about Length and Measurement

- The definition of a measurement is based on the process for comparing one measure to another similar measure.
- Any length comparison can be stated in two different ways (e.g. A is longer than B or B is shorter than A).
- Any object might be longer than a second object, but shorter than a third object (e.g. A could be longer than B but shorter than C).
- The length of an object does not change if the object is moved.

Chapter Goals

- Predict which object is longer/taller (or shorter).
- Compare directly the lengths of objects using correct techniques.
- Predict which line (including curved lines) is longer (or shorter).
- Compare directly and indirectly the lengths of lines.
- Sort objects based on the attribute of length.
- Make simple repeating patterns with objects and lines based on the attribute of length.

Maths Words

longer, shorter, as long as, long, short, taller, tall, shortest, longest, length, the same length as, height, estimate, predict, guess, compare

Initial Assessment

Show the students two objects, (say, two sticks) of which one is relatively longer than the other, and see if they can tell which is the longer of the two and then which is the shorter. Ask: Which of these two sticks is longer? Which is shorter then?

Repeat the process with showing two strings, of which one is clearly longer than the other.

Bring one student in front of the class. Ask: Who is taller, (Sonam) or me? Who is shorter then? Now have students get in pairs and do the same comparision with themselves as the two people. The students can begin with asking: Who is taller, (Pema) or (Deepak)? Who is shorter then?

Place several objects on the table, such as sticks of varying lengths including some of which are of same length. Pencils, crayons, marker pens, chalks, or strings could be used. Ask a student to pick up a short object from the collection on the table. Ask the class if they agree of the choice as a short object. Ask why it is a short object. Then ask another student to pick up a long object. Ask the class if they agree of the choice as a long object, and ask why. Then pick up an object which is of a medium length from the collection. Ask a student to pick up a **shorter** thing than the one you picked up. Ask why it is shorter. Ask another student to pick up a **longer** object, and ask why it is longer. Ask yet another student, either chosen by you, or a volunteer to come and pick up an object which is **as long as** the one you have in hand.

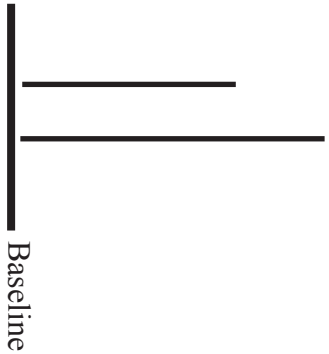
You might mimic to demonstrate and make clear the concept of short, long, shorter, longer, as long as, in all the above processes. Then put up the relevant maths words on the maths wall and teach the students to read the words correctly.

Reprint 2024

Lesson 1 Predicting and Comparing Straight Lengths Directly

Lesson Goal

Students should recognize whether one item is longer than another if they can be directly compared.



Relevant Maths Issues

Length is a 1-dimensional measurement. One item is longer than another if, when they are started at the same base line, one extends farther than the other.

It is critical that the students understand the need to start from a common base line to compare length.

To build measurement sense, it is important to encourage the students to predict which of two lengths will be greater and then test their predictions. Initially, focus the students on comparing lengths of long, thin things like pencils or ropes rather than things like books where it is not clear which linear dimension to focus on.

There are many words used when comparing lengths, including *width, height,* and *distance.* Gradually, students must be exposed to all of these words.

Initially, students should compare only two items; later they should compare more than two items and put them in order of length from shortest to longest or tallest, or longest or tallest to shortest.

Students might compare the lengths of parts of their bodies to the same part of another student's body, e.g. handspans, foot lengths, finger lengths, lengths from elbows to fingertips (Cubit), full heights, distances each can move in one long step, etc.

Make sure to compare the heights of short items sitting on a table with taller items sitting on the floor to remind students of the need for a common base line.

A few questions that should be asked during the course of the lesson activities are:

Can you build something that is as tall as …?
Which is longer?
Which is shorter?
Is … taller than ….?
Which is farther away? Why do you think that?
Why is the second line not the longer one (shown below)?

Activity 1 Comparing Sticks

Objective

Estimate and compare lengths directly.
Use terms for length comparison like longer, shorter, and about the same.

Materials

4 sticks - 2 of which are of about the same length, 1 relatively shorter and 1 relatively longer than the pair with the same length. If possible, colour the sticks.

Maths Note
In this activity, the students directly compare one length with another to see which is longer or shorter, or if they are about the same. The students should, as a general practice, first estimate or guess which object might be shorter or longer, before they actually compare to find out. This would build estimation skills, which is a useful mathematical skill. In comparing objects, the students should realize that it is important to align the objects at a common base line.

Activity Description

Show one of the sticks to the students and ask if they think of it as a long stick, or a short stick. *Whether an object is long or short to someone is relative, and depends entirely on whatever other thing you might be intuitively comparing it with. So when a student sees a stick as a long stick, or a short stick, he or she may be intuitively comparing it with something of a standard length. It might be worthwhile to ask why or how it is long (or short). There is no right or wrong answer to such a question, which really asks a person's perception.*

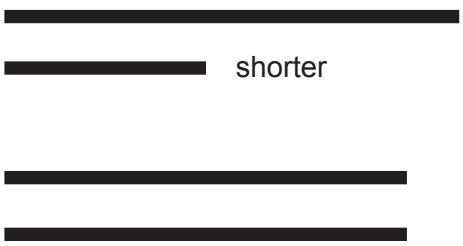
Show another stick and ask the students if they think the second one is longer or shorter than the first one. **Do you think this one is longer than this?** After they have predicted, demonstrate the comparison technique of aligning the two sticks at a common base to see which is longer or shorter. Explain that it is important to align the ends at a common base line.

Then put down one of the sticks, and bring up a third one. Ask them which of the two in your hand is the longer stick. After they have predicted, ask a student to come forward and compare the two sticks. The rest of the class observes to see if he or she did the comparison correctly.

Repeat the above process until all the sticks are compared in twos. Terms such as **longer than**, **shorter than**, and **about the same** should be used appropriately.

Assessment for Learning
Make sure that the students can predict whether a thing would be longer or shorter with an object shown, using the correct language, as **I think the _____ is longer/shorter than the _____.** *Also ensure that the students use the correct technique of comparing the lengths by aligning the ends at a common base line.*

Take a stick of medium length. Ask the students to think of and take an item they have. Ask: Do you think your thing (pencil) is longer than this stick? How can you tell for sure? Show us.



Reprint 2024

Activity 2: Comparing Lengths with your Hand Span

Objective
Estimate and compare lengths directly.
Use terms for length like longer, shorter, or about the same.

The *dzongkha* word for **hand span** is *tho*; **arm span** is *dhom*; **cubit** is *chu*

Maths Note
In this activity the students use their **hand span** *as a length to compare with their other body parts and with that of the other students. The students learn useful names of the body parts which are commonly used as non-standard units of length measurement like hand span, foot, arm span and cubit. Do not forget to ask students to estimate lengths before they actually compare them. It is still important to align the objects at a common baseline for comparing their lengths.*

Materials
None

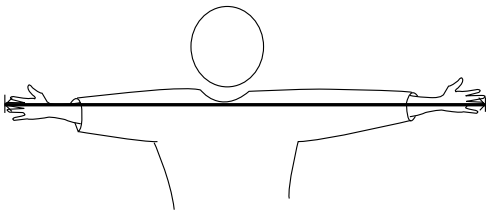
Activity Description
Stretch your hand from the thumb to the middle finger to make a **hand span**. Explain that the length from the tip of the thumb to the tip of the middle finger is called **hand span**. Have every student do the same and say the word **hand span**.

Illustrations of a hand span, arm span, and cubit.

Show the students one of your feet and tell them that it is called a **foot**. You might have to physically show the whole foot from the heel to the toe, and explain the same. Ask the students to look at their (right) foot. To make sure that the students know what a hand span is and what a foot is, tell them; **Show me your hand span. Show your right foot. Show your left foot.**

Ask: **Do you think your hand span is longer than your foot?** Have the students share their predictions. Then ask each one of them to compare. You might want students to remove their shoe from one of their feet. Ensure that the students compare their hand span and foot by correctly aligning the tip of the thumb with the end of the heel or the tip of the middle finger with the tip of the toe. For those comparisons where the two lengths are very close, model approximate language such as *about the same*. For those comparisons that are not close encourage the students to use the terms *longer* and *shorter* as may be the case.

A hand span is the length from the tip of the thumb to the tip of the middle fingers stretched.



An arm span is the length between the tips of the middle fingers when the arms are stretched side ways.

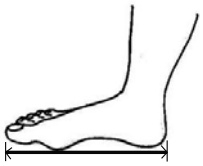
After everyone is done with the above comparison, ask the students to first predict and then compare the lengths for the following questions:

Do you think your hand span is longer than the length from your chin to the top of your forehead?
Do you think your hand span is longer than your neck?
Do you think your hand span is longer than from your armpit to your elbow?
Do you think your hand span is longer than from your elbow to your wrist?
Do you think your thumb is shorter than your little finger?
Which is longer – your right hand span or your left hand span?

Assessment for Learning
Are students able to say their predictions with confidence and correctly use the basic terms? Do they consistently use the correct technique of comparing the two lengths by aligning the ends at a common base line?

Variation/Extension

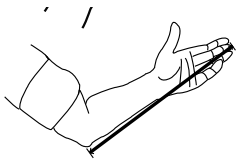
You can make the students work in pairs that involve estimating and comparing to tell which is longer, shorter or about the same.



A foot is the length from the heel to the tip of the toe.

Bring two students in front of the class, and ask: **Who do you think has longer hand span?** The class, along with the two students, can estimate who would have the longer hand span. (Alternatively, you may opt to be one of the two people and bring forth one student to compare with you). Then let them compare. Then ask the students to form pairs with their neighbours. Ask the pairs to first estimate and compare one at a time each of the following:

Who do you think has the longer foot?
Who do you think has the shorter arm span?
Who do you think has the shorter little finger?
Who do you think has the longer thumb?
Who do you think can take a longer step?



A cubit is the length from the elbow to the tip of the middle finger.

Activity 3: Who is the Tallest?

Objective

Estimate and compare the heights directly of two objects.
Order two or more objects by height.
Use terms for height like taller, tallest, shorter, shortest and about the same.

Materials

Activity Description

Invite two students of similar height to the front of the class. Ask one student to stand and the other to sit. **Who do you think is taller? How can we find that out?** Listen to the suggestions and identify who is taller and who is shorter by making them stand back to back on a level floor.

Now ask a third student, who is shorter than the first two to stand. Ask whether the third student is taller than one of the first two students. Compare their heights and confirm the guess. Ask: **Who is the tallest of the three? Who is the shortest of the three?** Then line them up height wise. Next invite the shortest student to stand on a sturdy block, like a wooden slab, so that he or she appears taller than the other two. Ask: **Now who is the tallest student? Isn't Dorji the tallest now** (referring to the student on the block)**?** The students should protest this. Then ask why this is not a fair comparison. This is a good point to reinforce that in order to compare correctly, we need to use the same starting point.

Maths Note
This activity compares the length of upright objects. The terms now shift from long to tall, longer to taller, and length to height. To start with the concept of height, the students use their own heights. Like in the case of lengths, it is important for the students to be aware that things need to be standing on a common base line to compare their heights.

Divide the students into groups of three or four. Have them stand by height. As they compare and order themselves in groups, ask each group: **Who is the tallest in your group? Who is the shortest? What is important to do when you are comparing your heights?**

Change the group members by asking two students from each group to join other groups separately. Ask the new groups to order themselves in line by heights. Do the changing of the group members and standing in order of heights a few more time.

Reprint 2024

Activity 4: Building Towers

Objective

Compare the heights of two or more objects directly.
Use terms for comparing heights like taller, tallest, shorter, shortest and about the same.

Materials

Dice (the singular is called a die)
Counters or snap cubes

Maths Note
This activity is a game. The students compare the heights of the towers they build, and say the appropriate terms used in comparing heights. This activity reinforces the students' ability to represent numbers up to 6 with counters. It also reinforces their number counting skills.

Activity Description

This game can be played in small groups of 2 to 4 students. Give each group a die, and about 30 counters. The rule of the game is: A student rolls a die, pulls out counters equal in number to the number of dots facing up on the die rolled. He or she then stacks the counters to build a tower. Students take turns rolling the die and stacking the counters. Once the stock of the counters provided is finished, the students in the group compare the heights of their towers. The student with the tallest tower is the winner! Students play the game repeatedly, by putting back all the counters and changing the order of who rolls first. In the groups ask questions like: **Who is the winner this time? Why is he or she (or Navin or Pema) the winner? Who has the shortest tower? Whose tower is taller or shorter - (Pema Dolma's or Dil Maya's)? How many counters are there in your tower?**

Assessment for Learning
See that the students can recognize and identify the number of dots on the die correctly with the number name, and also to represent the dots with counters. See if the students can count the counters in their towers using the correct counting sequence (like, one, two, three, four, five,…). See that the students are able to compare the heights using the terms like tallest, shortest, taller, shorter and the same.

Activity 5 Sorting Objects by Length

Objective

Estimate, compare, and sort objects based on their length.
Use terms for length comparison like shorter than, longer than, about the same length.

Materials

Collection of objects for comparing lengths (e.g., sticks of various lengths, pencils, crayons, paper strips, paper clips, grasses, toys, strings, drinking straws, chalks, markers pens, feathers, match sticks, tooth picks, etc) – about 15 objects for a group of 3-4 students.

A sorting mat as shown here – 1 for each group of students.

Shorter than _____	About the Same Length as _____	Longer than _____

Maths Note
Even though some students will be able to recognize visually and tell if an object is longer or shorter than a given one, it would be useful to ask them to show how it is longer or shorter than the given one. This will reinforce the need to line up the objects at a common base line for length comparison.

Activity Description

Display a collection of about 6 objects of different lengths and a sorting mat so that all can see easily. Use an object, maybe a marker pen as the standard length. Tell the students that we will be comparing the objects with the pen one by one and sorting them into three groups on the mat, based on their length – how long or short each object is. **If the object is longer than this pen, we place it here, if it is shorter than this pen, we place it here, if it is about the same length then we place it here** (in each case, referring to the appropriate column of the mat)**.** Pick up an object, and ask the students to guess if it would be longer, shorter, or about the same length as the pen. Then, actually compare the two objects, and place it in the appropriate column on the chart. Do this with a few more objects. Ensure that at least one object was longer than the pen, one was about the same length as the pen, and one was clearly shorter than the pen.

Then ask a few students to volunteer to come forward, so that each student guesses, compares and places an object appropriately on the sorting mat. Ask the student to pick up an object; make a guess of its length compared to the pen; then actually compare the two and place the object on the chart. You can demonstrate this first: Take out an object, and say: **I think this toy is shorter than the pen**. **Would you agree with me? Well, let's check that out**. Compare the two by using a common base line. **Yes, it is shorter than the pen. So I place it here.** Help the students with the language.

Divide the students into groups of 2 to 4. Distribute collections of objects and a sorting mat to each of the groups. Provide each group with a standard length object. Ask the students to sort the objects on the mat based on their lengths. As the students work, go around and encourage them to first guess before comparing the lengths. Ask questions like: **Are there more objects which are longer than this** (referring to the measuring standard)**? How many objects are shorter than this? How many objects are longer than this? How many objects are about the same length as this?** Encourage the students to physically count the objects each time.

Assessment for Learning
See that the students can come forward, and speak out their prediction of the length with confidence while correctly using basic language. See that they are aware of placing the objects at a common base line to compare the length.

Reprint 2024

Activity 6 Length Hunt

Objective

Estimate, compare, and sort length.
Use terms for length comparison like shorter than, longer than, about the same length.

Materials

Collection of objects with varying lengths (some as short as a paper clip and some as long as 1 metre) – one object for each group of students

Maths Note
This activity is similar to the previous one, except that the students choose their own measuring standard, and look for lengths shorter than it, lengths longer than it, and lengths as long as it.

Activity Description

Divide the students into groups of 2-3 students. Ask the groups to pick up any object from the collections of object from presented to them. Explain to the students that they will be going on a length hunt, or in search of lengths. Say: **We will go on a length hunt. Your task is to find two things that are longer than the object you have chosen from the bag, two things that are shorter than it and two things that are about the same lengths as it. You can look for the things in the classroom, or you can also go outside to get your things.** Give the students a time limit of about 15 minutes to collect the things. If the students choose to go out, you should accompany them, so that everyone is back in the class in time.

As students work on their collection, ask: **how do you know for sure that this (_____) is shorter than or longer than your (pencil)? Which is the longest (or shortest) thing you have found? What have you found that is about the same length as your (toothbrush)?**

After everyone has found their required number of objects, ask the students to sort and display their things in front of them. Help the students with their display. After that, ask: **Who found it difficult to find things shorter than your object?** For instance, if a group had a paper clip as their measuring standard, it would probably prove to be difficult to find things shorter than it. **Why might that have been?** Then ask: **Are both the things that are longer than your thing the same length? Who has the longest thing in the class? How can we check it for sure? Who has the shortest thing in the class?**

Lesson 2 Comparing Lengths Indirectly

Lesson Goal

When two straight lengths cannot be brought side to side, the students should develop simple strategies to compare them.

Relevant Maths Issues

Many measurements must be taken indirectly. For example, to decide which of two windows is taller, the windows cannot be moved; the students will have to find a way to use a third item, for example a piece of string, to compare each of the windows to see which is taller. They can either cut the string to the shorter length, or mark it with a crayon or mark it with a finger to then compare it to the other length.

Suggest things around the school that the students can compare indirectly. These include doors to two different rooms, the length compared to the width of a room, the height of a student to the distance he or she walked in 3 steps, etc. Students should be encouraged to first predict or estimate which length would be longer or shorter before actually checking it out.

Some essential questions that you should ask during the course of the lesson activities are:

Which one do you think would be longer?
How would you check which one is longer between the two?
Why did you need the string to help you compare the lengths?

Reprint 2024

Activity 1 Comparing Straight Lengths Indirectly

Objective

Compare two straight lengths indirectly, using a third length.
Use terms for length like longer, shorter, longest, shortest, about the same length.

Materials

sticks, marker pens, strips of paper, strings, sellotape, scissors

Maths Note
In this activity, we place two objects in such a way that they cannot be brought together for direct comparison of their lengths. This forces students to come up with an idea or strategy to compare the two lengths. The comparisons are still limited to straight lengths.

Activity Description

Show two sticks of different lengths and ask the students which one they think is longer. Ask how they would compare the two lengths to confirm their guess. Listen to their suggestions and help with their language to describe how they would compare. Ask a volunteer to show the comparison.

Then show two straight objects. Stick them on the wall using cello tape, one far from another and in different orientations. Ask the students to guess which one is longer or shorter. Tell them that the two items cannot be removed from the wall to bring them together. **Now, if you can't bring them together, how can you compare them to know which one is really longer than the other?** Encourage the students to come up with an idea to compare the two lengths. If children struggle to come up with suggestions, you can give hints like; **well, could we use strings to help to compare? Could we use any other things besides strings to compare the two lengths? Think of other ways to do it.** Allow the students to show the comparison of the two lengths.

Then draw two lines on the chalk board, one horizontal and other vertical or slanting. Ask students to guess which is longer, or shorter. Then ask them to compare the two lengths.

Variation/Extension

At least some of the following comparison of length should be carried out. Ask the students to first guess and then compare lengths in all the cases.

Assessment for Learning
Ensure that the students use the correct technique of aligning the base to the third object with the base of the other two objects respectively in comparing their lengths. See that the students use the terms for length comparisons like longer than, shorter than, and about the same length.

The edge of a table and the width of the classroom door.
The height of a window and the height of chalk board.
The length of the room and the width of the room.
The length from the top of the head to the waist, and the length from the waist to the heel of their bodies. Students can work in pairs for this activity.
The height of a student and the height of a window.
The height of a student and the distance he or she takes in 3 steps. (Try this with both large and small steps).

In all the above problems, the students should actually compare the length using a third object. Use of strings may not be the only third object. The students could use their hand spans and arm spans as may be appropriate.

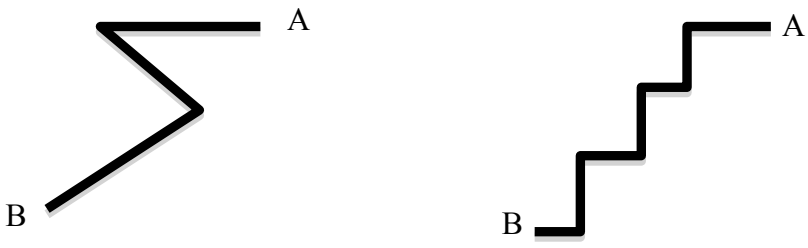
Lesson 3 Predicting and Comparing Curved or Bent Lengths

Lesson Goal

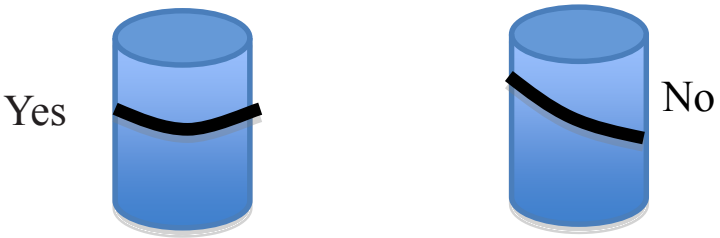
Students should be able to compare lengths that are not straight, for example, to decide which of two bent strings is longer.

Relevant Maths Issues

Sometimes lengths are not straight, yet we want to compare them. For example, we might want to know which of two paths from A to B is shorter.



The students need to understand that comparing lengths means that equivalent "straightened-out" lengths must be used.
When measuring curved items, the students must make sure to keep the string around at the same level, e.g.



Provide situations where the students compare non-straight distances—some curved and some made up of many straight parts.

Encourage the students to predict which length is longer before they actually measure or compare. This encourages them to think more clearly about what length actually is.

A few essential questions that should be asked during the course of the lesson activities are:

How would you use string to find which path is longest?
How would you use string to decide which cylinder is wider around?
Why is it important to keep the string at the same height on the can to measure around it?
How could you straighten out the path to see how long it is?

Reprint 2024

Activity 1 Which Path Will You Take?

Objective

Compare two or more lengths, which are not straight.
Use terms for length like shorter, shortest, longer, longest, and about the same.

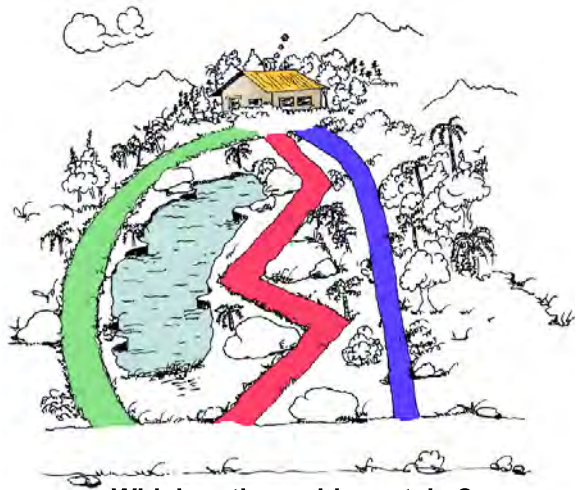
Materials

String or twine thread
Scissors
Drawing as shown here on a chart size paper

Activity Description

Display, or put up the chart size drawing you have made on the wall. Tell a story based on it…something like: T**here is a small hut deep in the forests. Let us say you are here** (point to the beginning of the paths)**. From where you are, there are three paths that lead up to the hut, a red path, a blue path and a green path. There are chocolates, cakes, juices, and toys in the hut waiting for you. Now, which path would you take?** Ask the students to individually tell their choice of the path, and why they chose a particular path. If a student says that he or she chose a path because he or she thinks it as the shortest path, ask why he or she thinks it so. Counter his or her guess of the shortest path by saying that all the three paths begin at the same place and end at the same place!

Ask the students to suggest how they would compare the lengths of the three paths. Listen to their ideas. Suggest that they could use strings to compare the three lengths of the paths. Ask students to open their Activity Book, page number ___ which has the same picture. Provide them strings, either individually or in pairs to compare the lengths of the paths. As they work, go around and engage with them. There could be more than one way of comparing the paths, as mentioned in the Maths Note. Observe which strategy the students were using.



Which path would you take?

After all have done their comparisons of the paths using strings, invite their attention to the front of the class. If the students used both the strategies as mentioned in the Maths Note, discuss how both are valid strategies. If students used only one of them, show them that the other strategy could also be used for to compare the paths.

Maths Note

When lengths are not presented in straight lines, it proves challenging to estimate and tell which is longer or shorter. This forces the students to come up with some strategies to compare the lengths. This is good because it involves a little bit of problem-solving and communication during the strategizing, execution of the strategies and analysis of them.
In this activity students may use a string to model one of the paths, and then use the same string to see if it is long enough or longer for the other two paths to determine which path is the longest or shortest. Students may also use separate strings for each of the three paths, and then bring all the strings together to compare the lengths of the three paths.

Assessment for Learning

See that the students are able to show and describe how they compared the paths using strings. Ask and also see if they can give a reason for estimating a path to be the shortest just by looking at the nature of the path.

Reprint 2024

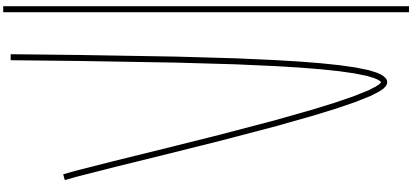
Activity 2 Comparing Various Lengths

Objective

Estimate and compare various lengths (straight or curved) of objects. Use terms for length comparison like longer, shorter, longest, shorter, and about the same length.

Materials

Cylindrical objects like tin cans and mugs
Rectangular objects like geometrical boxes and rectangular prism
Bottles in various sizes and shapes
Leaves in various shapes
Strings, scissors, paper strips, crayons



Activity Description

Draw two lines on the chalk board – a long straight line and a curved line along side it.

Tell that these are both lines, and that the first one is called a straight line and the second one a curved line. Ask students to guess which line is longer. After that ask them how they would check that. Model the two lines with two strings on the floor or on the table. Then straighten the curved string to see which line is longer.

Show the students a cylindrical object like a tin can and ask them to guess whether the length from the top to bottom would be longer than the length around the object. Ask how they might compare the two lengths. Then using either paper strips or strings check that out.

Illustration – real photo of a can or a jam bottle with strings and a questions below it.

Provide groups of students with one or two objects. Ask them to estimate which lengths will be longer, top to bottom or around the bases of the objects provided. Then let them compare the lengths. Make available strings and paper strips for the students to use.

Variation/Extension

Ask the students to guess and compare the lengths around various parts of their bodies. You may use the following questions.

Which is longer – the length around your neck or around your thigh just above the knee?
Which is longer – the length from your heel to the back of the knee or around the calf?
Which is longer – the length around your ankle or the length or your foot?

The students can also be asked to guess and compare in pairs or small groups their similar body parts. For example, to see who has the largest calf, or neck or arm.

Maths Note

With miinimal experience there is a tendency to see a curved length as the shorter one when shown along side a straight length, even though it may be otherwise, as in the illustration shown below.
This activity provides the students with experiences in comparing various curved lengths with straight lengths, and therefore, provides them with better estimation skills when presented with various types of lengths.

Assessment for Learning

See that the students can mark or cut the strings at the right points; and that they make sure that they line up the strings or paper strips at a common base line for direct comparison of the lengths. Also see that students maintain the string at the same level when they wrap or take the length around the cylindrical objects. (Note it will be common for differing lengths to be found by students wrapping string around a cylindrical object. It is the shortest length that is likely to be most accurate. Longer lengths wil be found by not wrapping at a fixed level.)

Reprint 2024

Activity 3 Lengths Around Same Groups of Snap cubes

Objective
Compare the lengths around shapes of the same area.
Realize that shapes of same area or size can have different lengths around them.

Materials
Snap cubes
Strings, scissors

Activity Description
Divide the students into small groups of 2 to 3 students. Provide each group with 12 snap cubes. Provide strings and scissors to the groups as may be required.

Ask each group to join 2 cubes and 3 cubes, as shown here. Make the blocks yourself too. Ask them which length would be longer – around the 2-cube block or around the 3-cube block. Ask why they think so. Listen to what the students say. Ask them how they would compare to show that the length around the 3-cube block is indeed longer. Provide strings for that. One way to compare the two lengths would be to wrap a piece of string around the 2-cube block and another piece of string around the 3-cube block. Then compare the lengths of the two pieces of string to see which block has the longer length around.

Now ask the students to join two more cubes onto the 2-cube block to make it a 4-cube block as shown here.

Ask which length would be longer – around the 4-cube block or around the 3-cube block. **Now which length do you think would be longer – around this or around this? Why do you think so? Let us all check that out.** Confirm that by wrapping around the two blocks with strings, and then comparing the lengths of two strings.

Now ask the students to make a 4-cube block as shown here.

Maths Note

Two shapes with the same size or area can have different lengths or distances around them. In other words, shapes of equal areas can have different perimeters. For instance, as an elongated rectangle becomes more and more like a square, it will use less and less perimeter to maintain the same area. This is an important mathematical realization. But you do not have to use the mathematical terms like area and perimeter yet.

Suppose that you are given a rope of 100 metres in length to enclose an area of flat land within the Thimphu city boundary. How would you do that? What would be the dimensions (length and breadth) of your land?

Assessment for Learning

See that the students can tell which block has more cubes, or be able to tell that they have the same number of cubes when it is the case. See that they can count the cubes in a block up to 5 using the correct counting numbers. See also that they can compare the shapes of the blocks using words like longer and shorter.

How many cubes are in this block (referring to the long 4-cube block)**?** **How many cubes are in this block (**referring to the 2 by 2 4-cube block)**?** **Which has more cubes? So which length do you think would be longer – around this block, or around this block? Why would you think that way?** Listen to what the students think and say on this. **Shall we check that out?** Let the students find out which one of the two blocks has the longer length around with the use of strings. It will be seen that the longer block will have a longer length around compared to the shorter but thicker block, even though the two blocks have the same number of cubes.

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 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.

Reprint 2024

Lesson 4 Creating Length Patterns

Lesson Goal

The students can use what they know about length to create simple repeating patterns based on the attribute of length.

Relevant Maths Issues

The students can build repeating patterns based on the lengths of objects. The patterns could be based on long and short in various combinations of long, medium, and short, or objects that get increasingly longer, for example.

You might start by having the students translate other patterns, such as colour patterns, into length patterns. Alternatively, the students can simply create length patterns without starting from other patterns.

It is ideal to use handy materials such as twigs of different lengths, but it is important that materials designated as short are similar in length, those designated as long are similar in length, etc.

A few essential questions that should be asked during the course of the lesson activities are:
What makes it a pattern?

What makes it a pattern?
What lengths did you use in your pattern?
How do you know which _____ is longer?
What different patterns could you make with these lengths?

Activity 1 Making Patterns with Twigs

Objective

Recognize simple repeating patterns based on certain attributes like colour.
Make or create simple repeating patterns using lengths.

Materials

Snap cubes in two different colours
Sticks in two or three different sets of lengths (about 5 sticks of each length for a student)

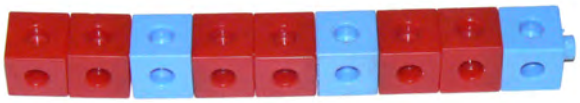
Activity Description

Prepare sets of sticks in advance. The sticks could be made out of bamboo. You may make two sets of bamboo sticks of about 5 cm and 10 cm respectively, such that each student can have 5 of each length.

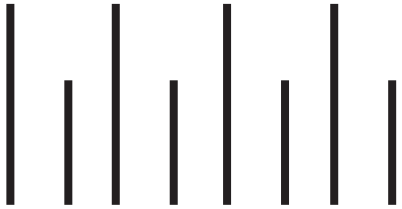
Make a colour pattern out of snap cubes, first an AB pattern. Show it to the students, and ask them if it is a pattern and why it is a pattern. Ask what part of the pattern is repeating.

Maths Note
This activity first starts with simple repeating patterns that the students can recognize from chapter 1 based on the attribute of colour. Then they make some simple repeating patterns using sticks using the attribute of length.

Then make an ABB pattern with the snap cubes. Ask the students if they see it as a pattern, and why ii is a pattern. Ask what part of the pattern is repeating.



Remind the students that the patterns they have seen with the snap cubes were based on colours, or they were colour patterns. Then say that we are going to make some length patterns. Make a simple pattern with the sticks, as shown here.



Ask the students whether they think it is a pattern or not. If it is a pattern, ask why they think it is a pattern.

Then provide each student with the sticks, 5 sticks each of the two different lengths. Ask them to make a pattern with the sticks. As they make a length pattern go around and ask them relevant questions or help them. **What makes your pattern a pattern? What part of your pattern is repeating? Is your pattern a colour pattern?** If they have successfully made a simple repeating pattern, challenge them to make a different pattern with the sticks. **Using the same sticks, can you make a different pattern? How is it different from your earlier pattern?**

Assessment for Learning
See that the students can describe the patterns they have made. See also that they can make at least two different patterns using the set of sticks they have.

Extension

You could use some of the pattern activities already covered in chapter 1. This will have the benefit of revisiting the concepts and skills for the students from chapter 1, which will serve as a useful link to the chapter on Repeating Patterns in chapter 7.

Reprint 2024

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 3 LENGTH

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):*			
		Estimate and compare lengths and use the comparative terms like shorter, longer/taller, and about the same length.	Use the correct technique when comparing lengths directly by lining them at a common baseline.	Sort objects according to lengths.	Identify straight lines and curved lines.
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Summative Assessment Recording Sheet (For Class PP)

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

CHAPTER 3 LENGTH

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

Task and Interview prompts	**Key concepts and skills to look for**
Task 1 Present the student two objects and ask: **Which one do you think is longer? Show how you know. If this one is longer, then which is the shorter one?** Present the student with a ball of string and scissors. Have the student cut a piece of string that is shorter than, longer than, the same length as a marker pen. Then ask: **Put the strings in order from the shortest to the longest (or longest to shortest).**	*The student is able to:* - Predict/estimate and compare lengths of two objects using terms like *longer* and *shorter*. - Create an item that is longer than, shorter than, and the same length as a given one. - Order items in order of length.
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 3

Total CA mark from Chapter 3 (Task 1: Mark out of 10): _____

Overall remarks on the student

Strengths:

Areas of Need:

Follow up Steps:

121

Reprint 2024

CHAPTER 4 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.

In Class PP, the focus of geometry is on exploring various 3-D shapes and 2-D shapes, learning their names and features, and being able to describe the shapes. As we move up the classes with the study of geometry, students study the properties and relationships of shapes and start using reasoning and proofs. The study of geometrical relationships and proofs helps in one's analytical and reasoning capacities.

This chapter deals with four basic 3-D geometric shapes: sphere, cylinder, cone, and rectangular prism. The focus of the chapter is on the students actually exploring these shapes or objects physically, and being able to describe their shape features. In the process, the students will be able to learn the correct names for these 3-D shapes. The geometrical concepts in class PP is then continued in chapter 9, 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 around with 3-D objects 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 the basic 3-D shapes students study in this chapter, it would prove easier to relate from the 3-D shapes later on.

This chapter has 5 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.
- By building with objects, properties of those objects become more readily apparent.
- Shapes can be combined and dissected to create other shapes.

Chapter Goals

- Identify, describe and compare 3-D objects.
- Sort 3-D objects based on shapes.
- Make patterns using 3-D objects based on the attribute of shape.
- Build structures using 3-D objects.
- Identify 3-D shapes in the environment.

Maths Words

sphere, cylinder, cone, rectangular prism, flat face, curved face, edge, corner

Initial Assessment

This initial activity is to see if the students can describe certain basic properties of some 3-D shapes in an informal way. For example, they may say spheres are round or ball-like, or notice, "this shape rolls," or

“this shape does not roll.” It is also to see if the students can name the shapes using a common language or even local languages. For example, they may say ball for sphere, box for rectangular prism, or can for cylinder. It will also be a good introductory activity for the chapter.

You will need a 3-D shapes for each student. If the class size is large, then maybe you can have one shape for ever 2 students, in which you will have to break the class into two groups. One group can watch while you engage the other group for the activity. Then repeat the activity with the group that watched, and have the other group watch.

The 3-D shapes could be a collection of the mathematics models of **sphere, cylinder, cone, rectangular prism and triangular prism** or everyday items like snap cubes, toothpaste cases, rectangular blocks of wood, crayon packets, chalk boxes, new rectangular erasers, or anything that is the shape of a rectangular **prism;** various balls and marbles for **spheres;** marker pens, bamboo blocks, empty cans, new crayons, candles etc for **cylinders**; funnels, and some improvised cones for **cones**.

Have the students sit in circle on the floor. It may be good to do this in an open space, where you have even floor or ground. Give each student in the circle a 3-D shape. Ask one student to raise his or her shape: **(Karma), raise your hand to show your shape. What shape do you have? Karma is showing his shape. It is a ball. We call this a sphere. Everyone say, “sphere”. Everyone who has a sphere, a ball like shape, raise it now.** Repeat this a few times for other shapes, like for a rectangular prism, triangular prim, cone and cylinder.

Now ask the students to place their shapes on the floor in front of them. Explain that when you say, “Pass” they will have to push the shape to their friend sitting to their left, without lifting the shape from the floor. After several passes, ask: **If you have a shape that you can roll, in front of you, pick it up and show it now.** Then ask the students what they notice about the shapes that are raised which can roll. Repeat their names, and say the mathematical names. Discuss what is the same and what is special about these shapes. Then resume the “passing” activity. After several passes, ask: **If you have a shape that slides, pick it up and raise it now.** Have similar discussions as before with the shapes that roll.

Lesson 1 Identifying, Describing, and Comparing 3-D Shapes

Lesson Goal

The students should be able to recognize, describe and compare spheres, cylinders, cones, and rectangle-based prisms.

Relevant Maths Issues

Although students may encounter many different 3-D shapes, the most fundamental ones with which students should become familiar at this level are cylinders, rectagnular prisms (including cubes), cones, and spheres.

A prism is a 3-D shape that has two identical bases. The two bases are joined by rectangular faces. So a rectangular prism is a 3-D shape that has two rectangular bases and 4 rectangular side faces. A *cube* is a special rectangular prism, because all its faces are identical squares. (A square is a special rectangle). There are other prisms like triangular prism, in which the two identical bases are triangles, but the side faces will still be rectangles.

A cylinder is a 3-D shape that has two identical circular bases. The part joining the bases is a curved surface.

A cone is a 3-D shape that has one circular base and an apex. The part joining the circular base and the apex is a curved surface.

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

The students do not have to be able to tell the definitions of the above 3-D shapes. They should do fine if they can observe and tell some features of the shapes; describe, tell the similarities and differences between these shapes.

It is also not necessary for the students to name the shapes, at least in the beginning, but more important that they describe and compare them. The teacher, however, should use the proper names for the shapes to help students become familiar with them. For example, the teacher would accept it if a student called a cylinder a can, but the teacher would say *cylinder*.

Suggest the that students focus on attributes such as whether objects are or are not round, will or will not roll, whether or not they have corners, whether or not they have flat faces, etc.

A few essential questions that should be asked during the course of the lesson activities are:

How are these two shapes alike?
How are these two shapes different?
What is true about every one of the cylinders?
Which of these shapes are the most alike? Why do you think that?

Activity 1 Introducing 3-D shapes

Objective

Identify and name 3-D shapes.

Materials

A set of 3-D geometric shapes (rectangular prisms, sphere, cone and cylinder)
A collection of everyday items for the 3-D shapes (snap cubes, rectangular blocks of wood, geometrical box cases, crayon packets, chalk boxes, or anything that is the shape of a rectangular **prism;** various balls and marbles for **spheres;** marker pens, empty cans, candles etc for **cylinders**; some improvised cones for **cones**)

Activity Description

In advance, have a collection of the 3-D geometric shapes and everyday items as mentioned above. Display the collection of the 3-D shapes where all can see easily. Pick up a 3-D shape, for example a rectangular prism, and ask: **What is this?** The students may say, "It is a box". Accept what the students say if they are correct. Say: **We call this a rectangular prism.** Have all the students say after you "**this is a rectangular prism**". Have the students say the same sentence one by one individually. This is to ensure that everyone can say the name of the shape and the sentence correctly.

Maths Note
This activity introduces the basic 3-D shapes like sphere, cylinder, cone, and rectangular prisms (including cubes) to the students. Students learn to identify and say the correct names of these shapes. It is important to include everyday items for these shapes along with the 3-D geometric models.

Have a student to come forward and pick up a rectangular prism from the collection and place it at a different area. For example, **(Pema), come here. Pick up a rectangular prism. Say, "This is a rectangular prism to your friends", and place it here.** After Pema has done that, thank her. Then have another student do the same. For example, **(Arjun), come here. Pick up a rectangular prism,... Thank you, Arjun.** Have a few more students to do the same until all the rectangular prisms in the collection are picked up and placed at a different area. This is important because it exposes the students to rectangular prisms of various sizes and materials, and thereby to the key idea of what a rectangular prism really is.

Repeat the process for the remaining 3-D shapes. The students who are asked to come forward to pick up the shapes should be a different one each time. At the end, all the 3-D shapes in the collection will have been sorted.

Say: **We had all these shapes here together. Now the shapes are separated into different groups. Some of them are here, some are here, some are here, and some are here. What did we do to the shape?** The students should be able to say that they have sorted the shapes. Ask: **Into how many groups did we sort the shapes? What is the same about all the spheres? What is the same about all the rectangular prisms? What is the same about all the cones? What is the same about all the cylinders?** With each of these questions, encourage the students to say what they think. Listen to what they say. The students might need a lot of encouragement and support from you to speak and communicate in the class.

Assessment for Learning
See that the students can say or pronounce the names of the 3-D shapes correctly and confidently. See that all the students get chances to fiddle or play with the shapes.

Then you can allow the students to just fiddle with the shapes freely. You should allow this as much as possible even in the future lessons.

Reprint 2024

Activity 2 Describing a Rectangular Prism and a Cylinder

Objective

Identify and describe rectangular prism and cylinder.
Compare rectangular prism with cylinder.

Materials

Geometric 3-D shapes for rectangular prism and cylinder
Everyday items for rectangular prisms and cylinder

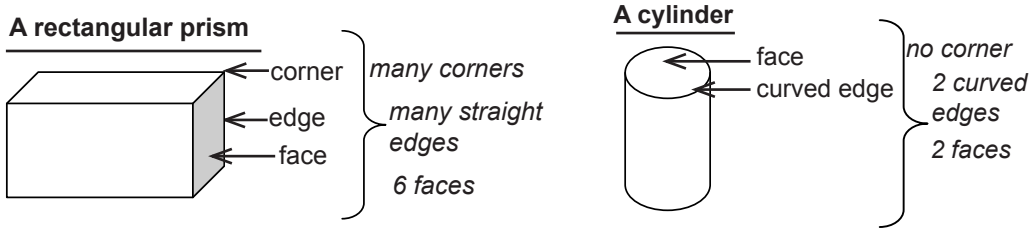
Maths Note
In this activity, the students learn to notice and describe the features of rectangular prism and cylinder. They do this through their senses of touch and sight, and observation of how the two shapes behave when pushed on a smooth surface. They talk about the similarities and the difference between these two shapes.

The flat surfaces of a 3-D shape are known as faces.

Activity Description

Display a collection of rectangular prisms and cylinders on the table. Pick up a rectangular prism and ask the students to name it. Place it back. Have the students say the names for a few more rectangular prisms and cylinders.

Pick up a rectangular prism, and tell the students that you want them to talk about it. Have the students describe it. Encourage them to say anything they would like to say about the rectangular prism. Listen to what they say. You might like to pass the rectangular prism around to the students for them to help describe it. Then, spend some time to talk about it. Say something like this, accompanied by appropriate actions: **A rectangular prism looks like a box. It has many faces (**Count to show that it has 6 faces. Explain that the *flat surface* of the prism are called *faces*). **It has many edges** (point to the edges). **It has many corners** (point to the corners). **If you push it, it will not roll. It will slide** (demonstrate this).



Then, pick up a cylinder and have the students try to describe it. Encourage them to say anything they like to say about cylinders. After that you could help them describe the shape of the faces of it, whether it has pointed corners like that of the rectangular prism, whether it will roll or slide etc. Then, spend some time to talk about it to summarize it. For example, say something like: **A cylinder has two faces** (show the two circular faces; explain that a flat surface is called a face, as in the case with the prism above). **A cylinder will roll if you push it on its curved surface** (demonstrate that). **It will not roll, but it will slide if you push it on its face** (demonstrate this).

Tell the students that we will together describe the rectangular prism by passing it around. When the prism has reached a student, the student will have to look at it, feel it, say one thing about it, and pass it to the next friend. More than one student can say the same thing. As the students tell a thing about the rectangular prism, write the descriptive words, preferably on a chart paper. It may look something as shown here.

Repeat the process with the cylinder.

Rectangular prism 

many faces
many corners
many edges
slides
does not roll
like a box

Cylinder 

2 faces
no corner
rolls
slides
like a can
like a markker pen

Then, ask students to compare the two lists, or talk about the similarities and the differences between the rectangular prism and the cylinder. **What words did we say same for both the rectangular prism and the cylinder? How are the cylinder and the rectangular prism different? How are they the same?**

Assessment for Learning
See that each student can say at least one thing about each shape, even if it is not in English. . If they cannot use the English terms, you can then teach them to use simple descriptive English terms.

Activity 3 Describing a Cone and a Sphere

Objective
Identify and describe cone and sphere.
Compare cone with sphere.

Materials
Geometric 3-D shapes for cone and sphere
Everyday items for cone and sphere

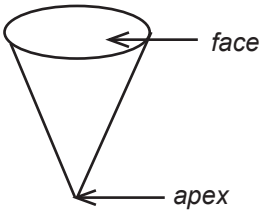
Activity Description
Display a collection of cones and spheres. Pick up a cone and ask the students to name it. Place it back. Have the students say the names for a few more cones and spheres.

Pick up a cone, and have the students describe it. Encourage them to say anything they would like to say about it. Listen to what they say. Then, spend some time to talk about it. Say something like this, accompanied by appropriate actions: **A cone looks like a funnel. It has one face (**show the flat circular base of it). **It has an apex** (Point to the pointed tip of it). **It will roll, if you place sideways and push it** (demonstrate this)**. It will slide, if you place it on its base, which is the face of it and push it** (demonstrate this).

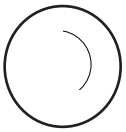
Maths Note
In this activity, the students learn to notice and describe the features of cone and sphere. They do this through their senses of touch and sight, and observation of how the two shapes behave when pushed on a smooth surface. They talk about the similarities and the difference between these two shapes.

Then, pick up a sphere and have the students describe it. Encourage them to say anything they like to say about sphere. Then, spend some time to talk about it. For example, say something like: **A sphere has no faces**. **It is curvy all over**. **A sphere will only roll if push it. It will not slide** (demonstrate that). **It is like a ball.**

Cone



Sphere



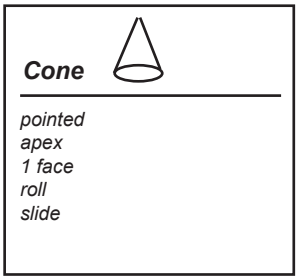
no face
no edge
no corner

Reprint 2024

Tell the students that we will describe the sphere and cone once again together. Explain that you will pass around a cone. When the cone has reached a student, the student will have to look at it, feel it, say one thing about it, and pass it to the next friend. More than one student can say the same thing. As the students tell a thing about the cone, write the descriptive words, preferably on a chart paper.

Repeat the process with the sphere.

Then, ask students to compare the two lists, or talk about the similarities and the differences between the cone and the sphere. **What words did we say the same for the cone and the sphere? How are the cone and the sphere different?**



Extension

Present the students will various combinations of two shapes from the 3-D shapes of cones, spheres, cylinders and rectangular prisms. Have them first identify the names of the shapes, and then tell the differences and the commonalties between the two shapes presented. For example, ask: **What it the same about a cone and a cylinder? What is different about a cone and a cylinder? From the four shapes – a sphere, a cone, a cylinder and a rectangular prism, which shape will not roll? Which shape will not slide?** Etc. In describing the 3-D shapes and comparing them, you should always have the 3-D shapes physically in front of or with the student.

Assessment for Learning
See that each student can say at least one thing about each shape, even if it is not in English. . If they cannot use the English terms, you can then teach them to use simple descriptive English terms.

Activity 4 What is in the bag?

Objective

Identify, describe, and compare 3-D shapes using the senses of touch and sight.

Materials

2 sets of geometric 3-D shapes (cones, cylinders, spheres, rectangular prisms)
4 feely bags

Maths Note
As students use their hand to feel the objects, they would naturally focus on the shape features of the object like the corners, curved faces, flat faces and edges. This will help them in describing the shapes better.

Activity Description

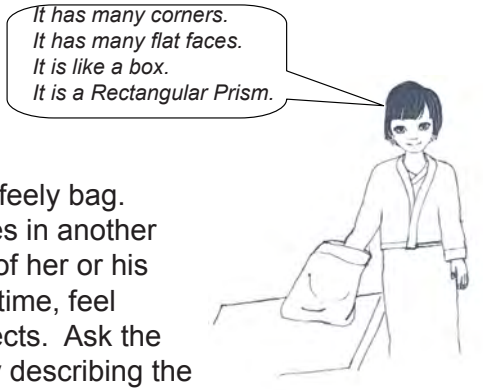
In advance, place a cone, a cylinder, a sphere, and a rectangular prism in feely bags separately. Display another set of the four 3-D shapes openly on a table so that all can see easily.

Have a student come forward. Tell him or her to put his or her hand in the a feely bag and feel the shape and describe it. Leaving the shape in the bag, the student will then have to identify the same shape from the table by picking it up and saying its name. You then ask why the student picked up the particular shape. Encourage other students to ask too.

You may have to model this before the students.

Have different students come forward and do similarly as above for the shapes in the remaining feely bags.

You could repeat the process with as many students as you and they like.



Assessment for Learning
If some students are having difficulty in their description, provide probing questions to help them.

Variation
Place a set of the four 3-D shapes in a feely bag. Place another set of the four 3-D shapes in another feely bag. Have a student to put each of her or his hands in each of the bags at the same time, feel the shapes and draw out matching objects. Ask the student to tell how she or he did that by describing the shapes. Repeat the process with other students.

Activity 5 Guess My Shape

Objective
Describe and identify a 3-D shape.

Materials
A collection of 3-D shapes (geometric 3-D shapes like cones, cylinders, spheres and rectangular prisms with everyday objects like balls, cans, snap cubes, marker pens, pencils, crayons, funnels, boxes, books etc.)

Maths Note
In this game activity, the students will really have to focus and describe the shape features of the 3-D shapes to identify each one of them. This reinforces the students in remembering and describing the properties of the 3-D shapes in a good and fun way.

Activity Description
The students can play this game preferably in pairs. They can also play it in groups of three.
The rule of the game is: Someone has a shape (hidden). Another person guesses the shape by asking yes/no questions – for example, "Does it have any curved surfaces?" The person holding the shape answers. The guesser keeps on asking questions until he/she knows what it is.

You might have to demonstrate the game: Ask a student to select a shape and show it to the class but not to you. Then ask the student series of questions (questions involving properties). For example, if the student had picked a cone, the following dialogue could occur:

Assessment for Learning
See that the students can ask the yes/no questions properly.

You:	**Does it have many corners?**
Student:	**No**
You:	**Does it have any straight edges?**
Student:	**No**
You:	**Does it have any flat faces?**
Student:	**Yes**
You:	**Does it have any curved edges?**
Student:	**Yes**
You:	**Does it have a pointed tip?**
Student:	**Yes**
You:	**It is a cone!**

Reprint 2024

Activity 6 Sketching the 3-D shapes

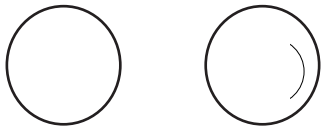
Objective
Draw the sketches for a sphere, cone, cylinder and rectangular prism.

Materials
Chalk board and chalk
Papers, pencils and erasers for the student

Activity Description
Guide the student through the following steps of drawing the four 3-D shapes one by one. You could demonstrate this using your hand movement in the air, making them observe while you draw the shapes on the blackboard using the same techniques as presented here, and guiding them physically as they draw with pencils in their note books. The students should use the guides presented in their Student's Activity Books. Ultimately, we would want the students to draw reasonably correct diagrams on papers with pencils.
It is not necessary that the students learn the drawings of all the four 3-D shapes in one period. The drawing practice should be continued over the next several days.

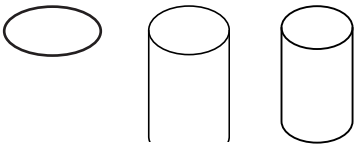
Maths Note
You can draw diagrams of 3-D shapes on paper, but these diagrams only show the view from one perspective. It is beneficial for the students to have experiences drawing or sketching the basic 3-D shapes. This would make it easier for them to identify the pictures and drawings of the 3-D shapes, and also enhance their fine psychomotor skills. There are many correct techniques of drawing the diagram of a 3-D shapes. The techniques presented here is only one of them. It would be better for the students to use only one technique consistently at this stage. Later, some students will develop their own techniques and styles of sketching.

Drawing a Sphere
First, draw a circle. Then, draw a short arc-like curve inside near the circumference



Drawing a cone
First, draw an ellipse (elongated circle). Then, from the left most edge of the ellipse, draw a straight line that goes down and right to the middle of the ellipse. Next, from the right most edge of the ellipse, draw a straight line that goes down and left to meet the earlier line. There you are with your cone!

Drawing a cylinder
First, draw an ellipse. Then, from the left most edge and the right most edge of the ellipse, draw a straight line each that are of the same length and they go vertically down. Next, join the ends of the two straight lines by a line that is sligthly curved outward.



Drawing a rectangular prism
First, draw a straight line from left to right. Second, draw another line of the same length that is slightly above and right of the first line. Third, draw a straight line each down from the right ends of these two lines that are of the same length. Fourth, join the ends and the corner of the two lines with straight lines. Fifth, from the left corner of this shape draw a straight line down that is the same length as the other lines from the right corners. Finally, close the shape witha straight line.

Reprint 2024

Lesson 2 Sorting and Re-sorting 3-D shapes

Lesson Goal

The students should be able to sort 3-D objects based on shape.

Relevant Maths Issues

Students are using concepts of classification when they identify shapes. But by having students sort shapes and physically put together shapes of a certain type, they can show what they understand about how to describe, compare and identify shapes.

Students should be encouraged to physically bring together the objects they have sorted into a group. The same objects could then be re-sorted a different way. For example a set of boxes and cans could be sorted to put together all of the objects that roll, but then re-sorted to put together all of the objects that are very wide.

A few essential questions that should be asked during the course of the lesson activities are:

What is the same about _____?
How could you sort these?
Suppose we put together all the shapes that had flat faces. Which shapes would we include?
Which shapes go with these _____?

Activity 1 Free sorting

Objective

Identify, describe and compare 3-D shapes.
Sort and resort 3-D shapes into two groups and explain the sorting rule.

Materials

A collection of 3-D shapes (geometric 3-D shapes like cones, cylinders, spheres and rectangular prisms with everyday objects like balls, cans, marker pens, funnels, boxes, books etc.)

Activity Description

In advance, have a collection of the shapes in adequate numbers. Divide the class into groups of 2-4 students. Provide each group with a set of various 3-D shapes. Ask them to sort the objects they have into two groups or sets. You could provide strings or yarns to help the students make the two sets. Otherwise, simply putting the things into two groups should do just as fine.

If any group has difficulty to start with the sorting, you could help them get started, but avoid intervening too soon.

As you go around and engage with the groups, ask the students to explain their rules for the sorting they are doing or have done. For example, ask: **What is the same about all these shapes** (pointing to a set)**? And what is the same about all these shapes** (pointing to the other set)**? What is**

Maths Note
Students already have some idea and experience about sorting objects based on certain attributes from chapter 1. In this activity, let them sort in whatever way they like. What is important is to ask during the process of sorting or at the end of it to explain how and why they have sorted in the way they have. Ultimately, in this lesson we want the students the objects based on the attribute of shape and the properties based on the shapes, like whether the objects have curved faces or flat faces, whether they roll or not or whether they slide or not.

different about these two sets? Could you put all the shapes back together and sort them in a different way? Have the groups show their sorting with the other groups. Encourage the students to sort the shapes in as many different ways as possible. Have the students share show or share their sorting with other groups members. Encourage the students to ask each other to explain their sorting rules.

Assessment for Learning
See that students can explain their sorting rules, by describing at least a common property of the things in a set. Also see that they can put back the things together and resort them using a different sorting rule.

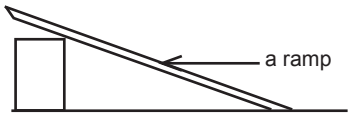
Activity 2 Roll or Slide

Objective
Identify, describe and sort 3-D shapes based on a rule.

Materials
A collection of 3-D shapes (geometric 3-D shapes like cones, cylinders, spheres and rectangular prisms with everyday objects like balls, cans, snap cubes, marker pens, pencils, crayons, funnels, boxes, books etc.)
An improvised ramp (with a smooth surface)

Maths Note
In this activity, the 3-D shapes are sorted according to whether they roll or slide. It will be noticed that some shapes like cylinders will both roll and slide depending on which face you make it move on the ramp. Let the students discover this and let them decide in which category to place such a shape for this activity. Later, we can then sort the shapes further into three sets as shapes that only roll, that only slide, and that both roll and slide.

Activity Description
In advance, bring in a rectangular piece of plank which is about one metre long and wide enough to make a ramp. Display the collection of the 3-D shapes as mentioned above. Tell the students that you will together sort the shapes into two groups based on a sorting rule. **We will together sort these shapes into two groups based on a sorting rule. The sorting rule is: does the shape roll or slide? We will place all the shapes that roll here, and we will place all the shapes that slide here. To do that, we need a ramp.** Make a ramp on the table for the shapes to roll or slide on it. Pick up a shape – a ball. **Let us see if this shape will roll or slide on this ramp.** Place it on the upper end of the ramp to demonstrate the rolling motion of it**. This shape rolls. The ball rolls. Let us place it here.** Pick up a book and ask. **Do you think this shape roll like the ball? Will it then slide?** Demonstrate the rolling motion and sliding motion with your hands, so that the students understand the two words. **Let us see how it goes.** Place the book at the upper end of the ramp and give it a put. **The book does not roll. It slides. So I am going to place it here.** Repeat the process with a few more items. Have the students say the sentences to describe the motion of each item so that they learn to use the language properly.



Ask a student to come forward. Have him or her pick up an item, predict to say whether it will roll or slide, check it against the ramp, and decide where to place it. Have the student say something like this, after choosing an item: **I think the pen will roll. Let me check that. Yes the pen rolls. So I am going to place it here.**

Continue the process with other students until all the things in the collection have been sorted. Help the students with the language. Emphasize that the students should first predict whether a shape will roll or slide before checking it against the ramp.

After all the items have been sorted, examine the things in the two groups. Referring to the set of things that roll, say; **let us look at all the things that we have here. What is the same about all these shapes? Why did these shapes roll? What made these shapes roll?** Pick up the shapes ones by one and observe their faces. See if the students can describe their faces. It will be discovered that a shape will have at least one curved face. Make the students realize that it is the curved face that makes a shape roll, and the flat face that makes a shape slide. Ask if a cylinder could belong to the other set also, and why.

Assessment for Learning
See that students can describe the faces of an object as either flat or curved, and also realize that it is the curved faces that make an object roll.

Activity 3 Roll, slide or roll and slide

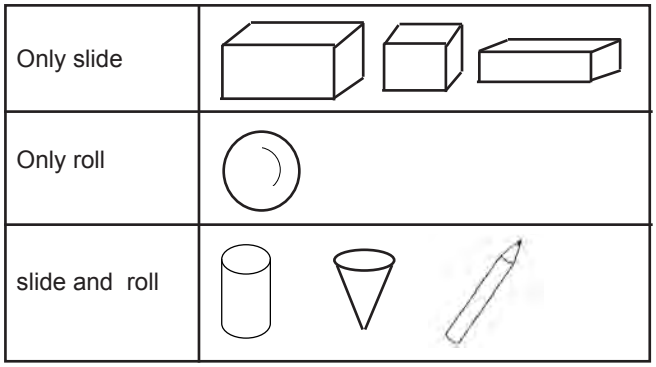
Objective
Identify, describe and sort 3-D shapes based on a rule.

Materials
3-D shapes sorted into two sets as shapes that roll and shapes that slide from the activity above
Newsprint papers
Marker pens

Activity Description
Use the two sorted sets of the 3-D shapes from the previous activity – shapes that roll and shapes that slide. If the shapes had been all put together already, then the previous sorting could be easily done again. Have the display of the two sets on a table. Examine each shape from a set one by one, and consider if they could also be placed in other set. For example, pick up a cylindrical object from the set of shapes that roll. Agree that it rolls and it is in the correct set. But consider if it will also slide. Say: **This cylinder rolls. So that is why it is with these other shapes that all roll. But will it also slide?** Have the students predict and explain what they think of that. After they are convinced that a cylinder will roll as well as slide, say that we can create a third set, a set for shapes that roll as well as slide. Have students examine each shape one by one from both the sets and sort them into the three sets. Repeat the process with each shape until all the shapes have been sorted into the three sets.

Maths Note
This activity is an extension of the previous activity. Here the students sort the 3-D shapes into three sets as shapes that both roll and slide, shapes that only slide, and shapes that only roll. The students study the shapes carefully, deduce whether they will slide or roll, and confirm it actually.

Draw the sketches of the 3-D shapes that have been sorted into the three sets, as shown here. You could have the students draw or copy the sketches. However, it is not necessary for the students to have their drawings neat, clean and perfect. You might need to help the students with their drawing mainly to get the ideas correct, and gain not to insist on perfection or neatness. Illustration here for shapes that only slide, shapes that only roll, and shapes that slide and roll.



Assessment for Learning
See that students can describe the faces of an object as either flat or curved, and also realize that it is the curved faces that make an object roll.

Activity 4 A 3-D Shape Sorting Game

Objective
Identify a 3-D shapes as cylinder, sphere, cone or rectangular prism.

Materials
A collection of 3-D shapes (geometric 3-D shapes like cones, cylinders, spheres and rectangular prisms with everyday objects like balls, cans, marker pens, funnels, boxes, books etc.)

Maths Note
This game reinforces both the identification of 3-D shape names and the sorting of shapes based on the shapes.

Activity Description
Display the collection of 3-D shapes on the table. Ask each student to choose an object to keep with him or her. After that is done, you can take the children outside to an open area, like a play ground. At the ground, have the student for a circle. Tell them that they are going to run around and sort themselves out as per your sorting rule. Have them run around, chanting; **run around the circle run, run, run**. As they carry on with the running, say aloud: **All the spheres come and sit here!** Check if everyone with a sphere is in. The rest of the students continue with the running and chanting; **run around a circle, run, run, run**. Then say aloud: **All the cones, come and sit here!** Continue the process until all the remaining shape names are called.

You could have the students trade their shapes with others, and then play the game again.

Variation/Extension
You could make the student play with game using the following rules for sorting.

All the ones with no flat faces come and sit here!
All the ones with two flat faces and one curved face come and sit here!
All the ones with no curved faces come and sit here!

Lesson 3 Creating Shape Patterns

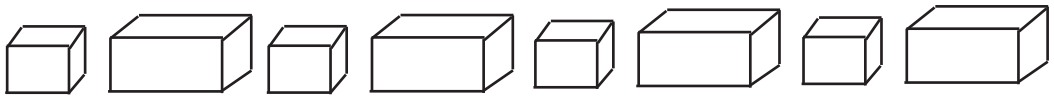
Lesson Goal

The students should be able to create patterns based on attributes related to shape.

Relevant Maths Issues

The students might build various types of repeating patterns based on classifications of shapes such as whether or not they are cylinders, rectangular prisms, cones, or spheres. They might also build patterns based on other attributes associated with shape, for example, whether they roll or not, or whether they have flat faces or not,

You might start by creating a pattern and asking students to copy it and then alter it to create a different shape pattern.
An example might be:



Students could modify it by replacing cubes with spheres or perhaps by creating an AAB pattern to replace the AB pattern.

A few essential questions that should be asked during the course of the lesson activities are:

What makes it a pattern?
What shapes did you use in your pattern?
Why did you use that shape in that position?
What different pattern could you make with these shapes?

Activity 1 Patterns with 3-D shapes

Objective

Identify and describe a repeating shape pattern.
Create a simple repeating shape pattern with two or more different 3-D shapes.

Materials

Snap cubes in two colours
A collection of 3-D shapes (geometric 3-D shapes like cones, cylinders, spheres and rectangular prisms with everyday objects like balls, cans, marker pens, funnels, boxes, books etc.)

Activity Description

Create an AB colour pattern with snap cubes and present it to the students. Ask the students: **Is this a pattern? How is this pattern? What part of this pattern is repeating over and over again?**

Maths Note
The students have some experience with simple repeating patterns based on the attributes of colour, length, position and even shapes with the experience provided in chapters 1 and 3. In this activity, the students identify and create simple repeating patterns based on the attribute of shape related to the four basic 3-D shapes.

Then make an AAB colour pattern, again with the snap cubes. Repeat the questions as above. Stress that both the patterns that the students have just seen are colour patterns.

Then make an AB pattern using two 3-D shapes – for example a sphere, a cylinder, a sphere, a cylinder, a sphere and a cylinder. The size and colours of the spheres need not be the same. In fact, they should not be the same. The same applies to the cylinders. This allows the students to focus on the shapes and not consider other attributes like size and colours, which is what we want in this lesson.

Now based on this shape pattern, ask the students: **Is this a pattern? How is this pattern? What part of it is repeating over and over again? Is this a colour pattern? What type of pattern is this?**

Divide the class into small groups of 2-3 students. Provide each group with two different types of 3-D shapes - say spheres and rectangular prism (including cubes), cones and cylinders, cylinder and rectangular prisms to various groups. The total number of shapes for each group should be about 10 with at least 5 of each type. Ask the groups to make any patterns they like out of the two types of shapes they have. As the students work in groups, go around and ask the following question with each group.

Explain your pattern to me. Why is that a pattern?
What part of your pattern is repeating?
If you want to extend your pattern, what shape should come next (here)? And the next?
Can you make another pattern using the same shapes? Please make another pattern.

The students may try to make patterns with colour if the shapes have colour, because that's what they have also seen at the beginning of the activity. That will be okay. Let them do a colour pattern with those shapes, but then they should be challenged to make a pattern based on shape, not colour.

After the students have made and presented a pattern, ask them to close their eyes, so that you can remove and hid a shape from it. Ask them to open their eyes. Ask: **What shape is missing from your pattern? How do you know that?**

After every group has made a pattern or two, ask two groups to get together and explain to each other their patterns. Encourage the students to ask each other questions and clarifications. Join the groups together for a class discussion and help students to ask questions of one another.

Assessment for Learning
Ensure that students can explain their patterns. Ensure that they can make at least three different types of simple repeating patterns out of the given two types of shapes, like AB, AAB, ABB, or even AABB patterns. Also see that students can extend a simple repeating pattern.

Extension

Once the students are confident with making simple repeating patterns with two types of shapes, provide a third shape, and encourage them to make pattern with three types of shapes.

Encourage the students to draw their patterns on sheet of papers that you can provide. Their drawing could be displayed on the wall.

Lesson 4 Building 3-D Structures

Lesson Goal

The students should use a variety of 3-D objects to build “towers” and be able to describe how they build the towers and what the towers look like.

Relevant Maths Issues

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.

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.

Make sure students encounter situations where the tower is easy to build as well as ones where it is more difficult to build. Sometimes allow the students to decide on the number of items in the tower and other times, indicate how many objects to use. Sometimes allow the students to select the sequencing of items in the tower and other times instruct them as to a sequence.

A few essential questions that should be asked during the course of the lesson activities are:

Why did you put the sphere on top and not on the bottom?
What shapes did you use in your tower?
Which shapes were the easiest for you to stack?
Why did you stand the cylinder up instead of use it on its side?

Activity 1 Building Towers

Objective

Build and describe towers with 3-D shapes.

Materials

A collection of 3-D shapes (geometric 3-D shapes like cones, cylinders, spheres and rectangular prisms with everyday objects like balls, cans, marker pens, funnels, boxes, books etc.)

Maths Note
Building towers and other structures with 3-D shapes focuses the students on the properties of the shapes. For instance, they will come to realize that we can’t use spheres or cones at the base or middle of the towers. They also learn about the need to use wide shapes at the base of the towers for their stability.

Activity Description

Provide each student with a 3-D shape. If the class size is small, you could provide each student with two 3-D shapes. After that, hold up a cone and say; **what shape is this? Yes, this is a cone. Who else has a cone?** Have the students to show their cones. Repeat this for other shapes, just so that the students can identify the shapes with their names.

Tell the students that we will be building a tower together. Ask the students to contribute their shapes in making a tower. Build a tower using about 5 to 10 shapes in all. After the tower is completed, discuss it. **Where is the cone? Where is the sphere? Why couldn’t we have sphere in**

the middle or at the bottom? What would happen to the tower if the cylinder was placed side ways?
Have the students who contributed their shapes to take the shapes back.

Then divide the class into groups of 2-3 students. Have each group build a tower or two using the shapes the group member have. Ask the students work on building their towers, go around, interact with them, and ask relevant questions to the students. After all the groups have completed their towers, ask them to describe and compare their towers. Use the follwoign questions to guide the discussions:
What shapes did you use to build your tower?
What shape is at the bottom of your tower? What shape is on the top of your tower?
What is similar between the (two) towers? What is the difference between the (two) towers?
Could you have exchanged the positions of these two shapes in your tower?

Assessment for Learning
See that students can reason out why we can not have a sphere or a cone to start a tower.

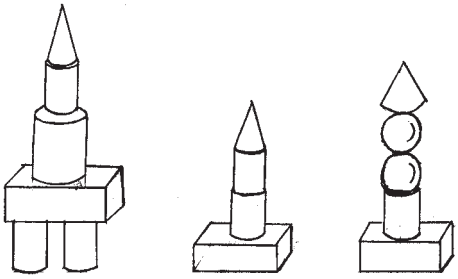
Activity 2 Building various structures with 3-D shapes

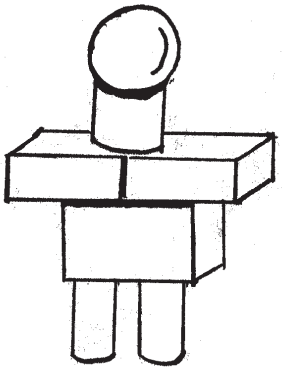
Objective
Build and describe structures with 3-D shapes.

Materials
A collection of 3-D shapes (geometric 3-D shapes like cones, cylinders, spheres and rectangular prisms with everyday objects like balls, cans, marker pens, funnels, boxes, books etc.)
Sketches of the of diagrams as shown here on newsprint or chart papers

Maths Note
This activity will allow the students to explore building various structures with the given 3-D shapes. In doing so, they practice their reasoning and communication skills in describing their structures.

Activity Description
In advance, prepare the drawings on chart or newsprint papers as shown here. Put up the pictures you have drawn. Discuss the pictures of the "Tall Towers". **How many towers are there in this picture? Which is the tallest tower? Which is the shortest tower? Can you make this tower with our shapes? Why can't we make this tower? Would you like to try making it, and see what would happen? Which of these towers can you make?**





Then point to the other picture, which looks like a human body. **What does this look like? Can you make one like this with our shapes?** Make available the collection of the 3-D shapes for the students to make any structure they like, either in small groups or individually. The structure could be things like people, houses, chortens, etc. After they have made the structures, encourage them to describe them. Encourage the students to draw their structures on sheets of paper that you can provide. But do not emphasize on the neatness and quality of the drawings. The drawings that the students have made could be displayed on the wall.

Assessment for Learning
See that the students feel free and supported in making various structures, and talking about them.

Activity 3 Modeling 3-D shapes

Objective
Make clay/mud/dough models of 3-D shapes and describe them.

Materials
Collection of 3-D geometric shapes (cones, cylinders, spheres and rectangular prisms)
Clay/clayey soil/dough
Stiff card boards or pieces of planks

Maths Note
Children love to make models with clay or mud. This activity would give the students an opportunity to experiment making 3-D shapes in a free manner. In the process they get to practise their language skills in describing their models.

Activity Description
If possible take the students to a site where you can get clay or clayey soil in the nature. This is good and strongly recommended because it allows the children to connect the environment (community and natural environment). They will learn about soil and other things in the soil.

If this is not possible, take the students outside and make dough, in which case you will have to bring flour (about 2 kg of atta mixed with maida), water, and the required bowls.

Have the students to make 3-D shapes of their choice. You can provide the geometric models for them to copy. It would be good to engage yourself into making the models with the children. Provide help and assistance to the students in making their models. After they have made their shapes, you can ask them questions like: **Which shape was easy for you to make? How did you make it? Which shape did you find difficult to make?** Have the students explain to each other their methods for making their shapes.
All the students to get their shapes dry at proper places. Students can then bring the shapes in to the classroom and keep at a corner. You can help them to label the shapes they have made. Some of these shapes could be used for other lessons later. You could also invite students from other classes, other teachers and the school Principal to come and look at the shapes your students have made. The students would love to get visitors asking them and appreciating their works.

Assessment for Learning
See that a student has made at least one 3-D shape.

Reprint 2024

Lesson 5 Locating 3-D Shapes in the Environment

Lesson Goal

The students should recognize and identify cylinders, spheres, cones, and rectangle-based prisms which include cubes in their environment.

Relevant Maths Issues

It is important that students recognize where the shapes they study in school appear in their everyday lives. These basic shapes are very prevalent.

Students might be asked to go on a shape hunt to find shapes around the school that match the five they are studying. Provide a chart where students can draw pictures of, or describe locations of, items they find that match each of the four types of shapes. The shapes in the environment need not be exact or perfect like the geometric 3-D shapes, but which look approximately like them should be accepted.

A few essential questions that should be asked during the course of the lesson activities are:

Where did you find spheres?
What shape is our classroom?
Did you find more _____ or _____?
How could you tell whether rectangle-based prism was a cube?

Activity 1 3-D Shape Hunt

Objective

Identify 3-D shapes (cones, spheres, cylinders, rectangle-based prism including cubes) in the environment.

Material

Chart or newsprint papers to make the table as shown on the next page
Marker pens

Activity Description

Tell the students that they would be going on a campus tour of the school. During the tour, they would be looking for the 3-D shapes in the things around, including the buildings and other structures.

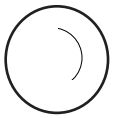
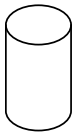
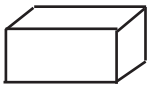
Take the students on the tour. Where available and possible, you could also take them to the science laboratory, computer laboratory, the office, and the school kitchen. Needless to say you would have to plan and arrange these. Encourage them to point to anything they see as a 3-D shape that they know. You may need to lead and prompt the students in their observations and discussions. Some of the things you could consider are: prayer flags, electricity poles, water tanks, building (if you don't consider the roofs), things and equipments in the rooms. The objects and structures which are approximately similar to the four basic 3-D shapes should be accepted as spheres, cones, cylinders and rectangular prisms. For example, an orange

or tomato can be accepted as spheres. But the students should be made aware that they are not perfect spheres. The tour will have to be interactive.

Assessment for Learning
See that the students have realized that many things around are made up of the basic 3-D shapes they already know.

Back in the classroom, put up the chart as shown. Then discuss and write on the chart the places and locations where you found the particular 3-D shapes. Ask questions like: **Where did we see (spheres)? What shape did we find the most (least)? Why do you think our houses like rectangle-based prism? Why are our drinking glasses and mugs not spheres or cones?**

3-D Shape Hunt

SHAPE	WHERE?
Sphere 	
Cylinder 	
Cone 	
Rectangular Prism 	

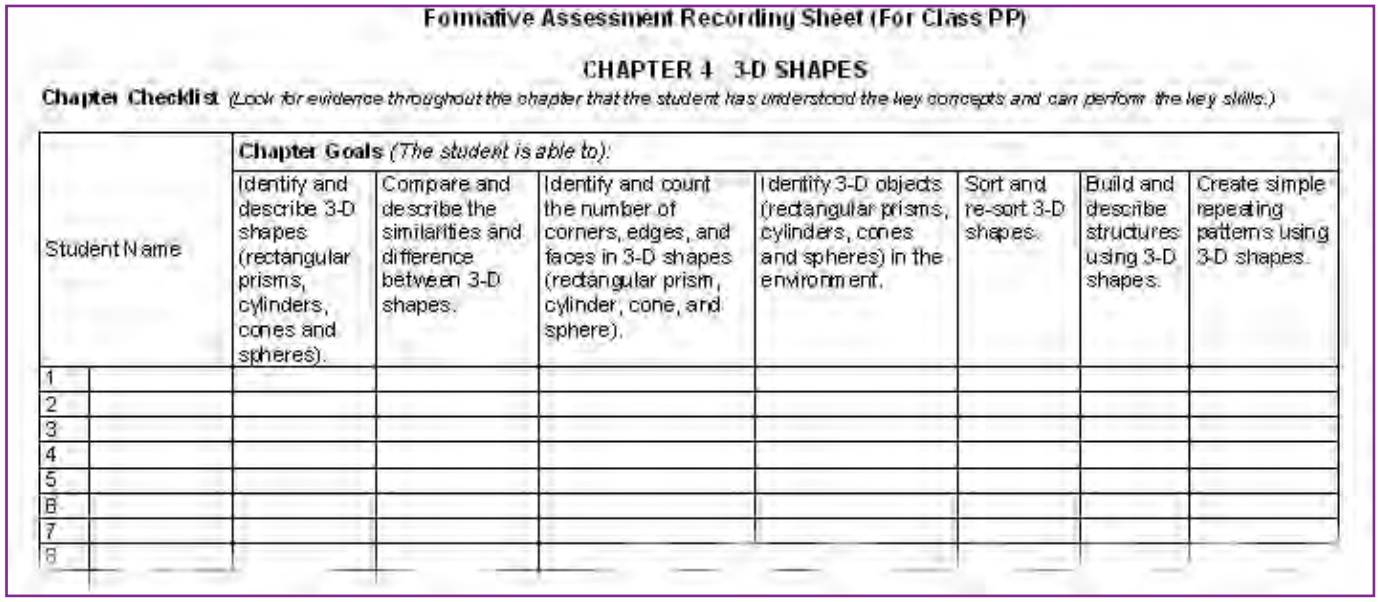
Reprint 2024

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.



Formative Assessment Recording Sheet (For Class PP)

CHAPTER 4 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):*						
	Identify and describe 3-D shapes (rectangular prisms, cylinders, cones and spheres).	Compare and describe the similarities and difference between 3-D shapes.	Identify and count the number of corners, edges, and faces in 3-D shapes (rectangular prism, cylinder, cone, and sphere).	Identify 3-D objects (rectangular prisms, cylinders, cones and spheres) in the environment.	Sort and re-sort 3-D shapes.	Build and describe structures using 3-D shapes.	Create simple repeating patterns using 3-D shapes.
1							
2							
3							
4							
5							
6							
7							
8							

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Summative Assessment Recording Sheet (For Class PP)

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

CHAPTER 4 3-D SHAPES

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

Task and Interview prompts	Key concepts and skills to look for
Task 1 Present the student a collection of 3-D shapes comprising of 3-D geometric shapes and other common objects like cans, balls, marbles etc. Ask the student to pick up a shape and describe it: **Tell anything you can about this shape.** Pick up and set aside at least three shapes of the same type (e.g. three rectangular prisms). Ask: **How are these shapes the same? What do we call this group of 3-D shapes? Can you find another rectangular prism in the larger group?** Repeat for other groups of 3-D shapes. Have the student sort the collection into two groups. **I want you to sort the objects into two groups.** After that is done, ask: **What is same about all the objects that are in this group?** Ask the student to build a tower using the 3-D objects. Ask: **Why did you use this block at the bottom. What will happen if you use a sphere as your base?** Etc. Pick up a 3-D shape, say a cone, and ask: **Show me the corner on this shape. How many corners does this shape have? Show me the flat face on this shape.** Repeat this for a few other shapes.	*The student is able to :* - Identify and describe 3-D shapes. - Compare and describe the similarities and difference between two 3-D shapes. - Sort the 3-D shape and describe the sorting rule. - Determine if a 3-D shape will stack or roll. - Identify the faces, corners, and edges on the 3-D shapes.
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 4
Total CA mark from Chapter 4 (Task 1: Mark out of 10): _____
Overall remarks on the student Strengths: Areas of Need: Follow up Steps:

CHAPTER 5 NUMBERS TO 10

Chapter Overview

The students learned number concepts, counting skills and numeral recognition and writing for the numbers 1 to 5 in chapter 2. These concepts and skills have also been reinforced through the experiences offered with the lesson activities in both chapters 3 and 4.

In this chapter, the students extend this learning to learn about the numbers from 6 to 10. The students will build on their understanding of numbers to include numbers from 1 to 10. It is recommended not to go beyond number 10 in class PP. Students will be introduced to the concept of zero. As already mentioned in chapter 2, the numbers 5 and 10 are important benchmark number for the students. The use of concrete materials, pictures, and ten-frames is important in building a strong number sense in the students.

This chapter has 5 lessons as detailed in the table of contents. The concepts and experiences with numbers are continued in chapter 11.

Basic Principles about Counting and Numbers

- In counting, one, and only one, number is said for each object, and the last number spoken tells how many.
- There is a consistent set of counting words that never changes.
- No matter what is counted, the process for counting remains the same.
- The order in which objects are counted does not matter; the number of objects in the set does not change.
- To understand what a particular number means, students must experience and create many representations for that number.
- Relating numbers to 5 helps students compare numbers, gives meaning to the numbers, and supports subsequent work in addition and subtraction.

Chapter Goals

- Count in correct sequence to 10.
- Determine how many are in a set that contains objects up to 10.
- Create sets to10 and describe its parts.
- Relate or compare a number to both the numbers 5 and 10.
- Write numerals from 6 to10.
- Identify the numbers before and after a given number.

Maths Words

Six, seven, eight, nine, ten, more than, less than, as many as

Initial Assessment

It is important to know that students know and understand the key concepts that they learnt of the numbers in chapter 2. The following assessment activities are suggested to check this. Additionally, you may repeat some of the activities from chapter 2.

Lay out 5 counters and ask students to count them. Alternatively, you may ask students to count aloud the fingers on a hand, one by one and loudly. See if they know the counting words; see if they count properly.

Provide counters to students that are different colours—ask them to show you three counters. Ask them to show you more (red) counters than (blue) ones.

Show the numeral cards from 1 to 5, one by one, and in random order. See if they can recognize and say correctly the number names for each of these numeral cards.

Provide each student with 3 rectangular pieces of paper, about the size of half a page of a notebook. On a paper, ask each child to draw 3 dots, or counters, or any 3 simple pictures of their choice. Let them colour their pictures, if possible. After everyone has finished that, collect the papers with the pictures. Then ask them to draw 4 pictures (the pictures could be again dots, counters, pencils, etc). Let them colour their pictures again, if possible. Collect the paper with the pictures. Repeat this for 5 pictures. Mix up all the pictures together randomly. Divide the class into 3 to 5 groups, depending on the class size. Distribute the mixed up papers roughly equally to the groups. Ask each group to sort the drawings by number. After they have sorted the drawings, ask them to represent each group of sorted drawings by a numeral that they can draw on a similar piece of paper and display. This activity reinforces in students that a number can be represented by different things and in different arrangements.

Use the drawing from the above activity. Display the papers, so that students can see them all. Pick up a paper showing three pictures. Ask a student to pick up a paper showing **more than** the number that you have. Check with the class to confirm. Ask another student to pick up another card showing **more than** the number you have. Repeat the same for **less than** and **as many as or same as**.

Provide groups of students with 5-frames and counters. See that students can put 1 to 5 counters on the 5-frame. For example, ask a group to put 3 counters on the 5-frame; ask: **Is it less than 5? By how many? How many counters do you need to make it 5?**

Show five snap cubes and 7 or 8 pebbles or maize seeds. Ask the students which is more – the cubes or the seeds. See that students are not confused between quantities or numbers with size.

Additionally, you may choose to carry out some of the activities from chapter 2.

Reprint 2024

Lesson 1 The Concept of Zero

Lesson Goal

The students should realize that the number used to represent the number of objects in a set which is empty is called zero.

Relevant Maths Issues

Zero is an abstract concept. But it may not be really that difficult to the students, even at this level, to understand it if it is introduced in a proper manner. Children should be made to realize that, when we say there are zero things in a set, it is just another way of saying that there is nothing in the set, or that the set is empty. We should be careful not to use zero in saying the counting words in sequence, such as **zero, one, two, three, four, five, etc**, for if we do that this could inadvertently imply to the students that numbers should always start from zero even in counting things. The danger with this is that for six objects to count the students could end up saying the number five with the object counted the last, and think that there are five objects. This is one reason why the introduction of zero has been delayed till now.

A few essential questions that should be asked during the course of the lesson activities are:

If you have no apples, how would you describe it with a number?
Show me the number five?
Write the number seven.
Write the number zero.

Activity 1 The Number Zero

Objective

Understand the use of the number zero as another way of saying that there is nothing in a set.
Write the numeral 0 for an empty set.

Maths Note
Read the section under the Relevant Maths Issues above. This activity introduces zero as the number we use when nothing is present/ remaining in a set.

Materials

Counters

Activity Description

Display a set of counters in an open container such as a tray or a *bangchung*, say 5 counters. Ask the students to count and tell how many are there. Then remove 1 counter from the set, and ask how many are there in the set now. Then remove 1 more counter from set, and ask them again how many are left. Continue in this way until only 1 counter is left. Then remove the final counter and ask how many counters are there now. Do not hurry to use the word **zero** yet. Stress that there is **no** counter left now. There is **nothing** in the container now; the container is **empty** now.

You could even represent what you have done above with sketch drawing on the black board, or on a chart paper. The drawing on the chart paper would be preferable, for it can remain on the

Ask 7 girls to come in front of the class. Other students may be asked to sit or stand in a semi-circle. Have the 7 girls sit down, and ask: **How many girls are sitting here?** Have 1 girl stand, and ask: **How many are sitting now?** Continue the process until the last girl has been asked to stand up. Then ask: **How many girls are sitting now?** Stress that there is **no** girl sitting now.

Now let the girls remain standing there. Bring the container with 5 counters in it. Show it to the students and ask again how many counters are there in it. Show up all your fingers and say, **when there are this many** (indicating to the 5 fingers) **we say there are five**. Remove 2 counters and ask the student to tell how many counters are there now. Say; **when we have this many** (showing 3 fingers up), **we say there are three**. Then remove 2 more counters and ask students to tell how many counters are there now. Say; **when we have this many** (showing 1 finger up), **we say there is one**. Now remove the last counter, and ask students to tell how many counters are there now. Students may say there is **no counter**, or that it is **empty**. Say; **when there is nothing; when it is empty; we say, there is zero**. Ask all to say there is **zero.**

Now ask: **How many girls are sitting here?** There is **no** girl sitting here. The other way to this say is: There are **zero** girls sitting here now. Have the girls go back to their seats.

Draw 5 cirlces on the board. Draw a set of 4 flowers in the 1st circle, 3 flowers in the 2nd cirlce, 2 flowers in the 3rd cirlce, 1 flower in the 4th cirlce, and nohing in the last circle. You might put up a newsprint paper for the same drawings. For each of the first 4 sets ask the students to tell how many flowers are in the sets. Ask for a student volunteer to write the correct number below each set. For the 5th or the empty set, ask: **How many flowers are there in this set?** Listen to what the students have to say. **How do we write zero?** Then introduce the numeral 0 to the students. Show them how to write it, by first making motion with your hand in the air. This should be relatively easy as the students have already written 10. Then write 0 below the empty container with the earlier drawing above.

Assessment for Learning
See that the students can pronounce the word zero properly.

Extension

Provide students with about 10 counters in small groups. Go around with an empty container. At each group, ask the students to put in any number of counters from 1 to 10. For example: Please put 2 counters in the container for me? Now put in 3 counters. Now give me 0 counters. Now give me 1 counter. Observe how the students react when you say, give me zero counters.

Reprint 2024

Lesson 2 Counting to 10 and back from 10

Lesson Goal

The students should continue to use the counting principles described in the chapter overview to identify how many are in a set of up to 10 objects. Students should also be able to count correctly and fluently forward from 1 to 10 and backward from 10 to 1.

Relevant Maths Issues

It is reasonable for the students in PP to continue to count up from 1 or back from 10 rather than counting on or back from other numbers.

It is useful to post the numbers from 1 to 10 on a number line to which students can refer. Emphasize, at this point, counting both forward and backward. These skills will serve students in later work with addition and subtraction.

Allow students to count everyday items on a regular basis.

Use counting in situations like, for example, when students are forming a line and you are counting how many are in the line (stopping at 10, however).

A few essential questions that should be asked during the course of the lesson activities are:

Which number tells how many … there are?
How many…. are there?
Show me 6 fingers.

(Count 7 items by saying 1, 2, 3, 4, 6, 7, 8) **What did I do wrong when I counted?**

Activity 1 Counting to 10

Objective

Say the counting words up to 10 in the correct order.

Materials

A large printed number line

Activity Description

In advance, make a large printed number line as shown here.

Count with students the fingers on the hands. Ask: **How many fingers do we have on our hands?** Listen to the responses from the students. Then say: **Let us count the fingers on our right hand**. Make a fist of the right hand. Have the student do the same. Then together count aloud the fingers on it one by one as you say each number from 1 to 5 and raise your fingers from thumb to the little finger. **So how many fingers do we have on our right hand?**

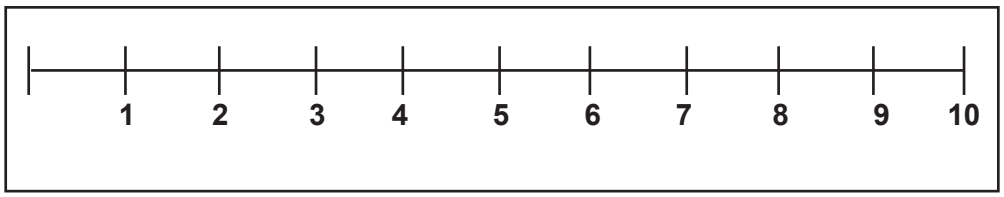
Then count together the fingers on the left hand in the same manner by first making a fist of it and raising the fingers as you say aloud the numbers from

1 to 5. Say: **So we have 5 fingers on the right hand. We have 5 fingers on the left hand. The right and the left hands have the same numbers of fingers. How many fingers do we have all together?**

Say: **how many fingers do we have all together? (5 here and 5 here – we have two fives of fingers)**…**let us count all the fingers and see how we do that.** Put up both the hands and make fist of them. Then start counting: **one, two, three, four, five, six, seven, eight, nine, ten**. As you count, raise your fingers one by one. The students repeat along with you. Ask: **how many fingers do we have all together?** Listen to the students say how many. **Let us count all the fingers.** Put up both the hands and make fists of them. Then start counting: **one, two, three, four, five, six, seven, eight, nine, ten**. As you count, raise your fingers one by one from the thumb of one hand to the little finger of the other. The students repeat along with you. Ask: **How many fingers do we have altogether?**

Do the counting from 1 to10 with the fingers a few more times, first by leading the students and afterwards asking the children to do it in small groups and individually. See that they can say the counting words from 1 to 10 in the correct order.

Put up the printed number line. Explain that it is called a **Number Line**. Point to each numeral on the number line as you say the numbers aloud from 1 to 10. Stress on the numeral 6-10, as the students are already familiar with the numerals from 1-5. Have a few students come forward and read out the numbers from 1 to 10 from the number line.



Maths Notes

It is important that children are able to say the counting words aloud and in correct order. But simply being able to do that may not necessarily always indicate that children have gained good number sense. So in order that they acquire the counting skills along with the gaining of the number sense, it is important that the counting skills are practiced with actual objects and are connected with everyday experiences. For instance, giving opportunities to show how much is 6, and frequently asking if 6 is less than or more than 7 and by how many would develop an understanding of what and how much is 6.

Extension

Provide the students to count various objects such as pencils, sticks, crayons, counters and students themselves as form lines or move away from a line from 1 to 10.

The following poem would be a suitable and appropriate extension only if the above activity with the fingers was used. The need to be sensitive to any possible physical deformities or abnormalities with finger applies here too.

In advance, have the following poem written on a chart paper, without the lines in the parenthesis. Put it up on the wall. Read the lines aloud once first. Then have the students say aloud the lines after you. Later you could say sing aloud the rhyme with appropriate actions as suggested with the lines and have the students do the same.

Ten Fingers
I have ten fingers (*hold up both hands, fingers spread*)
And they all belong to me, (*point to self)*
I can make them do things-

Special Note

Using the fingers on the hand to introduce and practise counting from 1 to 10 is a convenient way. But, as the teacher, it is extremely important for you to know if any student in the class has any finger missing or any extra finger on her/his hands or other related physical deformities. If such cases exist in your class, please modify the activity in a suitable manner, or better, do not use it at all. Instead, practise the counting with external objects such as sticks, pencil, pebbles and counters. In fact, later on you model and provide opportunities for the students to count various objects, including the students themselves up to 10.

Reprint 2024

Would you like to see?

I can shut them up tight (*make fists*)
I can open them wide (*open hands*)
I can put them together (*place palms together*)
I can make them all hide (*put hands behind back*)

I can make them jump high (*hands over head*)
I can make them jump low (*touch floor*)
I can fold them up quietly (*fold hands in lap*)
And hold them just so.

Assessment for Learning
See that each student can say the number names up to 10 correctly and in the correct order.

Activity 2 Show this many

Objective

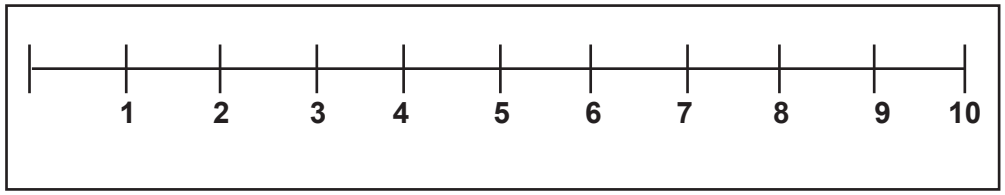
Say the counting words in the correct order up to 10.
Recognize quantities up to 10.
Associate the quantities up to 10 with their numerals.

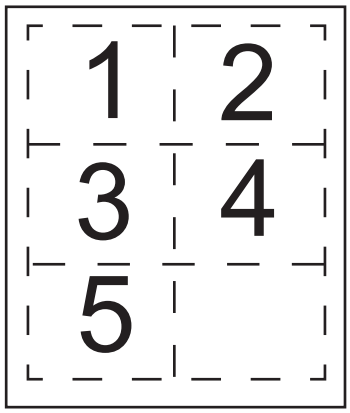
Materials

Pebbles (or snap cubes, or counters)
A tin container
Numeral cards from 1 to10
Number line

Activity Description

In advance, have a tin container, some pebbles or other such thing to drop in the tin, numeral cards from 1 to 10, and a number line ready. The number line would be the same one that was used during Activity 1 above. The numeral cards could be made by cutting out the printed numerals from the Student's Activity Book on page number ___, and pasting them on some stiff papers. If possible, laminate them for future use. The number cards from 1 to 5 could be the same one made during chapter 2.

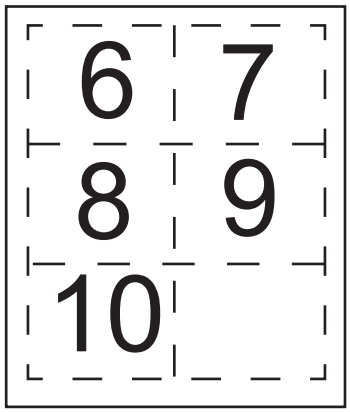




Drop 10 things (e.g. pebbles) in the tin container. As you drop a thing in the tin, say the counting words in sequence, **one, two, three, … ten.** Ask the students to join in the counting rhyme. Later, ask the students to say the counting words as you drop the things.

Have 7 things in hand, and ask the students to count as you drop the things one by one. At the end of it, ask questions like: **How many (pebbles) are in the tin? Someone, show us the number card for seven. Show me seven fingers. Make the sound of an animal 7 times.**

Ask a student to point to the correct numeral on the number line.



Take out one pebble from the container, and ask: **How many pebbles are there in the tin now? Is 6 more or less than 7? How do you know? How is 6 more than 5? How is 6 less than 10?**

Repeat similarly for some other number of things you drop in the container.

Assessment for Learning
See that the students are able to: say the counting words in correct sequence up to 10; recognize the correct numeral for the numbers; know that the last counting word said tell the number of things in a set; represent a number by other things; and compare a number with 5 and 10.

Extension

An extension would begin with materials being dropped into the container, as above. However, this time we count backwards as we take them out one by one to determine how many things remain in the container. We can stop any time and check that our count is correct. This could be done in small groups or as a whole class activity.

Activity 3 Rhymes with Numbers

Objective

Say the counting rhymes in correct order up to 10.
Associate the quantities up to 10 with their numerals.
Sing the rhyme properly.
Understand the meanings/context of the rhymes.

Materials

Reproduction of the rhyme "**One, two, where is my shoe?"** on a chart paper

Maths Note
This activity will be fun as well as providing a learning opportunity in terms of both Mathematics and the English language.

Activity Description

In advance, have the rhyme given here on a chart paper and display it. Explain to the students that you are going to sing a rhyme together. Say the rhyme aloud by first reading it from the chart, so that students also learn reading skills, and later without looking at it.

Discuss with students the simple story in the rhyme. Also explain the meanings of the words. Stress and show how the pairs of sounds are the same in their endings. For example, two with shoe, four with floor, six with Miss, eight with late, and ten with Ugyen.

The rhyme can be sung on other days also. And it will be nice if students can by heart it and sing it anytime in the future. But it is not necessary.

One, two, where is my shoe?

1, 2 where is my shoe?
3, 4, it's not on the floor.
5, 6, please help me Miss.
7, 8, now I will be late
9, 10, or is it with Ugyen?

Assessment for Learning
See that each student can sing and pronounce the words correctly.

Variation

The following rhyme is also a good one that could be taught to the students in this lesson, in a similar manner as above.

Reprint 2024

One, Two, Three, Four, Five

1, 2, 3, 4, 5,
Once I caught a fish alive.

6, 7, 8, 9, 10,
But I let it go again.

Why did I let it go?
Because it bit my finger so

Which finger did it bite?
The little one upon the right

Activity 4 Counting backward from 10 to 1

Objective
Say the counting words backwards from 10 to 1.

Materials
Counters, blocks, or pebbles (for the Variation/Extension only)

Maths Note
The ability to count both forward and backward is a useful skill in the students. The skill will help them in subtraction later. However, make sure that the students are able to count forward from 1 to 10 fluently before you teach them to count backward.

Activity Description
Make sure that students can count forward from 1 to 10 fluently. You can check this by asking the students to count 10 things; point to the number line and count forward from 1 to 10; or simply say the counting words from 1 to 10.

Make a fist of your right hand. Ask the students to count as you raise each finger from the thumb to the little finger one by one. Ask: **How many fingers are raised?** Close down the little finger, and ask: **How many fingers are raised now?** Then close down the ring finger, and ask: **How many fingers are raised now?** Continue till only the thumb is raised.

Then have the students count aloud from 1 to 5 as you raise the fingers one by one from the thumb to the little finger or from the little finger to the thumb. Then have say aloud the number of finger that are raised as you close down the fingers one by until only 1 finger is remaining raised. That would be counting backward from 5 to 1.

Then have the students count forward from 1 to 10 as you raise the finger one after another form one hand to the next. You would then have raised all the 10 fingers. Then as you close the fingers one after the other, have the students tell the number of fingers that remain raised. That would be counting backward from 10 to 1.

Have the student practise the counting forward and the counting backward with their fingers. You could have them do that in pairs. As a student counts forward and backward with his or her fingers on both the hand, the partner observes to see if the counter makes mistakes.

Assessment for Learning
The students may not be able to do the counting backwards with fluency early on. Do not rush them. With patience, and a context to help them, in this case, by focusing on how many fingers are remaining as raised, the students can slowly pick up the skill. Also if students still struggle, you would need to practise with fewer fingers.

Variation/Extension

Have a collection of 10 counters on the table. As you pull the counters aside one by one, say the counting word, **one, two, three, ….ten**. Ask the students to join in the counting. At the end ask: **How many counters are here?** Then ask the students to observe as you pull out a counter from the group of 10 and put it in a container. Ask: **How many counters are there now in the group on the table?** Then pull one more, and ask how many are remaining. Do that successively until only 1 counter is remaining.

If students struggle to tell the remaining counter, start doing the process with fewer counters than 10, say 3.

Distribute 10 counters to each student. If the counters are not sufficient, you could also distribute snap cubes, other blocks or pebbles. In fact, it would be good to distribute the later materials to some of the students even if you had sufficient counters for all. This conveys the message that counting and numbers are independent of any particular materials. Ask them to count the number of counters as they pull together to a side one by one. Then let them pull out their materials one by one, and say the number of the materials left in the group successively.

Activity 5 Counting backward with the Number Line

Objective

Say the counting words backwards from 10 to 1.
Recognize the numerals for the numbers from 1 to 10.

Materials

A number line (to put up on the wall)
A big number line (about 10 children's steps long)

Maths Note
An ultimate goal in this lesson is for the students to say the counting rhyme from 1 to10 both forward and backward fluently.

Activity Description

In advance, prepare the two number lines as shown here. The number line to be displayed on the wall might be already on the wall from Activity 1 of this lesson, and as such the students would be familiar with it.

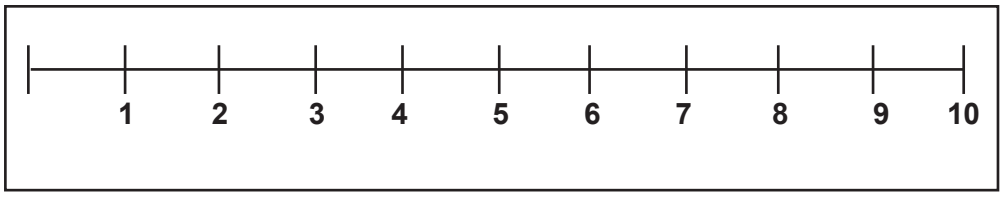
Lead the students in saying aloud the numbers forward as you point to the numerals from 1 to 10 on the wall. Then do the same in the reverse order. Do the process several times to gain fluency in counting backward.

Display the large number line on the floor or the ground, as shown here. You could also write the numbers from 1 to 10 on the floor or ground with chalk in it place. Ask a student to first stand at number 1, and then to step forward from 1 to 10 along the number line, saying the number aloud as he or she stops for a moment at each number. Then ask the student to step backwards from 10 to 1, saying the numbers aloud as he or she stops for a short moment at each number. The students take turns doing this. Later,

Reprint 2024

you can also have a small group of students stand across at number 1, and then have them step forward and backward in unison as they say aloud the numbers at each momentary stopping near the numbers.

Ultimately, you would want the students to say the counting words fluently both forward and backward from 1 to10. They will be able to extend this skill beyond the number 10 in the future.



Assessment for Learning
See that the students have gained reasonable fluency in saying the counting words backwards from 10 to 1. Also see that the students can recognize the numerals for the numbers from 1 to10, and also show how many a number is. Observe to sense whether the students have a relative sense of the positioning of the numbers. For example, that they know that 6 is between 5 and 7, or that 9 follows after 8 and is immediately to the right of 8 on the Number line.

Variation/Extension

You could play around saying the counting words both forward and backward accompanying with physical actions, like clapping 10 times as you say from 1-10, and clapping 10 times as you say from 10-1. You could also encourage students to come up with other physical actions, like going down a bit on you're their each time you say the counting words forward, and then straightening back as you say the counting words in backward order. You would need to pose with your legs apart as if to squat. This would be a good physical exercise too!

Another option (ideally outside in an open space) would be to have the students all line up across and begin counting and stepping in unison together. They would walk forward and backward steps as they count together as follows: 1, 2, 3, 2, 1, 2, 3, 4, 3, 2, 1,2, 3, 4, 5, 4, 3, 2, 1 and so on, until they could go forward saying 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and back saying 9, 8, 7, 6, 5, 4, 3, 2, 1 (and you could even say 0 as they return to their original place).

Activity 6 Counting backward with Rhymes

Objective

Say the counting words backwards from 10 to 1.
Recognize the numerals for the numbers up to 10.
Sing the rhyme properly.
Understand the meanings/context of the rhymes.

Materials

Reproduction of the rhyme "Monkeys on the Bed" on a chart paper.

Maths Note
This activity will be fun as well as providing a learning opportunity in terms of both Mathematics and the English language.

Activity Description

Write the rhyme given here on a chart paper and display it. Explain to the students that you are going to sing a rhyme together, and lead the rhyme, first by reading from the chart, so that students also learn reading skills, and later without looking at it.

Discuss with students the simple story in this rhyme. Also explain the meanings of the words.

After all have sung the rhyme for a few times, ask 10 students to act like the monkeys. One student can act like the doctor, and say the doctor's lines. Students can take turns as the actors.

Monkeys On the Bed

10 little monkeys jumping on the bed
1 fell off and bumped his head
Mama called the doctor and the doctor Said,
" No more monkeys jumping on the bed!"

9 little monkeys jumping on the bed
1 fell off and bumped his head
Mama called the doctor and the doctor Said,
" No more monkeys jumping on the bed!"

8 little monkeys jumping on the bed
1 fell off and bumped his head
Mama called the doctor and the doctor Said,
" No more monkeys jumping on the bed!"

7 little monkeys jumping on the bed
1 fell off and bumped his head
Mama called the doctor and the doctor Said,
" No more monkeys jumping on the bed!"

….and so on until the last monkey bumped its head.

Assessment for Learning
See that each student can sing and pronounce the words correctly. Also see that students can follow the pattern of the decreasing number of monkeys jumping on the bed.

Variation

The following rhyme is also a good one that could be taught to the students in this lesson, in a similar manner as above.

Ten In A Bed

There were 10 in a bed and the little one said,
"Roll over, roll over." (*show rolling motion*)
So they all rolled over and 1 fell out.

There were 9 in the bed and the little one said,
"Roll over, roll over."
So they all rolled over and 1 fell out..

Repeat this until you get to the number1.

There was 1 in the bed and the little one said,
"Good night!"

Reprint 2024

Lesson 3 Writing the Numerals 6 to 10

Lesson Goal

The students should recognize and write the numerals for 1 to 10. They do not do this all at once, but over time.

Relevant Maths Issues

The purpose of becoming familiar with conventional numerals is to simplify communication between different individuals.

The students have already been introduced to the writing of numerals from 1 to 5 in chapter 2. Consistent practice in writing the numerals from 1 to 5 over the days up to this lesson would have allowed students to write these numerals reasonably well by now. In this lesson the written numerals for the numbers 6 to10 are introduced formally. The strategies used in chapter 2 should be used here also. These strategies include: having the student to write in sand so they get a feel for the motion that is made; writing the numerals in the air with you (facing in the same direction as the students); and tracing, or following arrow directions to create the numerals, before attempting with paper and pencil. The opportunities to practice writing the numerals should be provided beyond the scope of this lesson.

A few essential questions that should be asked during the course of the lesson activities are:

What number does this (e.g. 8) show?
Which numerals are made up of only straight lines?
How would you start writing the numeral 8?

Activity 1 Numeral Making

Objective

Recognize and form numerals in the air for 6 to 10.
Describe the hand motions in the formation of the numerals.

Materials

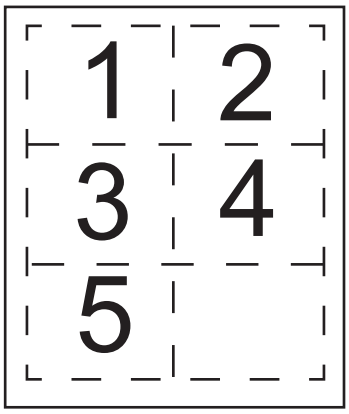
Large number cards for 1 to 10

Activity Description

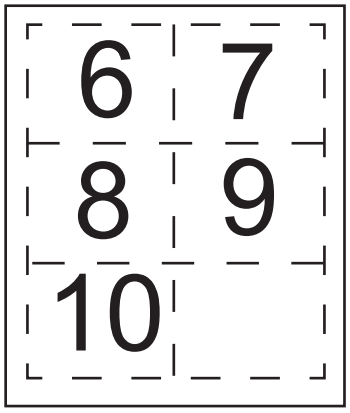
In advance, prepare and have the numeral cards ready. You could make the numeral cards by cutting out and pasting the printed numbers provided in the Student's Activity Book on page number __. If possible, laminate them for future use. In fact, you would have already made and used these number cards in Chapter 1.

Discuss with students the concepts of straight lines and curved lines. This should be familiar to them from the types of length in chapter 3. Draw a straight line and a curved line on the board and ask students what type of line each one is. Ask what type of line is the edge of a table, or the edge of the base of a cylinder is. You should have a cylinder or a cylindrical object to feel the edge of the base. Discuss the two types of lines with a few more objects.

Maths Note
This activity focuses discussion with students on the shapes of the numerals from 1 to10. This also provides an opportunity to group the numbers depending on their shapes.



Now show the number cards. See if students can recognize the numerals from 1 to 10. Show the numerals 1, 4, and 7, and ask: **How are these numbers the same?** Show the numbers 3, 6, 8, and 9 and ask: **How are these numbers the same? How about the number 5? How about the number 2?**



Ask the students how to make a number, for example; **how would you make the number 7? Show with your hand in the air.** Ask similarly for other numbers.

Describe how you would form each of the numerals from 1 to 10 in the airs with appropriate hand motions, as you would have done in lesson 4 of chapter 2. Have the students copy you.

Ask the students to form pairs. One member makes a number either on the back or palm of the other. The other guesses the number made. The students can take turns, and also switch pairs to play this game.

Assessment for Learning
See that the students can demonstrate the formation of the numerals in the air and also describe the motion of their hands.

Variation
You could have the students practise writing the numeral 6 to 10 on sands, soils, wall or trace over large printed numerals with their index finger.

Activity 2 Writing the Numerals 6 to 10

Objective
Write the numerals 6 to 10 on paper using pencils.
Count and recognize a quantity up to 10.

Materials
Student's Activity Book

Activity Description
Explain the instructions provided in the Student's Activity Book on page number ___ for the writing of the numeral 6, and guide the students in the writing it using their pencil. Some students may not be as advanced in their fine motor skill development as others. Be patient and encouraging to the students in this regard. Continue the process with other numbers up to 10. Please prepare additional worksheets, beyond the spaces provide in the Activity Book, to provide further practice in writing the numbers from 6 to 10 to the students if required.

Assessment for Learning
Take the students through the numeral writings one numeral at a time. Pay close attention to each student as he or she writes each numeral. Guide them manually to form the correct technique of writing each numeral

The numeral writing for the number 6 to 10 may be carried out over the next several days.

.

Reprint 2024

Activity 2 A Rhyme Ending in Zero

Objective

Learn something about dinosaurs.
Sing the rhyme with correct pronunciations.

Maths Note
This activity will reinforce the concept of zero in the students. Beyond this, there are other benefits this activity can bring about, even though they may not be mathematical in nature. Children can learn about dinosaurs, rhyming words, and derive fun in dramatizing with this rhyme.

Materials

Reproduction of the rhyme on a chart paper
5 cut out pictures of dinosaurs, either from magazines, stickers, downloaded from the internet, or simply drawn by yourself

Activity Description

In advance, prepare the rhyme and the pictures as mentioned above. Display the rhyme on the wall.

Tell the students that today we are going to discuss and know something about dinosaurs. Tell what you know about dinosaurs; their size, what they eat, when they lived on the earth, and how they have all died. If possible, you could arrange to show the students cartoon movies, or the movie with dinosaurs in it like the Jurassic Park.

First sing and lead the rhyme with the students. Then explain the stanzas. For the first stanza, display all the 5 cut out dinosaurs. Then remove one, as you say, One went away,…. Continue in this way till you have zero dinosaurs.

You could also accompany the rhyme with appropriate dramatizations. You could have 5 students to be the dinosaurs, and as the rest of the class chants the rhyme, the 5 students can dramatize with actions. The students can take turns to be the dinosaurs.

Dinosaurs

5 enormous dinosaurs
Letting out a roar.
1 went away, and
Then there were 4.
4 enormous dinosaurs
Crashing down a tree.
1 went away, and
Then there were 3.
3 enormous dinosaurs
Eating tiger stew.
1 went away, and
Then there were 2.
2 enormous dinosaurs
Trying to run.
1 ran away, and
Then there was 1.
1 enormous dinosaur,
Afraid to be a hero.
He went away, and
Then there was 0.

Assessment for Learning
See that the students can talk about what they understand of dinosaurs. Ask: What do you know about dinosaurs? Also see that the students can pronounce the words correctly as they chant the rhymes. It is not necessary that students should memorise the rhyme.

Variation

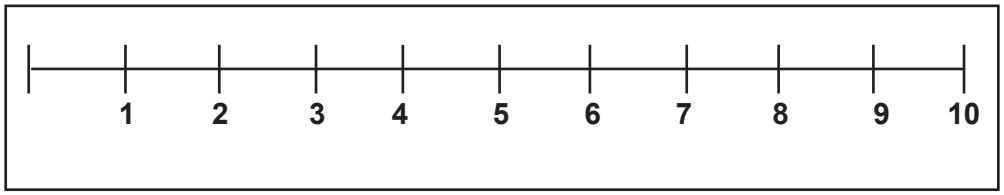
Have ten students stand at the front of the class, or at their seats. Have them sit down one at a time as the class counts down together: ten, nine, eight, seven, six, five, four, three, two, one, zero. This can be repeated with any number of students up to ten.

Activity 3 0 on the Number Line

Objective
Place or write 0 on a number line from 0 to 10.
Make a simple number line.

Materials
A ready made number line with numbers from 1 to 10, as shown here
Student's Activity Book page number __.
Rulers, pencils, note books

Activity Description
In advance, make a number line, with the numbers from 1 to 10 already written on it, as shown here. It could be the same number line made and used during the earlier lessons.



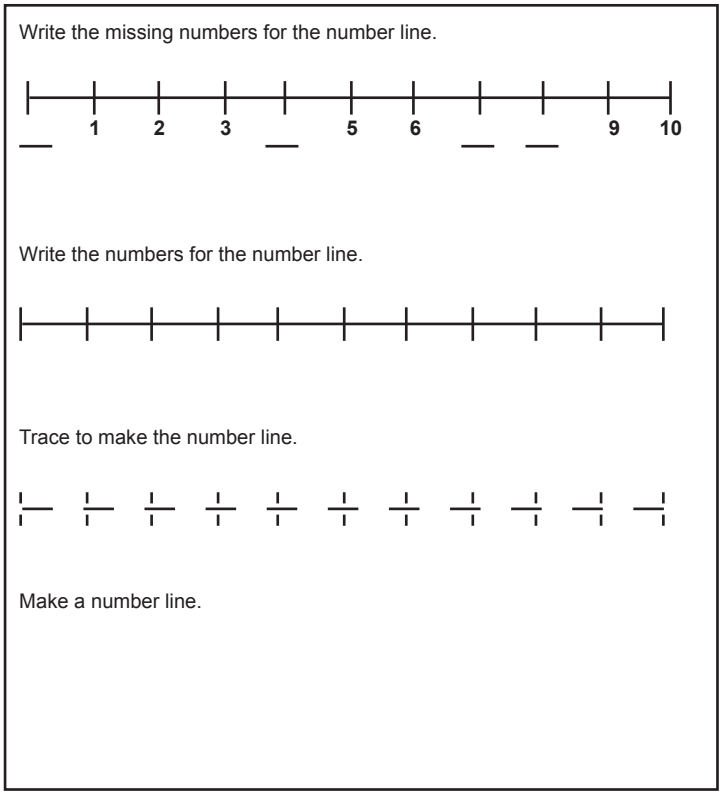
Display the number line. Explain that this is a number line, and show them how it is drawn, by drawing the same number line on the board. Stress that the numbers are written from left to right in order, by keeping the same distance between the numbers. Ask the students where the number 0 should be on the number line. Then write the 0 on the number line. Have the students chant aloud the numbers from 0 to 10 as you point them one by one on the number line.

Point to number 2 on the number line, and ask the students to show 2 counters. Then point to 3, and ask them to show 3 counters. Ask which is more – 2 or 3? Let the children realize that a number on the right is greater than the number on the left on the number line. Ask questions like: **Which is greater – 2 or 3? Why? How can you tell that from the number line? Which is greater – 5 or 7? Why? How can you tell that from the number line? Which is the smallest number on the number line? Why is that? Which is the biggest number on this number line? Why? Which number is the middle number on this number line?**

Have the students open their Student's Activity Book on page number ___. Have them do the activity on the page on drawing a number line. You could provide additional practice to draw straight lines and the number lines to the students in their note books.

Maths Note
A number line is simply a straight line, usually drawn horizontally, with regular marks (equally space) on it as designated places for the numbers. Number line is a simple yet powerful tool to study the relationships and the relative sizes of the numbers even in the higher classes. However, in class PP we just introduce the students to the idea of number line with which they write the numbers from 0 to 10. Here it also helps the students to see which number is greater or lesser than the other.

The students have been exposed informally to number lines in the earlier lessons. In this lesson they learn to draw a simple one themselves.



Reprint 2024

Extension

After all the students have drawn their number lines fairly successfully, draw their attention to the number line you have displayed on the wall. Ask questions based on the number line such as: **You are at number 8. How many steps do you have to go to get to 10? You are at number 3. How many steps have you gone from 0? How many steps do you have to go to get to 5 from 3? etc**

Assessment for Learning
See that the student can draw a straight line with ruler and pencil. Help the students with drawing straight lines. It should be accepted even if the spaces between the numbers on the number line are not perfectly equal.

Lesson 4 Creating Sets to 10 and Describing Parts

Lesson Goal

The students should make up sets of sizes 1 through 10 and should be able to divide the sets created into parts and describe the subparts.

Relevant Maths Issues

In preparation for later work in addition, it is useful to focus the students' attention on the parts that make up a whole. Seeing, for example, that 7 is made up of 5 and 2 will help students later when they are solving 5 + 2. It is important that the students separate the whole into different size parts, e.g. 8 as both 5 and 3 or as 2 and 6. At this point, there is no use of addition signs.

The numbers 5 and 10 are useful benchmark numbers for the students. It is very helpful if students relate others numbers like 6 to 5 and 10. They would view 6 as both being 1 more than 5 and 4 less than 10.

The use of a 10-frame to help students count is important. This is a set of two empty rows of 5 in which students place counters. Although they can place the counters anywhere in the frame, they should have experiences to help them see that it is beneficial to start in the top row at the left, fill that row and then start from the left of the second row. That helps relate numbers to 5 and 10, e.g. 7 as 2 more than 5 and 3 less than 10.

X	X	X	X	X
X	X			

If the 10-frame is used, students should have opportunities to become familiar with what the arrangement for each number looks like.

A few essential questions that should be asked during the process of the lesson activities are:

I have 8 pencils. How many more do I need to have 10 pencils? How many more than 5 pencils do I have?
You are at the number 8 on the number line. How much farther do you have to go to get to 10?
Show 9 pencils. Separate them into two parts. How many are in each part?
How can you use counting to know that 8 is more than 5?

Activity 1 Representing 6 in different ways

Objective

Explore 6 as various combinations of two numbers using two colour counters.
Represent 6 as various combinations of two numbers by diagrams as well as by numbers.

Materials

Counters in two colours

Activity Description

Display 6 counters of one colour, say 6 black counters, and ask: **How many counters are here? What colour are they?** Remove 1 counter and replace it by a counter of a different colour, say a white counter. Ask: **Now how many counters are here? What has changed? How many black counters are here? How many white counters are here? How many counters are here altogether?** Replace another black counter with a white counter, and ask similar questions. Continue the process until all of the black counters have been replaced by white counters. Stress that the total number of counters remains the same, and that it is the number of counters of each colour (black and white) that is changing.

Now do the process one by one once again. This time after each replacement of the black counter by a white one, represent it by diagram on the board, as shown below.

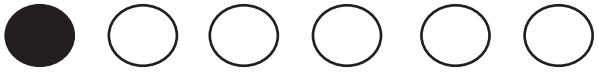

6


5 and 1 is 6


4 and 2 is 6


3 and 3 is 6


2 and 4 is 6


1 and 5 is 6


6

Maths Note
Looking at a number as a combination of smaller numbers builds strong number sense in the students. It also lays strong foundation for addition and subtraction later on. Students also employ the idea of patterns with this. However, to start with, we limit the breaking up of a number into only two parts. For example, 6 is looked at as 5 and 1, 4 and 2, 3, and 3.

Assessment for Learning
See that the students can talk or describe their thinking or counter arrangements when you talk with them. Eventually, the focus is to get them to say a number in terms of its parts.

Reprint 2024

After the diagrams are drawn, shift the focus to talking only about the number, but still based on the diagrams. That is, 6 is 5 and 1; 6 is 4 and 2; 6 is 3 and 3, etc.

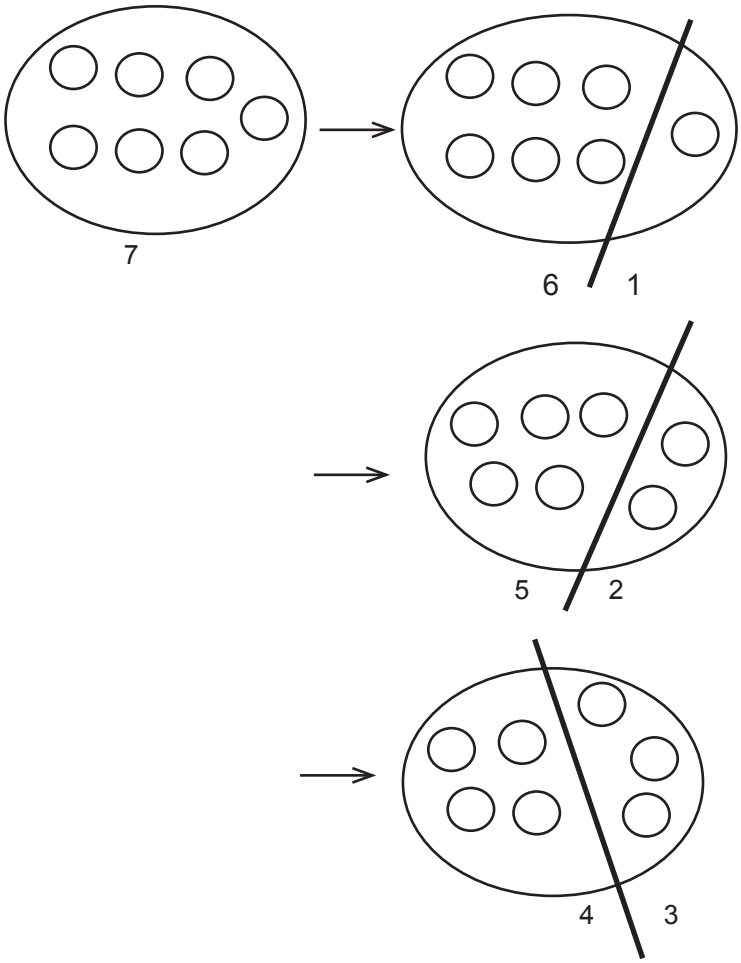
Students can copy the diagram in their notebook, and colour the diagrams.

Ask the students to do similarly with 5 counters. Ask them to record with diagrams and numbers in their note books. Move around and help the students. Ask questions such as: **Does it change the total number of counters? What two numbers together make 5? Is 2 bigger than 5? Is 3 bigger than 5?**

Extension

Do similarly with the numbers for 7, 8, 9 and 10.

You should also use counters of only one colour to break a set into two parts. For example, for the number 7, display 7 black counters, and ask how many are there. With the help of a stick or a pencil, separate the 7 counters into two distinct groups, as 6 and 1, then as 5 and 2, then as 4 and 3, as shown below. Have the student explore with more of such breaking of a set.



Ask questions like: **Show 9 counters (or pencils). Separate them into two parts. How many are in each part? Can you separate the 9 counters into two parts in another way?**

Activity 2 Representing Numbers on a 10-frame

Objective

Represent numbers from 1 to 10 on a 10-frame.
Describe a number in relation to 5 and 10.

Materials

Counters (about 10 for each student)
A 10-frame made on a chart paper
Student's Activity Book (for the students' copy of a 1-frame)

Activity Description

Display a 10-frame, and introduce it to the students. Explain that a 10-frame is a double 5-frame as the students have already been introduced to the 5-frame. Count the rectangles in it from left to right in the first row and continue the counting through the second row. Explain that they would be using the 10-frames to represent numbers from 1 to 10 and to compare these quantities relative to 10 or 5.

X	X	X	X	X
X	X			

Have the students open their Activity Book on page number ___ for their copy of the 10-frame. Distribute 10 counters to each student. Ask the students to fill up the 10-frame with 10 counters. See how they have done. Ask if there is any free space left. Then ask them to take off all the counters from the frame. Ask them to fill it again with 5 counters, without directing them to do it in any way. It is technically correct to fill the frame in any way one chooses. Go around and see how each student has done it. Ask how many free spaces are there now. Ask them to now fill the frame with any number of counters, and ask for the number of empty spaces. Do this a few more times.

Now if some students were not already doing it, instruct the students to fill the frame from left to right, first in the top row, and then continue with the second row. This is a valuable technique, because you can see at a glance whether a number is more or less than 5, or less than 10, and tell quite easily by how much.

Now ask the students to fill the frame with 8 counters, using the above technique. Ask: **Is 8 more than 5? How can you tell that? By how many is 8 more than 5? Is 8 less than 10? How do you know that? By how many is 8 less than 10?** Continue this with other number of counters.

Maths Note

The use of a 10-frame to represent numbers helps students to visualize the size of a number. A 10-frame is simply a rectangular grid of 2 rows by 5 columns. Although a 10-frame could also be a long row of 10 rectangles, the shape of 2 rows of 5 rectangles is recommended and used in this guide, because, it helps our eyes to view it at a glance. Therefore, helps us in subitising the amounts. This also helps the students in describing a number as to how large or small it is in relation to 5 and 10, the benchmark numbers for children. This will prove to be useful for children with addition and subtraction later on.

Assessment for Learning

See that the students can relate a number to both 5 and 10, especially a number between 5 and 10.

Extension

See that the students can transfer use of the 10-frame and counters to represent simple real life problems and use them to answer the problems. For example, make up situations and questions like the following.

We have 8 cows at home. My mother wants to buy a few more cows so

Reprint 2024

that she can have 10 cows. How many cows do we need to buy?
I have a car. There are 7 persons wanting to go in my car. But my car can take in only 5 persons, including me. So I take 4 other persons with me. How many persons could not go?

Activity 3 Rhymes with Numbers and their Subparts

Objective
Represent the numbers in the poems with counters.
Break a set of 10 into three parts in various ways and derscribe the parts.

Materials
Reproduction of the rhyme with the pictures on a chart paper
Counters

Activity Description
Display the chart size reproduction of the rhyme given here. Tell the students that you are going to sing a rhyme. Lead in reading and singing the rhyme. After all the students can follow the singing and rhythm of it, explain the meaning of the rhyme. Then it would be interesting if you can enact or dramatise the rhyme. For example, a student can be the Mrs. Hen, and another can act like the person who is asking the Mrs. Hen. Discuss how the 10 chicks can be represented by 10 counters. Then the 10 counters can be separated as 4 yellow chicks, 4 brown ones, and 2 speckled red ones. So 10 is 4 and 4 and 2.

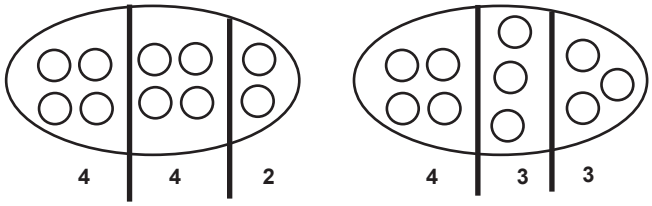
Good Morning, Mrs. Hen
Chook, chook, chook, chook, chook,
Good morning, Mrs. Hen.
How many chicks have you got?
Madam, I've got ten.
Four of them are yellow,
Four of them are brown,
And two of them are speckled red,
The nicest in the town.

Maths Note
The rhyme in this activity provides an extension of the previous activities of separating a number into it parts. So far, in the preceding activities we have limited the separation of a number into only two parts. However, with the rhyme, we go into separating a number into 3 parts. Since this is done within the context provided by the rhyme, it is hoped that the students will enjoy doing and understanding this. After the rhyme, you may explore separating a number into 3 parts, but it may not be necessary.

Assessment for Learning
See that the students can sing and understand the meaning of the rhyme. Relate how 4 and 4 and 2 makes 10.

Extension
Again represent the three colours of chicks with counters: 4 yellow, 4 brown, and 2 speckled red that make up the 10 chicks. Then move away from the dependence on this context and discuss how 10 can be described in terms of three parts as 4, 4 and 2. Then have the students describe 10 in terms of other three parts such as 4, 3 and 3.

Provide the students with 10 counters in small groups. Have them break the set of 10 counters into 3 parts and describe how many are in each part. Explore in various ways the breaking of a set of 10 into 3 parts, as shown below.



Activity 4 Identifying the Number Before and After

Objective
Tell what number comes before or after a given number.

Materials
Number line from 0 to 10

Activity Description
Display the number line. Practise saying the numbers from 0 to 10 forward as well as backward, as you point to the number on the number line. Point to a number, say 5, and ask: **What number is before 5? What number is after 5?** Explain the meaning of before and after. Repeat similar questions for other numbers. Make students realize that the number that comes before a given number is to the left of it on the number line, and the number that comes after it is to the right of it. The left and right are as per our left hand side and right hand sides as we face the number line respectively. After understanding this, ask: **How do you know that 4 is the number after 3? How do you know that 4 is before 5?**

Maths Note
This activity consolidates the correct order or sequence of the numbers. The skills of counting forward, counting backward, number comparison and numeral writing up to 10 are reinforced through this activity.

Write a number on the board. Ask two student to come to the board – one to write the number before and the other to write the number after the given number. Repeat this for some more numbers.

Write the numbers from 1 to 10 in order, with some numbers missing. Ask student volunteers to come and write the missing numbers. For example,

0 1 ___ 3 4 ___ ___ 7 8 ___ 10

Assessment for Learning
See that students can count forward, and count backward from 1 to 10 fluently. See that they can recognize the numerals and also write them correctly.

Extension
In advance, have a set of number cards from 0 to 10 ready. You would have the number cards, except for 0 from the earlier lessons. Distribute one of each of the numeral cards from 0 to 10 (number side down) to eleven different students. Ask them to not look at the numerals to begin. Make the students come forward and stand in random order. Then ask them to organize themselves in correct order, displaying the cards in front of them.

Repeat the same with another group of students. If there are students left still after that, do the activity again until all students have participated in it.

Reprint 2024

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 5 NUMBERS TO 10

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):*									
	Say the counting words in correct order to 10.	Say the counting words up to 10 both forward 10 and backward.	Determine the number of items in a set having items up to 10.	Recognise the numerals up to 10.	Write the numerals up to 10 and 0.	Describe the numbers up to 10 in terms of their parts.	Make a simple number line.	Represent numbers from 6 to 10 on a 10-frame.	Relate the numbers from 6 to 9 to both the numbers 5 and 10.	Identify the numbers before and after a given number.
1										
2										
3										
4										
5										
6										
7										
8										
9										

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Summative Assessment Recording Sheet (For Class PP)

Student Name: _____ Roll no.: ____Section: ____

CHAPTER 5 NUMBERS TO 10

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

Task and Interview prompts	Key concepts and skills to look for
Task 1 Present the student with a set of 10 objects (e.g. counters). Have a set of numeral cards ready for use. Ask: **How many (cubes) are there? Can you count to see how many there are?** Take out a few counters, say 2 counters and ask: **Now how many do you think are there? Show me eight with a number card. Or, Which card here shows eight?** Vary the number of counters by taking out and putting back a few of them, and ask the student to tell the number in the set each time. See how the student determines the number, whether he or she always counts all over again or takes into account the taking out or adding back from the last count. Also ask to show the correct numeral card each time. Ask: **Show me a number which is less than (7). Show me another number which is less than (7). Show me the numbers which are more than (7)**	*The student is able to:* - Count sets to 10 using correct order of counting words. - Identify and read numerals to 10. - Compare numbers as more than or less than.
Comments and Mark: **Teacher's Signature and Date:**	

Task 2 Present the student with a 10-frame and a collection of counters. Have the student represent various numbers from 6 to 10 on the 10-frame, using the counters, and ask them to compare the number to both 5 and 10. For example, **Show me number 7 on the 10-frame. Is 7 bigger than 5? By how much is 7 bigger than 5? How do you know? Is 7 less than 10? By how much is 7 less than 10? How do you know?** Ask similar questions with other numbers.	*The student is able to:* - Represent number to 10 on 10-frame. - Compare a number from 6 to 9 to both 5 and 10. - Tell by how much a number of more than 5 or less than 10, and describe how.
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 5

Total CA mark from Chapter 5 (Task 1 and Task 2: Mark out of 20): _____

Overall remarks on the student

Strengths:

Areas of Need:

Follow up Steps:

CHAPTER 6 REPEATING PATTERNS

Chapter Overview

This chapter is a continuation from chapter 1. The students have already learnt to recognise whether a sequence of things is a pattern or not in chapter 1. In this chapter, we build further on their understanding of repeating patterns by offering many experiences with it. The students will copy, extend, translate, compare, and create simple repeating patterns in this chapter. The students would need to consider various attributes like colour, shape, size, position, and materials of the things to look for patterns. In doing so, the students will use concrete objects, visual images, drawings, letters, and actions to talk about and give reasons.

This chapter has 4 lessons as detailed in the table of contents. The basic principles of patterns as mentioned in chapter 1 are repeated here for easy reference and reiteration.

Basic Principles about Sorting and Patterning

- Patterns are based on attributes that repeat in a predictable way.
- Every pattern is based on considering some attribute(s) of the items in the pattern, so students must be able to sort objects to identify objects with the desired attribute(s).
- 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.
- Attributes are things like colour, shape, size, use, sound, position, etc of objects. 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.

Chapter Goals

- Identify simple repeating patterns.
- Copy a simple repeating pattern.
- Extend a repeating pattern.
- Compare repeating patterns.
- Translate a repeating pattern.
- Create a simple repeating pattern.

Maths Words

Different, same, pattern, sort, core

Initial Assessment

Ask the students to observe and join in as you perform a simple AB pattern with sound and physical actions. For example, clap, snap, clap, snap; cough, tap on the desk, cough, tap on the desk; hands stretched up, hands down to the shoulders level, hands stretched up, hands down to the shoulder level; squat down, get up straight, squat down, get up straight, squat down, get up straight. After each ask the students to do it on their own. Discuss with the students why each was a pattern and what part of it was repeating.

Do similarly with some AAB or ABB patterns that you make up with sounds and physical actions.

Play the Singing Farm Animals of Ap Dorji from chapter 1. The poster would still be on the wall.

Lesson 1 Copying Repeating Patterns

Lesson Goal

The students should be able to copy a provided pattern.

Relevant Maths Issues

To help students really focus on the change in attributes that creates a pattern, it is helpful for them to physically copy someone else's pattern. It is helpful if the original pattern is described first, and to discuss why it is a pattern, whether it is in terms of colour, or shape, or position. Make sure to include different types of simple repeating patterns with structures like AB, AAB, ABB, and ABC.

It is important to use enough repetition of the core of a pattern so that the students can recognize it. The minimum number of the core that should be presented in a pattern is considered to be three.

A few essential questions that should be asked during the course of the lesson activities are:

What made this a pattern?
What is changing each time?
What part of the pattern is being repeated?
How did you find the repeating part of the pattern?

Activity 1 Copying Colour Patterns

Objective

Identify a colour pattern and copy it.

Materials

Snap cubes in different colours
Pattern blocks
Crayons

Activity Description

Make the following colour patterns with the snap cubes in front of the students.

an AB Pattern

an AAB Pattern

Show the AB pattern to the students and discuss with them. **Is this a pattern? Why is it a pattern? What part of it is repeating? Is this a colour pattern or a shape pattern?**

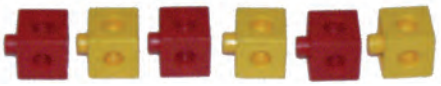
Repeat the process with the AAB patterns.

Maths Note
In this activity, the focus is on colour pattern. Initially, the use of snap cubes in different colours makes it easier for the student to focus on the attribute of colour. But to make it clear to the students that size, shape, and other attributes don't matter when the attribute under consideration is colour, other materials of different sizes and shapes are also used subsequently.

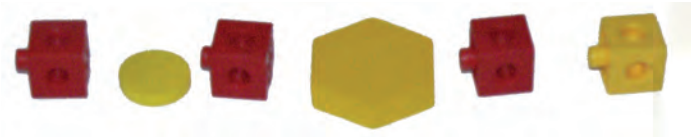
Reprint 2024

Provide each student or pairs of students with enough of snap cubes and have them make the two patterns as above. You might provide the snap cubes in loose and already sorted in the different colours. The two patterns should be displayed at a place where all can see, or made available to all for copying them.

Pick up one of the patterns again and reinforce that it is a colour pattern. So that size and shape do not matter in a colour pattern, replace one snap cube in the pattern with a pattern block of the same colour and ask if it is still a pattern and why. Replace some more of the cubes in the pattern by pattern blocks or other materials but of the same colours for the replacements and ask if the colour pattern still holds true.



Are these two colour patterns the same? Why?



How are these two colour patterns the same?

Variation/Extension

You might need to do more pattern with changing the shapes, sizes and materials in a colour pattern to make sure that the students realise that these things do not matter in a colour pattern with physical objects. Do the relevant activities in the Student's Activity Book.

Assessment for Learning
See that the students can recognise the colour patterns and the repeating parts in them. Ensure that they realize that the shapes, sizes and materials do not matter in a colour pattern.

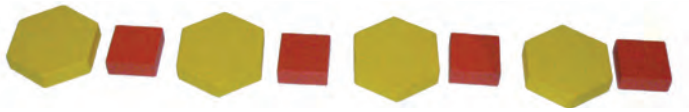
Activity 2 Copying Shape Patterns

Objective
Recognise a shape pattern; explain why it is a pattern, and copy it.

Materials
3-D geometric shapes like spheres, cones, cylinders, rectangular prisms
Pattern blocks in various materials (wooden, plastic, rubber, paper cut-outs)
Spherical objects like balls, marbles, model of it made of clay and dough
Objects which come in the shape of rectangular prisms like toothpaste cases, and other such containers

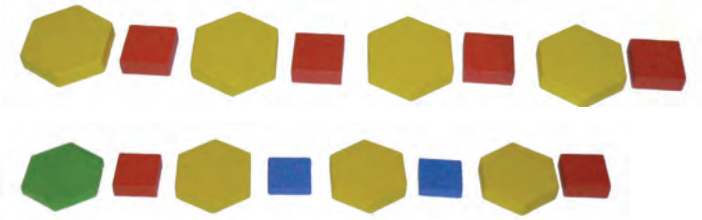
Maths Note
The focus of this activity is to see a pattern based on the shape of the objects. Ensure that a particular shape is represented by those coming in various sizes, colours and materials.

Activity Description
Display an AB shape pattern, as shown below, and ask the students; **Is this a pattern? How is it a pattern? What type of a pattern is this? Is this a colour pattern or a shape pattern? Does colour matter in this pattern?** Listen to students' responses and reasons. Help the students with the language and names of the shapes.



Replace one of the items with an item of similar shape, but of different size and colour, and ask if that has changed the pattern. **What has changed with the pattern now? Is it still the same shape pattern? Why?** Place the pattern at a place where every one can easily see it. Ask the students, either in pairs or small groups to copy or make a similar pattern. Make accessible the required materials.

Are these two shape patterns the same? How?



After the students have made their pattern, make and display an AAB or ABB pattern with the shapes. Ask the students if it is a pattern. **How is it a pattern? What part of the pattern is repeating? Is it a colour pattern or a shape pattern?** Then ask the students, either in pairs or in small groups to make a similar shape pattern. As they work, replace one or two of their items with objects of similar shapes, but of different colour, material, or size, and ask if their pattern has been changed or not. Ask for the reasons. You should also replace one or two items in their pattern with a different shape, and ask whether or not they still think their pattern has not been changed now.

Assessment for Learning
See that students are able to describe their patterns, and can recognise the repeating part of the patterns.

Variation/Extension
You could also present shape patterns with the structure of ABCABCABC, and take the students through the similar questions and processes as above.

Reprint 2024

Activity 4 Copying Position Pattern

Objective

Recognise a repeating pattern based on the orientation of the objects; and reproduce it.

Materials

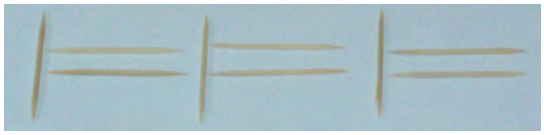
A collection or tooth picks, or sticks of uniform size and shape (bamboo sticks you have might have made for chapter 3)
Blank sheets of papers (half or quarter of A4 size papers)
Glue

Activity Description

Display the tooth picks or the sticks in three different arrangements so that two of them are simple repeating patterns and the third one is not a pattern. Ask whether each arrangement is a pattern, and how it is a pattern. Ask the students to tell the repeating parts of the patterns.

Maths Note
In this activity the students are presented with patterns based on the attribute of the how the objects are placed.

Is this a pattern? How is it a pattern? What part of this pattern is repeating?



Is this a pattern? How is it a pattern? What part of this pattern is repeating?

Is this a pattern? Why?

Each arrangement could be glued on in advance on separate sheets of papers. Ask the students, either individually or in pairs to reproduce the pattern with tooth picks or with sticks of uniform size. Students could then glue their patterns.

Assessment for Learning
See that the students understand that it is not the colour, shape or the size, but how the objects are positioned or laid which is considered in these patterns.

Variation/Extension

You could also make position pattern with other shapes like all cylinders, or all cones, or all rectangular prisms of same size, but not necessarily of same colours, and take the students through the similar processes as above. You could also use crayons for the sticks or the tooth picks.

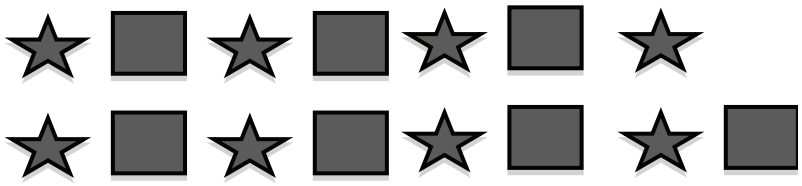
Lesson 2 Extending Repeating Patterns

Lesson Goal

The students should be able to extend a pattern once they have identified what it is that makes the situation they met a pattern.

Relevant Maths Issues

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.



This should be considered in terms of the sequence of situations with which the students are confronted. In addition, it is important to realize students cannot extend a pattern until they recognize the pattern, so a first step is always to ask what the pattern is. Finally, be aware that unless a student is given a pattern rule, there are many ways to extend a pattern. For example, with the pattern above, although most students will continue with repeating a star and then a square, others might realize that they could change the pattern as long as they continue in a consistent way, e.g. the line of shapes below could be repeated over and over.

It is important to sometimes tell the students the rule and ask them to extend the pattern, but other times let them figure out the rule and then extend it.
One way students can learn to extend patterns is to follow how you extend a pattern. A valuable situation is for the teacher to extend the pattern, but omit an item or two and ask students to fill in the missing item(s). You can also provide opportunities for students to detect “errors” in extending patterns so that they catch those errors. It gives them an alternate way to show that they understand how to extend patterns. To help motivate how far to extend a pattern, you can use language like “make it as long as this strip of paper”.

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

What is the pattern? How do you know?
What comes next? Why?
How can you tell which item is missing?
Is there another way to continue the pattern? How do you know?

Activity 1 Extending a Colour Pattern

Objective
Identify and extend colour patterns.

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

Activity Description
Prepare the coloured pieces of papers as mentioned above in advance. Put up a newsprint paper on the wall. Post the coloured papers in a repeating pattern, by pasting it with glue. As you post the papers, say the colours aloud: **red, red, blue, red, red, blue,…**Encourage the students to join you in saying the names of the colours. After posting about 9 colours, ask: **Is this a colour pattern? How do you know? What part repeats over and over again? Let's check.** Then ask: Do you know what colour paper am I going to paste next? Listen to their suggestions, and then paste it. Ask: **and 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.

Maths Note
Recognising and extending a pattern is an important mathematical skill, used in problem solving situations.

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. Say: O**ne colour is missing from the pattern. What colour do you think is missing from the pattern? Why do you think that, or how do you know it?** Reveal the missing colour after you have listened to several predictions.

What colour is missing from this colour pattern?
How do you know?

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

Assessment for Learning
Ensure that every student recognises the patterns, and is able to extend it. Help the students with the language to articulate their reasoning and describe the patterns.

Variation/Extension
Similar activities can be carried out using snap cubes.

Activity 2 Keep the Pattern Going

Objective
Identify and extend action patterns.

Materials
Students

Activity Description
Invite 6 students, 3 boys and 3 girls to come forward. Let the boys and the girls stand alternately, with the boys showing their back to the class and the girls facing the class. Sing the following to the tune of "Here We Go Round the Mulbery Bush":

What's the pattern that you see,
That you see, that you see?
What's the pattern that you see? Please tell me.

Ask the students to identify and describe the pattern. Listen to their description of the pattern. The students may describe or identify the pattern as front and back, front and back, front and back, or as boy and girl, boy and girl, boy and girl. To extend the pattern, sing the following:

Keep the pattern going.
We want to see it growing.
So keep the pattern going.

Ask: **Can someone come and keep the pattern going?** After a volunteer has joined, ask a few more students to come and join the line. Sing the above lines: **Keep the pattern going**….Invite the students to join the singing, and invite some more students to come one by one and extend the line. Keep on doing this until almost all the students have joined the line.

Repeat with different body positions, like students standing up and sitting down alternately, or students with in line with arms raised up and arms handing down alternately. Sing the songs as above. Also encourage students to suggest ideas for patterns.

Maths Note
Recognising and extending a pattern is an important mathematical skill. This skill helps students in problem solving and analysis.
In this activity, the pattern can be described in more than one way.

Assessment for Learning
See that the students can follow and sing the songs.

Reprint 2024

Activity 3 Extending Letter Patterns

Objective
Identify and extend letter patterns.

Materials
Letter cards in A, B, and C in square pieces of papers – about 10 of each
Newsprint papers
Glue

Activity Description
In advance, prepare the letter cards as mentioned above. Put up a newsprint paper on the wall. Post the letter cards in a repeating pattern, by pasting it with glue. As you post the papers, say the letters aloud: **A, B, B, A, B, B, A, B,…**Encourage the students to join you in saying the names of the letters. After posting about 9 letters, ask: **Is this a pattern? How do you know? Is this a colour pattern? Is this a shape pattern? What type of pattern is this? What part of the pattern is repeating over and over again?** Then ask: **Do you know what letter am I going to paste next?** Listen to their suggestions, and then paste it. **And then the next?** Invite some volunteers to come forward and post the letters one by one up to whatever extent you may want to go. Once enough letters have been posted, chant the letter names from the beginning to the end of the pattern.

Maths Note
Pattern can also be made with letters. Exposing the students to letter pattern is important because other pattern structures can be described using letter codes, and this is useful in comparing and translating patterns in the later lessons of the chapter.

A	B	C	A	B	C	A	B	C	A	B	C

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. Say: **Two letters are missing from the pattern. What letters do you think are missing from the pattern? Why do you think that, or how do you know it?** Reveal the missing letters after you have listened to several predictions.

A	B	C	A	B		A	B	C		B	C

What letters are missing from this pattern?
How do you know?

Assessment for Learning
See that students can describe the letter pattern and recognise the part of the pattern that repeats over and over again.

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

Variation/Extension
You could also do the pattern recognition and extension with number patterns. Just do not use more than three numbers to make the patterns.

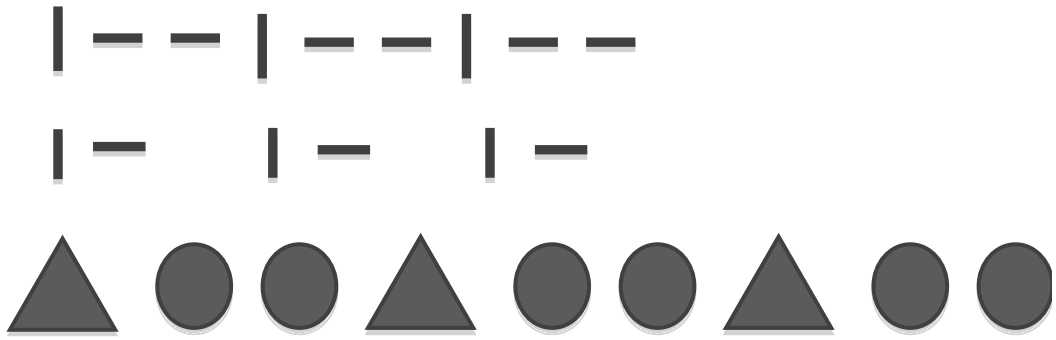
Lesson 3 Comparing Repeating Patterns

Lesson Goal

The students should be able to look at two different repeating patterns and observe how they are the same and how they are different.

Relevant Maths Issues

Sometimes the patterns the students compare should be the same mathematical structure, e.g. two different AB patterns; other times the patterns might use the same items, so there is some similarity between them, but a different structure, e.g. an AB and an AAB pattern involving squares and circles. Sometimes the patterns should be quite different.
For example, the students might compare the first pattern below to each of the others:



A few essential questions that should be asked during the course of the lesson activities are:

How are these patterns the same?
How are these patterns different?
Which of these patterns seem more the same to you? Why?
How could I change this pattern to be more like this other pattern?

Activity 1 Comparing Patterns

Objective

Identify patterns; describe the similarities and the differences between two given patterns.

Materials

Sticks in uniform size (or tooth picks)
Paper clips
Glue/sellotape

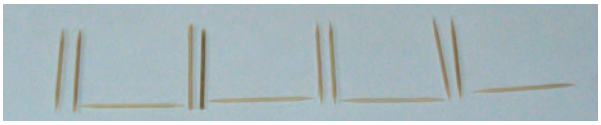
Activity Description

In advance, make three concrete patterns on pattern mats (rectangular sheets of paper), as shown below and ask the related questions. The objects would need to be stuck onto the pattern mats.

Maths Note
In this activity, the students first compare a given pattern with a second one, which uses the same objects but with a different pattern structure. Then they compare the first pattern with another one, which uses different objects but has the same structure. Then they compare the second and the third patterns.

Is this a pattern? How do you know? What part of it is repeating over and over again?

Pattern one

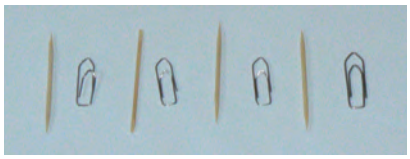


Is this a pattern? How do you know? What part of it is repeating over and over again?

Pattern two

Now look at the two patterns. What is the same about these two patterns? Listen to what the students say about the patterns. If need be use prompts like: W**hat things are used in both the patterns? How are the sticks positioned? How are these two patterns different? What part is repeating in this pattern (**referring to the first one**)? How many items are there in the repeating part? What part is repeating in this pattern** (referring to the second one)**? How many sticks are in this repeating part?** Use informal language to describe the orientations of the sticks, such as up right and flat, up right and flat, … for the first pattern and up right, up right, flat and up right, up right and flat, … for the second pattern. You may also try describing the structures of these two patterns using letter codes as ABABAB for the first one and AABAABAAB for the second one. It will be good if the students can understand the description using the letter codes, but it is not necessary at this point if the students find it difficult to understand it.

Put up the third pattern on the second one so that for the time being the second one is covered by it. Ask the students**: How is this pattern different than the first pattern? How is this pattern the same as the first one?** Listen to what the students think and have to say. The two patterns are different in terms of the objects used to make them, but they have the same structure of AB.



How is this pattern different than the first pattern? How is this pattern the same as the first pattern?

Pattern three

Then let them compare the second and the third patterns. Ultimately, we would like student to focus on the structures of the patterns to see their similarities and differences. Encourage them to use the letter codes to describe the structures of the patterns.

Assessment for Learning
Listen to how the students describe the similarities and differences between the patterns. Help them with the language to describe the structures of the patterns.

Variation/Extension

You could design simple repeating pattern with other available materials like snap cubes, and pattern blocks, where students can talk about colours, shapes, and structures of the patterns for the similarities and the differences. Display the following patterns on the table for the students to see, and ask them to talk about their similarities and differences.

Activity 2 Sorting Patterns based on their Structures

Objective

Identify patterns; describe the similarities and the differences between the patterns based on their structures; and sort the patterns based on the structures.

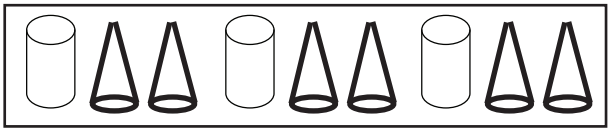
Maths Note
This activity focuses on looking at the structures of the patterns. In fact, the study of the structures of patterns is the key mathematics idea with patterns. It is the understanding of the structures that allows students to predict and extend the patterns.

Materials

Pattern strips as shown here

Activity Description

In advance, make 3 to 4 sets of six shape patterns on pattern strips, as shown here. Put up the first pattern strip, and ask the students to describe it. Listen to how they describe it. Chant the names of the shapes aloud with the students: **cylinder, cone, cone; cylinder, cone, cone; cylinder, cone, cone…** Put up the second pattern, and ask the students to describe it. Listen to how they describe it. Chant the names of the shapes aloud with the students: **flower, butterfly, butterfly; flower, butterfly, butterfly; flower, butterfly, butterfly...**

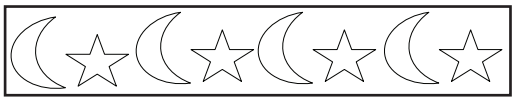


pattern 1

pattern 2

Ask the students to describe how these two patterns are the same and how they are different. Draw their attention to how the patterns are formed, i.e. the structure. It may not be necessary to use the word structure yet, but encourage them to use the letter codes to describe the structure. It would be ABB, ABB, ABB,.. for the first pattern and also ABB, ABB, for the second one. So the two patterns have the same structure.

Put up the third pattern. Have the students identify the shapes. Chant the names of the shapes aloud with the students. Discuss the structure of the pattern in terms of letters codes. Discuss how it is different from the first and the second in terms of the structure.



pattern 3

Divide the students into 3 to 4 groups. Distribute a set of the six patterns strips to each group and let them sort the patterns in to three sets based on how the patterns are formed. Provide assistance as they work on the sorting.

pattern 4

pattern 5

pattern 6

Once the students have finished sorting the patterns, you may want to display some of the patterns on the wall as:

Assessment for Learning
See that every student understands and can use the letter codes for the structure of the patterns.

AB Pattern

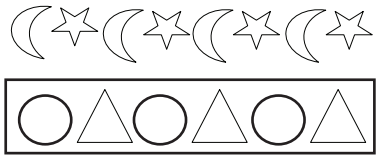
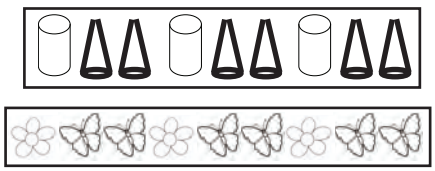
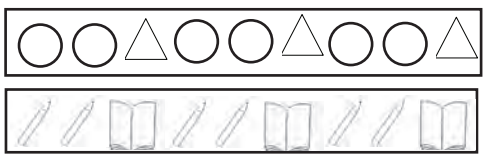


ABB Pattern



AAB Pattern



Reprint 2024

Lesson 4 Translating Repeating Patterns

Lesson Goal

The students will be able to represent a given pattern in a different way.

Relevant Maths Issues

The mathematics of pattern focuses on the structure of the pattern, not the actual items. However children focus on the items. To children a pattern like rectangle, circle, rectangle, circle, rectangle, circle,… is different from a pattern like red, blue, red, blue, red, blue,…; to a mathematician these have the same structure.
One way to help children focus on the pattern structure is to have them show the same pattern a different way. So red, blue, red, blue, red, blue… is called a translation of the pattern rectangle, circle, rectangle, circle, rectangle, circle…. They are both AB patterns. Comparing patterns by focusing on their structure, or how they are formed, would help in translating the patterns. So translating a pattern basically is creating another pattern which has the same structure as the given one, but using different objects, shapes, and colours.

A few essential questions that should be asked during the course of the lesson activities are:

How are these two patterns the same?
How are they different?
Suppose you replaced the colour red with the colour blue and the colour green with the colour yellow. How would you show the pattern?

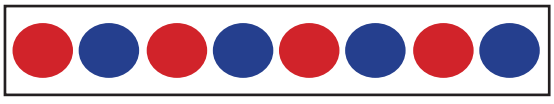
Activity 1 Translating a Colour Pattern using different colours

Objective

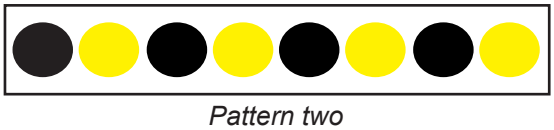
Describe the structure of a pattern using letter codes.
Describe the similarity and difference of structures between two given patterns.
Create a similar pattern to a given colour pattern using different colours in terms of structure.

Materials

4 pattern strips with simple repeating colour patterns as shown here
2 pattern strips with the same shapes but without the colours
Crayons
sellotape/duct tape/glue



Pattern one



Pattern two

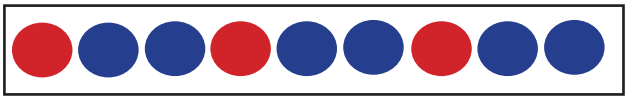
Pattern three

Activity Description

In advance, prepare the 6 pattern strips as shown here. Put up the pattern strip number 1, and ask the students to describe it. Chant the names of the colours with the students. Put up the pattern strip number 2, and ask the students to describe it. Chant the names of the colours with the students. Ask the students to compare the two patterns. **How are these two same in terms of how they are formed?** Encourage the students to describe the structures of the patterns using letter codes. After all

the students have understood that both the patterns are of the form AB, put up the pattern strip number 3. **Let us create a similar colour pattern here, but by using two different colours. What colours do you want to use? We have to choose any two colours different from these.** Let the students decide on the colours available in the crayon set. **If we start with (purple), then the next will be (black). Colour the first two or three circles with the help of students.** Then, invite volunteers to come up and complete the colour pattern. Emphasize that the 3 patterns are same in the way they are formed, even though the colours are different. They are all ABABAB patterns.

Now put up the pattern strip number 4. Ask the students to describe it. Put up the pattern strip number 5, and ask the students to describe it. Ask the students to compare the two patterns. **How are these two same in terms of how they are formed?** Students should be using letter codes to describe the two patterns. After all the students are sure that the two patterns are both ABB patterns, put up the pattern strip number 6 with the empty circles. **Let us create an ABB pattern here, but by using two different colours. What colours do you want to use? Choose two colours. Shall we choose (Orange) and (Brown). If we start with (Orange), then the next will be black. Which colour should we use next? And next?** Colour the first three or 4 circles as the students tell. Invite volunteers to come up and complete the colour pattern. Emphasize that the 3 patterns are same in the way they are formed, even though the colours are different. They are all ABB patterns.



Pattern four

Pattern five

Pattern six

Now ask the students how the first group of pattern and the second group of patterns are different.

Assessment for Learning
Ensure that the students can describe the pattern structures in terms of letter codes.

Extension

Prepare and put up an AAB colour pattern strip. Ask the students to describe its structure in terms of letter codes. Then put up a pattern strip with similar and equal number of empty shapes, and ask the students to create a similar colour pattern using two different colours.

Activity 2 Translating a Shape Pattern using Different Shapes

Objective

Describe the structure of a pattern using letter codes.
Create a similar pattern to a given shape pattern using different shapes in terms of structure.
Describe the similarity and difference of structures between two given patterns.

Materials

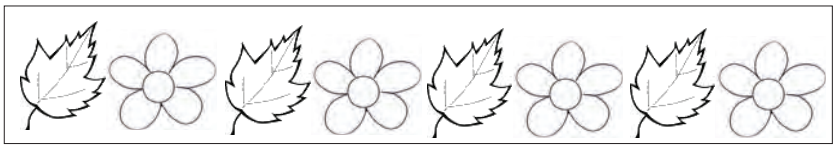
Pattern strips with simple repeating shape patterns as shown here
Newsprint papers

Reprint 2024

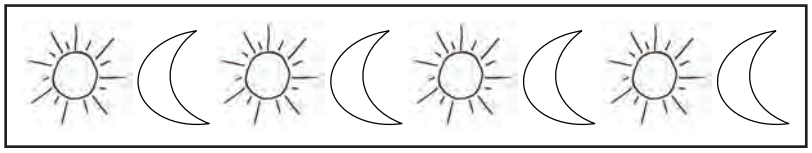
Markers
Chalk and board

Activity Description

In advance, prepare the pattern strips as shown here. Put up the pattern strip number. Ask the students to describe it. Chant the names of the shape aloud with students; leaf, flower, leaf, flower; leaf, flower;…. Use letter codes for the two shapes and chant as; AB, AB, AB,..



Pattern one



Pattern two

Put up the pattern strip number 2. Ask the students to describe it. Chant the names of the shape aloud with students; sun, moon; sun, moon; sun, moon, … Use letter codes for the two shapes and chant as; AB AB, AB,..

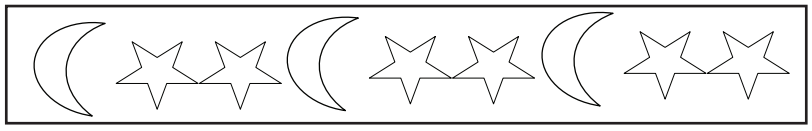
Ask the students how the two patterns are the same? Listen to what the students think and say.

Tell them that we could create a similar AB pattern using two simple shapes. Say that you would like to use a circle and a triangle for it. Put up an empty pattern strip. Draw a circle as the first item. Ask what the second item should be. Draw the triangle. Complete the pattern of circles and triangles with help of the students.

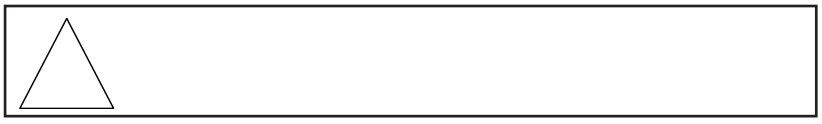
Pattern three

Ask the students to draw the three patterns on a sheet of paper that you provide them or in their note books.

Now put up the pattern starter strip number 4. Ask the students to describe its structure in terms of letter codes. Say that we want to create a similar shape pattern as this, i.e, an ABB pattern using again circles and triangles. Put up an empty pattern strip below this strip. Draw a triangle as the first item. Ask the students what the second drawing should be, and the third drawing should be. Ask for volunteers to come forward and draw the diagrams. After the pattern drawing is completed, chant the names of the shapes in the two patterns, linking both to the letter codes. You could also write the letters below each shape to emphasize that.



Pattern four



Ask the students to draw the three patterns on a sheet of paper that you provide them or in their note books.

Assessment for Learning
Ensure that the students can describe the structure of a pattern in terms of letter codes.

Lesson 5 Creating Repeating Patterns

Lesson Goal

The students should be able to create relatively simple repeating patterns.

Relevant Maths Issues

The Students need a great deal of experience identifying, copying, and extending patterns before they are ready to create them. The patterns students create must show some sort of repetition to be a pattern. It may be necessary to encourage the students to show enough of the pattern to make that 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. For example, a student might simply show:

One way to approach this goal is to provide a set of materials the students can use to create patterns, for example, pencils and pieces of paper. Then ask them to use the materials to create patterns that they think are really different from one another.
You could encourage students to make lenght patterns by providing long and short strips of paper, asking them to make different types of length patterns.

A few essential questions that should be asked during the course of the lesson activities are:

Tell me about your pattern. What makes it a pattern?
What part of your pattern is repeating again and again?
What could you change in this pattern to create another pattern?
How is this like other patterns you have seen before? How is it different?
What kind of clapping pattern could you make? What makes it a pattern?
Describe your pattern in terms of A and B.

Activity 1 Creating Repeating Patterns with Objects

Objective
Make simple repeating patterns with concrete objects.
Describe the patterns made.

Materials
Snap cubes, tooth picks, paper strips, leaves, pebbles, stick, beans, pattern blocks etc

Activity Description
In advance, have the above materials in separate containers. Make them available for the students to use.

Tell the students that you would like them to make at least one pattern using any available material they like. Let them feel free and supported to use the above materials. They could refer back to the pattern the class had already made. Go around and help the ones needing support. As they work on their pattern, ask the following questions.

Tell me about your pattern. How is this pattern? What part of your pattern is repeating again and again?

After the students have finished making their patterns, ask them to share and explain to others. Encourage the students to ask questions to each other regarding their patterns.

Maths Note
So far the students had practised with patterns in terms of discussing, copying, extending, and creating patterns in a directed way. The activities under this lesson give the students opportunities to create their own repeating patterns.

Assessment for Learning
See if the students can describe their patterns.

Activity 2 Creating Repeating Patterns with Drawings

Objective
Make simple repeating patterns by drawing simple diagrams.
Describe the patterns made.

Materials
Papers or note books, pencils, crayons

Activity Description
Ask the students to make simple patterns in their note books or on a sheet of paper that you provide. They could choose to colour their drawings. Encourage and reinforce the students for whatever type and quality of drawings they may come up with. The students may be still at an early stage of their fine psychomotor development. So expecting good, clean and expected types of drawing may not be necessary.
As the students work, ask the following questions.

Tell me about your pattern. How is it a pattern? What part of your drawing is repeating?

Provide encouragement and help to the students.

Some students may want and be in a position to share their drawings with the class. You could also display the students' work on the class wall.

Maths Note
The emphasis of this activity should be on the students' ability to make patterns and describe or explain their patterns, and not on the quality and accuracy of the diagrams.

Assessment for Learning
See if the students can describe their patterns, and how they interact with each other.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 7 REPEATING PATTERN

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 simple repeating patterns (made with sound, action, colour, physical objects, diagrams etc.)	Describe the repeating part in a simple repeating pattern.	Copy a simple repeating pattern (colour patterns, shape patterns, or position patterns).	Extend a simple repeating pattern, including identifying the mission item in a given pattern.	Compare and describe the similarities and differences between two given repeating patterns.	Translate repeating patterns using colours.	Translate repeating patterns using shapes.	Create simple repeating patterns using colours, objects and diagrams.	Describe the patterns he or she has created.
1										
2										
3										
4										
5										
6										
7										

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Reprint 2024

Summative Assessment Recording Sheet (For Class PP)

Student Name: _____ Roll no.: ____Section: ____

CHAPTER 7 REPEATING PATTERNS

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

Task and Interview prompts	Key concepts and skills to look for
Task 1 Have a collection of cubes in more than 4 colours, and a collection of two different objects (e.g. pebbles and leaves, or two different shapes) Present the student with an ABB colour pattern using snap cubes. Ask: **Is this a pattern? Why or how is it a pattern? What is the part that is repeating in this pattern? Can you extend this pattern using three more cubes?** Have the student extend the pattern by making him or here accessible to a collection of cubes in different colours. Ask the student to make a similar pattern using cubes of two different colours other than the ones already used in the above pattern. After that have him or her describe how the two patterns are similar. Then ask the student to make a similar pattern using pebbles and leaves, by presenting these materials to him or her. Ask the student to describe how the last two patterns are similar and how they are different.	*The student is able to :* - Identify a simple repeating pattern. - Identify and describe the repeating part (or the core) of a pattern. - Extend a repeating pattern. - Translate a colour pattern into another colour pattern. - Translate a colour pattern into other patterns (using the same pattern structure). - Describe the similarities and difference between two different patterns.
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 7

Total CA mark from Chapter 7(Task 1: Mark out of 10): _____

Overall remarks on the student

Strengths:

Areas of Need:

Follow up Steps:

Reprint 2024

CHAPTER 7 MASS AND CAPACITY

Chapter Overview

Measurement is really about comparison – comparison of how much some feature of one thing is as compared to that of another thing More specifically, when you compare a thing with another, you would be comparing or measuring a same attribute of the two things. For example, we can only compare the height of one object with the height of another object. Similarly, we can only compare the mass of the first thing with the mass of the second thing, or the temperature of the first with the temperature of the second. When we say that a line is 5 centimetres long, it should be clear that the length of the line is 5 times as long as a line which is 1 centimeter long. And how long is 1 cm? Likewise, all our measurements, be they length (which includes distance, height, depth), mass, force, temperature, time or duration, value or worth, intensity of light, amount of electricity, area, volume, speed and velocity, angle, quantities etc. are all comparative statements using numbers against some standard unit sizes. In fact, the numbers are a measurement. When we say 3 of something, what that 3 is, is relative to what 1 is. If we consider 2 apples as 1 (unit), then 6 apples would be 3 (units).

In class PP, students explore measurements related to only three attributes of objects. They are the length of objects, the mass of objects, and the capacity of containers. The students do not yet use standard unit measurement sizes for these measurements. They will mostly compare the lengths, masses and capacities of objects. In doing this, they will be using critical mathematical processes like prediction or estimation, problem solving, communication, representation and connection.

The students have already explored the measurement concepts related to length in chapter 3. This chapter takes up the measurement concepts related to mass and capacity in similar manners as with the Length. It develops ideas about estimating and comparing masses and capacities of objects. The students will use comparative languages related to mass such as *heavy, heavier, heaviest, light, lighter, lightest*, and *as heavy as; and* comparative languages related to capacity such as *holds more, holds less, and holds about the same*.

What is mass? Mass is the amount of matter that an 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 the mass and the 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 much less on the Moon than on the Earth. In fact, the weight of an object on the moon is one sixth of its weight on the Earth.

The International System of Units, also known as the Metric System, uses the kilogram (kg) as the standard unit for measuring mass. The students do not yet use the standard units of measuring mass in PP.

What is capacity? Capacity of a container is the amount of something, usually a liquid, which it can hold. Capacity is commonly measured in terms of units like the litre. The students do not yet use the standard units of measuring capacity in class PP.

This chapter has 2 lessons as detailed in the table of contents.

Basic Principles about Mass and Capacity

- The definition of a measurement is based on the process for comparing one measure to another similar measure.

- Any mass comparison can be stated in two different ways (e.g. A is heavier than B or B is lighter than A).
- Any capacity comparison can be stated in two different ways (e.g. A holds more than B or B holds less than A).
- Any item might have more mass than a second item, but less mass than a third item (e.g. A could be heavier than B but lighter than C).
- 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).
- Measures of items do not change if the items are moved.

Chapter Goals

- Predict which object is heavier (or lighter).
- Compare directly the masses of objects using a common balance.
- Sort and order objects based on their masses.
- Predict which container holds more (or less).
- Compare the capacities of containers.
- Sort and order containers by their capacities.

Maths Words

heavy, heavier, heaviest, light, lighter, lightest, mass, holds more, holds less, Hold about the same, capacity, estimate, predict, guess, compare

Initial Assessment

Arrange a collection of objects of varying masses which the students can lift and say which are heavy, very heavy, light, very light. For example, a feather, a pencil, a pebble are very light objects. A stone of about 2 kilograms, a thick book, or a small block of wood may be considered as light objects. A stone or a block or wood of about 5 kg may be considered as heavy by the students. A stone, or a table, which the students can barely lift may be considered as vey heavy. Ask the students to try lifting each of the objects and tell which they think is light, very light, heavy and very heavy. You could use the local language or the Dzongkha to describe how heavy or how light an object is, initially. But introduce the terms such as heavy, very heavy, light, very light and start using these English terms with the students. Put up these words on the wall for future reference and use, if possible, with appropriate diagrams

Lesson 1 Predicting and Comparing Mass

Lesson Goal

The students should be able to determine which of the two items is heavier as long as the items are not very close in mass.

Relevant Maths Issues

We use the term “mass” rather than “weight”. Mass tells the amount of matter independent of gravity. Two items have the same mass on the Moon and on Earth, but different weights in the two circumstances.

Mass is something that students cannot observe; it must be felt. This is different from other types of measurements. It makes the need for concrete experiences rather than the use of pictures or diagrams even more important than for other measurements.

One item has a greater mass than another if it takes more of the same material to make it, but if the items are made of different materials, it is not possible to judge which is heavier without feeling how heavy it is. If the items were on a pan balance and one caused the balance to go down, it would be the heavier item. It is important for the students to know that size alone does not determine mass.

Students can lift to feel and guess which of the two given objects is heavier (or lighter). If the difference between the two objects is not distinctly noticeable by feeling, then they can use a pan balance to compare the masses.

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

Which is heavier?
How do you know?
If something is big, does it have to be heavy? Explain.
Can you look at something to decide if it is heavy?

Activity 1 Lighter than Shoes, and Heavier than Shoes

Objective

Predict and compare masses of objects.
Describe the masses of objects using simple comparative terms such as light, lighter, heavy and heavier.

Materials

Shoes that the students are wearing
Two newsprint papers
Marker pens

Activity Description

Ask each student to remove one of his or her shoes and feel to see how heavy it is. **Is your shoe heavy or light? Now I would like all of you to collect three things that are lighter than your shoe. You can pick these things from the class, from your bag, or you can also go out and collect them from outside the class. If you pick a thing from the class,**

you have to place it back at the same place after we finish our activity. Give the students adequate time for this. As the students collect their three things, ask them how they know the things are lighter than their shoes. If a thing feels almost equal in its heaviness, ask them how they would judge if it is lighter than the shoe. One way is to place the shoe on one hand and the thing on the other hand to compare the mass. Some of the things the students could be collecting are pens, pencils, papers, empty plastic bottles, pebbles, leaves, sticks etc.

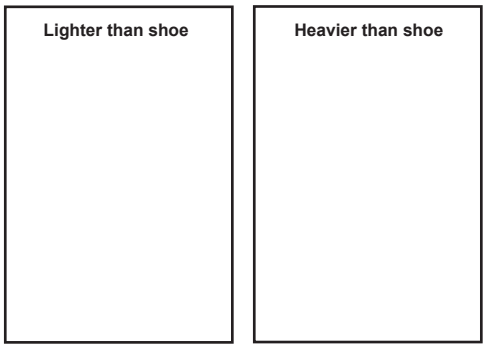
Display two newsprint papers next to each other, one with the label **lighter than shoes** and the other with the label **heavier than shoes**. Ask the students to place the things they have collected on the appropriate newsprint paper. Pick up a thing from the collection and say: **This is a pebble**. **This pebble is lighter than a shoe.** Have the students come forward and say similarly with other things one by one.

Next ask each student to collect two things which are heavier than their shoes. Do similarly as above. Some of the things that the students could be collecting are thick books, stones heavier than shoes, flower pots, or other thing in and around the classroom.

Maths Note
In this activity, the students guess the masses of some common objects and describe those using comparative terms like "lighter than" and "heavier than", as compared to the mass of a given object. Since mass is not visual, unlike the sizes and the shapes of objects, the only way to guess it is through feeling by lifting the objects or using a pan balance. The students are using the idea of sorting in colleting things which are lighter than and heavier than their shoes.

Extension

You could have the students draw some of the things in the two sets that they have collected in their note books with the two heading as, **things heavier than shoes** on one page and **things lighter than shoes** on another page. You could help the students with their drawings. However, while you should encourage and help the students to draw neatly, do not emphasize the students having to draw neatly and nicely too much. Commend on their drawings.



Assessment for Learning
Get the students to use the comparative terms related to mass such as lighter than and heavier than at every opportunity during the activity. Ensure that they practise using these two terms correctly.

Activity 2 Using a Pan Balance to Compare Masses

Objective

Predict and compare masses of objects.
Use simple terms related to mass comparison such as lighter than, heavier than, as heavy as or about the same as.

Materials

Pan balances
A collection of objects to compare masses (such as stones, balls, blocks, empty containers, containers filled with water, sand, soil, seeds, /grains, books etc
News print papers as sorting mats
Marker pens

Maths Note
The students should first feel and predict the mass of an object and be able to say heavier than, lighter than, or about the same as, compared to another object, before they actually compare the masses using a pan balance.

Activity Description

In advance, prepare and have about 5 pan balances in the class. You

could borrow some pan balances from homes or have some made using locally available materials. Have separate sets of objects for different groups of students. There should be a minimum of six objects in each set. The selection of the objects in each set should be such that at least two objects are clearly lighter than, two objects are clearly heavier than, and two objects are as heavy as or about the same mass as the object chosen as a standard object in each set. Choose an object of about 2 kg as a standard object for set. Have ready the sorting mats for each group of students as shown here.

Assessment for Learning
Ensure that the students can use a pan balance correctly, and can use the comparative terms correctly. Present the students with a faulty pan balance and ask them to describe what is wrong with it.

Divide the class in to groups of 2-4 students, or the number of groups should match with the number of sets of objects.

Distribute the standard objects (of about 2 kg) to each group for them to compare the masses of other objects. Let the students in the groups feel its mass and ask them if it is heavy or light. Distribute a set of about 6-10 objects to each group as mentioned above. Provide the sorting mats to each group. Have the students, in their respective groups to guess and compare the masses of each of the objects against the standard object by feeling the masses and have them sort the objects into three groups on the sorting mats provided.

As the students carry on with their guessing and comparing of the masses, go around and interact with them. After all the groups have sorted the objects, ask if they can be sure of the sorting. For example ask: **Can you be sure that this object is lighter than this? How do you know?** Listen to what the students say. Explain that the sorting they have done is based on our feeling of the mass. Tell that in most cases, it would be correct. But there are cases when we can not decide which is really heavier. In such case, we can use a thing called a pan balance to help us. Show a pan balance. Demonstrate how to place the objects and use the pan balance. Without the objects, the two pans should hang at the same level, and the stick should be lying horizontally.

Distribute the pan balances to the groups, and let them try using it.

Have the students put all the things they have back together. Then have them sort the objects again using their pan balances. As they work on the mass comparisons, go around and help them with the correct techniques of using a pan balance. Use the comparative terms such as **lighter than, heavier than,** or **as heavy as** consciously. Have the students use the terms at every opportunity with the activity.

Mass Sorting Mat

Lighter than _____	
Heavier than _____	
As heavy as _____	

Activity 3 Ordering Objects by Mass

Objective

Predict and compare masses of objects.
Use simple terms related to mass comparison such as lighter, lightest, heavier, and heaviest).
Order objects by mass (from the lightest to the heaviest or from the heaviest to the lightest).

Materials

Pan balances (1 for each group of students)
Collections of 4-5 objects for each group (such as stones, books, bottles, empty containers, containers filled with sand or soils etc)

Activity Description

In advance, have a pan balance and a set 4-5 objects ready for each group of students.

Divide the class into small groups. Distribute a set of 4-5 objects and a pan balance to each group. Ask the students to first estimate the masses of the objects. **Which of the things you have are heavy? Which are light? Which one do you think is the heaviest? Which do you think is the lightest? How do you know that?** Have the students then use the pan balances to compare the masses of the objects provided. Have them then order the objects by mass. Have the groups explain or describe their ordering of the objects. **How did you line up your things this way? How do you know that this is the heaviest thing among these things? Which is the lightest thing? How do you know that?** Bring a new object with you, and ask a group**: Where would this be placed? Why?**

Ensure that some of the objects are smaller in size, but heavier than some of the larger looking objects. For example, you could compare a block of soft wood with a stone or a metallic piece which is smaller in size. Ask: **Which is heavier, the big wood or the small stone? So are big things always heavier than the small things?**

Assessment for Learning
See that the students use the words lightest and heaviest when the masses of more than two things are compared and ordered. When only two things are compared, the words heavier and lighter are used. Also see that the students realize that big objects are not necessarily the heavier one.

Variation/Extension

If possible, make a seesaw in the school ground. The students would enjoy playing on it as well as comparing each other's body mass with it. Alternatively, you could arrange to take the students to a children's park for the same.

Lesson 2 Predicting and Comparing Capacity

Lesson Goal

The students should be able to determine which of two containers holds more (or less).

Relevant Maths Issues

Capacity describes the maximum amount a container can hold. The container could be a cup, a bowl, a jug, etc. The students can compare capacities either directly or indirectly.

To compare capacities directly, the students could fill A and pour the contents into B. If there is still room left in B, A holds less. If not all of the contents of A fits into B, B holds less. If the contents of A just fill B, they hold the same amount.

To compare capacities indirectly, the students could, for example, get two identical large containers. They could put the contents of A into one container and the contents of B into the other and see which of the large containers is fuller.

Containers that are used when capacity is compared should vary in both size and, if possible, in shape. The students should recognize that because capacity measures how much something holds, two containers that look the same on the outside could hold different amounts if one is thicker than the other.

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

Which holds more? How do you know?
Could I put more water into… or into ….?
Look at this container. Do you think that it will be easier to find a container that holds more than it or less than it?
If two cups are the same size, do they have to hold the same amount?

Activtity 1 Comparing the Capacities of Containers

Objective

Estimate and compare capacity of containers.
Use simple terms for capacity such as holds more, holds less, and holds about the same.

Materials

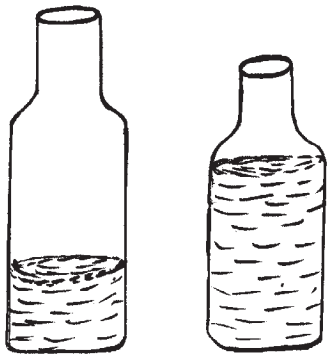
Bottles in various sizes, two of which are of same size and shape
Various other containers
A bucket of water
A jug or a funnel to help pour water into bottles and other containers

Activity Description

Bring two bottles of different sizes, but the size difference should not be too large. A mineral water bottle and a Pepsi bottle may be appropriate. Fill the larger one with water to less than half of it, and the smaller bottle with water almost to its full, so that it clearly shows that it contains more water than the

first bottle. Ask: **Which bottle has more water in it? Which bottle can hold more water (if we fill them both full)? If this one will hold more water, then which one will hold less water?** Ask all the students to say; this bottle *holds more* (referring to the bigger bottle); this bottle *holds less* (referring to the smaller bottle).

Pick up a container, for example a tin can, to compare with one of the bottles used earlier. Ask: **Which one do you think holds more – the bottle or the tin can? How do you know?** Listen to what the students think and say. **How can we check this out? We can check this with the help of water…** Fill the bottle with water. Then pour the water into the tin can. If all the water from the bottle does not fill the can, the can **holds more** than the bottle. If after filling the can, there is water remaining in the bottle, then the can **holds more**.



Which bottle has more water in it?
Which bottle can hold more water?

Pick up another container and ask: **Do you think this holds more than this bottle, or less than the bottle?** Listen to the students' prediction. Ask a volunteer to compare the two, and let the class say which holds more or which holds less.

Choose a container which you know has the same capacity as the bottle above, but is not a bottle, and ask the students to predict whether it will hold more than the bottle. Ask some one to compare by pouring water from the bottle into it carefully. The students should see that the water from the bottle almost exactly fills the container. See if anyone can say that the two hold the same. Then model correct language to describe this situation: **This *holds about the same* as the bottle.**

Assessment for Learning
See that the students can use the terms holds more, holds less and holds about the same correctly.

Extension

Carry out comparison of the capacities of various containers with pourable contents other than water such as dry sand, soil and cereals. You could take the students outside at a site where you can have suitable soil or sand to play with. Consciously use the terms holds less, holds more, and holds about the same between the containers.

Activity 2 Sorting Containers based on their Capacity

Objective

Estimate and compare capacity.
Use simple terms for capacity such as holds more, holds less, and holds about the same.
Sort containers based on the capacity.
Show and explain how a container holds more or holds less or holds about the same when compared to another one.

Materials

A tray of rice
A set of containers in various shapes and sizes (cans, cups, paper boxes, plastic *phobs*, etc)
Sorting mat as shown here

Activity Description

In advance, have a collection of various containers, a standard container, and a sorting mat for the each group of the students. Also have about 5 kg of rice in a sack in advance. The sets of containers should be chosen in such a way that at least a few of them **hold less than**, a few of them **hold more than,** and a few of them **hold about the same** as the standard container in the set.

Assessment for Learning
See that the students can use the correct comparative terms related to capacity, and can use the correct technique of filling the containers with rice.

Divide the class into small groups of 2-4 students. Distribute the set of containers, standard container, rice and sorting mats as mentioned above to the groups.

Ask the students to first guess, and then compare each of the containers with the standard one, and sort them on the sorting mat. Make accessible to all the groups the rice to compare the containers. As they work, go around and ask: **Do you think this will hold more than the cup? What makes you think that it will hold more (or less) than the cup? How would you check? Or how did you check that?**

Teach them the correct technique of filling the containers with rice, and how to remove the rice so that its level uniformly matches the surface of the containers.

After they have sorted out, let the students describe their sorted out containers.

Container Sorting Mat

Holds more than	
Holds less than	
Holds about the same	

Variation
You could use dry sand in place of rice. If you choose to use sand, you could preferably take the students to an open site where you can have access to plenty of it.

Activity 3 Making cylindrical containers of the same capacity but of different diameters

Objective
Make cylindrical paper containers of the same capacity but of different diameters and heights
Use simple terms for capacity such as holds the same, holds more, and holds less.

Maths Note
This activity reinforces the idea that different sizes of containers, in terms of how long or wide they are, could hold the same amount. It also gives them an opportunity to make cylinders.

Materials
Sets of three different sizes of rectangular pieces of papers; the largest size may be A4 size paper; if possible arrange to have stiff papers.
Cello tape, glue, stapler, scissors
A standard container (a melamine *phob*)
About 5 kg of rice

Activity Description
In advance, prepare to bring the above mentioned materials to the class.

Mix up the three different sized sheets of papers. Distribute a paper to each student, and tell that they will be making a cylinder with it. Demonstrate how to make an open cylinder by rolling the papers either in landscape form or portrait form. Use cello tape as necessary. Then cut out a circle from another paper, and attach it at one end of the cylinder, so that now you have a cylindrical container.

Assessment for Learning
See that students can use the comparative terms such as hold more, holds less and holds about the same correctly. See also that the students can describe, explain or show how two or more containers hold the same.

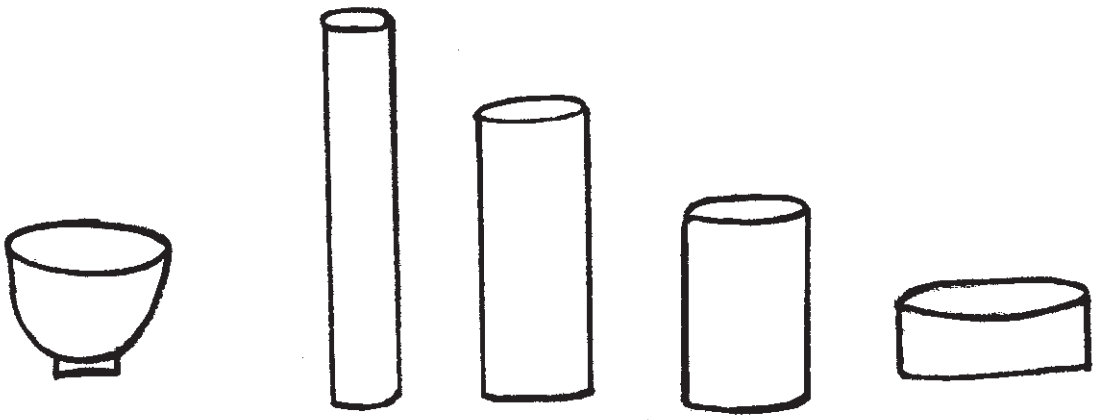
Ask the students to make their cylinder. Help the students if need be. Depending on the size of the paper each student got, and how they chose to roll their paper, there would be quite a few different sizes and shapes of cylinders. Let the students compare their cylinders, after each has made his or hers.

Show the students a *phob* to be used as the standard container, and tell the students that their cylinders should be cut so that each would hold about the same as the cup. Ask them how they would go about doing that. Encourage the students to describe how they would do that. Listen to what they say. Suggest that they could use the rice and the container.

A *phob*

As the students work, show them how to throw away the extra rice from the surface of the *phob* using a straight edge, and to pour the rice into their cylinders using a readily improvised funnel by a paper. Mark the cylinder at the level reached by the rice in it for cutting off.

After everyone has cut his or her cylinder so that it holds about the same as the standard container, let the students again compare their cylinders with one another. Ask: **Who has a tall cylinder? Who has a short but wide cylinder? Which holds more? Do they all hold about the same? How do you know that?**



All these containers hold about the same

Reprint 2024

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 8 MASS AND CAPACITY

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).*						
	Estimate and compare masses of objects and use the comparative terms like *heavier, lighter,* and *about the same mass.*	Compare the masses of two objects using a common balance.	Sort objects according to their masses.	Order objects according to masses and use terms like *lightest* and *heaviest.*	Estimate to compare the capacities of containers, and use comparative terms like *holds more, holds less,* and *holds about the same.*	Sort objects according to their masses.	Order containers according to their capacities.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Summative Assessment Recording Sheet (For Class PP)

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

CHAPTER 8 MASS AND CAPACITY

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

Task and Interview prompts	Key concepts and skills to look for
Task 1 Have two objects which are both about one Kg in mass. The objects could be a plastic bag of snap cubes and a block of wood. Have a common balance too. Present the student with the two objects, and ask: **Which one do you think is heavier? – the block of wood or the bag of cubes?** The student could lift both and guess the answer. Then ask: **If you say this is heavier, then which one is lighter? How can we compare to know for sure which one is heavier?** Have the student use the common balance. **So now which one is really heavier? Which one is lighter then?** Present the student with two more objects (e.g. a marker pen and a book). **Now I want you to place these 4 things in a line so that they are from the heaviest to the lightest. Which one is the heaviest? Which one of the 4 is the lightest? Which is lighter between the book and the block of wood?**	*The student is able to:* - Predict/estimate and compare the masses of objects using terms like *heavier* and *lighter*. - Compare the masses of two objects using a common balance. - Order items in order of mass.
Comments and Mark: **Teacher's Signature and Date:**	

Task 2 Present the student with two containers (e.g. a short container with a larger diameter and a taller container with a smaller diameter, so that their capacities are not hugely different). Have something to fill the container (e.g. rice or dry sand ready). Ask: **Which container do you think will hold more? Which one will hold less then? How can we find out which one will really hold more?** Have the student use the rice to fill the containers. See how he or she does that and compare.	*The student is able to:* - Predict/estimate which container *holds more/holds less.* - Compare the capacities of containers and use the terms *holds more/holds less.*
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 8

Total CA mark from Chapter 8 (Task 1 and Task 2: Mark out of 20): _____

Overall remarks on the student

Strengths:

Areas of Need:

Follow up Steps:

CHAPTER 8 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.

In class PP and other lower classes, the focus of geometry is on exploring various 3-D and 2-D shapes, learning their names and features, and being able to describe the shapes. As we move up the classes with the study of geometry, students study the properties and relationships of shapes and start using reasoning and proofs. The study of geometrical relationships and proofs helps in one's analytical and reasoning capacities.

The students have already studied exploring the basic 3-D shapes in chapter 4. Their experience and knowledge about the features of rectangular prisms, cones, cylinders, and spheres will now help them with identifying and exploring the basic 2-D shapes like rectangles, triangles, and circles. The focus of this chapter will be for the students to explore and describe the features of these three basic 2-D shapes. The students make connections between various 2-D shapes and the 3-D shapes. Although strictly speaking, we cannot have solid models of 2-D shapes, we could make use of cut-outs of 2-D shapes to help in describing and sorting them.

Basic Principles about 2-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.
- By building with objects, properties of those objects become more readily apparent.
- Shapes can be combined and dissected to create other shapes.

Chapter Goals

- Identify, describe and compare 2-D objects.
- Sort 2-D shapes.
- Cut and combine a 2-D shape to form other 2-D shapes.
- Make patterns using 2-D shapes.
- Identify 2-D shapes in the environment.

Maths Words

rectangular prisms, cylinder, cone, flat face, curved face, edge, corner, rectangle, triangle, circle

Lesson 1 Identifying and Describing 2-D Shapes

Lesson Goal

The students should be able to recognize, describe and compare rectangles, triangles, and circles.

Relevant Maths Issues

Squares are rectangles in every sense. Many people, including students normally distinguish squares from rectangles that are not square. In this curriculum, at least in class PP, square is simply considered a rectangle and is not distinguished from other rectangles. However, some students may know about squares. If some students identify a square as a square, agree that they are correct, but inform them that a square is a special kind of rectangle. You, yourself, should use the word 'rectangle' even for squares at the PP level.

It is important for the students to describe and compare the three basic 2-D shapes.
Suggest that students focus on attributes such as whether objects are or are not round, whether they look more like, for example, a rectangular sheets of paper or the sun, or whether or not they are "pointed". One way to help the students focus on characteristics of shapes is to hide a cutout shape in a container that the students can reach in to, but not see. They feel a shape to decide which of the three shapes above it is most like and why. Make sure to have shapes of different sizes, e.g. large and small circles, large and small rectangles, including rectangles which are square, triangles that look somewhat different from one another, etc.

Encourage the students to compare 2-D shapes to 3-D shapes as well as to other 2-D shapes.
To develop perceptual constancy (a shape can be moved and is still the same), it is useful to cut shapes out and flip and turn them so that students can see they have not changed.

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

How are these two shapes alike or the same?
How are these two shapes different?
What is true about every triangle?
How is a rectangle like a rectangular prism? How is it different?
Which of these shapes are most alike? Why do you think that?

Activity 1 Introducing Rectangle, Triangle and Circle

Objective

Relate 2-D shapes to 3-D shapes (2-D shapes as the shape of the faces of the 3-D shapes).
Identify and describe 2-D shapes (rectangle, circle and triangle).

Materials

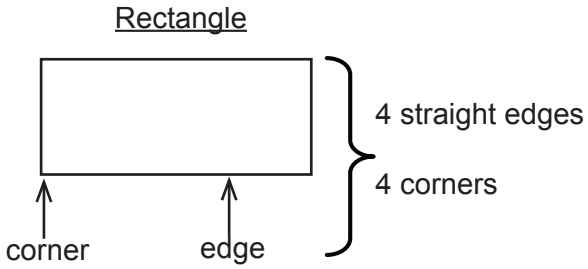
3-D geometric shapes (rectangular prisms, cones, cylinders, triangular prism)

Activity Description

Bring a set of rectangular prisms. They could be wooden models of it, a snap cube, a tooth paste case, etc. They could preferably be the same objects used in chapter 4. A rectangular prism should be familiar to the students from chapter 4. Show one of these objects and ask the students

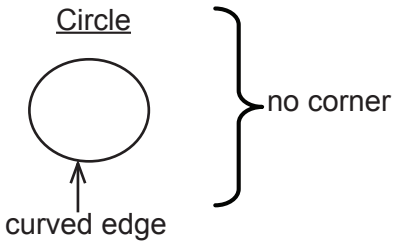
to name it and describe it. Listen to how the students describe it. Use the following question and appropriate actions to help describe the rectangular prism.

What shape is this? What is this part of the shape called (pointing and referring to one of the faces)? **Is this a flat face or a curved face? What is this called** (pointing and referring to a corner)**? What is this part called** (pointing and referring to an edge)? **Are there many edges for a rectangular prism? Let us count the edges**. Count the edges. **Let us also count the corners.** Count the corners. Then shift the attention on a face of the rectangular prism. **Let us look at a face of the rectangular prism. It is a flat face. It has four corners. Let us count them, one, two, three, four. How many edges does it have? Let us look at another face.** Take the students through a similar process. You may want to look at a few more faces similarly. Then explain that each face of a rectangular prism is called a **rectangle**. Emphasize with the action of your hand as you feel a face of a rectangular prism that it is the shape of the face that is the rectangle. **This is a rectangle. It has four edges** (run your fingers along the 4 edges). **It has 4 corners** (point to and count the 4 corners).



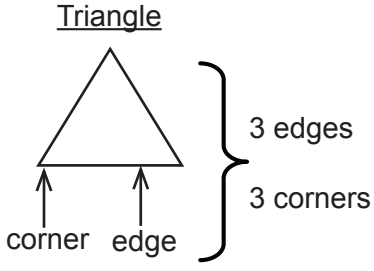
Distribute the rectangular prisms to the students. Have the student to feel the faces of the prism. Have them pass around so that everyone can feel a prism. Ask questions like: **Show me a rectangle on your rectangular prism. Show me the 4 edges. How many corners are there for a rectangle? Show me the corners. How many rectangles are there for a rectangular prism?**

Draw a rectangle on the black board or on the maths wall. Referring to the diagram you have just drawn, say: **This is a rectangle. How many edges does a rectangle have? Let us count them, one, two three, four. Let us count the corners also.**



Display a cone. **What is this? What can you say about a cone?** Listen to what the students have to say about it. You might like to guide the description using these questions and appropriate actions: **How many corners does a cone have? How many faces does it have? Are the faces like that of a rectangular prism? Do you see any rectangle with a cone? This face is a curved face** (referring to the side face)**. Let us look at the base of the cone. The base is a flat face. Is it a rectangle? It is called a circle.** Then draw a circle on the black board or the maths wall, and describe it with reference to the diagram. **A circles is a flat round shape. It has a curved edge all around. It has no corner.**

Show a cylinder, and ask the students to describe it, and to identify the circles.



Introduce triangular prism. You can find triangular prisms in the set of pattern blocks. Introduce the triangle with the triangular prism in a similar manner as above. Describe the features of the triangle both with

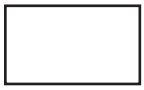
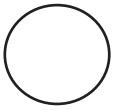
the help of the prism as well as with the diagram that you draw on the black board or on the maths wall.

To recap the points discussed in the above activities, point to the diagrams and ask the students to identify the names of the three shapes. Also ask them to describe the three shapes. You could ask specific questions related to how many corners and edges each of these three 2-D shapes have.

Assessment for Learning
Ensure that all the students can identify the three 2-D shapes above.

Extension

Put up a chart as shown below. Have the students identify, name and describe the 2-D shapes. Then with the help of the students, fill up determine the number of corners and edges for the shape.

	How many edges?	How many corners?
Rectangle 		
Circle 		
Triangle 		

Activity 2 Feel the Shapes

Objective

Identify and describe 2-D shapes.

Materials

A set of cutout 2-D shapes (triangles, rectangles, circles) using stiff papers - one shape for each student.

Activity Description

In advance, prepare a set of cutout 2-D shapes (circles, rectangles, and triangles), so that every student will have a shape, and some extra numbers of each shape. It is important that the students start off with a variety of shapes for each type of shape. There should be more than one rectangle as a model for rectangles, including long skinny ones, squares, and rectangles that are very close to being square. For triangles there should be an equilateral, some isosceles with various angles, and some scalene that are acute-angled, right-angled and obtuse-angled. There could be a few circles too, of various sizes. You could use the 2-D shapes given on pages ___, of the Student's Activity Book – first tear off the pages; paste them on stiff papers, and then cut out the various shapes.

Have the students sit in a circle, preferably in an open area. Place the cutout 2-D shapes of a circle, a triangle, and a rectangle at the centre of the circle on the ground. Describe a shape, and ask the students to identify it. For example, **I want to pick up a shape that has 3 edges and 3 corners.**

Reprint 2024

What is the shape that I should pick up (referring to the 3 shapes in the centre)? Repeat for the rectangle and the circle. For the rectangle, you could say something like: **Now I want to pick up a shape that has four corners and four straight edges. Can someone pick up the shape for me?** Have a volunteer pick up the shape. Ask the student: **Show us the edges. Show us the four corners. What is the shape called?** For the circle, you could say: **Now I want to pick up a shape that has no corners. It looks like the face of a coin. Can one of you pick the shape for me?** After a volunteer has picked up the circle, ask the students: W**hat is this shape called? Is there a corner for the circle? Is there an edge for the circle? What type of an edge does a circle have?**

Ask the students to place their hands behind them. Walk around the outside of the circle and place a cutout 2-D shape in each student's hand. Say that they are going to play a simple game. Select a shape from the centre, for example a rectangle: **Here is a rectangle. It has four edges and four corners. Everyone, feel your shape at your back. But don't look at it. If you think you have a rectangle, raise your right hand.** Ask those who raised their hands: **How did you know that your shape is a rectangle?** Listen to how the students respond. Ask those who did not raise their hands: **How do you know that you don't have a rectangle?**

After this, ask each student to "pass" his or her shape to the neighbour sitting on the left. Pick up a circle from the centre and say: **Here is a circle. It is has a round edge all around. Everyone, feel your shape. If you think you have a circle, raise your right hand.** Ask those who raised their hands: **How did you know that your shape is a circle?** Listen to how the students respond. Ask those who did not raise their hands: **How do you know that you don't have a circle?**

Again have the students "pass" their shape to their neighbour on the left. Repeat the above process for the triangle. Here is a triangle. It has three straight edges and three corners. Everyone, feel your shape. If you think you have a triangle, raise your right hand. Ask those who raised their hand: **How did you know that your shape is a triangle?** Listen to how the students respond. Ask the others: **How do you know that you don't have a triangle?**

Again have the students pass their shape to their neighbour sitting on their left. This time, ask: **Everyone, if you have a triangle bring it to your front**. Have the students look at all the triangles. **Do all the triangles look the same?** Listen to what the students say about it. Compare the various triangles. Then ask: **What is the same about all the triangles?** Then repeat the process with the rectangles and the circles.

After the activity, the cut out shapes should be collected for future use.

Variation

Put a collection of the 2-D cutout shapes in a feely bag. Have the students put their hands, in turns, in the feely bag, feel the shapes and draw out a shape as per your instruction. Have them explain or describe how they decided on the shape to draw out.

Maths Note

When we use a cutout 2-D shape, we should stress that it is the face of the cutout object that is the 2-D shape by using appropriate actions with the hands. The same would apply when using pattern blocks for the 2-D shapes. Otherwise, if we show the whole triangular block as triangle, it is not correct, for it is a triangular prism. Similarly, if we show and mean the whole of a paper cutout circle as circle, then we are really mixing up a cylinder with a circle. Even if the height of a cylinder is very small, as with a paper cutout, it is still a cylinder.

It is important that the students start off with a variety of shapes for each type of shape.

Assessment for Learning

See that the students can describe the rectangles, triangles and circles in terms of edges and corners.

Activity 3 Shadows of 3-D Shapes

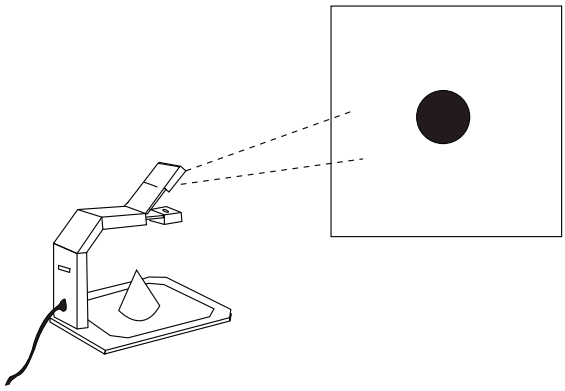
Objective
Identify and describe 2-D shapes.
Relate 2-D shapes to 3-D shapes.

Materials
Geometric 3-D shapes (Rectangular prisms, triangular prisms, cones, cylinders and spheres)
Overhead projector

Maths Note
In Activity 1 above, we discussed the relationship between the faces of a 3-D shape and a 2-D shape. This activity reinforces that relationship.

Activity Description
In advance, have the geometric 3-D shapes as mentioned above and an overhead projector ready in the class.

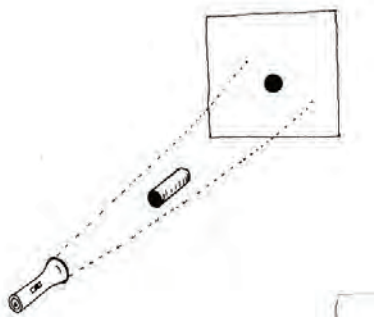
If possible, distribute a triangular prism to each student, or to pairs of them. It is important that you have triangular prism of varying sizes. Some of the triangular prism could be the ones available in the set of Pattern blocks. You could also make some with papers with the help of the nets provided in the Student's Activity Book on page number ___. Pick up one triangular prism yourself, and ask (referring to the whole block): **What is this block called? Where is the triangle?** (Stress with action that the triangle is a face of it). **How many triangles do you find with this prism?**
Turn on the light of the overhead projector. Say that if we put things on it, we will get a shadow on the wall. **If we put this triangular prism with this face down on it, what shape do you think will be the shadow?** Let the students predict. Then show it. **Now if I put down this face** (referring to a side face of the triangular prism, which is a rectangle)**, what will be the shape of the shadow?**



Repeat the process with other 3-D shapes and their faces.

You might want some students to come forward and take your role for some of the objects later.

Variation
In case you don't have electricity or an overhead projector in your school, you might do it by projecting the shadow of the 3-D shapes with torch light.



Reprint 2024

Activity 4 Drawing the 2-D Shapes

Objective
Draw the sketch of triangle, circle, and rectangle.

Materials
Geometric 3-D shapes (triangular prisms, rectangular prisms including cubes, cylinders and cones)

Activity Description
In advance, have a collection of the above 3-D shapes. Pick up a 3-D shape and place one of its faces on the black board, and trace around it with chalk. Before you remove the shape, ask the students what 2-D shape might it be that you have drawn.

Distribute a 3-D shape, as mentioned above to each student. Have them trace around the various faces of the blocks they have on their note books, and identify the 2-D shapes formed. Once the students have traced around their shapes enough, have them trade their blocks and do the tracing around the different blocks. As they work, go around and ask the names of the shapes they have made or are making. Assist the ones having difficulty with the tracings.

You could ask the students to trace or draw different types and sizes of one shape on one page of their note books. Ask them to colour the shapes. Ask the following related questions: **Show me your biggest triangle. What is same about all your triangles?** Ask similarly for other shapes.

Encourage the students to draw the shapes free hand or with the help of other instruments like rulers. For a circle, they could trace around other circular objects like coins, cups, cans etc.

Variation/Extension
You might also want to make various 2-D shapes by dipping the faces of 3-D shapes in water colour paints and imprinting them on papers by the students, in which case you would need the following.
Water colours; shallow containers to make the paints with water; various 3-D shapes, preferably made out of spongy materials; sheets of paper for each student.

Activity 5 Making 2-D Shapes with Yarns

Objective
Create 2-D shapes with students and yarn/strings.

Materials
Yarns/strings
Students

Activity Description
Take the students to an open space. Ask the students to form into groups of 4. Provide each group 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 student form various triangles.

Show the students a pentagon from the sets of pattern blocks, and ask them to form it.

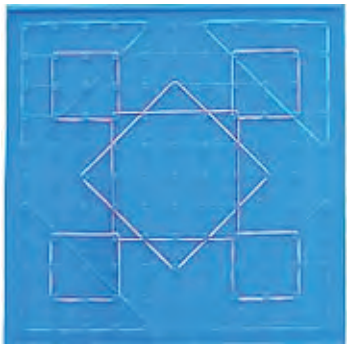
Ask the students to form various shapes and have them describe the shapes.

At the end, ask them what shapes were easy to form, and what shape were difficult to form. For example, it would be difficult to form a circle.

Activity 6 Making 2-D Shapes on Geoboards

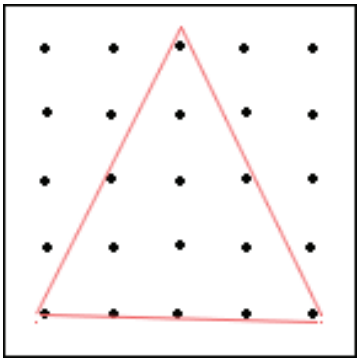
Objective
Create 2-D shapes on geoboards.

Materials
Geoboards (if possible one for each student)
Rubber bands



Activity Description
Provide each student or pairs of students with a geoboard and rubber bands. Let them experiment making various shapes with it for sometime. 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 enough 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 every one 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 4 sides the same. Make a very small rectangle.
Make a circle. Could you make a circle on the geoboard?
Make a pentagon. You may need to show how a pentagon looks, either with a pattern block or by drawing it on the black board.
Make a hexagon. You may need to show how a hexagon looks, either with a pattern block or by drawing it on the black board.



Lesson 2 Sorting 2-D Shapes

Lesson Goal

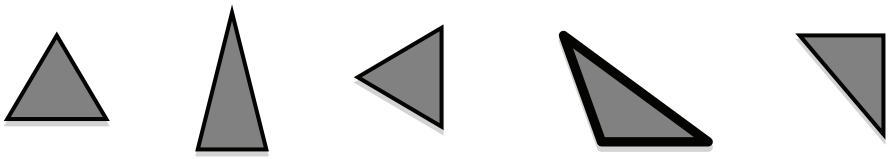
The students should be able to sort 2-D shapes.

Relevant Maths Issues

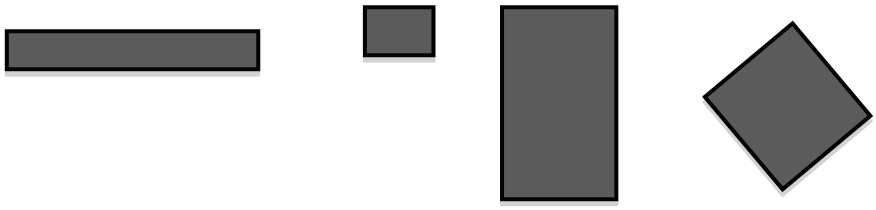
Students are using concepts of classification when they identify shapes. But by having students sort shapes and physically put together shapes of a certain type, they can show what they understand about describing, comparing and identifying shapes.

Make sure to have circles, triangles, and rectangles of different sizes and shapes for the students to use. If these could be cut out of paper, handled and moved around, it is better than if the students simply work with drawings.

Try to use a variety of triangles in different positions, for example



Also use rectangles with different proportions, some more like squares than others, and in different positions, for example



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

What is the same about _____?
What is different about _____ ?
How could you sort these?
Suppose we put together all the shapes that had straight sides. Which shapes would we include?
Which shapes go with these _____?

Activity 1 Sort and Resort 2-D Shapes

Objective

Sort and resort various 2-D shapes.
Explain the sorting rule.

Materials

A set of cutout 2-D shapes for each student (use the shapes provided in page numbers _____ in the Student's Activity Book)
Scissors
Envelopes (4 numbers for each student)

Maths Note
In this activity, the students are provided with various 2-D shapes besides the circles, triangles and rectangles, as can be found in the Student's Activity Book, for the purpose of sorting the shapes in various ways.

Activity Description

Have each student cut out the 2-D shapes from page numbers _____ of his or her Student's Activity Book. Provide scissors and assistance to the students with the cuttings where needed.

Ask the students to sort the shapes into sets. Ask they work, go around to each student and ask: **How did you sort? What is the same about all the shapes in this set? What is your sorting rule? Can you put back all the shapes together and sort it in another way?** Strongly promote or encourage the students to sort the shapes in multiple ways.

Extension

Ask the students to share their sorted sets with others. The students could ask their friends to guess their sorting rule.

At other times you could start off creating two sets, for example, place a triangle in a set; pick up another and place it with the first; pick up a shape which is not a triangle and place it separately; and continue similarly with a few more shapes. Then pick up a shape and ask the students where it should be placed. Let them guess your sorting rule. Students could also play this with their neighbours.

At the end, ask the students to sort the shapes such as triangles, rectangles, circles, and others and put them in different envelopes. Paste a shape on the outside of the envelopes. Collect the envelopes and keep them safely in the class for some other activities in the next lessons.

Assessment for Learning
See that the students can describe their sorting rules.

Reprint 2024

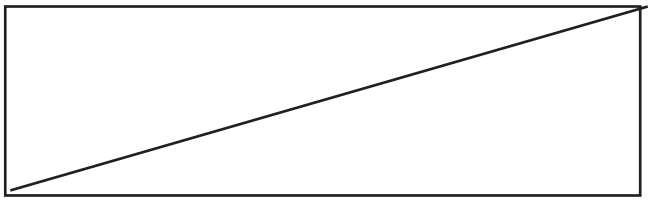
Lesson 3 Dividing and Combining Shapes

Lesson Goal

The students should have experiences cutting up shapes to create other shapes and putting together very simple shape “puzzles”.

Relevant Maths Issues

Many mathematical concepts in higher classes are built on students realizing that you can divide shapes up or put shapes together to create new shapes.
For example, students begin to realize that a right triangle is half of a rectangle. This helps them better understand how to divide a rectangle in half. And eventually, this will help them understand a rule for finding the area of a triangle.



At this stage, the cuts should be simple, and usually straight lines, and the shapes should not be divided into more than 2 or 3 pieces. Students can also use different cutout shapes to create different 2-D structures.

A few essential questions that should be asked during the course of the lesson activities are:

Put together these two triangles. What shape could you make?
If you put together two rectangles, can you make another rectangle?
What does half of a rectangle cut this way look like? (indicating the cut along diagonal)
What does half of a rectangle cut this way look like? (indicating the cut parallel to a side)

Activity 1 Cutting up 2-D Shapes to see What New Shapes are formed

Objective

Identify and describe 2-D shapes.
Cut up a 2-D shape into 2 pieces to see what new shapes are created.

Materials

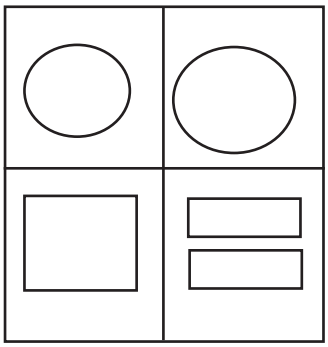
Cutout shapes of triangles, rectangles, and circles
Scissors
Student’s Activity Book

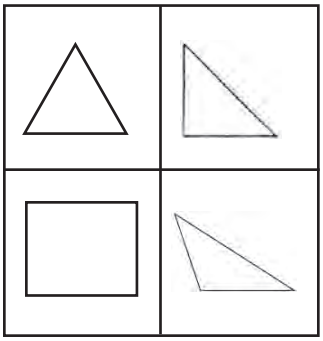
Activity Description

Ask the students to cut out the 2-D shapes from their Student’s Activity Book on page numbers ____ . The pages in the Student’s Activity Book are as shown here. Provide scissors. Pick up a cutout rectangle, and ask the students to watch as you demonstrate how to cut it diagonally. **I get two new shapes from this rectangle. What are these new shapes?** Ask

the students to cut their shapes into two pieces and see what new shapes they get. As they work, go around and ask: **Can you get two triangles by cutting one triangle? Cut a rectangle to get two smaller rectangles. How can you cut a rectangle to get two triangles? Can you cut a circle into two pieces to get two smaller circles? Can you cut a triangle out of a circle? Can you join two triangles to from a rectangle? What should be the size of the triangles? Can you join a small triangle with a bigger triangle to form a rectangle? Can you cut a triangle to get two smaller triangles and a rectangle?**

Assessment for Learning
See that the students can identify the 2-D shapes.





Activity 2 Shape Puzzles

Objective
Create and solve simple shape puzzles out of cutout 2-D shapes.

Materials
Scissors
Envelopes
Student's Activity Book

Maths Note
The students create simple shape puzzles by cutting a shape into 2-3 pieces and ask friends to solve it.

Activity Description
Ask the students to cut out the shapes from their Student's Activity Book on page number ____. Cut out your own set of shapes using the same master. Tell the students that you will be cutting a shape into 3 pieces to make a puzzle for them. Let them watch you make the cuts. Mix the three pieces up. Ask a volunteer to come forward to join the pieces to get back the original shape. Try once more with a different shape. Then ask the students to create their own puzzles by cutting a shape into 3 pieces. Then mix them up. Divide the students into pairs. In pairs the students solve each other's puzzles. Often, there will be more than one way of putting the pieces together to make an interesting shape. Therefore, it should be emphasized that when a student doesn't make the original shape, their result is not wrong. It's just different from the original shape. The student who made the puzzle might give the guesser some clues about how to put the shapes together to get the original shape. Then, they could explore together other interesting ways of putting together the shapes.

Assessment for Learning
When the cutout pieces are put together, a student may get a shape that is different from the original one that the puzzle developer has. But if the new shape could very well be a shape that solved the puzzle even though different from what was envisioned. Ensure that the students are aware of this.

As they work, go around and interact with the students by asking questions, and offering them to solve your own puzzles, and to solve theirs.

The students can store their puzzles in different envelops that you distribute to them. They can take the puzzles with them and play at their homes with their friends and family members. You can also play this at some other time in the future.

Reprint 2024

Activity 3 Shape Structure

Objective
Form different 2-D pictures of structures using cutout 2-D shapes.

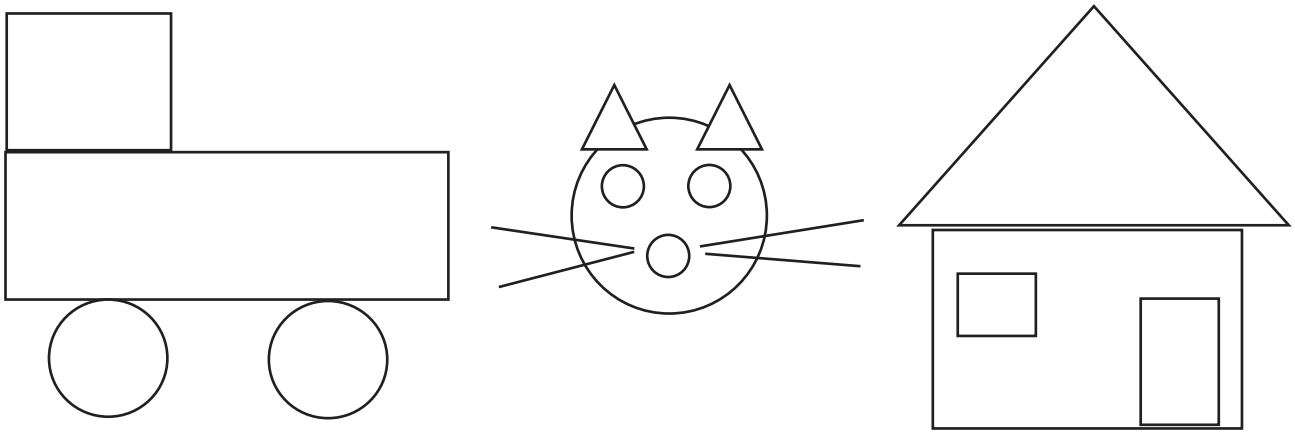
Materials
Sets of various cutout 2-D shapes of triangles, rectangles, and circles for each student
A sheet of paper for each student
Crayons
Glue

Activity Description
Distribute the collection of cutout triangles, rectangles and circles which were collected in envelops during lesson 2 above. Distribute a sheet of paper each.

Assessment for Learning
See that the students can talk about their pictures, and identify the 2-D shapes used.

Ask the students to make any shape they would like to make by joining or collaging the various cutout shapes. You can suggest making simple houses, trucks, bicylcles, people etc. using the shapes. They could also glue the shapes and use colours and pencils to add details. Encourage the students to share their pictures with others. Ask the students to describe their pictures. Ask questions like: **How many triangles are there in your picture? How many circles? How many rectangles are there?** You could display their work on the wall and commend them. You could arrange for another class to come look at the collages up on the wall. Maybe a senior class can come look with the task of looking for particular kinds of triangles. The PP children would be very proud of their work being analyzed by their older peers.

The students' structures made with combinations of various 2-D Shapes could be something like the following.



Lesson 4 Locating 2-D Shapes in the Environment

Lesson Goal

The students should recognize and identify rectangles, circles and triangles in their environment.

Relevant Maths Issues

It is important that the students recognize where the shapes they study in school appear in their everyday lives. These basic shapes are very prevalent as parts of 3-D shapes as well as in other situations in students' environments.
The students might be asked to go on a shape hunt to find shapes around the school that match the three they are studying. Provide a chart where students can draw pictures of, or locations of, items they find that match each of the three types of shapes.

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

Where did you find circles?
What shape is the floor of our classroom?
Did you find more … or ….?
What shapes were easy to find?

Activity 1 Locating 2-D Shapes in the Environment

Objective

Identify rectangles, triangles, and circles in the environment

Materials

Chart paper
Markers
Cello tapes

Activity Description

In advance, prepare and display the format as shown here on a chart paper.
Ask the students to look around the classroom. What is the shape of this table top? How is this a rectangle? Can you see rectangles in the windows? Can you show which part of the window is a rectangle? Where else can you see rectangles? Fill up the format by drawing or writing the names of objects or locations where the rectangles are found.
Ask the students to then tell where in the classroom triangles and circles are seen. The student could also look at pictures, calendars, and other things.

Then you can take the students for a walk within the school campus. Encourage them to look out for the three 2-D shapes, and point them to you and friends. You could hold a relevant discussion at each identification. You could be looking at the walls of the buildings as a big rectangle, the shape of the roof from a side of the building as a triangle, the rings on the basketball board as circles, etc.

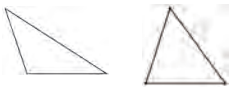
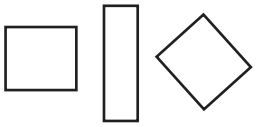
Back in the classroom, recollect where you located each of the three shapes, and write on the chart.

Reprint 2024

Ask the following questions to discuss the observations you made together:

Which of the shapes did we find easily and most?
Which shape was difficult to find?
Why do you think the roofs of the houses are like this (forming a roof like shape with your palms) like a triangle?
What shape do you find in the sky at night? Is it beautiful? Do you see it every night? What is the shape of the sun?
What is the shape of the classroom floor?
If you walk around the school building, what shape would your path make?

Locating 2-D Shapes in the environment

SHAPE	WHERE?
Circles 	
Triangles 	
Rectangles 	

Extension

Tell a simple story with physical action, something like this: **A horse is tied in the middle of a field by a rope to a pole. The horse wants to go away. So it pulls itself away from the pole, but the rope is strong. The horse ends up moving round and round around the pole. What shape do you think the horse creates by moving around?**

You can enact this, by tying a string on the leg of student and making him act like a horse to see the circle path. You can also draw this on the black board as you explain the situation of the horse.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 9 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 describe 2-D shapes (rectangles, triangles, and circles).	Compare and describe the similarities and difference between 2-D shapes.	Identify and describe the number of edges and corners in 2-D shapes.	Identify 2-D shapes (rectangles, triangles, and circles) in the environment.	Sort and re-sort 2-D shapes.	Combine 2-D shapes to make other 2-D shapes and describe them.	Create simple repeating patterns using 3-D shapes.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Reprint 2024

Summative Assessment Recording Sheet (For Class PP)

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

CHAPTER 9 2-D SHAPES

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

Task and Interview prompts	Key concepts and skills to look for
Task 1 Present the student with a collection of cutout 2-D shapes of various sizes and shapes of rectangles, triangles and circles, by displaying them on a table. Ask the student to pick up a shape and describe it: **Tell anything you can about this shape.** You may have to use probing questions (e.g., **How many edges does it have?**). Pick up and set aside at least three shapes of the same type (e.g. three rectangles). Ask: **How are these shapes the same? What do we call this group of 2-D shapes? Can you find another rectangle in the larger group?** Repeat similarly for other triangle and circle. Ask the student to sort the shapes: **Now I want you to sort the shapes into three groups. What is name for all the shapes in this group? What is the name for the shapes in this group? What is same about all the shapes in this group?** Present the student with a cone, a cylinder and a rectangular prism. Pick up a cone, and ask: **What is the name of this object?** Point to the base of the cone, and ask: **What is this shape? Can you see circles on a cylinder? Show it to me? Can you see circles on a rectangular prism? What shapes do you see on a rectangular prism?**	*The student is able to :* - Identify and describe 2-D shapes. - Identify corners and edges on 2-D shapes. - Compare and describe the similarities and difference between two 2-D shapes. - Sort the 2-D shape and describe the sorting rule. - Identify faces of 3-D shapes as 2-D shapes.
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 9

Total CA mark from Chapter 9 (Task 1: Mark out of 10): _____

Overall remarks on the student

Strengths:

Areas of Need:

Follow up Steps:

Reprint 2024

CHAPTER 9 DATA MANAGEMENT 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 be already available. We use data to extract certain understanding and meaning out of it; to predict future events under similar situations; to confirm certain assumptions; and to help make decisions.

Data are collected through various means, such as observations and recording, interviews, questionnaire, polls, and surveys. After a data have been collected, it has to be organized and presented in certain manners and forms, for the purpose of data analysis. 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.

In class PP, students are exposed to collecting very simple data that are directly related to them. Then they sort or organize the data collected, present them in the form of simple column graphs, compare them, and make very simple predictions.

This chapter is a continuation of Chapter 6. In Chapter 6, the students collected data about themselves and from simple experiments, and made simple column graphs using actual objects and concrete representational objects. The students also practised making simple predictions based on the results of the experiments they performed as games. In this chapter, the students will collect similar data related to children themselves and familiar everyday situations to make simple picture graphs, and perform simple experiments and predict the results based on the data collected already.

Basic Principals about Data Management and Probability

- There are different ways to collect data.
- Data are collected for various purposes.
- To collect data, we should create appropriate questions and choose the best ways to gather the data.
- Once data are collected, there are always different ways to sort or organize the data, depending on the type of data and the purpose of its collection.
- Once the data are displayed, they can be analysed to look for patterns, make comparisons, draw inferences, and make predictions and decisions.
- Graphs are powerful data displays since visual displays are easy to interpret very quickly.
- We use data to predict the chances of something happening in future.
- Probability is about predicting the chances of an event occurring.
  chances of an event occurring.

Chapter Goals

- Create and interpret simple column graphs using pictures
- Predict results of experiments based on the result already collected
- Use simple languages of probability
- Understand the importance of commone baseline

Maths Words

Sort, organize, graph, picture graph, graphing mat, title, label, more, less, same, always, never, might, sometimes

Lesson 1 Collecting and Organising Simple Data

Lesson Goal

The students should collect data about simple situations usually involving yes or no or other simple responses.

Relevant Maths Issues

Collecting data helps students better understand their world. Once the data is collected, they will need to organize it and talk about it.

Young students may need help in creating the questions they want to ask to collect data. The questions need to be simple and focused. For example, they could ask whether people have brothers or not, but would not be asking questions where there are many possible different answers at this stage in their development.

The size of the group from whom students collect data should be fairly small at this stage, for example 10 or fewer.

Students can also collect data that describes events and observations rather than people's responses. For example, they could collect data about the number of days of rain for a given period of time, or they could collect data about the results of picking a certain colour of cube out of a bag with different colour cubes in it.

Students will need support in learning how to organize the data.

A few essential questions that should be asked during the course of the lesson activities are:

What could you find out about your classmates' families?
What could you find out about your classmates' favourite colours?
How do you know more people chose _____ than _____?

Activity 1 Which Fruit Would You Like To Have?

Objective

Respond to a simple question requiring a choice of answer.
Describe a data collected.

Materials

Two or three fruits
Knife to slice the fruits
News print papers
Marker pens

Activity Description

In advance, decide and bring two or three fruits to the class depending on availability. Apples, pears and bananas are used here as examples. In advance prepare a chart as shown below to use for recording the answers. Explain to the students, and ask them to come up and record their choice of the fruit on the chart, by making a tick mark in the relevant boxes. You might like to be the first respondent and show the class how to do that. After that discuss the data recorded, by asking questions like; **how many of us like apple? How many of us like banana? How many of us like pears? Which of the three fruits is liked by most of us?** After that, share the fruits you have and enjoy eating them!

Maths Note
This activity introduces the students to a simple data collection through the use of a simple questionnaire. The idea of data organization and description is also embedded in the answer recording sheet.

Which fruit would you like to have?

Apple 									
Pear 									
Banana 									

Talk to the students about the food values of the fruits.

Assessment for Learning
See that the students can describe the data by looking at the chart and make some basic observations like which fruit is liked by most students in the class and which one is liked by not many of them.

Activity 2 Data Collection through Simple Questions

Objective

Frame a simple question requiring Yes/No response from friends.
Respond to a simple Yes/No question.
Describe the data collected from a Yes/No question.

Materials

A4 size paper for each student or pair of students
Marker pens
Glue or sellotapes

Activity Description

Tell the students that you will be asking a very simple question to all of them, and that they will each have to give a very simple answer. The answers will be recorded in a simple format. Say that the question is: **Do you have a brother?** Explain that in English, both *acho* and *nochu* are called brothers. Put up the answer recording sheet, and record the response as each student responds, by using a tick mark. After everyone's response has been recorded, describe and discuss it. Referring to the data displayed, say something like: **It is clear that some of us have brothers, and some of us don't have brothers.** Refer and point to the Yes row and the No row. **Which one is more – those of us who have brothers, or those of us who don't have brothers? How do you know? By how many is it more, those who have/have not brothers?** The last question may prove to be too hard for the students if the class size is large, or the difference of numbers is 10 or more. You may nevertheless try the question.

Maths Note
In this activity, the students frame and ask a very simple question requiring either a Yes or a No response from friends. The responses are recorded in a simple format, and the student describes to the class his or her findings. The data collected and displayed can be left on the wall for use later with graphing activities.

Do you have a brother?

Yes										
No										

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 to ask the others. Discuss with each student (or the pairs of student) what he or she has in mind to ask others. Help them with framing the questions, or suggest the questions to struggling students. Once everyone is clear of what he or she is going to ask, provide the sheet of papers with an answer recording sheet to each student. Write or help them write the question on top of the format, as shown above.

Assessment for Learning
See that students have understood their questions, and knew how to record the data. Also, observe whether students are able to describe their data. Students may need a lot of support and encouragement in presenting and talking about their data. Ask relevant questions e.g., What did you find out about our class? How do you know which is more? etc..

Some suggested questions that you could help students with are:

Do you have sisters?
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?

It may be mentioned that more than one student can use the same question.

After all the students, or pairs of students, have finished collecting their data, ask them to put up their data and describe them. You might want to have only some pairs present their data if the class size is large. Encourage and support the students in their presentations. 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.

Activity 3 Data Collection through Simple Observations

Objective

Come up with an idea to observe.
Record the observation in a pre-developed simple format.
Describe the data collected from the observation.

Materials

A4 sheet of paper with data recording sheet for each student
Sellotapes
Marker pen

Activity Description

Explain to the students that you are going to collect some data simply by observing, and not by asking. Say that you are going to see how many of them have a missing tooth (a milk tooth that has fallen out), and record the data in the chart that you show them. Make sure students understand how the chart is used.

Maths Note
Observation is another means of data collection. But it is important that we are clear what we want to observe and how we want to record the data. This activity provides the students an opportunity to observe and collect data in a very simple situation.
In this activity, there is an element of asking when students are asked to open their mouths, but the actual data is observed.

Approach each student and ask him or her to open the mouth for you, and record the data. Explain how you are recording the data. For each data, you could represent it by a stick mark, a tick mark, or a small circle.

Tooth Missing 											
Tooth not missing 											

After the data collection, display the data and talk about it. Describe it. Compare the number of students with their teeth missing with those who have their teeth still in place.

Then talk about milk teeth, and how they fall out in children as they grow. Talk about the proper ways of extracting their loose teeth, and the importance of maintaining oral hygiene.

Divide the class into pairs, and explain that each pair should think of something simple to observe and record. The observations could be of their

friends or things in the classroom, or even outside of the classroom. Explain that you will help them with that. Discuss with each pair of students what they have in mind to observe. Help them with that. More than one pair of students could be observing and recording the same thing. Once every pair is clear about what they are going to observe, provide the sheet of papers with the observation recording table.

Some suggested things for the students to observe and record the data are:

Girls who use hair ribbons and who do not use hair ribbons
Girls with earrings and girls not wearing earrings
Girls with long hair and girls with short hair
Students wearing shoes with laces and students wearing shoes without laces
Students with long nails and students with short nails
Sirs (male teachers) and Madams (female teachers) in the school

Assessment for Learning
See that the students have understood their questions, and knew how to record the data. Also, see that 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.

Sample of an observation recording sheet that a pair of students might use:

Shoes with laces									
Shoes with no laces									

After all the pairs of students have finished collecting their data, ask them to present to the class. Encourage and support the students. Hold relevant discussions after each presentation. Ask relevant questions e.g., **What did you find out about our class? How do you know which is more?** Etc.. You might have to continue the presentations during the next class if the class size is large.

Activity 4 Data collection through Simple Experiments

Objective

Record the data from a simple experiment.
Describe and compare the data collected from the experiment.
Predict an outcome of an experiment based on the pattern of the data collected.

Materials

Snap cubes in two colours
A feely-bag
Newsprint paper

Maths Note
Performing experiments and recording outcomes is yet another means of data collection. Sometimes, experiments simulate real life situations to understand them.

Activity Description

In advance, prepare a result recording format on a newsprint paper as shown below. Put some (green) snap cubes and some (red) snap cubes in a feely bag. The number of one colour should be about double the other, with a total of no more than 20 or so cubes. Mix them up thoroughly. Show the students the two colours, and explain that the feely bag contains these two colours of cubes. Ask a student to come forward, put his hand in the bag, and draw out a cube. The result is recorded in the format chart already

put up. The student puts back the cube. The cubes are again mixed up. Ask another student to come up and draw a cube in a similar manner. Record the result. Put back the cube. Continue this for several times or until all the students have had a chance to draw, or when a row of the table has been filled.

Assessment for Learning
See that the students knew how to record the data. Also, observe whether the students make reasonable predictions based on the data . Ask relevant questions e.g., Why do you think that we picked more [greens]?

Green Cube 										
Red Cube 										

Describe and discuss the data thus collected. Ask the students what they think might be the colour if you draw out a cube, based on the results so far. Let them predict or guess. Ask the reason for their prediction. Then draw a cube. It may confirm their prediction. It may also be otherwise. But agree that in experiments results always do not appear as expected. But that the prediction is fair and reasonable nevertheless, and that it will be true most of the time.

Show the contents of the bag so that they can see the colours of the cubes in the bag. This will help them understand why one colour came up more than the other.

Lesson 2 Creating Concrete Graphs

Lesson Goal

The students should create concrete graphs using people or real objects to display collected data.

Relevant Maths Issues

In making a concrete graph, actual objects are lined up in a one-to-one correspondence so that visually it is easy to see which of the two groups is greater. It is necessary that a common base line be used so that the longer line actually represents a greater amount. It is also necessary to either use a grid to line things up or to make sure that the items in each group are matched up. There should be **titles** and **labels.**

In situations where the data is being collected about students themselves, the students can form the graph—they need to line up, though, so that they are in one-to-one correspondence.
In other situations, where data is collected about objects, the objects should be lined up.

A few essential questions that should be asked during the course of the lesson activities are:

How does the graph make it easy to tell which there is more of?
Why is it important to match items when we make the graph?

Activity 1 Comparing Shoes

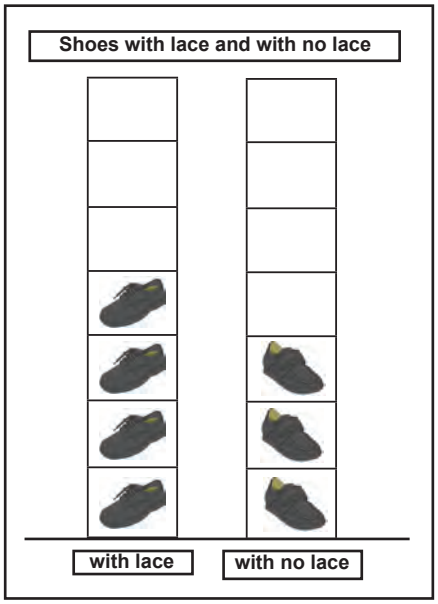
Objective
Sort a set; create and interpret a 2-column concrete graph.

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 on papers
Marker pens

Activity Description
In advance, prepare a floor graphing mat with the labels as shown below on chart papers.

Ask all the students to take off one shoe and pile the shoes in a corner of the class. 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 or more 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. Tell them that a graph can help us compare which is more and which is less more easily. Place the graphing mat on the floor. Place the labels (laces and no laces) on the mat. Place the shoes in each column starting from the base line. Have the students help place the shoes. At the end, explain that it is called a graph because it is a "picture" of the data once it's been organized. Introduce and explain the terms columns and labels. Help the students interpret the graph by asking questions like: **Are there more shoes with laces, or 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 graphs?**



Ask the students to wear their shoes.

Maths Note
The students might have already collected data on how many students in the class wear shoes with laces and how many wear shoes without laces in lesson 1 of the chapter. However, this would be the first time that the students would be making a graph. It is important that a graphing mat is used in these initial graphing activities.

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 with no laces? See if they can also use the reverse relationship like; there are fewer/ less shoes with no laces than with laces. Also, ask: Which line of shoes is longer? If this line is longer, then which line is shorter?

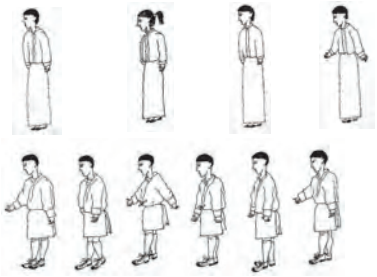
Variation/Extension
Tell the students that we can also make a graph with people. And that is exactly what they would be making. Place the labels on the floor. Ask all the students wearing shoes with laces to stand and make a line. Ask the other students to make another line. Ensure that the two lines 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.

Activity 2 Comparing Students

Objective
Sort students into groups; create and interpret a 2-column concrete graph.

Materials
Students
Paper labels (boys, girls)

Activity Description
Ask students: **Do you think there are more boys or more girls in our class?** Listen to the students' guesses. Ask them how we can use the idea of graph to compare the number of boys and girls in the class. Place the paper labels on the floor and ask the boys and girls to form the respective lines. Ensure that the boys and girls are standing in one-to-one correspondence. Ask: **What does this graph tell us? Are there more boys or more girls? How many more? How can we use counting to help us find out? Do you think we would get the same graph if we do this in the next period? Tomorrow? Next year? Why or why not?**



Ask a group of about 10 students to come forward. There should be 4 girls and 6 boys in the group. Ask the class: **Are there more boys or girls in this group?** Listen to the students' responses. Ask the group to create a concrete 2-column graph of themselves. Ask the boys to stand closely, and the girls to stand far apart from each other, so that the line of the girls looks longer than that of the boys. Ask: **Are there more girls or more boys now? What is wrong with this graph?** After the lining of the boys and the girls is rectified, ask: **What is missing with this graph?** (in case the students have not used the paper labels)

Variation/Extension
Ask for suggestions from the students as to what other things they can compare by creating 2-column people graphs. Some suggested ideas are:

Girls wearing earrings with girls not wearing earrings.
Girls with long hair with girls with short hair.
Boys wearing *gong/tego* inside with boys wearing only *lagaes.*
Boys who would prefer to play archery with boys who would prefer to play football.
Students who come from a particular village with students who come from another village (in case of a community school serving two villages).
Student who are right-handed with students who are left-handed.

Do not forget to make and use paper labels in each case.

Assessment for Learning
See that the students use labels for the graphs.

Activity 3 Graphing a Collection of Objects

Objective

Sort a collection; create and interpret a 2-column or a 3-column concrete graph.

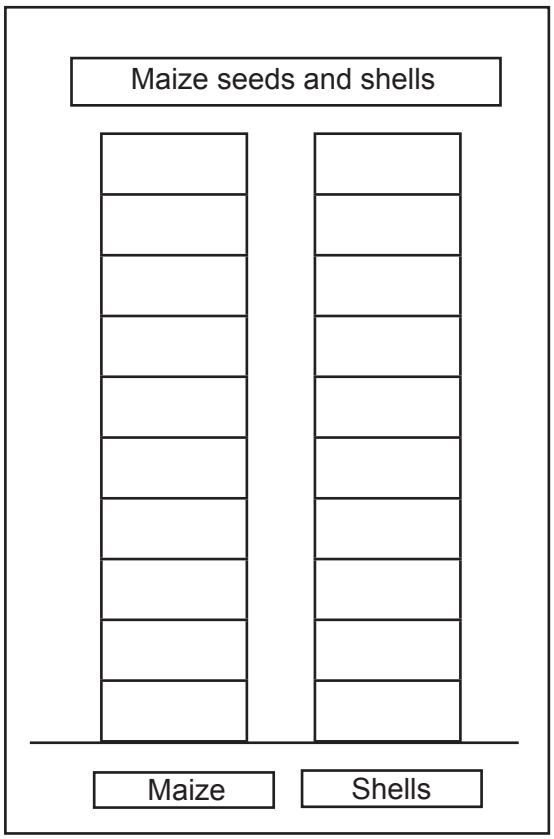
Materials

Collection of small objects (e.g., buttons, shells, pebbles, snap cubes, crayons, bottle tops, beans, maize seeds, etc)
Graphing Mats (included at the back of the Student's Activity Book)

Maths Note
First, start with 2-column concrete graphs, and then extend to creating and interpreting a 3-column concrete graphs. It is important to use labels for the graphs. Help the students in making and using the labels. The use of graphing mats is also important at this stage so that the objects can be compared easily.

Activity Description

In advance, prepare the materials ready for the class. Divide the students to small groups of 2-3 students. Provide sets of 2 different types of objects for each group; for example, it might be shells and maize seeds or pebbles and pencils. The number of objects in each set should be no more than 10. Ask the students to look at the collection they have got and guess which there is more of. Distribute graphing mats to the groups. Ask them to use the graphing mats to create a 2-column graph for the objects. Go around and interact with each group. For example, with the group which has maize seed and shells, ask: **Are there more maize seeds than shells? If there are more maize seeds than shells, are there less maize seeds or less shells? How many more maize seeds are there than the shells? Where are your labels for this graph? How many shells do you need so that it is the same as the number of maize seeds? How can you use counting to tell which is more and which is less? How many columns are there in this graph? Why is it that you have only 2 columns here?**



Variation/Extension

Make a set of collection of 3 different objects for each group. Ask the groups to first guess which object there is the most of and which the least. Then ask them to create 3-column graphs to compare the objects. The use of graphing mats and labels is still important for the graphs.

Assessment for Learning
See that the students know and use the meanings of the terms graph, column, and label. Make sure they line up the materials appropriately.

Lesson 3 Creating Representational Concrete Graphs

Lesson Goal

The students should create concrete graphs using objects, such as counters, to represent the items about which the graph is made.

Relevant Maths Issues

In making a representational concrete graph, actual objects are still lined up in one-to-one correspondence and a common base line is still required. What is different from the previous type of concrete graph is that counters rather than the actual objects are used. This might be because it is awkward, or even impossible, to use the actual objects.

Students might collect data, for example, on how many students prefer pork momos and how many prefer cheese momos. They could create a graph by lining up the students or they could use counters in a grid to show the number of students who chose each type of momo. You could also use the data already collected during the previous lessons to create concrete graphs with representative objects.

A few essential questions that should be asked during the course of the lesson activities are:

Are there more _____ or more _____?
How can you tell that there are more _____?
What does the title tell you?
What do the labels tell you?
How many more _____ are there than _____ ?
What else could we make a graph about?

Activity 1 Which Fruit Would You Like to Have?

Objective

Collect data; use representative objects to create a 3-column concrete graph; and interpret the graph.

Materials

Three different fruits (e.g. a few apples, a few bananas, a few peaches – if possible)
Knife to slice fruits
3-column graphing mat with labels
Counters or snap cubes

Maths Note
In this activity, the students record the data on a data recording table, as well as create a 3-column concrete representational graph. The data recording is similar to the first activity you might have carried out in lesson 1.

Activity Description

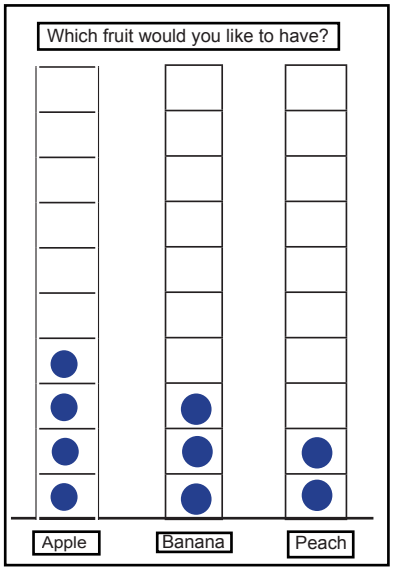
In advance, prepare a data recording sheet and a 3-column graphing mat on separate newsprint papers, as shown on the back page. If possible, bring three fruit items. The fruits mentioned here are used only as examples. Say something like: **Today I would like to treat you with your favourite fruit. But before that we have to do some graphing activities.** Put up the data recording table on the wall, place the graphing mat on a table or at a convenient place with the counters nearby it.

Explain to the students that each will have to come forward, record the fruit choice on the recording sheet, pick up a counter and place it appropriately

on the graphing mat. 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.

Apple										
Banana										
Peach										

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 to the students their choice of fruits. Enjoy!

You could ask the students to copy the graph on a sheet of paper, or in their note book.

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? See that the graph the students make or draw has a title and labels.

Variation/Extension
You could have students create similar graphs with the students' preferences or choices of their snacks, pets, sports, colours, days, subjects, etc. It may not be necessary to always record the data first in a recording sheet or chart.

Activity 2 Graphing the Results of a Spinner

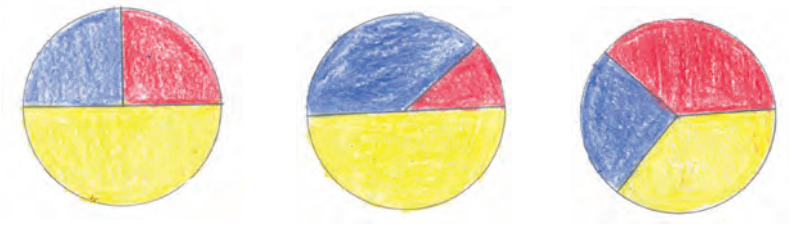
Objective
Create a 3-column representative concrete graph; interpret it; and predict future events under similar conditions.

Maths Note
Here the students create a 3-column concrete graph with representative objects based on an experimental result. Experiments such as this promote estimation and prediction skills and reasoning in students. Students also get an opportunity to use basic probability language very informally.

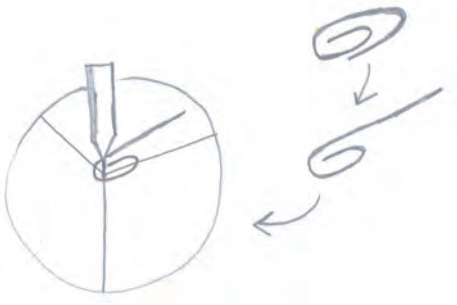
Materials
Spinners with 3 coloured sections for each group
Graphing mats for each group
Counters for each group

Activity Description
In advance, prepare some spinners for the activity. Divide the class into groups of 2-3 students. Distribute a spinner, a graphing mat, and counters to each group. The spinners need not be made the same way for all the groups. Tell the students that they will be playing a game with the spinner and creating a column graph at the same time. Label the columns as per

the colours of the sections of the spinners. Let the students spin the spinner in turn in the group. Place a counter in the appropriate column of the graph for each landing of the pointer of the spinner. Stop the game when one of the columns gets filled with counters.

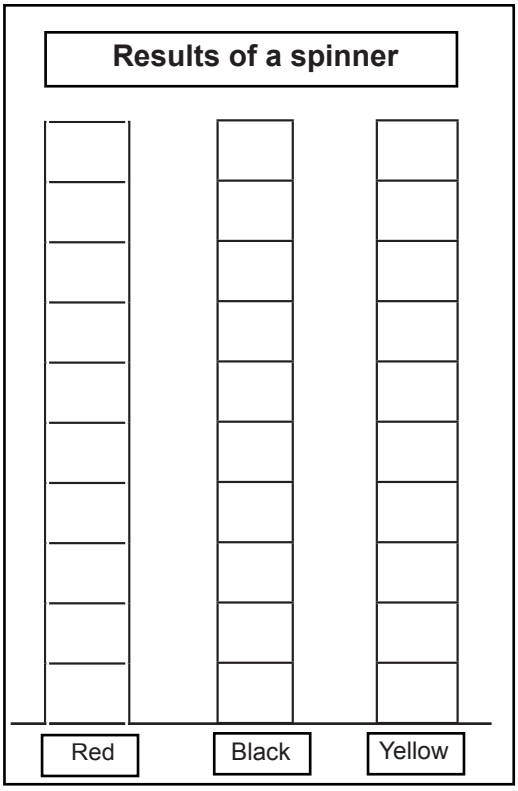


A spinner can be quite easily improvised: make a circle; divide it into the required regions; use the tip of a pen or something sharp to anchor the pointer; and use a paper clip as the pointer.



Let the students interpret the graph. Ask: **In which region of the spinner did the pointer land most of the time? In which region did the pointer land the least number of times? Why do you think this has happened? Just by looking at the graph, can you tell in which column you may be putting your next counter? Why do you think that way?**

This game can be played again and again at later times.



Assessment for Learning
Listen to students discuss the graph. Do they use comparative language to describe the relationship among the colours? Do they relate the graph to the sizes of sections of the spinner?

Activity 3 Graphing the Results of a Die Throw

Objective

Create a 6-column representative concrete graph; interpret it; and predict future event under similar conditions.

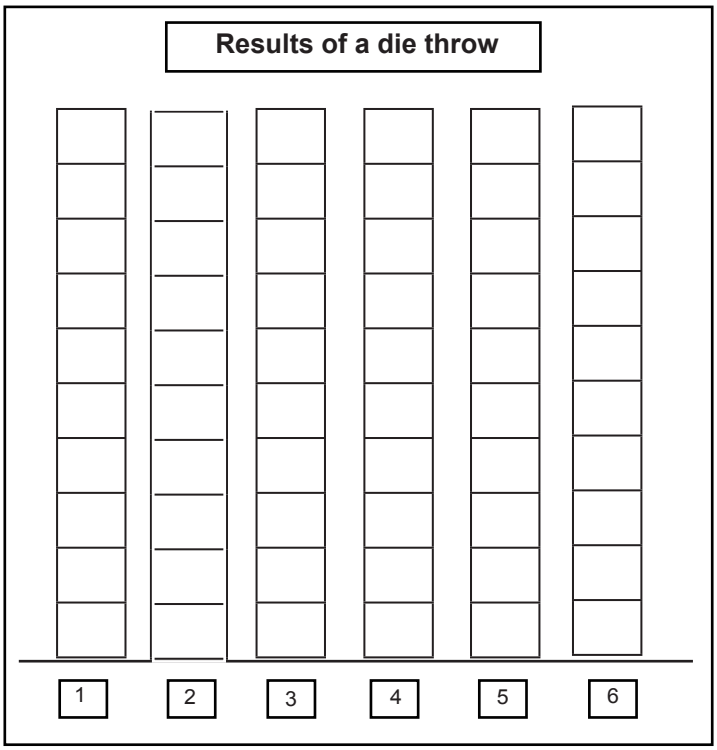
Materials

A standard 6-sided die for each group
A 6-column graphing mat for each group
counters

Activity Description

Tell the students that they will be playing a game with dice, and also be making a column graph based on the game. Divide the students into groups of 2-3 students. Distribute a graphing mat and a die to each group. The rule is: Students roll a die, and for each number displayed by the roll of the die, students place a counter on the appropriate column of the grahing mat. The game stops when one of the columns gets filled with counters. Help the students in groups to understand the rule of the game. Help them label the graphs. Discuss and let the students interpret their graphs. Ask questions like: **Which number came up most of the times for you? If you were to roll the die one more time, which number is more likely to come? Why do you think that way? But can you by sure that that number will come? Is there any chance that you will roll a number like 7 on this die? Why?**

Maths Note
Here students create a 6-column concrete graph with representative objects based on an experimental result. Experiments such as this promote estimation and prediction skills and reasoning in students. Students also get an opportunity to use basic probability language informally.



Assessment for Learning
Listen to students discuss the graph. Do they use comparative language to describe the relationship among the groups? Do they relate the graph to the number of faces of the dice?

Lesson 4 Creating Picture Graphs

Lesson Goal

Students should create picture graphs, using pictures of a standard size to represent the objects about which the graph provides information.

Relevant Maths Issues

In making a picture graph, pictures on pieces of paper of the same size are lined up in one-to-one correspondence. A common base line is still required. The pictures can represent people or objects. It is important that the papers are of the same size so that a one-to-one correspondence is easy to create.

Students might collect data to show their favourite sport. Each child would draw a picture to show either the equipment used or perhaps a picture of themselves playing the sport. The teacher provides small pieces of paper of a consistent size on which students can draw.
As with other graphs, the graphs should have a title and labels.

A few essential questions that should be asked during the course of the lesson activities are:

Are there more _____ or more _____?
How can you tell that there are more _____?
What does the title tell you?
What do the labels tell you?
How many more _____ are there than _____?
What else could we make a graph about?

Activity 1 Our Favourite Fruits

Objective

Create and interpret a column picture graph.

Materials

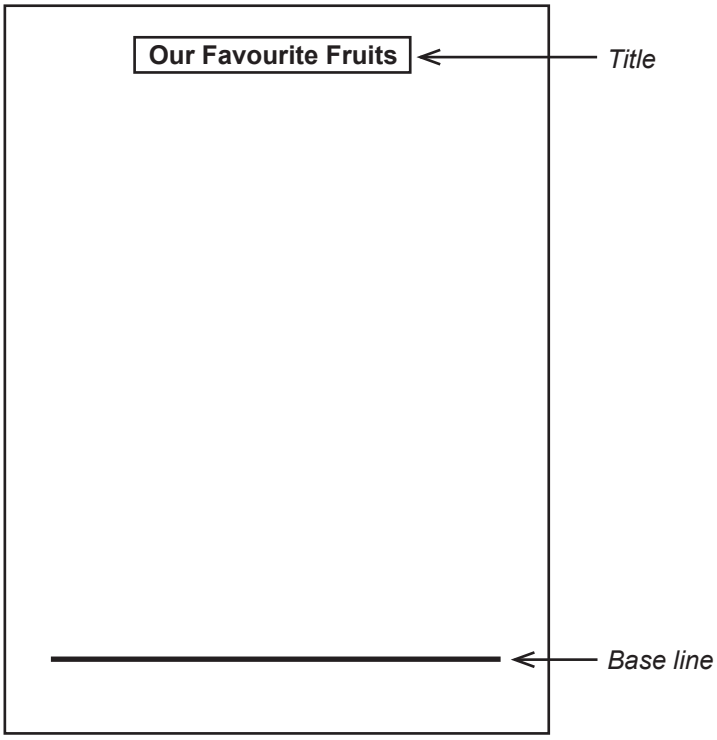
uniform sized paper sheets (about 1/8th the size of an A4 size paper) for each student
crayons
newsprint or chart papers for a graphing mat
marker pen
glue

Maths Note
In this activity, the number of columns for the graphs in not predetermined as in the cases of concrete graphs students created in chapter 6.

Activity Description

In advance, prepare uniformed sized sheets of papers for each student. The size of the paper could be about 1/8th of an A4 paper. Tell the students that for this activity, you would like them to talk about the fruits they like and together will be making a column graph with pictures. First, ask the students and hold relevant discussions around questions like; **Do you like fruits? What kind of fruits do you like? Why do you like fruits? Are there any fruits that you don't like? Why is that? What fruits do we find in our place?** Talk to the students about the benefits of eating fruits (in terms of the vital food contents they provide us like vitamins, minerals and roughage), and encourage the students to eat fruits. **Do you have a favourite fruit?**

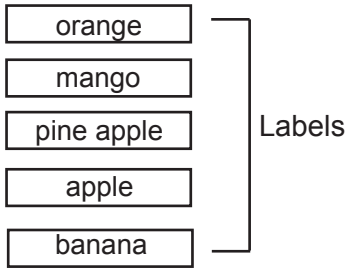
What fruit do you like the most? Why do you like (apple) so much? Is there a reason for it? Listen to a few students telling about their favourite fruits.



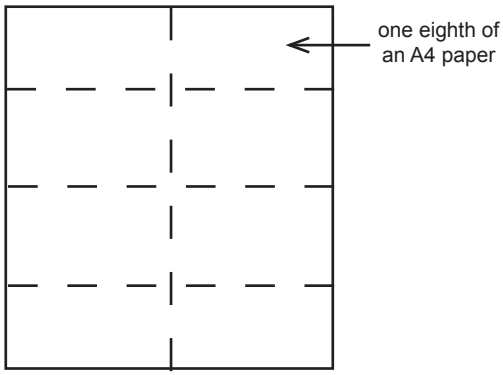
Have the students draw one fruit they like the most. Provide the uniformed sized papers to the student for the drawing. As they work on their drawing, go around and help them where needed. You may notice that some students worry too much about the quality of their drawing. Provide support and encouragement to such students; tell them their work is fine. The emphasis should not be on clean and good drawings, as much as it is on the concepts. 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 column graph.

Put up a newsprint paper, draw a base line on it, and write the labels with appropriate spacing for the graph.

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 like 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? 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?
This is called a picture graph.
Why do you think it is called a picture graph?

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.

Variation/Extension
Make a picture graph about the students' favourite sport, 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 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.

Reprint 2024

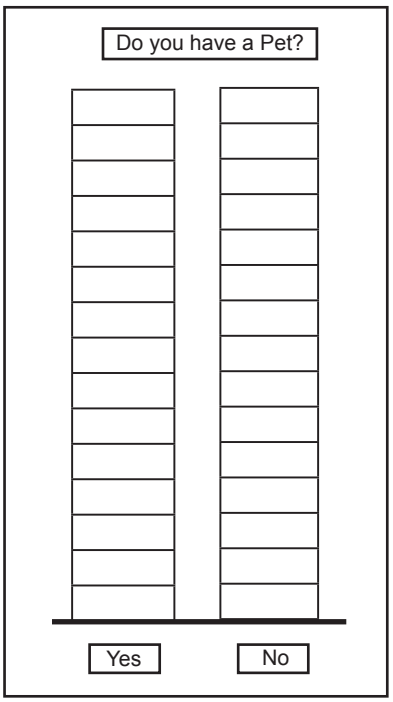
Activity 2 Do You Have a Pet?

Objective
Collect data; create and interpret a 2-column picture graph.

Materials
Uniform sized rectangular sheets of papers, big enough for the students to write their names
A graphing mat on a newsprint paper or a chart paper
Marker pens
Glue

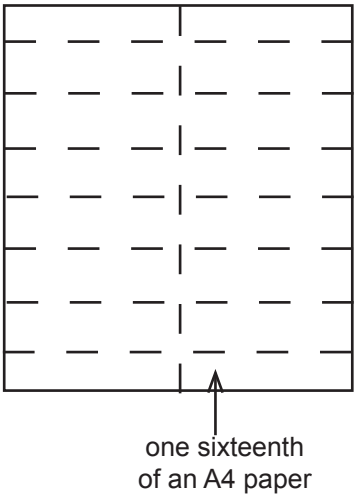
Maths Note
In this activity, a question is posed to the students requiring them to answer with either yes or no. There would then be two groups of students. A graph is made based on the two groups.

Activity Description
In advance, prepare the uniformly sized sheets of papers as mentioned above, and a graphing mat as shown here. For the uniforn sized paper, a size of one sixteenth of an A4 paper might be appropriate.



Tell the students that they would be discussing about pets animals and making a graph on it.
Ask if the students know anything about **pet animals**. Then talk about pet animals; as animals that we keep at home generally because we want to keep them. Some people also keep pet animals to serve a purpose for them. For example, some people keep cats to keep away rats rather than for the love of cats. Ask the students what some of these animals are. Some of the common pet animals that people keep are cats, dogs, rabbits, birds, and fish.

Ask the students if they have a pet animal at home. Tell the students that they can answer the question silently by putting up their names to make a picture graph. Distribute a uniform sized paper to the students and tell them to write their names. While they write their names, put up the graphing mat. If there are many students in the class, so that the column might go very high, you could design the graph mat to go horizontally. See if some students might need help with writing their names. After all the students have written their names, draw their attention to the graphing mat, and explain the graphing mat; read the title and the labels and explain them. Then have students come up one by one and put up their names on the graphing mat to make a 2-column picture graph. Help the students with the glue and sticking on the names. You might like to join the students by having your name put up too.



After the graph is made, interpret it using the following questions:
What question did we ask? What does the graph tell us? Did more of us answer Yes or No? How many more of us answered (No)? Can you tell if all of us answered the question? How can you tell? Is there more of us who have a pet or more of us who don't have a pet at home?

Have the students who answered **yes** to form a line, and ask the students who answered **no** to form another line. The two lines should start at a common base line, and the students in the two lines should stand in a one-to-one correspondence. Tell the students that they just made a graph of themselves and that this people graph is the same as the picture graph.

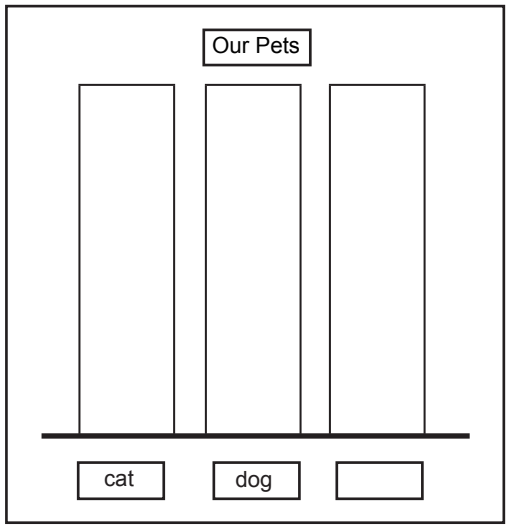
Assessment for Learning
See that all the students can answer the above question.

Activity 3 More with Pet Animals

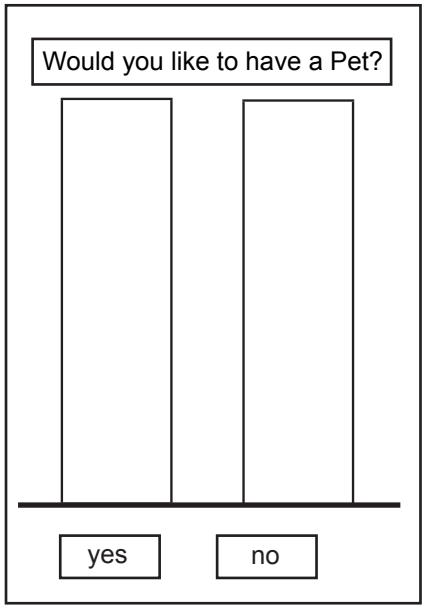
Objective
Create and interpret column graphs.

Materials
Uniform sized paper sheets (about 1/8th of an A4 paper for some student)
Uniform sized rectangular sheets of paper big enough for students to write their names (1/16th of an A4 paper for some of the students)
Glue
Two graphing mats on separate newsprint or chart papers

Activity Description
Divide the class into two groups based on the previous activity – all the students who answered **yes** as having a pet in one group and all those who answered **no** as not having a pet in another group.
To the students in the **yes** group, ask each student to draw the picture of his or her pet. Distribute the uniform sized papers to these students. Some student might become stressed with not being able to draw properly. Tell the students not to worry about that, as this is not to test how well and neatly they draw their pictures. To the **no** group , ask this question: **Would you like to have a pet?** Again let them answer by **yes** or **no**, by putting up their names on the new Yes/No graphing mat. Distribute uniform sized papers for them to write their names.



After all have finished with their drawings and writing names, put up the two graphing mats with the titles and the labels. Ask the students in the two groups to come up and put up their drawings or names one by one on the graphing mats.



Have the students interpret the graphs. The following questions should help in interpreting the first graph.
How many of us have (cats) as pets?
How many of us have (dogs) as pets?
How many of us have pets? etc

The information interpreted from the graph could be written alongside the columns as 5 dogs, 7 cats, 1 fish etc.
Related to the other graph, the following questions should help in its interpretation.
How many of us don't have a pet?
How many of us would like to have a pet?
What kind of pet would you like to have? This could be asked to the individual students who answered that they would like to have a pet.
Why don't you want to have a pet? This question could be asked to students who answered **no** to having a pet. Listen and accept their answers.

At the end, you can talk about the values of taking care and loving one's pets. Encourage the students to talk about their pets; why they like them; how they take care for them, etc.

Assessment for Learning
See that the students can interpret the graphs and also talk about their pets in general.

Reprint 2024

Activity 4 Do you like _____?

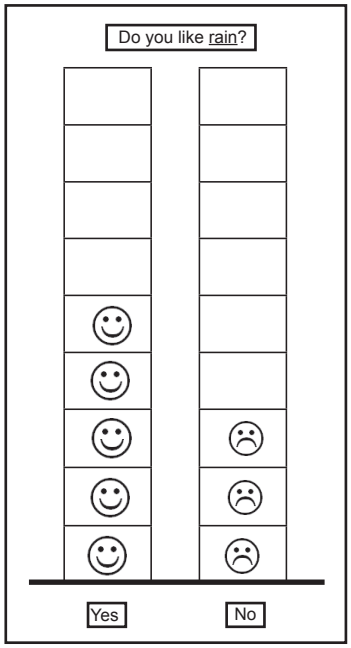
Objective
Collect data; create and interpret 2-column picture graph.

Materials
A data recording table and a graphing mat for each student as shown here (This is provided in the Student's Activity Book on page number ___)
Graphing mat on a newsprint paper as shown here
Marker pen

Maths Note
In this activity, individual students ask their friends in the class a question with a yes or no answer. The students collect and create a picture column graph at the same time.

Activity Description
In advance, prepare a graphing mat as shown here. Tell the students that today, you are going to introduce them to two faces! Ask the students to show a facial expression when they are happy, and a facial expression when they are not happy or sad. Encourage volunteers to show the two expressions to the whole class. You can demonstrate also. Then draw the two smileys on the black board and explain them.

Ask the student to try drawing the two faces in their note books. Go around and help them with the drawings where necessary. All the students should be able to manage drawing the two faces.



Put up the graphing mat as shown here. Ask the question: **Do you like <u>rain</u>?** Have about 15 students answer this individually with **yes** or **no**. Encourage the students to make the appropriate facial expressions too. For each answer, quickly draw an appropriate smiley on the graphing mat. Alternatively, you could have cut out copies of the smileys to paste on the graphing mat. After that hold relevant discussion based on questions like: **what do most of us like - rain or sunshine? Why do some of us like rain? Why don't we like rain? How many of us liked rain?** etc.

Extension
Have the students open their Activity Book to page number ___, which is reproduced below. Read the incomplete question aloud; **Do you like _____ ?** Ask them to read aloud too. Tell them that they should decide on a word or phrase to complete this question. Then they would be going around asking the question to their friends and recoding the answers by drawing an appropriate smiley in the recording sheet below the question. Alternatively, it would be nice if you could provide the students with the smiley face stickers. Tell that you will help them with the questions one by one.

Do you like _____?

Yes										
No										

Meet with each student and help him or her decide on a question. Then brief him or her on how to go about asking and recording the answers from

the friends. Some suggestions to help students complete their questions, **Do you like _____ ?** are: Reading book; cat; dog; ice cream; snake; tiger; travelling in bus; chilli in curry; eating meat; suja; milk; Wai Wai; Koka; cartoon movies; Tom; Jerry; school; watching TV; studying at home; sleeping; momos; banana; playing football; singing; dancing; etc. But first, see if students can come up with what they want to ask the friends about. As you discuss this with students, the ones who are ready can go ahead collecting and recording in their graphing mats. Tell the students that they could ask as many friends as they like or until one of the rows gets filled.

Assessment for Learning
Ensure that every student has understood his or her question and how to go about collecting the data.

After all the students have finished collecting and recording their data, ask them to present, or talk about what they asked and what they found out to the class. The students could choose to tear off the page from the Activity Book and display it on the wall.

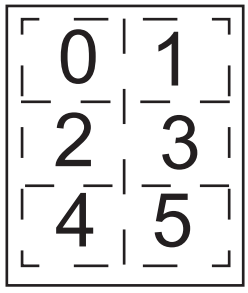
Activity 5 Lines of the Numbers

Objective
Create and interpret a 3-column picture graph.

Maths Note
In this activity the students create a 3-column picture graph by sorting the numbers from 0-10. based on the type of their lines.

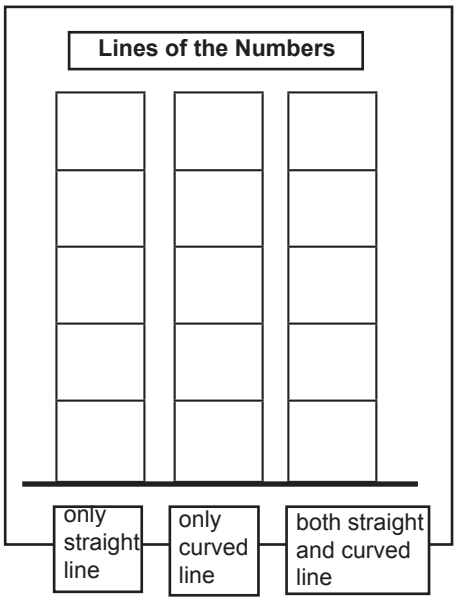
Materials
Sets for number cards from 0-10 for each group of students (You could cut this out from the Student's Activity Book)
A graphing mat for each group
Glue

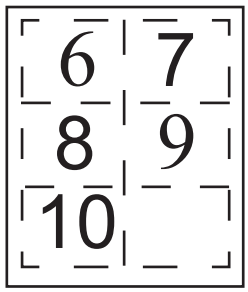
Activity Description
In advance prepare, or cut out enough sets of number cards, and graphing mats as shown here.



Review the concept of straight lines and curved lines with the students, by drawing these on the black board.

Divide the class into groups of 2-4 students. Distribute a set of number cards from 0 -10 and a graphing mat to the groups. Explain the title and the labels of the graph. Have the students create the picture graph in their groups by sorting and pasting the numbers appropriately on the graphing mat.





Have the students interpret their graphs in the groups. **How many numbers have only straight lines? How many numbers have only curved lines? How many numbers have both straight and curved lines?** The information could be written alongside the graph, like; 3 numbers have only straight lines, 5 numbers have only curves lines; 3 numbers have both curved and straight lines.

Assessment for Learning
See that the students can recognize the numerals for the correct number names and also demonstrate how many each number is from 0 to 10.

Reprint 2024

Lesson 5 Predicting Data Results

Lesson Goal

By examining a data collected, the students should be able to predict what might happen in another similar data collection situation.
By examining the results already collected in an experiment, the students should be able to predict the result of an event not yet conducted within the experiment.

Relevant Maths Issues

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 should look at the results of a variety of different experiments and talk about whether or not they expect the same results if they repeat the experiment a different day or with a different group of people. For example, if students discovered that more students in their class in a group of 10 had brothers than not, they would have to suggest whether they expect the same thing to happen if they asked a different groups of 10 students in another class.

Some of the data the students collect could be simple experiments like what number they roll on a die or they might put the numbers 1, 2, 3 on slips of paper in a bag, select a paper, record the result and then return it to the bag. They keep track of what numbers they select. Then they predict what numbers they are likely to select if they repeat the experiment again.

A few essential questions that should be asked during the course of the lesson activities are:
What happened most often?
Do you think that would happen again?
Why do you think it might not happen again?

Activity 1 Tossing a Bottle Cap

Objective

Perform a bottle cap tossing experiment and record its results.
Predict the result or outcome of a toss based on the previous results.
Use probability language (more likely, less likely, may be, never)

Materials

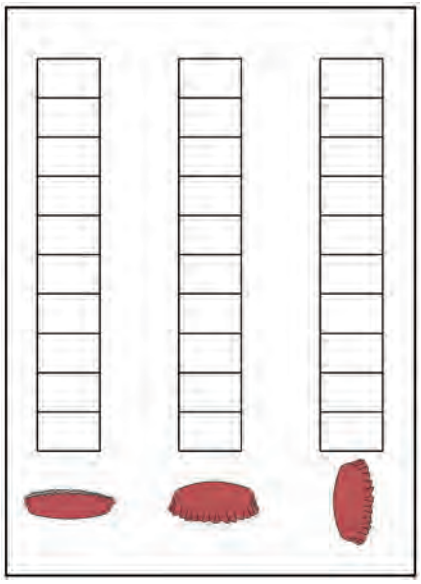
Bottle caps (caps of mineral water bottles, juice bottles, and at least a few of them should be of beer bottles) – one cap for each group of student
Results recording table – one for each group of students

Maths Note
In this activity, the students perform an experiment; record the results, examine the results recorded, and predict the result for a future event within the experiment. In the process they use basic probability language.

Activity Description

Divide the class into groups of 2-4 students. Distribute a bottle cap and a result recording table to each group. Tell them that they will perform a simple experiment of tossing a bottle cap and record the results of how the cap lands. Demonstrate the tossing, and record the result for it in the table. You

can either make a tick mark or a small circle in the result recording table for each tossing of the bottle cap. Let the students then perform the experiments in groups. The experiment stops when one of the result recording columns gets filled. Go around and help the students with recording the results.



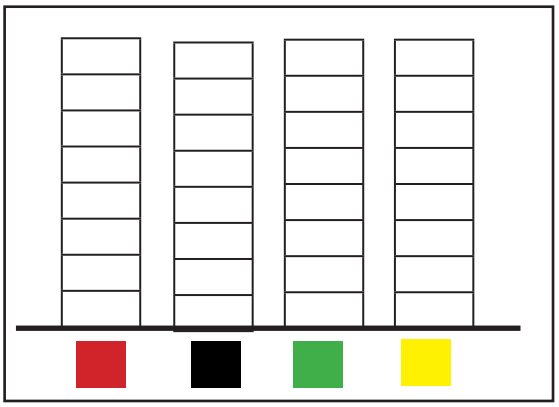
After all the groups have done the experiment and recorded their results, ask them to interpret the results. The results recorded look like a 3-column graph. This discussion could also be conducted in the groups when they finish. Ask the following questions:
How did the cap land most of the time? How did the cap land the least number of times? If you toss the cap again, how will be cap likely land? 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?**
To the group with the beer bottle caps, ask, on top of the above question:
Do you think the cap will ever land like this on its side? Why or why not?

Assessment for Learning
See that the students understand that what result they predict in an experiment is what they think might happen, and that it may not always happen as predicted. You would have to teach the use of terms like never, may be, likely etc.

Activity 2 Drawing Out Snap cubes

Objective
Predict the result of a future event.
Use probability language (never, more likely, less likely, equally likely)

Materials
Sets of 16 snap cubes (say, 5 green, 5 red, 5 yellow, and 1 black) for each group
Feely bags
Graphing mat for each group
Crayons
result recording column as shown here



Activity Description
In advance, prepare the sets of snap cubes in different colours as mentioned above in feely bags. Divide the students into small groups of 2-4. Distribute the feely bags with the cubes in them and the result recording columns. The result recording columns is available in the Student's Activity Book on page number ___, as shown here. Distribute the crayons.
Explain to the students that they will perform a simple experiment in their groups. The procedure of the experiment is: A student draws out a cube from the feely

bag without looking in. Then they colour a box in a column of the result recording column same as the colour of the cube. The cube is put back in the bag. The cubes are then mixed thoroughly. Students take turn in drawing out the cubes from the bag and putting back. The colouring of the columns on the result recording sheet continues until one of the columns is completed.

As the student work, go around and see that they are doing the experiment in the right way. See that every time a cube is put back the set in the bag is thoroughly mixed up. Ask questions like: **Which colour do you seem to be drawing out most of the times? What do you think your next colour is going to be? How did you guess that?**

Assessment for Learning
See that the students can respond to the above questions and interpret their graphs. See that they can use the probability languages appropriately with their thinking.

After all the groups have completed their experiment, interpret the results from their graphs. Encourage the student to describe or talk about their results. The discussions could be done either with the whole class, or it may be more effectively done with separate groups as they finish their experiments. The following questions should guide the discussion. **What does your graph tell or show? How many colours have you drawn? What are the colours? Which colour did you draw out the most? Which colour did you draw out the least? Is there a clear winning colour over all the other colours? If you do this experiment once again, do you think, other colours like green or yellow might win (assuming that red has won this time)? How do you guess that, or what makes you guess that? Don't you think that black may also win if you do the experiment again? Do you think you might draw out a pink cube if you try again and again? Why?**

Activity 3 Another Drawing Out of Snap cubes

Objective
Perform a simple experiment and record the experimental results. Predict the overall results of a similar experiment.

Maths Note
In this activity, the students, in groups, perform an experiment and record the results in a result recording form. The experiments are designed by the teacher toward producing a biased result for all the groups. Students then compare their results. Then they are asked to predict the overall result for a similar experiment, by filling up a similar result recording form without actually performing the experiment.

Materials
A set of 20 snap cubes (15 red and 5 blue) for each group
A feely bag for each group
2 data recording forms for each group (the forms are available in the Student's Activity Book on page number ____ , which is reproduced here)

Activity Description
In advance, prepare the sets of 20 snap cubes (15 red and 5 blue) in feely bags for groups of 2-4 students. Mix the cubes thoroughly. Distribute a set of the snap cubes in the feely bags and a result recording form to each group. Say: **The bags you have contain some red cubes and some blue cubes. I do not know how many of each cube is inside the bags. You are going to perform a simple experiment. It is very simple. In your groups, one of you put your hand and draw out a cube without looking in. If the cube is red, you give a tick mark for it in the format. Then you put the cube back in the bag. Mix them thoroughly. Then another of you put your hand and draw out a cube. If it is blue, you mark it on your result recording sheet. Put it back in the bag. Continue the**

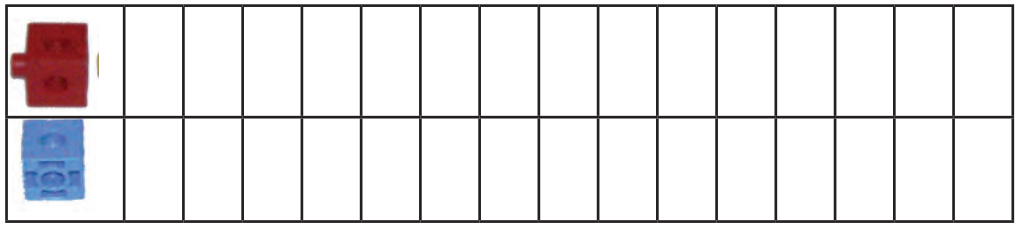
drawing out, recording in the sheet, and putting back the cube until one of the rows is filled. You can take turns in drawing the cubes in your group. Are you all clear and ready to go?
As the students work, go around and see that each group is doing as expected.

After all have finished conducting the experiment, have them compare their results with one another. Encourage them to describe and compare their results. Ask: **Which colour cube was drawn out most of the time? Is that the case with all the groups? That is interesting…how does that happen?**

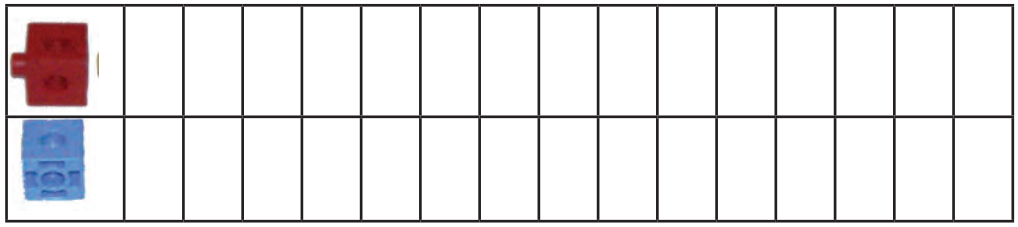
Assessment for Learning
Probe the students to ask why that was happening, and encourage them to think of the possible reasons for it. I wonder why it is mostly the red colour that was drawn out. Could there be a reason? After sufficient wondering, you might like to take out one of the sets and count the two colour!

If you are to perform this experiment once more, what do you think the result is going to look like? Listen to what the students think and have to say.
Distribute a result recording sheet. Tell them that this time they will not do the experiment, but they have to discuss and imagine that they are doing the same experiment and fill up the result sheet. Give each group some time to discuss and fill up the form. Then ask them to again compare their form. Ask the students or groups to explain and describe how they have filled up the forms. Ask: **Would it be possible that sometimes we might**

Experimental result recording sheet



Result prediction sheet



Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 10 DATA MANAGEMENT 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):*				
		Create and interpret 2-column and 3-column picture graphs, using data collected by asking or observing.	Create and interpret 2-column and 3-column picture graphs, using data collected by doing simple probability experiments.	Identify the parts of a column graph such as title, label, columns.	Predict the result of an event in a simple probability experiment.	Use probability language such as never, likely, sometimes, always.
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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Summative Assessment Recording Sheet (For Class PP)

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

CHAPTER 10 DATA MANAGEMENT AND PROBABILITY

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

Task and Interview prompts	**Key concepts and skills to look for**
Interview 1 Ask the student to watch while you put a (green) snap cube and a (white) snap cube in a feely bag. Ask: How many cubes did I put in the bag? **How many white cubes are there? How many green cubes are there? Now if I draw out a cube without looking, what colour might it be? What else could it be?** Draw out a cube and show it to the student. Put it back and mix the cubes. Ask: **If I draw again, what colour might it be? What else could it be?** Again draw out a cube and show it to the student. **Could we ever get a (black) cube from the bag? Why? Why not?** Empty the bag. **Ask the student to watch as you put 10 red cubes and 1 white cube. Ask: If I draw out a cube, what colour might it be? Could it be white? What colour is mostly likely to draw out? Why? Could we get black again? Etc.**	*The student is able to:* - Describe the outcome of a simple probability experiment. - Use the language of probability such as never, always, and sometimes.
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 10
Total CA mark from Chapter 10 (Task 1: Mark out of 10): _____
Overall remarks on the student Strengths: Areas of Need: Follow up Steps:

130

CHAPTER 10 ORDINAL NUMBERS AND HALVES

Chapter Overview

This is the last chapter of Mathematics for class PP. It has two lessons as detailed in the table of contents. The students explore the concepts of Ordinal Numbers in lesson 1, and Halves in lesson 2.

Ordinal numbers are numbers which describe the position of objects in a sequence or order. The ordinal numbers, then, are *first, second, third, fourth, fifth, etc*. These are commonly expressed as 1st, 2nd, 3rd, 4th, 5th, … In class PP children learn the ordinal numbers up to *tenth*. When we count to determine how many objects are in a set, we do not have to count the objects in order, for instance, the object number 5 need not be the one right after the object counted as 4, but for designating an object as the *fifth*, it must be the one right after the object which is *fourth* and the one immediately before the object that is *sixth* (if there are more than five objects in the set). Also, to use the ordinal numbers, the objects should be in order or sequence, and that we must clearly designate which is *first*. So what position an object is depends on which object in the line is first. For example, the X in the following is 2nd if starting from the left, but 4th if starting from the right: O X O O O.

The concepts of halves presented in this chapter will form as the foundation for the study of fractions later on in the higher classes. Although half does mean one of the two equal parts of an object, and also one of the two equal parts of a set, in class PP the students are exposed to only the former meaning and context.

Basic Principals about Ordinal Numbers and Halves

- Ordinal numbers describe the position of objects in a sequence or order.
- The position of an object depends on which object in the sequence is designated as first.
- The concept of halves is often used as an effective starting point for the understanding of fractions.
- A half means one of the two equal parts of an object, as well as one of the two equal parts of a set.

Chapter Goals

- Describe the positions of objects in a sequence using ordinal numbers from 1st to 10th.
- Recognize and say the ordinal numbers from first to tenth for the symbols 1st to 10th.
- Write the symbols for the ordinal numbers as 1st, 2nd, 3rd, 4th, …10th.
- Identify and create half of a shape.

Maths Words

Position, ordinal number, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, half, halves.

Lesson 1 Ordinal Numbers

Lesson Goal

The students should identify and describe ordinal positions from 1st to 10th.

Relevant Maths Issues

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 6th if starting from the left, but 3rd if starting from the right.
O O O O O X O O.

The students may not recognize that distinction at this stage, but the teacher must be careful to always identify which item is first. It is also important that the items be in lines so it is clear how to move forward in the line.

The students should be asked which in a line of items is 1st, 2nd, 3rd, etc. They should also form lines where the teacher asks that a particular item be in a particular ordinal position, e.g. 5th.
A few essential questions that should be asked during the process of the lesson activities are:
Who is 1st in line? Who is 3rd?
What position is between 3rd and 5th?
If Dorji is right behind Amber, and Amber is 4th, in what position is Dorji?

Activity 1 Let Us Race!

Objective

Identify and say aloud the ordinal numbers from 1st to 10th with correct pronunciations.
Identify the symbols for 1st to 10th.

Materials

Ordinal number cards from 1st to 10th

Activity Description

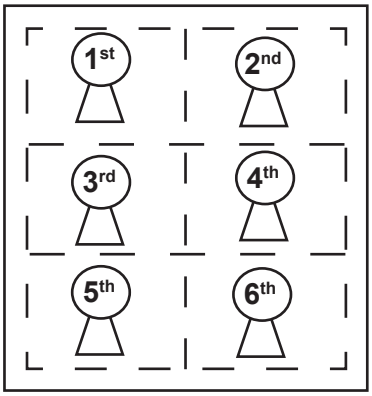
In advance, prepare the ordinal number cards from 1st to 10th, if possible made in the forms of rosettes. You could cut out the ordinal numbers cards provided in the Student's Activity Book on page numbers ____. And paste them on to the stiff papers, and laminate them if possible.

Take the students to a safe play ground, where there are no sharp stones or glasses lying around. Tell them that they would be doing a race in groups. However, before the start of the race, let the students do some physical warm up. Do some stretching and let the students jog around the ground a few times.

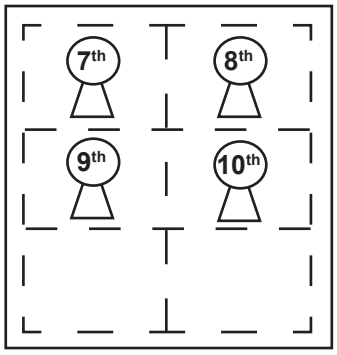
Make a start line and a finish line for the race. The distance of the race should be just about 30 metres. Then divide the students into groups of 5. Let the first group race from the start line, while the rest of the class watches from near the finish line. The students in order of crossing the finish line are given the position cards, and declared 1st, 2nd, 3rd, 4th and 5th. Let the runners stand in order with the ordinal number cards they have. Ask: **Who**

Maths Note
This activity would be an opportunity to link Physical Education with Mathematics. The students compete in a simple race and in the process learn to use the ordinal numbers. It is important to teach the students the value of having to warm up their body before the dash. The idea of this activity is to introduce and use the ordinal numbers, so care should be taken not to overemphasize the fast runners to the detriment of the self esteem of the slow runners.

finished the race first? Who finished second? Who was third? Who was fourth? Who finished the race 5th? Congratulate all the runners for the successful completion of the race! Then ask the next group of 5 students to race at the time you indicate. The five students who just finished the race will now wait near the finish line and hand over their cards to their position holders in the next racing group. Have the second group who just completed the race to stand in order as the first group did. Ask the same question as before to the class. Continue the process with other groups of 5.



Next divide the class into groups of 10. The first group of ten students race, and they are given the cards in order of their crossing the finish line. Have them stand in order with the cards. Ask the question as before to the rest of the class. Then the next group of ten students race. And the same process is repeated.



At the end, practice with the students saying the ordinal numbers from 1st to 10th by chanting them aloud: **first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth.**

Assessment for Learning
See that every student can say the ordinal numbers aloud with correct pronunciation and in correct order.

Variation
A variation of this activity could be to have each student (in groups of 5 or 10) take three large steps and then arrange them in order by how far those steps took them.

Activity 2 Positions of Students in a Line

Objective
Identify and describe the position of students or objects placed in a line using ordinal numbers.
Understand and use the word position.
Understand that the ordinal position of an object depends on where it is placed in the line in relation to the object designated as first.

Materials
Students

Activity Description
Ask 5 volunteers to come forward. Have them stand in line; describe their positions using ordinal numbers, as: For example, **Karma is first in the line, Geewanath is second in the line, Tenzin is third, Kuenga is fourth. What is Pelden's position in the line?** (referring to the last student in the line). Ask **Wangmo** to come and stand next to Pelden, and ask: **What is Wangmo's position in the line?** Ask **Choizang** to join the line, and ask what his position is in the line. Ask **Nima** to join the line, and ask his position in the line. Then ask **Deki** and **Amber** to join the line, and ask the class what their positions are. Ask the students to say aloud the positions from **Karma** to **Amber** in order.

Now ask, **Nima** to come and stand between Karma and Geewanath. Ask: **What is Nima's position now? Who is third now? Who is fourth now? Who is tenth now?**

Once more say aloud the ordinal positions of the students standing from Karma to Amber in sequence. Now explain that you have started the order of the numbers from Karma as the first. Explain that you could start using the ordinal numbers from Amber as the first. **So if Amber is first, Deki will be second. Then who will be third? Who will be fourth?...Who will be tenth now?**

Ask how many students are standing. Ask 2 students from the middle of the line to go back to their seats. Ask: **Now how many students are standing? Is 8 more than 10 or less than 10? Amber is still the first, now what is Karma? Is he still the tenth? Why is that?** Ask Wangmo and Choizang to go back**. Who is first now? How many students are there now still standing? What is Nandalal's position now? If Peldon is first now, can we call Kuenga as second? Why can't we do that? Etc…**

Assessment for Learning
See that every student can describe the positions of the students in the line, and that he or she can say the ordinal numbers with correct pronunciations. You could ask some of the questions during the activity to individual students.

Extension
If you think your class is ready for a challenge, you could shift from a line to a circle. Have ten students arrange themselves in a circle. Have different students designated as the first person and the proceeding clockwise, have the others identify their positions. Students can be removed from the circle to work with sets less than ten students.

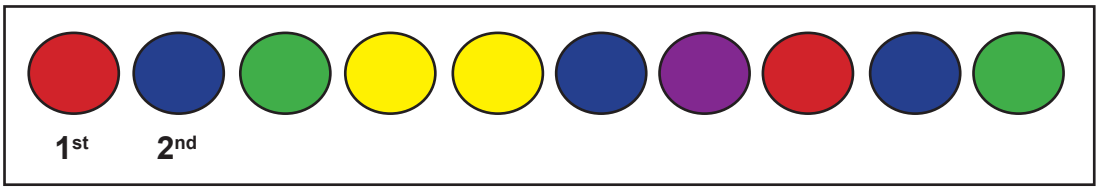
Activity 3 Positions of Colours

Objective
Identify and describe the positions of objects in a line using ordinal numbers. Understand and use the word position.

Materials
Newsprint paper with the drawing of ten coloured circles in a row.

Activity Description

In advance, prepare 10 coloured circles in a row as shown below on a newsprint paper. Display it on the board. Identify the 1st and the 2nd circles. Ask the following questions:



How many circles are there? Let us count them, one, two, three,…ten. This would be important to differentiate between counting to see how many are there and ordering to use ordinal numbers to describe the positions of the objects.

Which colour is the first circle? Which colour is the second colour? Which colour is the tenth circle? Which colour comes after the first? Which colour comes before the tenth? What position is before the tenth? Which colour is the fifth circle? Which colour comes before the fifth? What colour comes after the fifth? What colour comes between the second and the fourth? What position is between the third and the fifth? Which two circles have the same colour? What is that colour? Etc..

Assessment for Learning
See that the students can differentiate between questions like what colour… and what position….and can respond appropriately to these questions.

Activity 4 Positions of Shapes

Objective

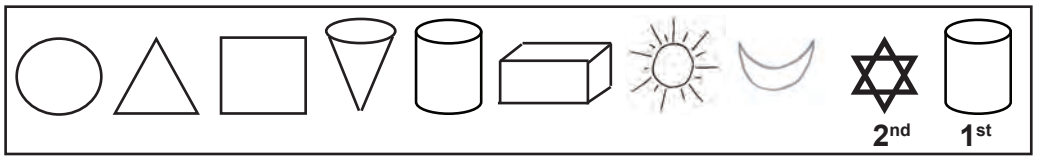
Identify and describe the positions of objects in a line using ordinal numbers.
Understand and use the word position.
Identify the various 2-D and 3-D shapes presented.

Materials

Newsprint paper with the ten different shapes drawn in a row

Activity Description

In advance, draw ten different shapes in a row on a newsprint paper as shown here. Display it. Identify the 1st and 2nd shapes for the students. See if you need to identify the shapes first. Ask the following questions:



How many shapes are there? Let us count them, one, two, three,…ten. It would be important to differentiate between counting to see how many are there and ordering to use ordinal numbers to describe the positions of the objects.

What is the first shape? What is the second shape? What is the tenth shape? Which shapes are the same? What shape comes before the (triangle)? What shape is before the tenth shape? What shape comes after the fifth shape? What shape comes between the second and the fourth? What position is between the third and the fifth? etc…

Assessment for Learning
See that the students can identify the names of the shapes and describe their positions in the line.

Activity 5 Writing the Ordinal Numbers

Objective

Identify the numerical symbols for the ordinal numbers from 1st to 10th.
Write the ordinal numbers from 1st to 10th.

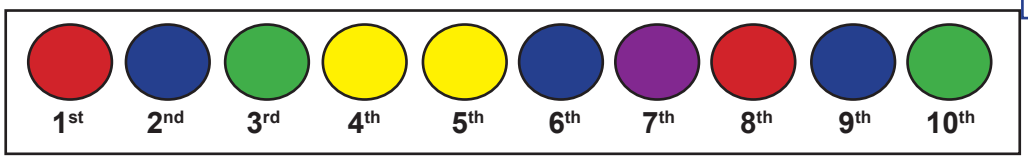
Maths Note
The students should be able to write the symbols for the ordinal numbers from 1st to 10th. This should be fairly easy for them as they would already know the numeral writing from 0 to 10 by now. It will not be necessary for the students to write the ordinal numbers in words like the first, second, third, fourth, etc.

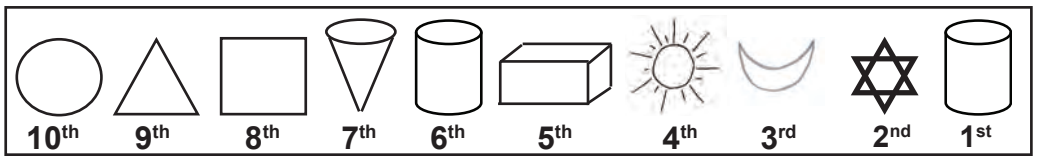
Materials

Ordinal number cards (used during Activity 1)
The chart with the 10 circles or the 10 shapes from activities 3 and 4 with the ordinal numbers written below each shape in order

Activity Description

Display the charts with the 10 circles from activity 3 and/or the chart with the 10 shapes from activity 4 with the ordinal numbers already written below each shape in order. Have the students say aloud the ordinal numbers from 1st to 10th as you point at the pictures in order. After that, point at the ordinal numbers on the chart in random order and have the students identify them.





Keep the ordinal number cards (made during Activity 1) face down on the table. Pick up the cards in random order, and have the students identify them as you show them one by one.

Tell the students that they will learn to write the ordinal numbers. You could also explain that saying first, second, third,…is called ordinal numbers, and that ordinal numbers are used to describe or tell the position of objects in order.

Demonstrate how to write the ordinal numbers on the board with chalk. Explain that for the ordinal number first, we write the number 1 with the letters **s** and **t** which are slightly raised to the right of 1. Similarly, explain and demonstrate how it is written for second, third, fourth, and so on up to tenth. It would be good to ask the students to observe and tell what they find with the letter after the numbers from fourth to tenth, rather than you telling it directly.

Then have the students practise writing the ordinal numbers in their Student's Activity Book on page ___ . They could take up the ordinal number one by one, and the writing practices should be continued in the following classes.

Assessment for Learning
See that the students are able to write the numerals from 0 to 10 correctly, as well as the letter/ alphabets correctly, using the correct techniques.

As they write, go around and see that the students are writing the numerals and letters with the correct technique. Help those who need your assistance. If you find some students still struggling with writing the numerals and letters, you should extend extra help by giving them additional worksheets, and the required coachings.

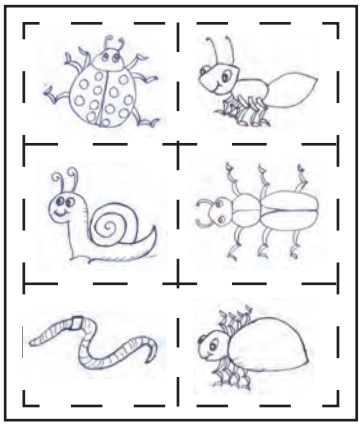
Activity 6 Garden Animals' Race!

Objective
Describe the positions of the animals in the race using ordinal numbers.

Materials
Cutout pictures of an ant, a spider, a snail, an earthworm, a lady bug, and a beetle (These pictures are given in the Student's Activity Book)
Newsprint papers
Duct tape
Ordinal number cards from activity 1

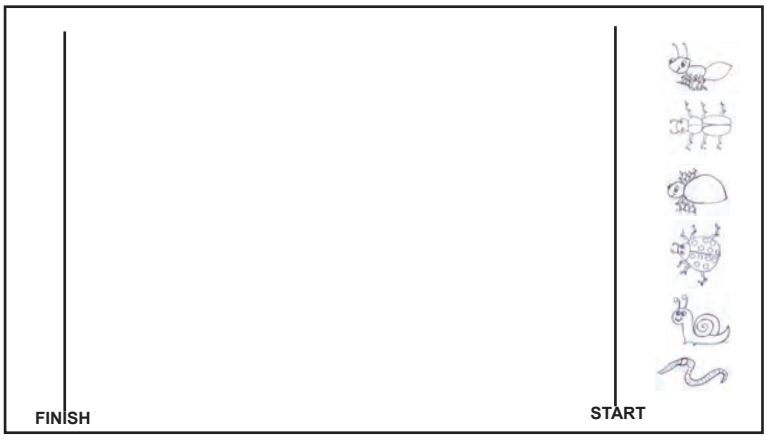
Maths Note
This activity allows an opportunity to link Mathematics with students' knowledge of insects.

Activity Description
In advance, prepare on a newsprint paper a start line and a finish line for the insects race; and have the cut out pictures of the insects. You could use the pictures provided in the Student's Activity Book on page numbers ____.



Tell the students a story. Something like: **Children, today I am going to tell you a story. Would you like to hear a story? The story is about some insects in a garden. There is a garden, and in the garden live some insects. These insects are all friendly with each other, and they love to have fun together. Sometimes they would go on a picnic together. Other times, they go for water together. Today, one of them suggested that they have a race among themselves, and guess what? The other insects agreed! The other insects thought it was a brilliant idea! So they are about to race now. But I need you to tell me who these racers are going to be.**

Have the students name some insects that live in a garden. You can prompt them in many ways including using local languages, or even showing them the cut out picture you have. Finally, introduce the insects who would be participating in today's race, as you show them the cut out pictures of 6 insects mentioned above.



Put up two newsprint papers side by side with a start line drawn at the end of one and the finish line drawn at the end of the other paper. Line the insects up at the start line of the race, using duct tape. Once all the insects are lined up, ask the children to predict who will be first, second, third, etc. Encourage them to tell why they think which will be first, which will be second, which will be last, etc.

Have student volunteers for each of the insects. As you indicate the start of the races, the students move the cutout picture slowly toward the finish line. Have some students ready with the rosette at the finish line. As an insect crosses the finish line, it is awarded with the rosette with the appropriate ordinal number. Later paste the insect with the appropriate rosette on the maths wall.

Assessment for Learning
See that the students can also describe each insect, like how it looks, how it moves, what it eats, and where it lives. Explain how the insects are useful and beneficial to our gardens, and why we should be compassionate towards them.

Lesson 2 Halves

Lesson Goal

The students should recognize the concept of one half as one of the two equal parts of a whole.

Relevant Maths Issues

The fraction one half (the numerical representation of ½ is not used at this stage) is the easiest one for the students to understand. They think of it as a fair share if two people are sharing something, for example a biscuit or a piece of paper. *Although fractions will also later be used to represent parts of groups, they are not used in this way at this point in the students' development.* At this stage the students can understand the idea of half as one of the two equal parts of an area, a length, or an object.

With certain items, for example, 2-D shapes, the students show their understanding of half by folding. This is the easiest way for students to be sure of whether an area is one half or not.
It is important for the students to understand that one half is always defined in relation to the whole. In other words, there could appear to be big halves if the whole is big or small halves if the whole is small.

The students at this stage of development are likely to learn best with the use of shapes having lines of symmetry on which students can fold to show halves. Have the students fold to divide shapes like rectangles, isosceles triangles, circles, etc. Also show non-examples of halves, i.e. situations where an item is divided into two unequal pieces; make sure the students realize these are not halves.

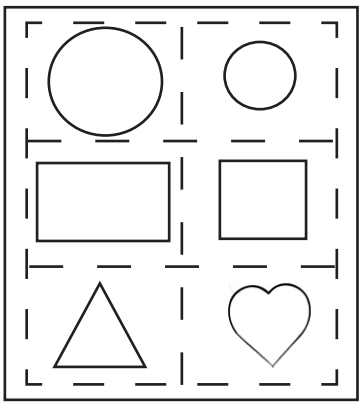
A few essential questions to ask during the course of the lesson activities are:

How much is half of this? How do you know?
Why is this not half?
How is half of this piece of paper different from half of this one?

Activity 1 Half of 2-D shapes

Objective

Divide a symmetrical 2-D shape into two equal parts.
Understand a half as one of the two equal parts of a whole.
Understand that if a whole is broken into two unequal parts, then both are not halves and identify the bigger part and the smaller part.



Materials

A set of 2-D cutout shapes (2 circles of different sizes, 2 rectangles of which one is a square and the other a non square rectangle, an isosceles triangle, a symmetrical heart-shaped shape) for each pair of students
Scissors

Activity Description

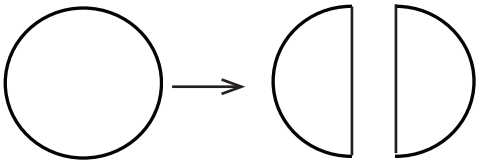
Have the students cut of the 2-D shapes provided in their Student's Activity Book on page number ___. Make scissors accessible for that. The same shapes provided on page number ___ of their Activity Book is provided in case some students spoil their shapes while cutting or for further activities.

Then have them divide the shapes equally into two parts. As they work,

go around and interact with each pair. Observe how they are sharing. Do they fold the shapes? Do they fold along diagonals? Do they look for and consider lines of symmetry, although you do not use the word as such? Do they draw lines? Do they need and ask for scissors to cut the shapes, or use folding and tearing off a part using rulers and other innovative means? Ask how they know that the two parts or shares are equal. Especially in the case of the square rectangle, ask if they could also share it differently than how they have done.

Maths Note

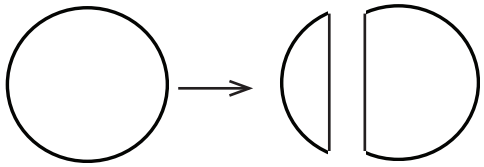
The use of cutout 2-D symmetrical shapes is an effective way to teach the concept of halves. The shapes can be easily made and used in the class. It allows the students to fold some of the shapes into two identical parts in more than one way on their own. The shapes can also be easily divided into two unequal parts, to ask the students if each is a half now. This leads to the discussion and understanding of the idea of one half as one of the equal parts of a whole. It also explains well how large a half is depends upon how large a corresponding whole is.



A whole is divided into two equal parts.
Each part is a half.

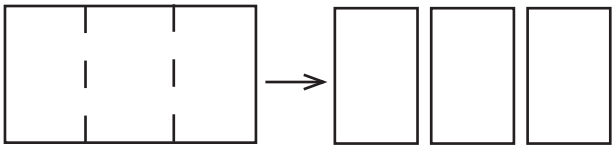
Once all the students have finished dividing each of the shapes into two equal parts, draw their attention to you at the front of the class. Pick up a circle, from one of them. Join the two halves, and say something like: **This is a circle. You have divided it into two parts. Are the two parts equal? How can we know that they are equal?** Listen to how they say the two parts are equal. Then say: **When we divide one shape into two equal parts, each part is called a half. So how many half shapes make up one whole shape? Which is bigger – the whole shape or a half of it? (**Accompany this with appropriate shapes).

Now take up an undivided circle, and say: **I have a circle here. I am going to divide it into two parts like this.** Divide it into two clearly unequal parts. **So how many parts have I divided this one circle into? Is this a half** (referring to the smaller part)**? Is this a half** (referring to the larger part)**? So both parts are not halves. Why are they not halves?** The realization we need from the students is that for the two parts to be both called a half, the two have to be equal in size.



A whole is divided into two unequal parts.
Either part is not a half.

Now show a rectangle and divide it into three equal parts as you say and demonstrate it to the class. **I have a rectangle here. I am going to fold it like this into three parts and cut them up. How many parts do I have now? What can you say about their sizes? Are they all equal? Is each one of them a half? Why? Why not?** The realization we need here is that for a part to be called a half, we need to divide the whole into two parts and the two parts should be equal.



A whole is divided into three equal parts.
None of the parts is a half.

Collect all the halves that the students created for reuse during subsequent activities.

Extension

It is important to realize that one half is a special part that if replicated will allow for the whole to be produced. It may be appropriate in some situations to discuss the ideas later towards the end of the lesson of having three parts that are not all equal yet one of the parts can be a half. The simplest way to demonstrate this is to divide a shape into two equal parts. Then divide one of the new parts into two parts that are not equal. The (undivided) part that was not touched again remains one half of the whole shape.

Assessment for Learning

Ensure that the students realize that for a part to be called one half, the other part should be equal in size to it. In other words, the two parts of a whole should be equal in size.

Activity 2 Big Halves and Small Halves

Objective

Understand one half as one of the two equal parts of a whole.
Understand that the physical size of a half is relative to the physical size of the whole.

Maths Note
The students need to understand that half is relative to its whole. Two halves are equal and the same only if they belong to the same whole or a whole of identical size. A big whole will give rise to two big halves, and a small whole will give rise to two small halves.

Materials

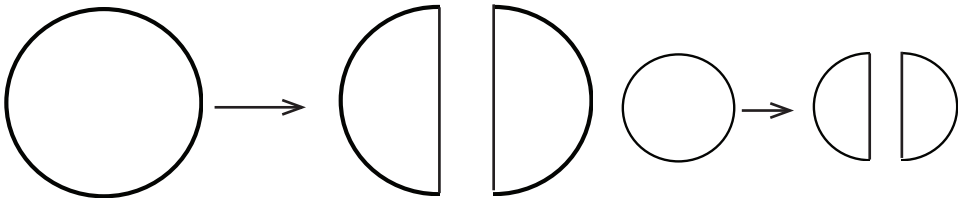
Two circles of two different sizes.
The collection of the halves of different shapes that the students made during Activity 1 above.

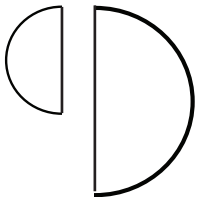
Activity Description

In advance, have two cut out circles of different sizes ready. Show the smaller circle, and cut it up into its two halves, so that the students agree that the two parts are halves. Then pick up the bigger circle, and cut it into its two halves, so that students agree that the two parts in this case are also halves. Then ask: **What is true about the two halves of a shape? How do you check if the two halves are the same or equal?**

Assessment for Learning
See that students can describe or explain why a half of a shape is not equal to a half of another shape when the two shapes are of different sizes. Also see that the students can explain why a half of a shape is equal to a half of an identical shape.

Pick up a half of the small circle and ask: **Is this a half?** Then pick up a half of the big circle, and ask: **Is this a half? Again, what is true about the two halves of a shape? Are these two halves the same? If they are not the same, can they be halves then? What is wrong about comparing these two halves?** The point that we would want to drive home here is that half is relative to whole, or one whole. And here, the two halves belonged to two different wholes; the small half is a half of the small circle and the big half is a half of the big circle. This should be an important realization for the students. These halves come from different wholes and so they are not equal in size. So if you have a big whole, then you will have a big half. And a small whole gives small halves.





These are both halves.
Are they the same?
Why? Why not?

Distribute the collection of halves that the students created during activity 1, and have them put together the halves that belong to the same wholes.

Activity 3 Equal Halves with Different Shapes

Objective

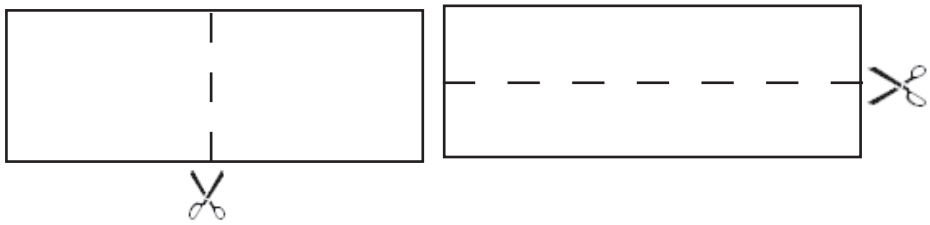
Understand that a whole shape can often be divided into halves in more than one way.
Recognize the equal halves of different shapes.

Materials

Two equal rectangles which are not squares (for each student)
Two equal rectangles which are squares (for each student)

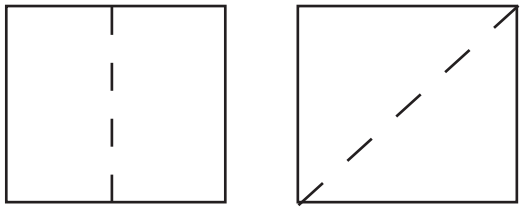
Activity Description

Take two equal rectangular sheets of paper, which are not squares. **What are these shapes called? Are they the same, or equal in size? How do we know that are equal or the same?** Demonstrate that the two rectangles are the same or equal by superimposing one onto the other. **If we take a half of this, and a half of this, will the two halves be the same? Why would the halves be the same?** Ask a volunteer to divide one of the rectangles into its two halves. Show the two halves of it to the class, and ask: **How are these two halves of this rectangle?** Then ask: **Can we divide the same rectangle into two halves in a different way?** Listen to the students' suggestions. Ask a volunteer to divide the rectangle into two halves in a different way than the earlier one. Pick up the two halves from the later rectangle, and ask: **Are these two halves the same?** Then pick up a half from the earlier rectangle and compare it against a half from the later rectangle: **Are these two halves the same? If they are the same, how are they the same? If they are different, how are they different?** Guide the students to realize that they are both halves from the same rectangles, and therefore that the two halves are the same or equal in size. Then proceed to prove that by cutting the longer one into two and superimposing them on to the other shape.



Distribute two rectangular sheets of equal sizes to the students and let them confirm that for themselves.

Show a rectangular sheet of paper that has all its four sides equal. Explain that this is a special rectangle, because it has all its four sides equal. You can show this by folding it along the diagonal to show that the adjacent sides fit exactly onto each other. Then divide this rectangle into its two halves by bringing two opposite sides on to each other and folding along the middle. Then bring up an equal rectangle as this one, and ask the students to suggest how to divide it into halves in a different way. That would be folding it along the diagonal and tearing or cutting it off. Pick up a half, which is triangular and a half from the former rectangle which is rectangular. Say: **These are both halves from the same rectangles. Are the two halves the same? If they are the same, why are they the same?** Guide the students to realize that the two differently looking halves are the same or equal in size.



Distribute two equal square rectangles to each student. Ask them to divide the rectangles into their halves in the two ways as demonstrated. Then let them figure out how the half which is rectangle and the half which is triangular are the same in size.

Maths Note

A half of a shape can be in different shapes, but still be a valid half of it. This is demonstrated easily with a square rectangle which can be halved by folding along the diagonal and also folding it from edge to edge. The halves produced would then look different, but in terms of their area they will be the same.

It is recommended that we do not call a rectangle with all its four sides equal as square yet in class PP, but to continue to call it simply a rectangle. Not calling a rectangle which has all its four sides equal as square would avoid the observed risk of children wrongly considering squares as not rectangles in the lower classes, although ultimately we would like the children to call them squares later on.

Assessment for Learning

Ensure that students can divide a shape into halves in more than one way and also describe how and why its halves that look different in shape should be the same in size.

Activity 4 Halves of Lengths

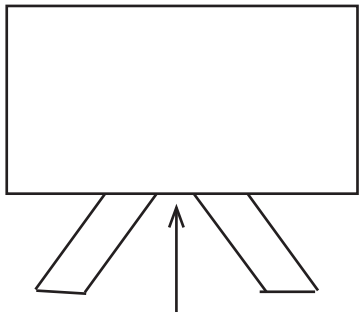
Objective
Determine the halves of lengths.

Materials
Threads
Marker pens
Objects which are long (like pencils, long sticks, etc)
Edges of tables and desks
Lines drawn on papers

Activity Description
Take out two pieces of string or thread, one longer than the other. **Which of these two strings is longer? Which is the shorter one? How can we compare to find out which one is longer and which one is shorter?** The length comparison is done to see if the students remember the skills of length comparison from chapter 3. The actual focus of the activity is to see if the students can determine the halves of a length.

Maths Note
This activity extends the idea of halves using the attribute of length.

Take up one of the strings. **Can we divide this string into two equal parts, or into its two halves?** Listen to suggestions from the students. Distribute a piece of string to each student. The pieces need not be measured nor be of equal lengths. Their lengths could range from about 15 centimeters to 1 meter. Ask the students to divide the strings they have got into halves, and show you how they have done it. Encourage them to share what they did amongst themselves too. You could tell them that scissors may be used if needed, and make the scissors accessible.



Where would be the middle of this side of the blackboard?

Now ask every student to take out their pencils. Ask if they can determine half the length of their pencils, and mark the pencils at their half length. Suggest they could use the strings they have to do that. As the students work, go around and prompt them in to how to do that.

After everyone has successfully determined the half length of their pencil, draw the students' attention to the horizontal edge of the black board. **I want to put a mark along this side of the blackboard, so that the length from this mark to either end of the blackboard is the same or equal. Can you suggest how to do that**? **Can we guess where the mark should be?** Listen to what the students have to suggest. With the string determine the middle of the side of the black board.

Assessment for Learning
Encourage the students to always guess or estimate before actually finding the half of the lengths. The students who make a reasonable estimate show that they understand the concept.

Extension
As an extension of the activity, ask the students to determine half the length of various objects like dimensions of the classroom floor, the edges of the desks, the height of the classroom door, the lengths of the windows, the lengths around certain curved objects or structure, etc.

Activity 5 Half of An Object Using Its Mass

Objective
Divide an object into two equal parts based on the attribute of mass.

Maths Note
This activity extends the understanding of halves and wholes using the attribute of mass of objects.

Materials
Pan balances
Rice, or maize seeds, or wheat, or buckwheat, or barley
Empty sacks

Activity Description
In advance, arrange to bring into the class about 10 kilograms of rice, or maize seeds, or both. Other cereals that could be used are wheat, barley or buckwheat. Also have some pan balances and empty sacks.

Provide pairs of students some of the rice or the other cereals. The amount distributed to the pairs need not be the same. Ask the pairs to share the rice equally between them. Suggest that they could use the pan balances to help them do that. As the students work, go around and interact with them, and see that they use the correct techniques of using the pan balance. Check with them if any of the pan balances are faulty. In case of faulty pan balances, discuss and rectify them.

Assessment for Learning
See that the students can describe or explain what they are doing while you are interacting with them in small groups or pairs. Encourage them to speak informally.

Also ask, either while you are with the pairs or when everyone has finished with the sharing using the pan balances, ask: **Can you share the rice equally into two parts without using the pan balances? Would you like to show us that?** Listen to the students' suggestions and encourage them to do that.

Activity 6 Identifying the Whole from the Half

Objective
Identify the whole shape for a given half of it and vice versa.

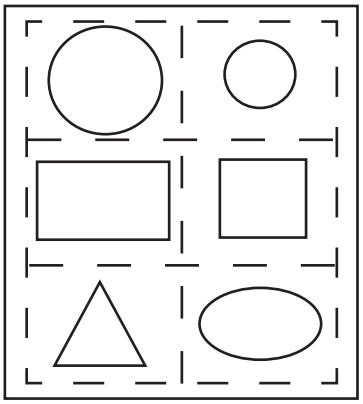
Materials
Sets of cutout shapes of: a small circle and its half; a bigger circle and its half; a rectangle and its half; a heart and its half; an apple and its half; a star and its half; a triangle and its half; a square and its half (made as a rectangle, as well as a right angled triangle); an oval and its half; etc – a set of these shapes for each group of students.

Maths Note
Recognizing the whole shape of objects based on the given half shape or part of it is important for the conceptual understanding of the idea of halves. This experience and understanding will be vital for the conceptual understanding of the concepts of fractions later on.

Pattern blocks (especially the hexagonal prism and its half trapezoidal prism, the diamond shaped prism and its half triangular prism).

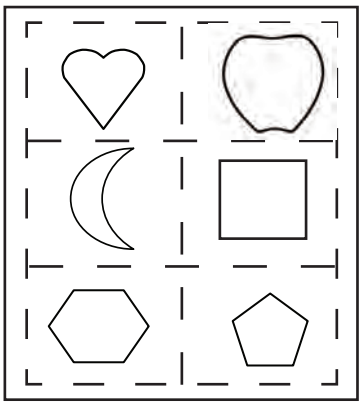
Activity Description
In advance, prepare the above mentioned sets of the cut out 2-D shapes. These shapes are available in the Student's Activity Book on page numbers ___ , which is reproduced here for reference. You may have to ask for the Activity Books of some of the students in advance to making the sets. For a set, you would have to use pictures two Student's Activity Books. Use teh pictures from one of the Student's Activity Books for cutting oput the full shpaes. Use the other Student's Activity Book for cutting out the half

shpaes for the corresponding full shapes. Mix up the full shapes and teh half shapes in each of the sets. Also, in advance, have the pattern blocks as mentioned above.



Show a full shape, say a circle and ask: **What is this?** Then show its half, and ask: **What is this? What is the relation between these two shapes? How is this related to this?** Listen to what the students say. **This is the half of this. This is the full circle and this is its half. If this is the half, this is the full shape.**

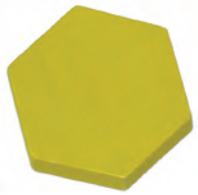
Show another shape, say a heart, and repeat the questioning and discussion as above.



Distribute the sets as mentioned above to groups of 2 to 4 students. The shapes should be mixed up within the sets. Ask the students to match up the halves with their wholes. As the students work, go around and help them with further promptings. Encourage all the students in the groups to participate actively, and see that everyone does understand the activity. Especially, pick up the half circle belonging to the small circle and ask: **Is this half a circle?** Then pick up the bigger circle, and ask: **If this is half** (referring to the half circle of the small circle), **is this the full** (referring to the bigger circle)**? Why? Why not?** Also ask and see how the students check the halves against the corresponding wholes.

Once every group has finished with the sorting, draw the students' attention to you at the front of the class. Use the pattern blocks as mentioned above to identify the wholes for their halves. Pick up a trapezoidal prism and say: **This is a half of something. Which is the whole shape then? How would you know that this is the whole for this?** Repeat similarly with different 3-D shapes from the set of pattern blocks. Ask questions in both ways, like: **If this is the half, which is the whole? If this is the whole, which is the half?**

If this shape  is the half, which of the following shapes is the whole of it?



Assessment for Learning
See that the students can identify and describe the whole shape for the given half and vice versa. Also check that they can show how a half is a half of a whole.

Extension

With the help of the cutout shapes and/or the pattern blocks at hand, the students can ask each other to identify the whole for a half, or half for a whole. A student shows the half of a shape, and tells his or her partner: **If this is half, show me the whole**. Show another shape and say: **If this is the whole, show me its half, etc.** The students then switch their roles.

Chapter Assessment

Formative Assessment

Formative assessment ideas, tips and reminders are provided within each lesson activity 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 evidences 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. And what is even more important will be 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 annual examination.

Formative Assessment Recording Sheet (For Class PP)

CHAPTER 11 ORDINAL NUMBERS AND HALVES

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 the position of an object in a sequence using ordinal numbers to the tenth.	Say the ordinal number words correctly to 10th.	Identify and write the symbols for ordinal numbers to 10th.	Understand that the position of an object in a sequence is relative to the object designate as 1st.	Identify half of a shape.	Identify half of a line.	Create half of a shape.	Describe a half as one of the two equal parts of a whole.	Identify half of a shape when presented with both a half and a full shape.	Identify the full shape when presented with a half of it.
1											
2											
3											
4											
5											
6											
7											

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 to the students to display their understanding by ways of telling, describing, showing, and demonstrating in an non-threating 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 secondary purpose.

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

Summative Assessment Recording Sheet (For Class PP)

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

CHAPTER 11 ORDINAL NUMBERS AND HALVES

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

Task and Interview prompts	Key concepts and skills to look for
Task 1 Have cutout pictures of the six animals/insects from the Student Activity Book. Have also the cutouts of the ordinal numbers from 1st to 10th. Line up the pictures and tell a story that the insects are in a race competition. **Which insect is 1st? Which insect is 2nd?...which insect is 6th? Which insect is last in the line?** Ask the student to pick up and show the ordinal numbers from the cutouts. **Show me the ordinal number third. Show me the sixth…** Ask the student to write 1st (2nd, 3rd, 4th and 5th) on a piece of paper, one at a time.	*The student is able to:* - Identify the position of animals in a line by using the ordinal numbers. - Identify the symbols for the ordinal numbers. - Write the ordinal numbers.
Comments and Mark: **Teacher's Signature and Date:**	

Task 2 Present the student with a rectangular sheet of paper. **Show me half of this paper by folding. Can you show the half of this paper by folding it in another way?** Fold and tear the paper into two parts, such that the two parts are clearly not equal in size. Ask: **Is this half of the paper? Why?** Present the student with a piece of string and a pair of scissors, and tell: **Cut this string into two halves. How do you know that you have cut the string into halves? Or how is this half of the full string?**	*The student is able to:* - Create half of a shape. - Create half of a shape in more than one way. - Identify and describe a half of a shape as one of the two equal parts of it. - Create half of a length. - Describe and show a half of a length as one of the two equal parts of it.
Comments and Mark: **Teacher's Signature and Date:**	

Summary of the Summative Assessment for Chapter 11

Total CA mark from Chapter 11 (Task 1 and Task 2: Mark out of 20): _____

Overall remarks on the student

Strengths:

Areas of Need:

Follow up Steps: