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TEACHER'S MANUAL

MASTERY IN MATHEMATICS THROUGH THE CONCRETE PICTORIAL ABSTRACT (CPA) APPROACH

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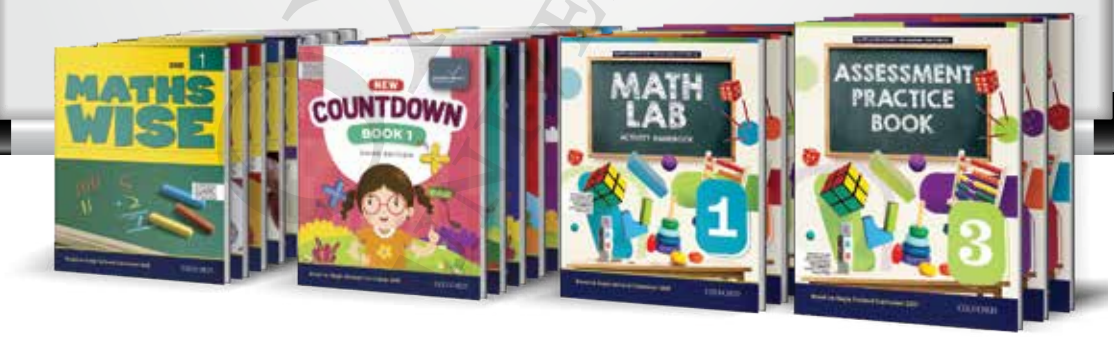

SPACE FOR T/V

Contents

Our Core Philosophy

This Teacher's Manual has been designed to promote good teaching practices for teachers to implement the SNC/ NCP 2020. This series provides teachers with the flexibility to choose the elements that are right for their learners.

Teachers must create a conducive environment for learning mathematics in the class that rewards creativity and enjoyment. When introducing a concept, teachers need to ensure that pupils can relate mathematical activities and problems. Therefore, teaching mathematical concepts with real-life context and providing hands-on experience facilitates the learning process, so long as the context is comprehensible to the class. Pupils should be able to find solutions to real-life situations based on what they have learnt in class. This series engages pupils by providing interactive hands-on activities, as well as individual exercises. Each unit in the book ends with a class discussion, inviting pupils to share their perspective, and all concepts are supported by real-life tie ins. This approach begins by each pupil having an opinion, and at each unit's end, they can discuss how their opinions have changed, and whether they see the importance of what they learnt. The heavy focus on inquiry-based learning, demonstration approach, and cooperative learning allows the teacher to expose the class to different teaching styles, which ultimately help pupils to better understand their own needs as learners. The Teachers' Manual provides instructions on the use of resources to help them carry out the above-mentioned objectives. If a concept is taught in a comprehensive manner with clear instructions along with hands-on activities and practice, most pupils would be able to achieve the set assessment target. Each pupil has a set pattern and pace of grasping concepts, but the expectation is the plateau of mathematical competency for all. In this regard, the manual serves as a support for teachers regardless of what series they use.

The Teacher's Manual supports a meaningful and holistic approach to teaching the strands of mathematics. The build-up of concepts throughout this series is progressive and thorough. With the implementation of hands-on activities, the learning of a mathematical concept is complemented with experiences that make learning mathematics enjoyable and give pupils the ownership of independent and group practices. Multiple strategies, in the form of games, standard and non-standard materials, and resources, are implemented through activities. The Teacher's Manual facilitates teachers to implement this aspect of the series proficiently. It also provides a structure whereby teachers and coordinators can select, combine, and improvise various pedagogical practices for the pupil-centric textbook and workbooks. In this regard, the Teacher's Manual provides the following elements:

- **Aligned with SNC/ NCP 2020** – SLOs listed at the start of each unit, as well as next to each activity in the margins.
- **Unit Guides** – Detailed lesson plans for each lesson to keep the teaching approach organised and accessible for the teachers. It encompasses prior learning, pre-emptive pitfalls, introduction, and problem solving.
- **Inclusivity in the Class** – An essay detailing some of the most prevalent disabilities in schools. How to see the signs, and how to make sure your class is a good learning environment for all your pupils.
- **Tackling Math Anxiety and Avoidance** – Math should be taught in a fun and inviting way, and to do it right, one must understand what not to do. This write-up discusses all the contributors of Mathphobia, as well as how to see the signs of it in pupils.
- **Let's Begin** – An introductory paragraph to start a class discussion, preparing the class to break into a new unit.
- **Activities** – Structured activities designed to make sure that pupils learn everything they need to know in an interactive on way.
- **Let's Try It** – Class exercises for pupils' individual or pair work so they can practice concepts as they learn them.

- **Let's Talk Math** – Mathematical communication support. Real-life connections are necessary for pupils to really appreciate the math that they are learning. This will help you start a conversation at each unit is end, bringing the topic to conclusion, as well as leading pupils to reflect on what they learnt.
- **Let's Get Practical** – An end-of-unit activity that incorporates a real-life connection, including as many SLOs as possible.
- **Confusion Bar** – A bar that ranks confusion levels from 1 to 5, both reminding the teacher to check in, as well as allowing them to track the number of pupils whose understanding is not up to par.
- **Math Lab** – Alongside our activities, we list page numbers from Math Lab; an activity handbook that might help struggling pupils, and help all pupils practice their concepts.
- **Self Assessment** – Given at the end of each unit, a page for the teacher to assess how well the class has understood the lesson, in accordance with the SNC/ NCP's "Role of a Teacher".

A user-friendly guide to the SNC/ NCP to help teachers perform to the best of their abilities, and to remind pupils that there is a place for creativity in math. It is crucial that children build a good relationship with the subject at early stages, given that there is so much of it in day-to-day life, and a solid foundation would be very helpful for later years.

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Tackling Math Anxiety and Avoidance

The fact that it is common for students to struggle with math is often written off as nothing more than a difficult subject being neglected by unmotivated students. Surely, if children put in the necessary practice time, they would succeed at whatever they tried. Or perhaps some children are unable to comprehend ideas so complex because they are not smart enough.

Researchers believe that about 20 % of people suffer from "math anxiety" and some psychologists believe it to be a diagnosable condition. Math anxiety will most likely lead to "math avoidance". Students will often appear unfocused, like they are looking for reasons to leave the class. It might look like they would prefer anything to try to learn the material. They may also appear to be lazy or naughty, but the fact is, these children are just looking for an escape from a stressful situation. They do not ask for help or guidance because they do not believe they have any chance of doing better, and because they feel unable to confront their fears. The stress that they feel during class also impacts their ability to learn. Children are already so susceptible to distractions that a high stress situation can almost entirely block their working memory. Furthermore, these feelings are not simple enough for young children to be able to explain to adults, even if they are offered help. What they understand is that they are low achievers, they are bad at math, and they will always be bad at math.

When trying to understand how to fix or avoid the anxiety associated with math in the class, here are some things you should keep in mind:

Math Anxiety is Contagious

As a teacher, if you start seeing math avoidance, ask yourself what might have triggered it. Is the overall class attitude toward math negative? How did it become that way? It is not uncommon for the idea to be picked up from the teacher. That is why it is important to never present the subject as something that students should worry about. Do not tell your students that the next unit is difficult. Instead, give them the lesson, and let them ask questions so they know that it is not a big deal to ask for help.

Do Not Promote the Idea That Some People are Just Not Good at Math

Also, be sure to reassure your students that everyone is different, but everyone can do math. Remind them that it is not their fault if something did not make sense the first time because all people have different ways of learning. Or better yet, tackle new topics by catering to multiple learning styles. Incorporate some activities and some creativity so that at the end of the introduction, they will all have a clearer idea of the concept.

Avoid Shame in the Class

One of the bigger roots of stress in the class is the fear of failure. Instead of calling out children by name and asking them to answer a question in front of the class, ask the question and allow them to raise their hands. If you notice some children that do not tend to volunteer, check their written work to see how they are performing. If they are doing well, then they are simply not comfortable speaking up in front of their classmates and maybe just need a confidence boost. If they are not performing well, then you are more likely dealing with avoidance.

Group Weaker Students with Students that Could Help Them

When doing group exercises in the class, make sure the students who are struggling are evenly distributed. Often, they will feel more comfortable approaching their peers for help, or might even learn from watching them, because they will not be feeling as though they are the ones faced with the problem. Furthermore, children have a better idea of what was challenging about a subject than an adult. They may be able to clear up some confusion for their friends that the teacher was not aware of.

Students Who Experience Math Anxiety Can Actually Be Good at Math

Do not think of these children as underachievers. Instead, think of them as students who have something crucial missing from their learning process. Instead of repeating the same explanation, try to use different language, or better yet, design an experience that will show them what you are trying to explain. Keep in mind that anxieties are impacting students' comprehension skills, so your approach must be something that helps students feel like there is less pressure to succeed.

Inclusivity in the Class

Every student is differently abled, and as teachers, we try multiple approaches to cater to each one of them. However, some students need special consideration. Below are some examples of students who could be held back in the class due to their special needs, and small considerations that could be made that might make all the difference without compromising on learning objectives. Be sure to be aware of exactly how severe the impact is before deciding what changes to make. The goal here is to create an environment where the children can adapt to life amongst abled people, and learn to be as independent as possible, which is why one should try to avoid extra attention. Children should never believe that they are not able to do things, and instead be given the tools to find ways to do things.

Sight

While it is commonly believed that visually impaired or blind students need constant help, teachers should keep expectations high, while still making it clear that it is always alright to ask for help, as is for regular students. Any changes or adaptations should apply to the entire class, to avoid singling anyone out.

Some good practices to incorporate are being more verbal, especially when writing on the board, and always calling children by their names rather than pointing. When the illustrations in the book are pertinent to the lesson, describe them aloud to the entire class so that no one misses out. If possible, use tangible objects, such as counters, so that the class is not entirely reliant on images. If you do see these students struggling, instead of rushing in to help, offer information to the entire class, for example, if the child is having trouble finding a book, describe the shape instead of getting it for him or her.

Hard of Hearing

Depending on when these children lost their hearing, they may be lacking in vocabulary, and have trouble speaking.

Seat these students near to the front of the class since they will be almost entirely reliant on the blackboard, and they may be able to lipread if they have clear sight of the teacher. Therefore, the teacher should always face the class when speaking, and also, keep in mind that hearing-impaired students cannot listen and take notes simultaneously, especially if watching an interpreter. If possible, make sure important information is also available as handouts, including class announcements about deadlines and scheduling. Furthermore, any videos or documentaries screened at school should have subtitles.

Speech

These students will need some facilitation when encountering new vocabulary. It might be helpful if before starting a new unit, there is five-minute class discussion about the unfamiliar terminology that might pop up so that they can make note of it. Always ask students if they need help before assuming that they do. If they can successfully complete a task that involves communication, praise them, but do not draw too much attention as if it was unexpected. It might seem necessary to eliminate verbal assessments for these students but be cautious about this. There should always be an opportunity for the student to attempt to improve, or practice their communication abilities, and they should feel comfortable doing so. Small improvements should be acknowledged, and the goal should remain to meet the learning objectives however possible.

Memory

To help these students, one must understand the difference between working short-term and long-term memory. When a student learns new information, it is initially stored in working memory, as he or she uses it, and with time, as it stops being pertinent to their actions, it shifts to long term memory. If the child can recall concepts that were taught within the last 24 hours, but struggling to remember information from two weeks ago, then the issue lies with their long-term memory. If it is the other way around, like if they are forgetting instructions they were just given, then it is their working memory that is the problem.

While it has a bad reputation, rote learning can be very helpful for these students. Even employing repetition to really drill things into their minds might be helpful. The more modern approaches like project-based learning will certainly help them grasp concepts, but those concepts need to stick in their minds, so constantly relating new material to what was learned previously, and revising will help achieve this. Also, encourage active reading when assigning homework. Ask students to make notes while reading so that they can engage more with the text and have a personalized reference point when they need to revise. Lastly, create associations. Make games out of math activities, sing songs, use acronyms, and relate math to real-life. These students might have to work slightly harder on their own time, but these small changes to the class will both encourage and facilitate this.

Dyslexia, Dyscalculia, and Dysgraphia

While these learning disabilities are estimated to affect 5 to 20% of people globally, they often go undiagnosed. Since students are not aware that the way they perceive things is different, as a teacher, one must be aware of the signs.

a) Dyslexia

causes problems with reading, writing, and spelling. Some signs to look out for are delayed speech development, trouble pronouncing words, for example, saying "taplop" instead of laptop, trouble with sentence construction, even verbally, and lack of appreciation for rhymes. These children will often seem disinterested in learning the alphabet as they would not be asble to comprehend it as well as their peers.

b) Dyscalculia

a range of difficulties with maths. Students may not immediately understand the meaning of numbers and applying mathematical principals. To identify students suffering from it, look out for children who lose track when counting, and rely heavily on visual aides, like fingers when counting. Placing objects in order, and connected numerals (7) with written out words, like seven will be a struggle for these children.

c) Dysgraphia

affects the act of writing that requires a set of motor and information processing skills. The signs include problems with spelling, handwriting, and expressing thoughts on paper, because students will not be able to think and write at the same time. Their writing will show an inconsistency in spacing, and missing words and letters. An unusual hand position while writing or keeping the paper at an angle is also a symptom.

All these learners will be different. Some may be able to get by in a normal class environment, while some will need special allowances. For instance, allowing the student to bring in an audio recording device would be very helpful. Furthermore, providing a multisensory learning experience will make it less likely that they will miss certain things entirely. It is imperative that these allowances are only made where necessary, and that, as often as possible, they apply to the entire class, as opposed to just one or two students.

Autism

When dealing with Autism, one must keep in mind that it is a spectrum, and that it will be different in every student. Some children are diagnosed early on as their Autism affects their every day lives, but some are not diagnosed until quite late in life, as the symptoms vary both in nature and in visibility.

Students who make little or no eye contact, are not able to interact with others, repetitive movements (like flapping arms, or tapping), have low spatial awareness, and are extra sensitive to bright lights and sounds might be on the spectrum. While only a professional can make a diagnosis, proper medical help is not always accessible, and parents do not always notice the signs. Autistic children are often also prone to tantrums, and can come across as insensitive, and or, unemotional.

While this is a complicated disorder, small efforts can go a long way in helping these students thrive. Highly structured environments, following a routine, and giving plenty of warning before big changes will make these students feel more comfortable and able to focus on subject matter. Limit class distractions and give written instruction instead of long verbal announcements. These children express themselves differently, but often are very intelligent and passionate. Approaching their learning with a positive attitude will do wonders for them.

ADHD (Attention Deficit/Hyperactivity Disorder)

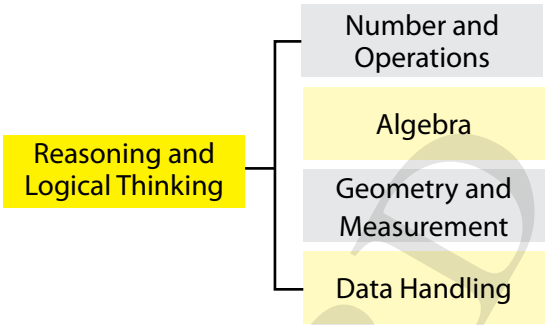
ADHD is a disorder that leads to problems paying attention, impulse control, and hyperactivity. While all children are easily distracted, it will be especially apparent in these children. Like Autism, a diagnosis can only be made by a professional, but since not all children will have that privilege, teachers can facilitate their learning by making the class environment as stable and predictable as possible.

The instructions given in class should always be clear, and if possible, consistent. All students should understand what is expected of them, and this should be repeated as often as it seems necessary. Furthermore, instead of just verbally communicating them, also put them up in the room so that students can refer to them whenever they need to. A good tool is to have the children tell you what they understood was or is expected of them, as children often listen without absorbing, and children with this particular disorder may be skilled at appearing engaged, whereas their mind is actually elsewhere.

Single National Curriculum/ National Curriculum of Pakistan 2020

The curriculum for Mathematics is comprised of the following four strands. The strands are intentionally kept broad to allow flexibility to the teachers to adapt their teaching styles in accordance with their students.

These strands include Numbers and Operations, Algebra, Geometry and Measurement and Data Handling. All of this content is underpinned by reasoning and logical thinking. All standards, benchmarks and students' learning outcomes are built around these strands.



Key Learning Strands	Standards
1. Numbers and Operations	• identify numbers, ways of representing numbers, comparing numbers and effects of number operations • compute fluently with fractions, decimals and percentages • examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking
2. Algebra	• analyse number patterns • known facts, properties and relationships to analyse mathematical situations • examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking
3. Geometry and Measurement	• identify measurable attributes of objects, construct angles and two-dimensional figures • analyse characteristics and properties of geometric shapes and develop arguments about their geometric relationships • examine real-life situations by identifying, mathematically valid arguments and drawing conclusion to enhance their mathematical thinking
4. Data Handling	• collect, organise, analyse, display and interpret data/ information • examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking

The Mathematics Curriculum Standards and Benchmarks – SNC/ NCP 2020

The Standards for Mathematics are further sub-divided into the following Benchmarks for Grade I – V.

Standards	Benchmarks Grade I – III	Benchmarks Grade IV – V
Numbers and Operations • **identify numbers, ways of representing numbers, comparing numbers and effects of operations in various situations.** • **compute fluently with fractions, decimals and percentages** • **examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance mathematical thinking**	The students will be able to: • identify, read and write whole numbers up to 10,000 • read and write Roman numbers up to 20 • identify and differentiate even and odd numbers up to 99 • arrange, compare numbers up to 3 digits using symbols (<, > or, =) • identify and recognise place values up to 5-digit numbers • represent and identify the given number on number line • round off a number to the nearest 10 and 100 • add, subtract numbers up to 4 digits • develop multiplication tables up to 10 • multiply number up to 2 digits with 1-digit numbers • recognise and use of division symbol, divide up to 2-digit numbers by 1-digit number • solve real-life situations involving addition, subtraction, multiplication, and division • recognise fractions and different forms of fractions with the help of objects and figures	The students will be able to: • read and write whole numbers up to 1,000,000 (1 million) in numerals and words • add and subtract numbers of different complexity and of arbitrary size • multiply and divide numbers, up to 6 digits, by 2 or 3-digit numbers and by 10,100 and 1000 • solve real-life situations involving operations of addition, subtraction, multiplication, and division • recognise and differentiate between factors and multiples of two or three 2-digit numbers • find highest common factor (HCF) and least common multiple (LCM) of two, three, or four numbers, up to 2-digits • solve real-life situations involving HCF and LCM • recognise and compare like and unlike fractions • arrange, convert and simplify fractions • add, subtract, multiply and divide fractions • solve real-life situations involving addition, subtraction, multiplication and division of fractions

Standards	Benchmarks Grade I – III	Benchmarks Grade IV – V
	• express and match fractions in figures and compare fractions with same denominators using symbols <, >, or = • identify and write equivalent fractions for a given fraction • add and subtract two fractions with same denominators	• apply unitary method for solving real-life situations • identify and recognise decimal numbers • convert decimal numbers into fractions and vice versa • add and subtract numbers up to 3 decimal places • multiply and divide decimal numbers with whole numbers • round off decimal numbers up to specified number of decimal places • solve real-life situations involving decimal numbers (up to 3 decimal places) • convert percentage to fraction and to decimal and vice versa
Algebra • **analyse number patterns** • **known facts, properties and relationships to analyse mathematical situations** • **examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance mathematical thinking**	• develop the concept of equality using addition and subtraction of numbers • identify and complete geometrical patterns on square grid according to attributes like shape, size and orientation	• develop the concept of equality using addition, subtraction, multiplication, and division of numbers • identify and describe repeating pattern using relationship between consecutive terms and generate number patterns

Standards	Benchmarks Grade I – III	Benchmarks Grade IV – V
Geometry and Measurement • **identify measurable attributes of objects, construct angles and two-dimensional figures** • **analyse characteristics and properties of geometric shapes and develop arguments about their geometric relationships** • **examine real-life situations by identifying, mathematically valid arguments and drawing conclusion to enhance mathematical thinking**	• use language to compare heights/ lengths, masses and capacity of different objects • read, recognise and use units of length (kilometre, metre and centimetre), mass (kilogram and gram) and capacity (litre and millilitre) and time (minute and second) • add and subtract in units of length, mass, capacity and time for solving real-life situations • use solar and Islamic calendar to find a particular date/ day • recognise and identify two- and three-dimensional figures • determine perimeter of square, rectangle, and triangle • identify and differentiate straight line and curved line • identify and draw points, lines, line segments, and rays • identify and describe symmetrical shapes	• convert standard units of length, mass, capacity, and time • solve the real-life situations involving addition and subtraction of units of distance/ length, mass, capacity, and time • distinguish parallel and non-parallel lines • identify, classify and construct different types of angles • describe and classify 2-D figures and 3-D geometrical objects • determine perimeter and area of square and rectangle • describe and complete symmetric figures with respect to given line of symmetry and point of rotation

Standards	Benchmarks Grade I – III	Benchmarks Grade IV – V
Data Handling • **collect, organise, analyse, display and interpret data/ information** • **examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance mathematical thinking**	• read, interpret and represent data using Carroll diagrams, picture graphs and tally charts	• read and interpret bar graphs, line graphs and pie charts • represent real-life situations using pie chart • find an average of given quantities in the data • draw and read simple bar graphs both in horizontal and vertical form • solve real-life situations using simple bar graphs

Note: Lifted from SNC/ NCP document. To learn more about the SNC/ NCP go to mofept.gov.pk, choose curriculum, then SNC/ NCP, the Pakistan National Curriculum. Click on maths 2020 to open the document.

Unit 1

Whole Numbers

1.1 Roman Numbers

i. Read Roman numbers up to 20.
ii. Write Roman numbers up to 20.

1.2 Even and Odd Numbers

i. recognise even and odd numbers up to 99 within a given sequence.
ii. Differentiate between even and odd numbers within a given sequence.

1.3 Place Values

i. Identify the place values of numbers up to 5 digits.

1.4 Numbers up to 100,000

i. Read and write given numbers up to 10,000 (ten thousand) in numerals and words.

1.5 Number Line

i. Represent a given number on number line up to 2-digit numbers.
ii. Identify the value of a number from number line up to 2-digit numbers.

1.6 Comparing and Ordering Numbers

i. Compare two numbers up to 3-digits using symbols "<", ">", or "=".
ii. Write the given set of numbers in ascending and descending order (numbers up to 3 digits).

1.7 Estimation

i. Round off a whole number to the nearest 10 and 100.

Plan Ahead:

1.1 Roman Numbers
1.2 Even and odd numbers
1.3 Place Values
1.4 Numbers up to 100,000
1.5 Number Line
1.6 Comparing and ordering numbers
1.7 Estimation

Allocate realistic time frame/number of periods to teach each topic as per requirement.

Before You Start:

Pupils have already learnt to identify the place value of numbers up to 3 digits. Now, they will learn to read and write numbers up to 5 digits, in numerals and words. They will also be able to write numbers in ascending and descending order, represent and identify a given value of number on a number line. They may have seen the Roman numbers on clocks and watches. Pupils are new to comparing two numbers using symbols, but they are familiar with the idea of greater and lesser, so it should notbe too difficult for them.

Watch Out For:

Pupils generally get confused between the symbols of greater than and lesser than, while comparing numbers. They might also struggle to remember which Roman numeral is which. The introduction to new numbers may also seem intimidating, but they should feel more comfortable when they realise that it is simply an extension of the concepts they have previously learnt.

This Pairs with:

Math Lab 3, pages 2 to 14

Make Sure You Have:

Roman numeral cards	Two differently coloured highlighters
Chart papers	Bowl
Markers	Chits
Tape	3-digit number cards

If They're Struggling:

Roman numerals will be harder for the pupils to retain as they will not necessarily be seeing or using them in their daily lives. The only solution is to give them plenty of practice so that they get the hang of it, and to take pauses throughout the unit. If the concept of rounding off is difficult for the pupils to grasp, use the example of time. Explain how people always round off when stating how long they need to do things. Explain that this is because when you are guessing, you might be quite sure about the fact that you need 17 minutes to do something, but because you are not absolutely sure, you will say twenty minutes, more likely.

When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a level or above, move on to the next activity.

Let's Begin

Ask pupils why numbers are important. They will have many real-life examples of how and why they use numbers and see numbers being used in their lives. Ask them if they think that numbers are complicated. They have learnt a lot about numbers, and should realise that even though there is more to learn, that doesn't mean it has to be complicated. Point out how everything is related to numbers and how they can apply what they have learnt, about numbers, everywhere. For example, knowing place value helps the students to add and subtract big numbers. Ask them to think out loud about how their knowledge of numbers improves the quality of their lives.

SLOs		
1.1 i ii	**Activity 1** 10 min	Write all the Roman numerals on the board, up to 20. Ask pupils to try to identify them. Some pupils may be familiar, so if anyone has the right answer, allow them to try and explain to the rest of the class. If they do not know, explain to the class that these are Roman numerals. They Roman numerals are just like Arabic numerals the that they are used to, and they are read the same way as well. They are only written differently. Go through them with the class once, reading them aloud, and pointing to each number as you say it. Explain that the I is a 1, the V is a 5, and the X is a 10. The way to read them is simply to add them together. For example, XX is two tens, therefore, it is 20. Go through them a few times, and then make groups of 3 to 5 pupils, and give each group a set of twenty cards with a Roman numeral on each card. Give them some time to arrange them in order.

Let's try it

Give pupils time at their desks to write all the numerals in their notebooks, in order. This should be done silently. After they are done have pupils peer review. Remind them to remember that I is a 1, the V is a 5, and the X is 10.

1.2 i ii	**Activity 2** 20 min	Ask the class, which numbers can be divided by 2. They should be able to certain number divisible by 2, at random. name even numbers at random. Explain that all numbers than a by 2 are called even numbers. Ask them then to think of numbers that cannot be divided by 2. Tell them these are called odd numbers. Divide the class into 5 groups. Allot them each few numbers between 1 to 99 and ask each group to make cards for those numbers. Once they are done, tape them up on the walls around the class, in order, so that there is a sort of number line all around the class. Give highlighters and ask pupils and to identify and colour even number cards one colour, and odd number cards a different colour. Make sure they all know the colour code that you have decided, and also remind them not to highlight unless they are sure. Once they are done, ask them to take their seats, and think of any tricks to identify whether or a number is an even or odd number. Since bigger numbers are difficult to divide, after the discussion, point out an easy way to identify even and odd numbers is to look at the last digit. If the last digit of a number is 0, 2, 4, 6 or 8 then the number, for sure, is even.

Let's try it

Write up to 20 random number sequences on the board. Ask pupils to copy these down, and highlight the even numbers. Once they are done, ask them to peer review.

SLOs		
1.3 i	**Activity 3** 7 min	**This pairs with Math Lab page 2** Write 5 zeros on the board, and ask pupils how many there are. Point to the right-most 0 and ask them the place value of it. They should say ones. Write ones on top of the 0. Then do the same for the rest of the zeros. The place values, from right to left should be ones, tens, hundreds, thousands, and lastly, ten thousands. Go over this a few times, then erase the place values, and ask pupils to raise their hands to name them. Once they all get the hang of it, write random five-digit numbers on the board and ask pupils to come to the board one by one to circle a particular place value.

Let's try it

Read out twenty five-digit numbers, and after each number, say a place value up to ten thousands. Ask pupils to write them down in digits and circle the stated place value. Once they are done, allow them to peer review.

1.4 i	**Activity 4** 20 min	**This pairs with Math Lab page 3** Divide the class into groups of up to 5 pupils each. Before you start, explain the activity. Each group will need to elect a member to write on the board. Two of the groups will be randomly selected to go first. They will both come to the front of the class, and you will read out a number up to ten thousand. Then each group will discuss among themselves and decide whether they can spell out that number. The first group to raise their hand will get to go first, but after they have raised their hand, the writer can no longer discuss with the rest of the group. The first group to get two words wrong, will be disqualified, and another group will replace them. Keep playing until all but one have made a mistake, so that they can be winners. If the activity is taking longer than 20 minutes because no one is making a mistake, then interrupt to declare a tie, and replace the two groups with a different two. Before starting, write the number ten thousand three hundred and four(10304) on the board, in words, just so that they know that while five-digit numbers may be long, they are comprised of words that they should know how to spell. Erase the board before starting.

Ask the class to revise their spellings of numbers up to ten thousand as homework so that you can have a spelling test.

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

SLOs		
1.5 i ii	**Activity 5** 10 min	This pairs with Math Lab pages 7 and 8 Fill a bowl with chits and pass it around the class. Each chit should identify two 2-digit numbers that have a difference of 10. For example, 35 and 45, or 76 and 86. Once everyone has picked their chits, pick one out yourself. Draw a line on the board, and make a number line, ranging from the smaller number on the chit to the larger one. Do it so that the class can see how it is to be done. Then ask them to get into pairs and help each other make a 10-centimetre line and make a number line from the smaller number on their chits to the bigger one.

Let's try it

This exercise should be done individually. Ask each pupil to choose three two-digit numbers. Then ask them to make three number lines, one for each, that start from five numbers before, and extend to five numbers after. However, when they write the numbers along the lines, they should leave the space for any three numbers blank. So if the chosen number was 45, the digits on the number line would read 40, 40, 41, 42, ___, 45, ___, 47, 48, ___, 50.. Give them about 5 minutes to do this, and then collect their notebooks, and redistribute them at random. Ask the class to open to the page with the number lines and fill in the three blanks by looking at the surrounding numbers. Before collecting the books, ask pupils to be sure that they haven't written the chosen numbers down. The number that comes just before a number is called the predecessor of that number ('pre' means before.) The number that comes just after a number is called the successor of that number ('succeed' means follow.)

Assign twenty minutes of classwork from the textbook here before moving forward.

1.6 i	**Activity 6** 5 min	Draw a number line. Taking different numbers on the number line, tell the students that a number closer to zero is smaller than a number further from zero. Give the pupils a few examples on the number line, like 7 and 11. 7 is closer to zero as compared to 11 which is further from zero. Hence, 11 is greater than 7 or 7 is smaller than 11. Give similar examples to enhance students' understanding. A number strip can also be used in place of a number line. At this stage, you can introduce the symbols of greater than (>) and less than (<) by using a common yet interesting activity of a hungry crocodile. The open mouth of hungry crocodile is always towards the greater number. Therefore, 7 < 11 or 11 > 7. Present more pairs of numbers on the board, slowly moving up to three digits.

SLOs

1.6
ii

Activity 7
13 min

Make groups of 3 pupil and explain the following activity. You will hand each group f number cards and ask them to arrange the cards in ascending order. They will need to do this as quickly as they can, because you will wait 30 seconds and hand them two more numbers cardsthat they will have to add to their arrangement, making sure that it remains ascending. This will happen five times, so the activity, once they get their numbers, should take no more than two and a half minutes. After time is up, they will have to stop touching their cards, so that you can check if they have done it right. If any of the groups have made mistakes, ask them to take a second look, so you can know whether they need help with the concept, or if they just ran out of time. Once all the arrangements have been checked, and if necessary, corrected, collect all the cards, shuffle the groups, and repeat it once more, but this time, making sure to ask them to arrange the cards in descending order instead.

Assign classwork from the textbook.

This pairs with Math Lab page 9

1.7
i

Activity 8
10 min

Start by telling the pupils that while it is important to be specific with numbers, majorly during measurement, sometimes being intentionally non-specific is necessary. Write the number 9 on the board and use the example of time. If you need 9 minutes to do something, are you going to say 9 minutes, or 10? While some pupils may prefer to say 9, most pupils will not. Therefore, when using a number that we are not entirely sure about we round up. Any number can be rounded up, however, they are not always rounded up to ten. In fact, they can be rounded up to tens, hundreds, and thousands. For this activity they will be rounding up to the nearest tens and hundreds. Explain the students that rounding up to 10 means you want the number to end with one zero. However, if you want the number to be rounded off to the nearest 10, it means you want that number to end with two zeros. To explain the concept of rounding off, use the idea of a number line. Ask pupils to pick any number, with any number with certain number of digit containing no zeros. . Once they suggest a number, say that you will be rounding it up to the nearest ten. Then draw it on a number line. For example, if the number is 839, draw a number line showing 820, 830, 840, and 850. Then mark 839 between 830 and 840. Explain to pupils, when you say round up to the nearest ten, it literally means nearest ten. Now ask the pupils, what is the nearest ten. When asked, they should be able to tell that the nearest ten to 839 is 840. Explain that the midpoint between tens is five, so if the number had been 834, it would have rounded down to 830. Ask them at this point if they have questions. If no one asks, explain that if the number is at the midpoint, meaning that it ends in five, then it goes up. Repeat this, but now round the same number up to the nearest hundred, using a number line again. Do it on the board, and explain that the midpoint for rounding to 100 is 50, so if a number ends in 50, or 51, then it goes up, but if it is 49, it will go down.

Let's try it

Present pupils with the following numbers:

1392	20035	749	3055	754	82950	82925	3333	355	450
25150	83923	2032	238	802	733	272	819	285	

Ask them to round each number up to the nearest ten and the nearest hundred. They need not draw forty number lines if they do not feel the need, and are able to do it mentally, but they should draw at least five.

Let's talk Math

Numbers are seen everywhere in our daily life. We find numbers on price tags, phonebooks, and house addresses. Numbers are also found as page numbers in a book, age, measuring length, weight, capacity, and many more. Ask pupils if the answers they gave during the Let's Begin discussion have changed. Do they think that any of what they learnt during this unit could improve their lives? Ask them to discuss thoughts and wait for Roman numerals to come up. Ask pupils how they feel about learning different kind of numbers. Do any of them use Roman numerals in their day to day lives? Give them 5 minutes at the end of the discussion so that they can write a reflective essay.

Let's get practical

Make teams of 3 pupil each.. The way that this activity will work is that a team will come to the front of the class, and two of the team members will get one sheet each. The sheet will have ten numbers, which will need to be rounded up (the sheet should mention if it is to the nearest ten or hundred, individually). The pupil who did not get a sheet will stand in the middle of the board, and the other two will stand at his sides. When you say go, the two with the sheets will turn around and they will write down the first number, rounded up. The middle pupil will then have to as quickly as possible, draw a greater or lesser sign in between the two rounded up numbers. They will have to do this fast, because each team will be timed, and whoever does it fastest will win.

Self Assessment

1.1 Roman Numbers
1.2 Even and Odd Numbers
1.3 Place Values
1.4 Numbers up to 100,000
1.5 Number Line
1.6 Comparing and Ordering Numbers
1.7 Estimation

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) What numbers are these? (VI, IV, XIII)
   a) 6, 4, 13
   b) 4, 6, 13
   c) 6, 4, 30
   d) 4, 6, 7

2) If a number ends in 0, then
   a) it is even
   b) it is Odd
   c) it could be either
   d) it could be non of the above

3) What is the missing symbol? 6 ☐ VI
   a) >
   b) <
   c) =
   d) ≠

Unit 2

Number Operations

2.1 Addition

i. Add numbers up to 4-digits with and without carrying vertically and horizontally.
ii. Add numbers up to 100 using mental calculation strategies.
iii. Solve real-life number stories up to 4-digits with and without carrying involving addition.

2.2 Subtraction

i. Subtract numbers up to 4-digits with and without borrowing.
ii. Subtract numbers up to 100 using mental calculation strategies.
iii. Solve real-life number stories up to 4-digits with and without borrowing involving subtraction.

2.3 Multiplication

i. Develop multiplication tables for 6, 7, 8, and 9.
ii. Multiply 2-digit numbers by 1-digit numbers
iii. Multiply a number by 0 and 1.
iv. Apply mental mathematical strategies to multiply 1-digit numbers to 1-digit numbers.
v. Solve real-life situations involving multiplication of 2-digit numbers by 1-digit numbers.

2.4 Division

i. Divide 2-digit numbers by a 1-digit number (with zero remainder).
ii. Apply mental mathematical strategies to divide 1-digit numbers by a 1-digit number.
iii. Solve real-life situations involving division of 2-digit number by a 1-digit number.

Plan Ahead:

2.1 Addition
2.2 Subtraction
2.3 Multiplication
2.4 Division

Allocate realistic time frame/number of periods to teach each topic as per requirement.

Before You Start:

Pupils are familiar with all the concepts introduced in this Unit i.e. addition with/without carrying and subtraction, with and without borrowing so this should more or less serve as a revision and a refinement of their skills. They are also familiar with multiplication and division to somes extent.

Watch Out For:

Since pupils are not as used to multiplication and division as they are to addition and subtraction, therefore, do not assume that they are comfortable with it. It would be a good idea to brush up on the multiplication tables for 2, 3, 4, 5, and 10. Mental math is also something the pupils should know how to do, but since this will be the first time they will not have the option of using paper, start with very simple sums to build confidence.

This Pairs with:

Math Lab 3, page 15 to 22.

Make Sure You Have:

Bowl Fake receipt

Chits

If They are Struggling:

Problems with this Unit will most probably come from a lack of practice, or a misunderstanding of the concepts. If a pupil is finding something difficult, help them through a series of easier questions, so that the concept becomes clear, and then gradually increase the difficulty. It is also a possibility that pupils might struggle to remember what they have learnt previously, so revising base concepts would be helpful. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at level 4 or above, move on to the next activity.

Let's Begin

By this time students know several number facts and are comfortable with addition, subtraction, multiplication, and division. Concepts such as multiplication being, a form of repeated addition, and division being a form of repeated subtraction, are used in everyday life. Ask pupils for examples where they use multiplication and division in real-life, or where do they see others use it. At first, they may think that they do not, so remind them that we make calculations every day without even realising it.

SLOs

2.1
i
ii
iii

Activity 1
20 min

Write the following on the board:

$$3819 + 2930$$

Point out that since these numbers are quite big, the equation looks difficult to solve, but when written vertically, not so much. Show pupils how to write addition vertically.

$$\begin{array}{r} {}^{1}3819 \\ +\ 2930 \\ \hline 6749 \end{array}$$

Explain the reason vertical calculation is much easier to solve is because they are not trying to do it mentally. Mental math is when you solve sums in your head, Calculating sums mentally helps when there are smaller numbers, however, with larger numbers it is always wise to use pen and paper and show the every step of your working. . Write up to five more equations on the board and allow pupils to volunteer to come to the board to write them vertically. These do not necessarily have to involve carrying. It makes sense to start with easier sums with only 2-digits number so that weaker pupils feel more comfortable with addition. Here are some recommended sums:

1 + 25 738 + 829
82 + 11 4271 + 2839
832 + 722

Let's try it

Have pupils attempt real-life number stories up to 4-digits, with, and without carrying, making sure they show their working. Here are some examples:

1) Jehanzeb is on a road trip. He stops to make coffee and sees that he still has to drive 628 kilometres. He has already driven 599 km. How many kilometres is his entire road trip?
2) Manal wants to buy a painting. She chooses one at the gallery that costs Rs 6975, but it is not framed. The gallery owner says he can have it framed and delivered to her house, but it will cost an additional Rs 2500. What will the total cost be if she takes this option?
3) Hashim writes for a magazine that pays him based on how long the article is. In June, he earned Rs 3085 from one article, and Rs 5950 from another article. What is the total amount Hashim will be paid in June?4) Hasnain forgets his wallet at home, so he borrows Rs 4999 from his friend to buy a video game, and 195 for snacks. When he gets home, how much money should he put aside to give to his friend?
5) Asad has a twin sister. For their birthday, they each get to choose a cake. Asad's cake costs Rs 2499, while his sister's cake costs Rs 1650. How much will his mother pay at the bakery?
6) Rida has Rs 3159. Her grandmother gives her Rs 2550. How much money does she have now?
7) Ansar goes out shopping for his wife's birthday. He buys a cake for Rs 1499, and flowers for Rs 1850. How much did he spend?

8) Aslam has a cupcake company. He has two customers who are both having a party on Saturday. One has ordered 925 cupcakes, and the other has ordered 588. On top of that, Ansar would like to make 13 extra for his staff since they will have worked so hard. How many cupcakes will he need to have ready by Saturday?

9) Laila goes grocery shopping with her parents. Her father takes one cart and fills it up with Rs 2896 worth of groceries, and her mother puts Rs 6097 worth of things in the other. What will their total be?

10) Tehreem takes her family out to a buffet dinner for her parents' anniversary. The total cost of what they ordered is Rs 1083, but there is also a set charge for them to attend the buffet, which is Rs 3996. What will the total cost of the dinner be?

SLOs

2.1
ii

Activity 2
15 min

For this activity, pupils will have to avoid writing. The following questions should be solved mentally. math. The way it will work is that you will write a sum on the board and wait for the pupils to solve it in their heads. Once they are done, write answers to each sum on the board and ask the pupils to compare them with their own. If they have different answers from yours, encourage them to point out what problems they are facing. Remind them that you are there to help, so if they get the wrong answers, they should let you know. Here are some sums you can use as mental math questions. Do not go higher than 100.

10 + 10	38 + 22
20 + 50	67 + 13
35 + 35	56 + 15
48 + 20	34 + 29
23 + 43	56 + 19

At the end of this activity, ask pupils if they have any tricks for mental calculation that they want to share.

Let's Pause

Pupils who did not get any right answers would benefit from practicing with 1-digit numbers. Once they get a hold of solving 1-digit numbers correctly, slowly incorporate more digits,, but do not go higher than 100 at this point.

Refer to the textbook for more sums and assign classwork.

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

SLOs

2.2
i
iii

Activity 3
20 min

Since pupils now have an understanding of vertical addition, write the following on the board:

8392 – 6397

Ask for volunteers who would be able to come to the front of the class and write this out vertically on the board. If you have a volunteer, help them write it out, and then solve it step by step, with the help of the class. It should look like this:

$$\begin{array}{r} {\scriptstyle 1\ \ 12\ 18\ 1} \\ 8\not{3}\not{9}2 \\ -\ 6\ 3\ 9\ 7 \\ \hline 1\ 9\ 9\ 5 \end{array}$$

Go over this enough times so that the class understands exactly how you got the answer. Then divide the class into two; group A and group B. Have one bowl of chits with random 4-digit numbers under 5000, and another with 4-digit numbers over 5000. Have group to choose chits from one bowl, and the group B from the other bowl. Then ask all members of group A to pair up with members of group B, so that each pair will have a number over 5000, and a number under 5000. Ask the pairs to come to the front of the class, and, carry out the subtraction of the bigger number from the smaller number. They should try to solve it as a pair, but if they are stuck, then the class should help them. Let the weaker students know it is okay to ask for help and allow them to pair up with more confident students. Encourage the abled students to be helpful as explaining an answer to someone is a good way for other pupils to learn and for them to revise.

Let's try it

Have pupils attempt real-life number stories up to four-digits, with, and without borrowing, making sure they show their working. Here are some examples:

1) Asim is going on a three-day hike that is 302 km. After three hours, he takes his first break, and a sign tells him he has 286 km left. How much did Asim walk in the first three hours?
2 Maria is given a gift card to a spa for her birthday. She goes to the spa and gets a massage for 4000. Since the value of the gift card will be removed from the bill, how much will Maria pay at the spa?
3) Faisal borrows Rs 1525 from Naveed. The next day, Faisal doesn't have enough money, so he gives Naveed Rs 725. How much more does Faisal have to pay?
4) A school has 2400 pupils. On average, every day 42 children are absent every day. How many pupils are present every day on average?
5) Faiza has 350 employees in her office. She has decided to move 80 to another branch. How many employees are left in the office?

SLOs		
2.2 ii	**Activity 4** 15 min	For this activity, pupils will have to avoid writing. The following questions should be solved mentally. The way it will work is that you will write a subtraction number sentence on the board wait for the pupils to solve it in their heads. Once they are done, write answers to each sum on the board and ask the pupils to compare them with their own. If they have different answers from yours, encourage them to point out what problems they are facing. Remind them that you are there to help, so if they get the wrong answers, they should let you know. Here are some sums you can use as mental math questions. Do not go higher than 100. 20 – 10 20 – 5 75 – 35 67 – 22 78 – 20 56 – 15 23 – 12 34 – 29 38 – 15 96 – 24 At the end of this activity, ask pupils if they have any tricks for mental subtraction that they want to share.
2.3 i	**Activity 5** 20 min	This pairs with Math Lab pages 15 to 18 Write the 6, 7, 8, and 9 multiplication tables, up to fifteen multiplication statements, on the board, but do not write the answers. Remind that pupil that 2 x 6 is equal to 6 x 2, that is the order in which the number are written does not change their product. Ask the pupil to raise their hands if them know the answers and the first one to raise their hand and answer correctly will get a point. Encourage them to keep track of their points, and whoever has the most wins. Once you are done completing the the multiplication tables, allow the students them to copy the tables down in their notebooks so that they can go over them at home, and also so they have a better chance of retaining them. Once they are written down, read them aloud with the class.

Let's try it

Ask pupils to solve some multiplication questions. Start with a few 1-digit numbers, and gradually move towards multiplying 1-digit numbers with 2-digit numbers. Show them how to multiply vertically.

Write on the board, 13 x 8 and ask the class if they can solve it quickly. Some might suggest simply adding thirteen 8 times, but tell them that there is a better way. Like vertical subtraction and addition, there is vertical multiplication. Solve the question on the board, step by step so that they can watch. It should look like this.

$$\begin{array}{r} {}^{2}13 \\ \times\ 8 \\ \hline 194 \end{array}$$

Have them try a few more on the board, as a class.

Assign thirty minutes of classwork from the textbook.

SLOs		
2.1 iii	**Activity 6** 10 min	Ask the class what happens if you multiply any number by 1. For example, what is 10 times 1. They should respond with 10, and now ask how they got to that answer. If they struggle to explain how they got the answer, you may remind them that multiplication is repeated addition. However, when a number is multiplied by 1, it not repeated and hence, remains the same. Then ask them what they think would happen if they multiply a number with zero. Allow them to discuss the possibilities as a class so that they can challenge each other to think deeper. Once they have all had a chance to express an opinion, explain that any number, when multiplied by 0, is always 0 equals 0.
2.3 iv	**Activity 7** 15 min	For this activity, pupils will have to avoid writing. The following questions should be solved with mental math. The way it will work is that you will write a number sentence on the board and and wait for the pupils to solve it in their heads. Once they are done, write answers to each sum on the board and ask the pupils to compare them with their own. If they have different answers from yours, encourage them to point out what problems they are facing. Remind them that you are there to help, so if they get the wrong answers, they should let you know. Here are some mental math questions using only 1-digit numbers. 6×5 0×9 2×2 2×8 4×2 6×6 3×0 9×9 6×1 7×4 At the end of this activity ask pupils if they have any tricks for mental multiplication that they want to share.
2.4 i ii iii	**Activity 8** 10 minutes	This pairs with Math Lab pages 19 to 22 Remind pupils that division is multiplication in reverse or, repeated subtraction. Give them a brief revision using $4 \div 2$, and go over it until they are all on the same page. For the activity, tell them you will be calling out numbers at random, and they will have to try to calculate either, mentally or on paper, what that number, divided by 2 is. Start with 1-digit numbers, and once the class is confident enough about the topic, call out an easy number, like twenty. Slowly make the numbers more difficult, but do not going over 2-digits number.

Let's try it

Assign some division questions so that pupils can practice. Make sure to keep to 1-digit numbers, with no remainder. Halfway through, ask pupils to stop using their notebooks, and try to do the calculations mentally. Here are some examples of questions. Since there are not a lot of 1-digit number division questions with no remainder, you may have to repeat some.

$5 \div 5$ $8 \div 4$ $3 \div 1$

$9 \div 3$ $6 \div 2$ $8 \div 2$

Let's talk Math

This Unit had a lot of focus on mental math. Ask pupils what they think of mental math, in terms of difficulty. If they say it was difficult, ask them why they think so. You may further discuss different strategies of carrying out calculation without the use of pencil or paper. Discuss the real-life applications of mental maths and allow them a couple of minutes to come up with a story of how they or one can use mental maths in their daily life. Allow pupils to narrate the stories they come up with, making sure they're short, and at the end of the discussion, ask them to take 5 minutes to write a reflective essay.

Let's get practical

Separate the class into groups of 4 to 5 pupils. Hand out fake receipts to them that look something like the following:

No. of Items	Item	Cost per Item	Cost for Items
☐	Banana	5	10
13	Pencil	10	☐
☐	Eraser	15	45
3	Book	20	☐
☐	Marker	4	☐
	Total cost		269
	Total Paid		300
	Change		☐

Ask them to fill in the blanks using whatever number operations they think might help. You might need to explain the categories to them.

Self Assessment

2.1 Addition

2.2 Subtraction

2.3 Multiplication

2.4 Division

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) Calculate the following mentally: 26 + 33.
   a) 69
   b) 59
   c) 70
   d) 50

2) Calculate the following mentally: 25 × 3.
   a) 75
   b) 65
   c) 80
   d) 100

3) Calculate the following: 81 ÷ 9.
   a) 9
   b) 10
   c) 12
   d) 7

Unit 3

Fractions

3.1 Common Fractions

i. Express the fractions in figure and vice versa.
ii. Match the fractions with related figures.

3.2 Proper and improper fractions

i. recognise proper and improper fractions.
ii. Differentiate between proper and improper fractions.

3.3 Equivalent Fractions

i. Identify equivalent fractions from the given figures.
ii. Write three equivalent fractions for a given fraction.

3.4 Comparing Fractions

i. Compare fractions with same denominators using symbols "<", ">, or, "=".

3.5 Addition of Fractions

i. Add two fractions with same denominators.
ii. Represent addition of fractions through figures.

3.6 Subtraction of fractions

i. Subtract fractions with same denominators.
ii. Represent subtraction of fractions through figures.

Plan Ahead:

3.1 Common Fractions
3.2 Proper and improper fractions
3.4 Equivalent Fractions
3.5 Comparing Fractions
3.6 Addition of Fractions
3.7 Subtraction of fractions

Allocate realistic time frame/number of periods to teach each topic as per requirement.

Before You Start:

Pupils already know that a fraction is a part of a whole. They are familiar with $\frac{1}{2}$ and $\frac{1}{4}$, as used in everyday life. They are gradually introduced to other fractions, starting with the simplest: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and, $\frac{1}{5}$ … With practical work, addition and subtraction of like fractions are also introduced.

Watch Out For:

Pupils might find it confusing that a fraction's denominator is not affected when added and subtracted, and may also not understand the difference between the numerator and the denominator.

This Pairs with:

Math Lab 3, pages 23 to 38.

Make Sure You Have:

Bowl	Chits
Chart paper	Coloured pencils in a pack
Boxes	Strips of paper

If They are Struggling:

Pupils have worked with fractions before, so it is unlikely that they will not be comfortable. Keep reminding them that fractions are numbers and so the calculations involved with them is no different from the calculation of regular numbers. For pupils who are quite stuck, ask them to take a moment to draw fraction discs, or fraction bars. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at level 4 or above, move on to the next activity.

Let's Begin

A fraction is a number that represents a part of a whole. The number below the fraction line indicates the number of equal parts a whole (or a collection) has been divided into. It is called the denominator. The top number above the fraction line indicates the number of certain equal parts are being referred. It is called the numerator. When the numerator and denominator are multiplied by the same number (except 0), we get an equivalent fraction. Fractions with the same denominator are called like fractions. In unlike fractions with the same numerator, the smaller the denominator, the greater is the value of the fraction. To add like fractions, add only the numerators. The denominator remains the same. To subtract a fraction from another like fraction, subtract the smaller numerator from the larger one. The denominator still remains the same.

SLOs

3.2
i
ii

Activity 1
10 min

Divide the class into pairs. Provide each pair with blank paper chits (4 to 5) Each pair will write some proper and improper fractions on the given blank chits and give it to the other pair. The other pair will now sort out the proper and improper fractions and place them in the tagged boxes accordingly. Make sure every pair has some fractions to sort into boxes. Check the boxes in the end for any wrong placements.

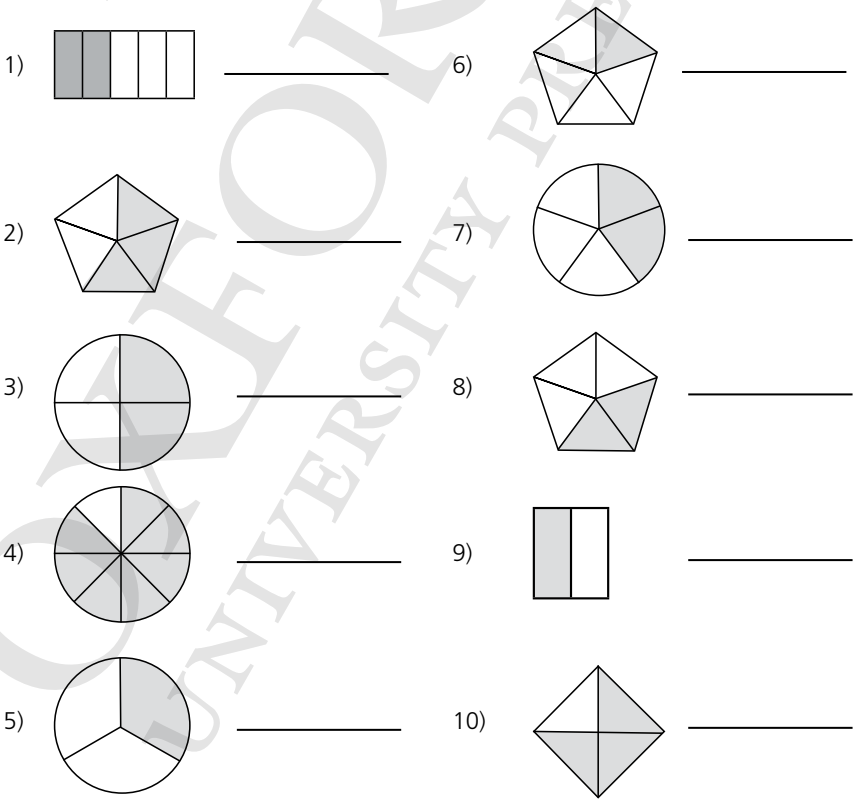
Assign 25 minutes of classwork from the textbook.

3.1
i
ii

Activity 2
15 min

This pairs with Math Lab pages 23 and 24

To familiarise the pupils with the concept of fractions as part-part-whole, draw the following on the board:



Go through them with the class and ask them to help you figure out which fractions apply to which shape. As homework, ask them to find one thing in their homes that they could use a fraction to describe. Remind them that this could be anything. The number of socks they have that are a certain colour (the fraction would be the number of coloured socks over the total number of socks), or even the number of males in their family out of the total number of family members.

Assign 25 minutes of classwork from the textbook.

SLOs

3.3
i
ii

Activity 3
15 min

Fill a bowl with chits with various fractions. Make sure there are both proper and improper fractions, but make sure that they can all be simplified so they have the same denominator. Ask each pupil to pick a fraction out of the bowl, and using a chart paper, create a drawing that they think illustrates their fraction. Then call pupils at random to the front of the class and ask them to hide their drawings. At the count of three, both pupils will hold up their chart papers, and the class will have to decide whose fraction is greater. The first one to have their hand up should answer the question.

Let's try it

Present a sifferent pairs of fractions and ask pupils to decide which is greater, lesser, or equal using the signs <, >, =. Make sure to only give them pairs with the same denominator, or that can be simplified to have the same denominator. Here are some examples below:

1) $\frac{5}{10}$ and $\frac{7}{10}$
2) $\frac{8}{32}$ and $\frac{25}{32}$
3) $\frac{20}{100}$ and $\frac{40}{200}$
4) $\frac{12}{3}$ and $7\frac{1}{3}$
5) $\frac{1}{2}$ and $\frac{2}{4}$
6) $\frac{27}{9}$ and $\frac{10}{18}$
7) $\frac{5}{35}$ and $\frac{11}{70}$

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

3.3
i
ii

Activity 4
10 min

Introduce students to other fractions with the use of strips of paper, coloured circles, or even a pack of coloured pencils. Use one shape at a time, but the same fraction must be demonstrated with different shapes, so that children see a fraction associated with any shape or any set of objects. Associate the fractions and fraction names.

2 equal parts:	2 halves in a whole
3 equal parts:	3 thirds in a whole
4 equal parts:	4 quarters in a whole
10 equal parts:	10 tenths in a whole
100 equal parts:	100 hundredths in a whole

Use this activity to explain equivalent fractions. Remind pupils that two quarters are one half, which is why $\frac{1}{4}$ is equal to $\frac{1}{2}$. Ask them for other examples of equivalent fractions.

Assign 25 minutes of classwork from the textbook.

Let's try it

Ask pupils to write down three equivalent fractions for the following:

$\frac{5}{10}$ $\frac{3}{9}$ $\frac{63}{70}$ $\frac{18}{25}$ $\frac{13}{15}$

SLOs

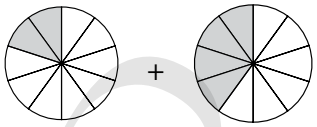
3.5
i
ii

Activity 5
15 min

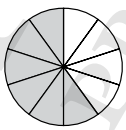
Write on the board:

$$\frac{2}{10} + \frac{4}{10}$$

Since pupils have not added fractions before, they will need help solving it. To help them, ask a volunteer to come to the front of the class and help them draw, fraction discs or fractions bars to represent each fraction. It should look like this:



Use such diagrams to explain how the addition works. Explain that when fractions have the same denominator, only the numerators are added and that using figures can make the addition easier to understand. The answer will be $\frac{6}{10}$, shown by:



Here pupils should be able to understand how only 6 out of the 10 equal parts are shaded. Solve up to five more addition sums on the board.

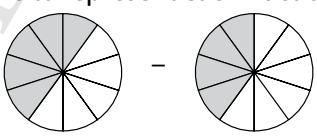
3.6
i
ii

Activity 6
15 minutes

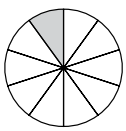
Write on the board:

$$\frac{5}{10} + \frac{4}{10}$$

Since pupils have not subtracted fractions before, they will need help solving it. To help them, ask a volunteer to come to the front of the class and help them draw, fraction discs or fractions bars to represent each fraction. It should look like this:



Use such diagrams to explain how the subtraction works. Explain that when fractions have the same denominator only the numerators are subtracted, and that using figures can make the subtraction easier to understand. The answer will be $\frac{1}{10}$ shown by:



Here pupils should be able to understand that removing 4 out of 5 shaded parts only leaves us with 1 shaded part (out of 10 equal parts). Solve up to five more subtraction questions using fractions of the same denominator on the board.

Let's talk Math

Fractions are used for baking. It is important to have precise measurements when cooking and often, even though we have units, we must be able to divide them accurately. Fractions can also help with portion size. Also point out that when we tell time in hours and minutes, or work with most units, we are constantly using fractions without even realising it, because a minute is $\frac{1}{60}^{th}$ of an hour. For all things that need to be measured precisely, like doctors' prescriptions to tell how much of a medicine to take, especially the quantity of syrup, fractions are needed. Games, like soccer, football, and basketball, are also split into halves and quarters, as they are the easiest way to divide something. Ask pupils to think about other instances in their lives where fractions may be present that they may not have realised. At the end of the discussion, give them 5 minutes to write a reflective paragraph.

Let's get practical

Distribute chart paper and ask pupils to cut out circles and take 5 minutes to draw pizzas. Make sure they have divided the pizza into 6 equal slices by drawing lines on the circle. Then ask each pupil to roll a six-sided dice and, having obtained a number between one and six, write that number on the back of the pizza, over 6. For example if the number on the dice was 2, the fraction on the back of the pizza would be $\frac{2}{6}$. This will signify that $\frac{2}{6}^{th}$ of the is leftover because four slices were eaten, so pupils should be sure to cross out the number of slices that have been eaten on their drawings. Once all the pizzas are done, organise them face down in a straight line so that all the fractions are visible. Each pupil should add all the fractions together, and using only the fractions, work out how many slices are leftover in total. Given that it is a long addition sentence, it will not be surprising if some of the class has varying answers. Once everyone has an answer, flip the pizzas so that the sides with the fractions are down, and count, out loud with the pupils, how many slices are left. See how many pupils were able to reach the correct answer using only the fractions.

Self Assessment

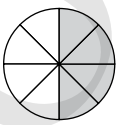
3.1 Common Fractions
3.2 Proper and improper Fractions
3.3. Equivalent Fractions
3.4 Comparing Fractions
3.5 Addition of Fractions
3.6 Subtraction of Fractions

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) What fraction correctly describes this circle?



a) $\frac{1}{2}$
b) $\frac{5}{10}$
c) $\frac{3}{6}$
d) All of the above

2) The given two fractions $\frac{3}{7}$ and $\frac{4}{7}$
a) are like fractions
b) are unlike fractions
c) are mixed fractions
d) are equal fractions

3) Choose an equivalent fraction for $\frac{5}{6}$.
a) $\frac{5}{60}$
b) $\frac{50}{6}$
c) $\frac{10}{12}$
d) All of the above.

Unit 4

Measurement: Length, Mass, and Capacity

4.1 Length

i. Use standard metric units of length (kilometre, metre, and centimetre) including abbreviations.
ii. Add measures of length in same units without carrying.
iii. Solve real-life situations involving same units of length for addition without carrying.
iv. Subtract measures of length in same units without borrowing.
v. Solve real-life situations involving same units of length for subtraction without borrowing.

4.2 Mass

i. Use standard metric units of mass (kilogram and gram) including abbreviations.
ii. Add measures of mass in same units without carrying.
iii. Solve real-life situations involving same units of mass for addition without carrying.
iv. Subtract measures of mass in same units without borrowing.
v. Solve real-life situations involving same units of mass for subtraction without borrowing.

4.3 Capacity

i. Use standard metric units of capacity (litre and millilitre) including abbreviations.
ii. Add measures of capacity in same units without carrying.
iii. Solve real-life situations involving same units of capacity for addition without carrying.
iv. Subtract measures of capacity in same units without borrowing.
v. Solve real-life situations involving same units of capacity for subtraction without borrowing.

Plan Ahead:

4.1 Length
4.2 Mass
4.3 Capacity

Allocate realistic time frame/number of periods to teach each topic as per requirement.

Before You Start:

The pupils are able to solve word problems involving addition and subtraction with length, weight, and capacity. (They are already familiar with the use of the four operations). Now they will learn to add and subtract the units of measurement by carrying the smaller unit to the bigger unit and borrowing from the bigger unit.

Watch Out For:

Avoid moving too quickly with this unit. Although pupils are familiar with all the mathematical concepts, they have a lot of new terminologies given to them, which can be intimidating.

This Pairs with:

Math Lab 3, page 39 to 40.

Make Sure You Have:

Water containers	Weights
Metre ruler	Measuring cups

If They are Struggling:

Pupils may need to revise the abbreviations at the start of each lesson. A good idea would be to put up a chart paper in the classroom, for the duration of this unit so that pupils can refer to it. Seeing it regularly will also help them retain it. You might like to use flashcards to reinforce them. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at level 4 or above, move on to the next activity.

Let's Begin

Measurement is very important in every day life. It helps one be truly aware of their surroundings. Ask pupils what comes to mind when they think of measurement? Who are measurements important for? The class will probably list professions that make use of measurements, but prompt them to discuss how almost everyone uses measurement in one way or another. Ask them why they think measurement has become so significant. After they have each volunteered their answers, ask them to think of an instance where they have tried to guess instead of properly measuring, for example, adding too much of a particular ingredient when baking. If they do not have any such personal experiences, ask them to think of anyone they know who has.

SLOs

4.1
i
ii
iii

Activity 1
10 min

This pairs with Math Lab pages 39 and 40

Remind the class of the abbreviations; km, m, and cm. Give them an example of each, perhaps showing them 2 centimetre and a metre on a metre ruler. For one kilometre, it might be a good idea to point out a distance between two things which are one km apart. Tell them that as a class activity, you will be reading out number stories, one at a time, as pupils come to the board in pairs. One of the pairs will have to construct a number sentence, using units, and the other pupil in the pair will have to solve the number story, and thereby the number sentence, writing their answer on the board, being sure to include the units. Try to make the stories as realistic as possible, and avoid addition that requires carrying.

Let's try it

Ask pupils to solve up to 20 addition questions using units like km, m, or cm. Here are some examples. Avoid carrying, and you may also refer to the textbook for more questions.

20 m + 35 m	60 km + 5 km
30 cm + 68 cm	305 cm + 70 cm

4.1
iv
v

Activity 2
20 min

Tell pupils a number story that involves subtraction and metres, centimetres, and kilometres. Repeat activity 1 with subtraction until they are comfortable, avoiding borrowing. Then, give the class 5 minutes, asking each pupil to come up with their own number story, preferably drawn from a real-life experience. Ask the class to listen as each pupil reads aloud their real-life example, which the other pupils should solve in their notebooks, while making sure to make note of the number sentence. Tell pupils that the subtraction should not require borrowing. At the end, ask pupils to peer review.

4.2
i
ii
iii

Activity 3
10 min

Remind the class of the abbreviations; kg and g. Give them an example of each, perhaps showing standard weights that they can pass around a class. Tell them that as a class activity, you will be reading out number stories, one at a time, as pupils come to the board in pairs. One of the pairs will have to construct a number sentence, using units, and the other pupil in the pair will have to solve the number story, and thereby the number sentence, writing their answer on the board, being sure to include the units. Try to make the stories as realistic as possible, and avoid addition that requires carrying.

SLOs

4.2
iv
v

Activity 4
20 min

Tell pupils a number story that involves subtraction and weight units. Give the class 5 minutes, asking each pupil to come up with their own number story, preferably drawn from a real-life experience. Ask the class to listen as each pupil reads aloud their real-life example, which the other pupils should solve in their notebooks, while making sure to make note of the number sentence. Tell pupils that the subtraction should not require borrowing. At the end, ask pupils to peer review.

4.3
i
ii
iii

Activity 5
10 min

Remind the class of the abbreviations; l and ml. Give them an example of each, showing water containers and telling them their capacity. Tell them that as a class activity, you will be reading out number stories, one at a time, as pupils come to the board in pairs. One of the pairs will have to construct a number sentence, using units, and the other pupil in the pair will have to solve the number story, and thereby the number sentence, writing their answer on the board, being sure to include the units. Try to make the stories as realistic as possible, and avoid addition that requires carrying.

Let's try it

Ask pupils to solve up to 20 addition questions using units like kg or g. Here are some examples. Avoid carrying, and you may also refer to the textbook for more questions.

2 kg + 35 kg 27 kg + 11 kg
21 g + 68 g 42 kg + 5 kg
403 g + 60 cg

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

SLOs

4.3
iv
v

Activity 6
20 min

Draw three swimming pools on the board. Tell pupils that the smallest one has 50 litres, the middle one has 100l, and the largest has 300l. If a family of three is planning on going swimming in all three pools, and they are planning on splashing a lot of water, ask pupils to figure out how much water will be left in the pools. Explain that the father splashes out 5 litres of water in every pool, while the mother splashes out 3 litres. The child splashes much more than his parents so he splashes out 8 litres. After the family has played in all three pools, ask the class to figure out how much water will be left in each pool. Once it is solved, ask the class to come up with their own number stories involving l and ml.

Let's try it

Ask pupils to solve up to 20 addition questions using units like or, ml. Here are some examples. Avoid carrying, and you may also refer to the textbook for more questions.

30 l + 6 l 40 m l + 45 ml
60 ml + 5 ml 305 l + 73 l
84 ml + 15 ml

Let's try it

A zoo is closing and is transporting its animals in containers to various locations. Currently they have five containers, containing five animals each. The weight of each container is as follows:

Zebras – 1200 kg

Tigers – 600 kg

Apes – 450 kg

Giraffes – 4000 kg

Meercats –480 g

Today they will be offloading two zebras who weigh 250 kg and 300 kg, one tiger who weighs 180 kg, three Apes who weigh 150 kg, 70 kg, and 60 kg, two giraffes who weigh 890 kg and 920 k, and one meercat who weighs 70 g. How much will each container weigh once these animals have offloaded?

Let's talk Math

Ask pupils if they know how tall they are. And how tall the were last year. If they do not, ask them if their parents keep track. Some might say yes. Explain that keeping track of your height and the amount and speed that it changes at every year is something important that people do. Our heights are a significant identifying feature. Measurement allows us to document and record things, and also to recreate exact proportions. For example, if you made an amazing cake, and wanted to tell your friend the recipe, standard units would allow them to recreate what you made exactly, whereas non-standard units could potentially lead to a completely different creation.

Let's get practical

Make the class into groups of 3 to 5 pupils. Hand out various water containers at random, making sure to give at least one to each student, and a measuring cup to each group. Ask each them to each calculate the total capacity of all of their containers. This means that they will have to use the measuring cup to determine the capacity of each bottle, by seeing how many times it needed to be filled. Once they have calculated a total, ask them to show their work, as well as the individual capacities of the containers. Be mindful that no water is wasted, rather use it water some plants in the school garden.

Self Assessment

4.1 Length

4.2 Mass

4.3 Capacity

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) If Maryam has a a 30 kg suitcase, and her sister has a 25 kg suitcase, how much more does Maryam's suitcase weigh?
   a) 5 kg
   b) 5 g
   c) 25 kg
   d) 10 kg

2) What does kg measure?
   a) Capacity
   b) Mass
   c) Distance
   d) Time

3) What does the unit *l* measure?
   a) Capacity
   b) Mass
   c) Distance
   d) Time

Unit 5

Time

5.1 Time

i. Use a.m. and p.m. to record the time from 12-hour clock.
ii. Read and write time from analogue and digital clocks.
iii. Read and write days and dates from the calendar.
iv. Add measures of time in hours
v. Solve real-life situations involving measures of time for addition of hours.
vi. Subtract measures of time in hours.
vii. Solve real-life situations involving subtraction of measures of time in hours.

Plan Ahead:

5.1 Time

Allocate realistic time frame/number of periods to teach each topic as per requirement.

Before You Start:

Pupils should be comfortable with digital and analogue clocks, and will be able to read time, but have no experience calculating with it.

Watch out for:

Pupils will need to get used to the idea that the numbers pointed to by the minute hand need to be multiplied by 5. Memorising the 5 times table might make this easier.

This Pairs with:

Math Lab 3, page 42 to 50.

Make Sure You Have:

Analogue Clock Calendar
Digital Clock

If They're Struggling:

Pupils are familiar with the clock-face and know how to read time half past the hour, quarter past the hour and on the hour. They have a fair idea about simple fractions and are able to skip-count in fives. Pupils can read time in hours, and, with some help, in minutes. With a little practice, they will be able to use a.m. and p.m. and read the clock face accurately. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at level 4 or above, move on to the next activity.

Let's Begin

Ask pupils what role planning plays in their lives. Do they like to plan, or do they find it difficult? Ask them to come up with examples of how planning has or has not improved their lives. Ask them if they think it would be possible to plan ahead all the time. Ask pupils to get creative and think of other ways of measuring time.

SLOs

5.1

i

ii

Activity 1

10 min

Hold up an analogue clock in front of the class and ask them what time it shows. Then do the same with a digital clock. Ask pupils if they think that they should write a.m. or p.m. in front of these times. Discuss how one would be able to tell if the time could be distinguished as either. Point out that we can tell this by looking at the sky, or by thinking about how much of the day has gone by. Let them know that a.m. is for the first half of the day, and p.m. is for the second half.

Let's try it

This exercise is for pupils to complete individually at their desks. Hold up an analogue and digital clock (separately) to show six different times on each clock. Pupils should make note of the time shown, and once they have all of them written down, they should make note of what they do, at that particular time, on a regular day, both a.m. and p.m. For example, if the time is 4:30, then 4:30 a.m. would be for sleeping, and p.m. would be, perhaps for homework, or for playing.

5.1

iii

Assign 15 minutes of classwork from the textbook.

Activity 2

15 min

This pairs with Math Lab pages 42 to 44

Compile a list of all the pupils' birthdays and share it with the class. Make groups of 3 to 5 pupils and ask them to use a calendar to figure out what day of the week each of their classmates' birthdays fall on. Ask them to make a table that includes all the pupils.

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

SLOs

5.1
iv
v

Activity 3
20 min

Using an analogue clock, set the time to 1. Ask pupils what time it shows. After they give you the answer, ask them what time it would be three hours after this. Then, pointing at the numbers on the clock, count three ahead, and get to 4. Point out that calculating a later time is the same as addition. Move the clock forward to 4 and ask for a few more calculations. Move to the board and start to write out the calculations like number sentences. Give pupils up to 20 questions that require them to add time in measures of hours, to solve as a class. Here are a few examples of questions you can ask.

1) 1 o'clock + 3 hours
2) 7 o'clock + 5 hours
3) 6 o'clock + 12 hours
4) 4 o'clock + 8 hours
5) 5 o'clock + 5 hours
6) 9 o'clock + 6 hours
7) 8 o'clock + 8 hours
8) 12 o'clock + 14 hours
9) 12 o'clock + 13 hours
10) 8 o'clock + 9 hours

Make sure to explain the difference between 12 am and 12 pm.

Let's try it

Present pupils with a series of real-life scenarios involving the addition of hours to solve individually. They should develop the problems into number sentences, and solve them as equations, making sure to write a.m. or p.m.

Here are some examples scenarios you can give them:

1) If Alina gets to work at 8 a.m., and leaves 2 hours later, what time will she leave?
2) At a bakery, they allow the dough to sit at room temperature for three hours before baking it. If the three hours started at 5 p.m., when will it go in the oven?
3) Haider asks his mother if he can visit his friend for 6 hours so that they can have a movie marathon. If Haider is dropped off at 11 a.m., what time will he be picked up?
4) Jehanzeb is going on a long road trip by himself and decides to share his location with his family. At 6 a.m., he shares his location for 5 hours. At what time will the location expire?
5) A machine in a factory can run for 7 hours before it has to charge. If it is turned on at 4 o'clock when will it need to charge?

Assign 15 minutes of classwork from the textbook.

SLOs

5.1
vi
vii

Activity 4

20 minutes
Analogue clock

Hold up an analogue clock and ask pupils if they would be able to subtract using hours. Explain that just like addition, where they counted forward on the clock, to subtract they just need to count backwards on the clock. Solve the following questions on the board:

1) 2 o'clock – 5 hours
2) 12 o'clock – 12 hours =
3) 6 o'clock – 6 hours
4) 4 o'clock – 10 hours =
5) 5 o'clock – 5 hours
6) 9 o'clock –12 hours =
7) 8 o'clock – 10 hours
8) 11 o'clock –14 hours =
9) 12 o'clock –13 hours
10) 7 o'clock – 9 hours =

Make sure all the pupils are participating in the solution.

Let's try it

Present pupils with a series of real-life scenarios involving the subtraction of hours to solve individually. They should develop the problems into number sentences, and solve them as equations, making sure to write a.m. or p.m.

Here are some examples scenarios you can give them:

1) If at 10 a.m. you have been awake for 3 hours, what time did you wake up?
2) At 8 p.m. Ali and his mother finish making dinner for their family. It took them 5 hours to do all the prep and cooking, so what time did they start?
3) Alam is 2 hours late to school because he is having car trouble. If he reached school at 10 a.m. what time did school start?
4) Two flight land on the same day at the same airport, only 7 hours apart. The second one lands at 4 p.m. What time was did first one land?
5) Hassan is staying up late to finish some work that it will take him 9 hours to do. He finishes at 4 a.m. so what time did he start?

Let's talk Math

In the unit opener, pupils discussed alternate ways of measuring time, and how to plan ahead without using time. They also discussed whether time made their lives difficult or easier. Ask the class if any of them have changed their minds after having learnt more about time. At the end of the discussion, allow 5 minutes so that they can write a reflective paragraph about what the learnt.

Let's get practical

Ask pupils to create a week planner showing the days of the week, and the dates, showing a timetable for each day. Make sure that there are exactly 7 days on each calendar, and that every hour of the day is shown. Encourage creativity and accuracy, where the dates are concerned.

Self Assessment

5.1 Time

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) If Alia has kept a fast for 14 hours, and her fast opened at 7 p.m. what time did she start?
   a) 6 a.m.
   b) 5 a.m.
   c) 10 a.m.
   d) 9 a.m.

2) Hassan's mother says he needs to wait two hours after eating to swim. He finishes his lunch at 2pm, so what time can he swim?
   a) 4 p.m.
   b) 5 p.m.
   c) 4 a.m.
   d) 12 noon

3) If Arshad says he has dinner at 7, would he mean:
   a) p.m.
   b) a.m.
   c) It could be either
   d) 20:00

Unit 6

Geometry

6.1 Geometrical Shapes

i. Draw and measure line segments to the nearest centimetre and millimetre.
ii. recognise point, line, ray, and line segment.
iii. Classify figures according to number of sides as quadrilaterals (rectangles, squares, and triangles).
iv. Calculate perimeter of square, rectangle, and triangle.
v. Identify centre, radius, and diameter of a circle.

6.2 Symmetry

i. Identify reflective symmetry in two- dimensional (2-D) shapes.
ii. Identify and draw lines of symmetry.

6.3 Three Dimensional (3-D) Objects

i. Describe 3-D objects (cubes, cuboids, and pyramids) with respect to the number of edges and faces.
ii. Differentiate 3-D objects (cubes, cuboids, and pyramids) with respect to the number of edges and faces.

Plan Ahead:

6.1 Geometrical Shapes
6.2 Symmetry
6.3 Three Dimensional (3-D) Objects

Allocate realistic time frame/number of periods to teach each topic as per requirement.

Before You Start:

Pupils are already familiar with shapes, and measurement. They should be comfortable using units and making calculations. They also know how to draw lines correct to a certain measure.

Watch Out For:

Many new concepts are introduced in this unit and there may be confusion about why a circle is measured differently from other shapes. Although perimeter is new, the level of it in this unit should not be too challenging as long as you move slowly. For both these things, pupils simply need to become familiar with the ideas and practice will facilitate this.

This Pairs with:

Math Lab 3, page 45 to 54.

Make Sure You Have:

Tape measure A4 sheet Rulers Large graph paper Chits

If They're Struggling:

Since it will be difficult to remember how to differentiate between different kinds of lines, it may help to put up labelled displays that show all of them, and also to relate them to real life. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at level 4 or above, move on to the next activity.

Let's Begin

Ask pupils about the geometry they have studied previously. Ask them if they have used it at all in their lives. If they say yes, ask for examples, but if they say no, ask them if they think that is because their lives do not involve geometry, or that the geometry that they have learned so far is not helpful. Can they think of any examples of people who do need to use geometry in their daily lives, or at all? To remind them about the shapes they have learned, take five minutes for the class to play I spy with shapes, by spotting shapes around the classroom.

SLOs		
6.1 i	**Activity 1** 10 min	Pass a set of rulers around the class that show centimetres and millimetres. Explain to the class that a millimetre is a tenth of a centimetre. Allow them to get an idea of both measurements by looking at the rulers, and once they are done, divide the class into 2; group A and group B. Provide pupils of both groups with A4 sheets, and give ten different measurements to each side in centimetres and millimetres. Ask them to draw line segments correct to those measurements, but do not label them. Collect all the sheets, keeping group A's separate from group B's, and then distribute all of group A's sheets to group B, and vice versa. Once each pupil has received a sheet with lines already drawn on it, they should use their ruler to measure each line, and draw another line of the exact same length on the other side of the sheet, and label it by length. At the end of this activity, each group should have identical sheets. Ask group members to stand and read out the lengths they have measured and ask if anyone has anything different.
6.1 ii	**Activity 2** 10 min	This pairs with Math Lab pages 45 to 48 On the board, draw a line, a ray, a point, and a line segment. Go one by one and ask pupils if they can identify any of them. Start with the line, which pupils will probably correctly identify, and then move on to the point. Some may call it a dot, so correct them that it is a point. When you get to the segment and the ray, pupils might not be able to differentiate between them and a regular line. Explain that a line segment is a part od section of a line that lies between two points. It can not be extended any further from either side. A ray is a line that starts at a point and extends indefinitely. It can be extended in one direction only. Now you will come back to the line. Pupils will have previously correctly identified it as a line but will not know what its defining characteristics are. A line can be extended infinitely in either direction.

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

SLOs		
6.1 iii	**Activity 3** 10 min	Draw on the board, a square, a rectangle, and a triangle. Ask pupils to identify the number of sides for each one. Point at each shape one by one, allowing the class to call out the answer. After they've all jotted down their notes, point out that both the square and the rectangle have 4 sides. Ask pupils if they know what a four-sided shape is called. Clarify that you mean any shape with four sides, even if it is not a square or a rectangle. If anyone knows the word quadrilateral, allow them to do their best to explain it to the rest of the class. Once they finish, add any information they left out. If no one knows, then explain that "quad" means 4, and quadrilateral refers to a figure with four sides. Be very clear that this is the only characteristic for a shape to identify as a quadrilateral. Ask each pupil, to draw a quadrilateral in their notebooks. It could be a square or a rectangle, or it could be something from their imagination. If it has four sides, it is a quadrilateral.
6.1 iv	**Activity 4** 15 min	Place a large sheet of graph paper on the ground. Ask pupils to gather around and draw square on the paper, making sure to align it with the graph. Then ask them to count the number of squares on each side so that you can label them. Now explain that perimeter is the boundary of a closed shape. To find the perimeter of a shape, start from a point and add all sides clockwise or anti-clockwise until you reach the point from where you started. Add all the sides, out loud along with the class, and when you get to your total, explain that it is the perimeter. Make squares, rectangles, and triangles of different sizes on your classroom's floor using tape and mark them A, B, C, and so on. Divide the class into groups of 4. Write A, B, C etc. on chits, fold them, and ask each group to pick one chit. Each group will calculate the perimeter of the composite shape mentioned on their chit. Two groups can be given the same shape as well so that they can compare their answers in the end.

Let's talk Math

Area and perimeter play an important role in our daily lives. Whenever we want to cover a room's floor with tiles or carpet, we need to calculate the area of the floor. Similarly, in construction of any building or any infrastructure we need to know its perimeter and area. Ask pupils if they can think of any uses of perimeter in real-life. At the end of the discussion, allow five minutes so that they may write a reflective paragraph about what they learnt in this unit.

Let's get practical

Ask each pupil to choose a room in the school that is easily accessible. Allow them some time to go into the rooms and get measurements. They will need a tape measure. Explain that they should make a rough drawing of the shape of the room in their notebooks and add measurements as they collect them. Once they have all the sides, they may come back to class and work out the perimeter of the room.

Self Assessment

6.1 Geometrical Shapes

6.2 Symmetry

6.3 Three Dimensional (3-D) Objects

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) Which of the following is this line? (Draw a ray on the board)
   a) Ray
   b) Line
   c) Line Segment
   d) None of the above

2) Which of following statement is not true for a rectangle?
   a) three-sided figure
   b) four-sided figure
   c) shape with all straight lines
   d) has four right angles

3) Which of the following is not a part of circle?
   a) Radius
   b) Diameter
   c) Circumference
   d) Angle

Unit 7

Data Handling

7.1 Data Representation

i. Representation of data by
   - Carroll diagram
   - Tally chart

ii. Read and interpret a Carroll diagram and tally chart.

iii. Read and interpret picture graph.

Plan Ahead:

7.1 Data Representation

Allocate realistic time frame/number of periods to teach each topic as per requirement.

Before You Start:

Pupils have not handled data representation yet. Therefore, they need to introduce them with what data is. They need to be able to gather, record and understand different information (data) provided to them.

This Pairs with:

Math Lab 3, page 54 to 55.

Make Sure You Have:

Chart paper

Building blocks

If they're Struggling:

Pupils will need to relate the idea of data handling to their real lives. They will also need to understand that collecting data is just like making a list, and the different kinds of diagrams only offer different ways to do that. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at level 4 or above, move on to the next activity.

Let's Begin

Ask pupils how many siblings each of them have in their family. As they answer, create a tally chart to show the total number of siblings in the class. Explain that a tally chart is used to keep track of how many of something there are. The tallies will be easier to count because they are in fives, much like an analogue clock.

SLOs

7.1
i
ii

Activity 1
20 min

Create groups of up to five pupils and hand out building blocks. Ask the class, as a whole to find something that they think they could use to create a collection of data. This would have to be a question for their classmates, like the one used in the Let's Begin. For example, how many books has everyone in the class read this year, or how many pencils does everyone have in their pencil cases. Encourage pupils to be creative and use their imagination, but keep the values low. Once they have collected their information, ask them to count it out in blocks. So, for example, the question is of how many pencils they each have, each group will count up the total number of pencils they have between them, and put that number of blocks at the front of the class. Once every group has put their blocks, ask the class what the total number of blocks is. How many pencils does the class have altogether. They will not be able to say without counting the blocks by hand. Now write the same data on the board, in the form of a tally chart, by asking groups to tell you one by one, how many pencils there are. Once it is done, point out how much quicker it is to read the tally chart, and explain that this is why we use charts and graphs.

Let's try it

Ask each pupil to choose a story book that they feel they could find enough data in to create a tally chart. Ask the pupils to construct them on chart paper and write on top which story they have based it on, and what it shows. Once they are done, put them up around the class, and allow them to explore each other's approaches.

7.1
i

Activity 2
10 min

This pairs with Math Lab page 55

A Carroll diagram is a chart with four squares that can sort things into two different categories based on their characteristics or properties. Ask pupils to come up with something in the classroom that could be sorted into two categories. One example is glasses and gender. Create a Carroll diagram on the board, and on the top two squares write "girls" and "boys" and on the side, write "glasses" and "no glasses". Now fill it in the squares with pupils' names, asking them to help you. As homework, ask them to create a Carroll diagram in their notebooks to show data that they have collected in their daily lives.

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

Let's Pause	Carroll diagrams are rectangular tables that show data in a positive or negative way. They are named after the celebrated Lewis Carroll, pen name of the author of Alice in Wonderland. He was a mathematician whose interest lay in symbolic logic.

SLOs

7.2
iii

Activity 3
10 min

Explain to pupils what a picture graph is and draw the following on the board:

Day	Oranges picked
Day 1	
Day 2	
Day 3	
Day 4	
Day 5	
 = 15 Oranges	

Help pupils interpret this picture graph to answer pupils the following questions.

1) How many oranges did the farmer pick on the fourth day

2) Which day did the farmer pick the most oranges?

3) Which days did the farmer pick the same amount of oranges?
How many did he pick in total on both of those days?

4) What is the difference between the number of oranges picked on Day 3 and Day 4?

5) How many oranges in total did he pick for this season?

SLOs

7.2
iii

Activity 4
10 min

Prepare a data sheet for the pupils, like the following:

Favourite games	Numbers of students
Football	9
Tennis	3
Volley ball	5
Cricket	8

Ask them, as a class, to construct a picture graph on the board. Ask them to compare these to tally charts and Carroll diagrams, and discuss how different ways of representing data are chosen based on the data they have to represent.

Let's talk Math

Ask pupils what the purpose of using charts and diagrams is. Ask them to think about whether they have ever used them before. Remind them that even if they haven't seen all of them, they surely must have seen a picture graph. Discuss whether these diagrams make it easier to work with data or add another step. As they discuss this, point out that using a chart for small numbers may seem unnecessary, but for larger numbers that are difficult to keep a track of, charts are required. What kind of things in real-life would be easier with a figure to represent the data? And do any of the pupils have things in their lives that they think could be organised with a chart? At the end of the discussion allow the class 5 minutes to write a reflective paragraph.

Let's get practical

Ask pupils to collect data as homework for a Carroll diagram. It must be real, and it must be drawn from personal experience. Give them a few examples to get them thinking. They could categorise their clothes, or relatives, into any two categories. Ask them to bring their data to class, and each construct a Carroll diagram in class. Once they are done, ask them to show their diagrams to the rest of the class to make sure that it can be interpreted easily.

Self Assessment

7.1 Data Representation

Refer to If they are struggling	Confusion level	1 – Does not understand any concept	2 – Does not understand most of the concepts	3 – Understands some concepts but has questions	4 – Understands all the concepts, just needs more practice	5 – Feels confident solving questions	If pupil is below 3 use Math Lab
	Number of Pupils						

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) Which of the following would be suitable to show with a picture graph?
   a) The number of people in a school
   b) The number of boys and girls in a class
   c) The number of siblings each pupil has
   d) None of the above

2) A Carroll diagram is?
   a) a diagram that divides objects into two groups
   b) a diagram that divides objects into four groups
   c) a diagram that lists the number of things
   d) a diagram that is represented by bars

3) To recognised a large data, the best options would be a?
   a) tally chart
   b) picture graph
   c) carroll diagram
   d) bar graph

NEW

COUNTDOWN

BOOK 3

Lesson plans to be used in conjunction with the New Countdown book series.

Features of the Lesson Plan

The lesson plan contains the following features. The headings through which the teachers will be led are explained as follows:

Suggested Time Frame

Timing is important in each of the lesson plans. The guide will provide a suggested time frame. However, every lesson is important in shaping the behavioural and learning patterns of the students. The teacher has the discretion to either extend or shorten the time frame as required.

Learning Curve

It is important to highlight any background knowledge of the topic in question. The guide will identify concepts taught earlier or, in effect, revise the prior knowledge. Revision is essential, otherwise the students may not understand the topic fully. The initial question when planning for a topic should be how much do the students already know about the topic? If it is an introductory lesson, then a preceding topic could be touched upon, which could lead on to the new topic. In the lesson plan, the teacher can note what prior knowledge the students have of the current topic.

Each topic is explained in detail by the author in the textbook supported by worked examples. The guide will define and highlight the specific learning objectives of the topic. It will also outline the learning outcomes and objectives.

Real-life Application

Today's students are very proactive. The study of any topic, if not related to practical real-life, will not excite them. Their interest can easily be stimulated if we relate the topic at hand to real-life experiences.

Frequently Made Mistakes

It is important to be aware of students' common misunderstandings of certain concepts. If the teacher is aware of these they can be easily rectified during the lessons. Such topical misconceptions are mentioned to support teachers.

Summary of Key Facts

Facts and rules mentioned in the text are listed for quick reference.

Suggested Activities

This teaching guide provides you enough hands on activities for making your lesson plan more interesting and engaging. These activities will have more impact on students' learning.

Model Lesson Plan

Planning your work and then implementing your plan are the building blocks of teaching. Teachers adopt different teaching methods/ approaches to a topic.

A model lesson plan is provided in every unit as a preliminary structure that can be followed. A topic is selected and a lesson plan is written under the following headings:

Topic

This is the main topic/sub-topic.

Duration

The suggested time duration is the number of periods required to cover the topic. Generally, class dynamics vary from year to year, so flexibility is important.

The teacher should draw his/her own parameters, but can adjust the teaching time depending on the receptivity of the class to that topic. Note that introduction to a new topic takes longer, but familiar topics tend to take less time.

Specific Learning Objectives

This identifies the specific learning objective/s of the sub-topic being taught in that particular lesson.

Key Vocabulary

List of mathematical words and terms related to the topic that may need to be pre-taught.

Resources: Teaching and Learning Aids (Optional)

This section includes everyday objects and models, exercises given in the chapter, worksheets, assignments, and projects.

Strategy

Starter: Engagement Activity

The lesson can begin with something interesting, such as telling a story, relating a real-life experience or an everyday event which may or may not lead to the topic; but is interesting enough to capture the attention of the students. Involving students in a discussion to find out how much knowledge they have of the topic being taught is also a good strategy. Teachers can use their own creativity to come up with ideas to create a sense of fun.

Main Developmental Activity

Learning needs to start with practical activities, therefore the main developmental activity is the first step that leads to actual learning, which in turn leads to the required outcome of the lesson. This activity can be planned as individual work, pair or group work as per requirement. Working individually creates self-confidence where the child enjoys a sense of self-achievement, whereas pair and group activities create a sense of discovering and learning together.

These activities enhance concentration and improve retention of memory. Through these activities the teacher can build understanding of concepts in a fun-filled way. It is easier for students to grasp the concepts and then move from abstract to concrete.

Written Assignments

Finally, written assignments can be given for practice. It should be noted that classwork should comprise sums of all levels of difficulty, and once the teacher is sure that students are capable of independent work, homework should be handed out. For continuity, alternate sums from the exercises may be done as classwork and homework.

Supplementary Work (Optional): An activity or assignment could be given. It could involve group work or individual research to complement and build on what students have already learnt in class.

The students will do the work at home and may present their findings in class.

Wrap up

At the end of each sub-topic, a wrap up should be done using various strategies. For example, a quick question and answer session involving the whole class, challenging students with a question to check their understanding of the concept taught.

1 Whole Numbers

Suggested Time Frame

10-12 periods

Learning Curve

Students have already learnt to identify the place value of numbers up to 3 digits. In the light of their previous knowledge, they will read and write numbers up to 6 digits. In Grade 3 they have learnt to write 3-digit numbers in expanded form, they have also ordered and compared 2-digit and 3- digit numbers. Now, they will learn to read and write numbers up to 6 digits in numerals and words. They will also be able to compare two numbers using symbols, write numbers in ascending and descending order, represent and identify a given value of number on a number line.

They may have seen the Roman numbers on clocks and watches. They learn about the letters of the alphabet, which represent different Roman numbers and the order in which they are placed.

Real-life Application

Numbers are seen everywhere in our daily-life. We find numbers on price tags, phonebooks, and house addresses. Numbers are also found as page numbers in a book, age of people, in buying and selling, measuring length, weight, and capacity, and many more.

Frequently Made Mistakes

- Students generally get confused between the symbols of greater than and lesser than, while comparing numbers.
- Sometimes the terms successor and predecessor are not clearly understood.

Summary of Key Facts

- Even numbers are exactly divided by 2. They end with 0, 2, 4, 6, or 8.
- Odd numbers are not exactly divided by 2.
- The numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 are called Arabic numerals.

- Romans used 7 letters of the alphabet to represent numbers i.e. I, V, X, L, C, D, M.
- For comparison of numbers, first check the place values of thousands, secondly, the hundreds, then check the tens and lastly, the ones.
- When numbers are arranged from smallest to the greatest, they are said to be in ascending order.
- When numbers are arranged from greatest to the smallest, they are said to be in descending order.
- The number that comes just before a number is called the predecessor of that number ('pre' means before.)
- The number that comes just after a number is called the successor of that number ('succeed' means follow.)

Model Lesson Plan

Topic

Roman Numbers 1-20

Duration

80 minutes

Specific Learning Objective

To introduce Roman numbers to children

Key Vocabulary

Roman number, alphabet, Arabic numbers

Resources

A board display with the Roman symbols and their corresponding Arabic numbers, clocks or watches with time written in Roman numbers.

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

Engagement Activity (5 mins)

The students may have seen Roman numbers on clocks and watches.
Show the students the clocks and watches which have time written in Roman numbers. Ask which letters they can see on the clocks and watches. Are they the same on each clock?

Main Developmental Activity (20 mins)

- Introduce Roman numbers to the children, using the board display, based on the diagram on page 3 in Countdown 3.
- Moving from the known to the unknown, tell them that today's number system uses the Arabic numerals.

- Ask the students to find similar numbers in other places, inside or outside the classroom. A smart child may spot it on the watch brought to the class by the teacher, or sometimes in books showing unit numbers.
- Teach them some ways of remembering the Roman number symbols.
- Tell them the Roman numbers 1-10 written in their symbols is as following:

1	2	3	4	5	6	7	8	9	10
I	II	III	IV	V	VI	VII	VIII	IX	X

Tell them the rules of forming numbers.

When a symbol appears after a larger (or equal) symbol it is added.

Example: VI = V + I = 5 + 1 = 6 Example: XX = X + X = 10 + 10 = 20

But if the symbol appears before a larger symbol it is subtracted.

Example: IV = V – I = 5 – 1 = 4 Example: IX = X – I = 10 – 1 = 9

Do not use the same symbol more than three times in a number.

Children need to be able to do further mental addition, in order to work with Roman numbers.

VIII = 8, and X = 10 XVIII = 18 and MM = 2000

2 Numbers Operations

Suggested Time Frame

12-14 periods

Learning Curve

The students are able to add and subtract numbers up to 999. With the help of practical work as well as written sums in these pages, the students will add and subtract numbers with results up to 9999. They learn how to group ones into tens tens into hundreds, and hundreds into thousands (carry over sums). The children first subtract 4-digit numbers without borrowing. Next, they convert thousands to hundreds, hundreds to tens, and tens to ones by 'borrowing' from the thousands, hundreds, and tens columns respectively. The methods are identical, and this transition does not take long.

The children are able to skip-count using the number line. They know their tables to 10, and are able to multiply 3-digit numbers by a 1-digit number. (They already know conversions). Here, they move a step forward and multiply 3-digit numbers by 2-digit numbers with ease.

Children are familiar with multiplication. Division can only be understood if there is a sound knowledge of multiplication and children have had adequate practical exercise in this area.

Children are also familiar with long division. Now, they learn to divide 3-digit numbers, and are introduced to the concept 'remainder', first in practical situations and then in division sums.

Real-life Application

- Numbers are an essential part of our life. Numbers are used in everything we do. We add and subtract all the time without realising it.
- Going shopping involves all the four operations. To work out what we need to pay, we add the costs of our purchasing. We subtract to know how much we are going to get back if we present a bigger note than the shopping amount.
- A new car or furniture, or a new sibling in the family is as addition.

- For lending some toys to a friend and calculating how many toys will be left, or spending some money and finding out how much money we still have, involves subtraction.
- Problems about real things that children can see and touch give them real experience of addition and subtraction. Similarly, knowing the cost of one and finding the cost of more will bring experience of multiplication. Similarly dividing and sharing things will give them the idea of division.

Frequently Made Mistakes

- Students make mistakes in carrying and borrowing numbers.
- They make mistakes in times tables.
- They fail to bring down the correct number while performing division.

Summary of Key Facts

- For addition and subtraction of 4-digit numbers, place the numbers correctly under each place value.
- Multiplication is repeated addition.
- Division is equal sharing or equal grouping of numbers.
- The number to be divided is called the 'dividend'.
- The number which divides is called the 'divisor'.
- The result of dividing a number is called the 'quotient'.
- If the number is not fully divided, the remaining number is called the 'remainder'.
- The number which is being multiplied is termed the 'multiplicand.'
- The number which multiplies is termed the 'multiplier.'

Model Lesson Plan

Topic

Number Operations

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson students will be able to add and subtract 4-digit numbers.

Key Vocabulary

addition, subtraction, altogether, totals, and left

Resources

Worksheet, chart papers, and markers, fish cut-outs with attached metal clips, and a fishing rod attached with a magnet at one end.

Strategy

Engagement Activity (5 mins)

Give them story sums of addition and subtraction as follows:

- Grade 10 students raised Rs 4624 and Grade 9 collected Rs 1118 at the Bake Sale. How much money did they collect altogether?
- Hina takes 5544 bangles to sell at a fair. In one day she sells 666. How many does she have left for the next day?

Ask them to solve the sums on their whiteboards and hold them up.

Main Developmental Activity

- Group the students pairs.
- Place 2 baskets on the table, each basket contains fish cut-outs with 3- or 4-digit numbers written on it, such as 20145, 1000, 997, and so on.
- Ask the students of each group to come in pairs and catch one fish from each box.
- Ask each pair to make an addition and a subtraction sum from the numbers written on the fish. One of them will add and the other will subtract showing their answers on whiteboards.

```
   2  9  8  5        5  0  7  4
+  5  0  7  4     –  2  9  8  5
_____________     _____________

_____________     _____________
```

- The pair which finishes early can have another chance to collect the fish.
- Acknowledge the pair which delivers the maximum number of correct answers.

3 Fractions

Suggested Time Frame

8–10 periods

Learning Curve

Students already know that a fraction is a part of a whole. They are familiar with $\frac{1}{2}$s and $\frac{1}{4}$s, as used in everyday life. They are gradually introduced to other fractions, starting with the simplest: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and, $\frac{1}{5}$ …

With practical work, addition and subtraction of like fractions are also introduced.

Real-life Application

Fractions are used in:

- baking–they tell how much of an ingredient to use.
- telling time; each minute is a fraction of the hour.
- doctor's prescription to tell how much of a medicine, especially the quantity of syrup to be taken.
- games like soccer, football, and basketball, as they are split into halves and quarters.

Summary of Key Facts

- A fraction is a number that represents a part of a whole.
- The number indicates the number of equal parts a shape (or a collection) has been divided into. It is called the denominator.
- The number indicates the number of those equal parts used or referred to. It is called the numerator.
- When the numerator and denominator are multiplied by the same number (except 0), we get an equivalent fraction.

- Fractions with the same denominator are called like fractions, while fractions with different different denominators are called unlike fractions.
- In unlike fractions with the same numerator, the smaller the denominator, the greater is the value of the fraction.
- To add like fractions, add only the numerators. The denominator remains the same.
- To subtract a fraction from another like fraction, subtract the smaller numerator from the larger one. The denominator remains the same.

Model Lesson Plan

Topic

Fractions

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson students will be able to revise the concept of $\frac{1}{2}$ and $\frac{1}{4}$, moving to other fractions such as $\frac{1}{8}$ and $\frac{1}{10}$.

Resources:

Strip of papers, differently coloured circles.

Key vocabulary

numerator, denominator, equal, halves, quarters, like fractions, and unlike fractions.

Strategy

Engagement Activity (5 mins)

Begin with a recapitulation of fractions, using a story and build up more stories on the rest of the fractions.

For example, Mamma Bear spread some chocolate sauce over a crusty pie cut in quarters. She put it on one quarter for Baby Bear, one for Papa Bear and one for her own share. How many quarters did she put the sauce on? How many quarters did not have any chocolate sauce? The answer is three quarters or $\frac{3}{4}$; and one-quarter or $\frac{1}{4}$

Main Developmental Activity (20 mins)

- Introduce students to other fractions with the use of strips of paper or coloured circles.
- Use one shape at a time, but the same fraction must be demonstrated with different shapes, so that children see a fraction associated with any shape or any set of objects.

- Associate the fractions and fraction names. For example:
  2 equal parts: 2 halves in a whole
  3 equal parts: 3 thirds in a whole
  4 equal parts: 4 quarters in a whole
  10 equal parts: 10 tenths in a whole
  100 equal parts: 100 hundredths in a whole
- Demonstrated the same, using pictures and finally the children move on to calculating with numbers alone.

4 Measurement: Length, Mass, and Capacity

Suggested Time Frame

16 periods

Learning Curve

Children are able to convert:

- metres to centimetres and kilometres to metres
- kilograms to grams
- litres to millilitres.

They are able to solve word problems involving addition and subtraction with length, weight and capacity. (Children are already familiar with the use of the four operations, working with 4-digit numbers.)

Now they will learn to add and subtract the units of measurement with carrying the smaller unit to the bigger unit, and borrowing by the bigger unit.

Real-life Application

- Units of length are used to measure the distance, to find height, length, and breadth.
- Units of mass are used at grocery shops, doctor's clinic, hospitals, and markets.
- Units of capacity are used to measure liquids like water, juices, milk, and smoothies etc.

Frequently Made Mistakes

- Students get confused in conversion factors.
- They make mistakes when converting smaller unit to bigger unit.

Summary of Key Facts

- We can use a short form for the standard units of measurements.

kilometre	= km	metre	= m
centimetre	= cm	millimetre	= mm
kilogram	= kg	gram	= g
litre	= l	millilitre	= ml

1 km = 1000m
1 m = 100 cm
1 kg = 1000 g
1 l = 1000 ml

Suggested Activities

Group Activity (20 min)

Learning Outcome: Write standard units of length in abbreviations.

Resources: Cards with different length, mass, and capacity with units in full form for example, 5 kilometres, and a tic-tac-toe board made on a sheet of chart paper

Instructions:

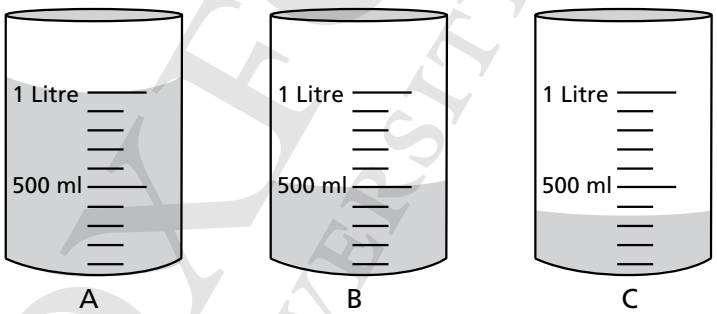
- Students are divided into two groups, named 'Os' and 'Xs'.
- They are each given a bunch of measurement cards.
- To place their mark on the tic-tac-toe board, players have to pick one measurement card, read it, and then record the unit of measurement in the abbreviation on the tic-tac-toe board.
- Continue until someone wins or all spaces are filled.
- You can make several groups of 'Os' and 'Xs' and have this competition between them.

Individual Activity (15 min)

Learning Outcome: Read standard units of volume.

Resources: Activity sheets

Instructions: Use the clues to work out who has which container.



Ayesha I have exactly half a litre.
Answer: Container_____

Ahmed I have 1000 ml.
Answer: Container_____

Areeba I have more than 300 ml but less than 400 ml.
Answer: Container_____

Individual Activity (20 min)

Learning Outcome: Solve real-life problems involving the same units of length, mass and volume.

Resources: Worksheet

Instructions:

- Prepare the given worksheet for the whole class.
- Revise units of length, mass, and capacity orally.
- Discuss the addition and subtraction of units of measurement.
- Distribute the worksheet and provide help where needed.

a. To make Fruit Punch for 2 people, we need :
   - o 300 ml of pineapple juice
   - o 250 ml of orange juice
   - o 500 ml of lemonade
   - How much liquid is used in total to make Fruit Punch for 2 people?
   - How much orange juice would be needed to make enough for 4 people?

b. Dania buys two apples and three bananas. One apple weighs 75 g. Three bananas weigh the same as two apples. How much does one banana weigh?

Model Lesson Plan

Topic

Measurements

Suggested Duration

2 Periods

Specific Learning Objectives

By the end of the lesson students will be able to add and subtract with accuracy, using units of length (m, cm), mass (kg, and g).

Key Vocabulary

length, weight, metre, centimetre, kilogram, and gram

Resources:

Pieces of ribbons, small buckets, various containers of different shapes

Strategy

Engagement Activity (5 min)

Reinforce the bigger and smaller units of length, mass, and capacity with abbreviations.

Main Developmental Activity (20 min)

- Divide the students in pairs.
- Set up the classroom in such a way that it provides a large number of things for measurement and measuring equipment too.
- Ask one child to guess the length of a piece of a ribbon and the rim of a bucket, and the other to write it down. Then, ask them to take actual measurements and decide whether their guesses were correct or not.
- Similarly, ask the students to try and guess the capacity of containers of different shapes, and sizes. Will a tall vase hold more water than a flat plate? By how much?
- Ask them to hold a papaya in one hand and a banana in the other hand. Ask them to say which is heavier? Can they guess by how much?
- Now move to addition. Write the following word problem on the board and ask them to solve it. (Record the addition, with m and cm in separate columns.)
- 'A lorry is carrying 4 cars, one on top of the other. The floor of the lorry is at a height 1 m 10 cm from the road surface. The three cars (without wheels) are 1 m 30 cm high. Will the lorry be able to go under a flyover, which is 8 m from the ground?'
- Then move to subtraction. Write the following word problem on the board.
- 'Cut a 4 m 2 cm piece of ribbon from a 7 m 20 cm long one. How much is left?'
- Find the difference between the heights of two students in the class.
- Ask them to solve these problems in their school notebook. Once they are done, check the work of each student thoroughly and provide guidance where needed.

5 Time

Suggested Time Frame

8-10 periods

Learning Curve

Students are familiar with the clock-face and know how to read time, such has half past the hour, quarter past the hour, and on the hour. They have a fair idea about simple fractions, and are able to skip-count in fives.

Students are also able to read time in hours, and, with some help, in minutes. With a little practice, they will be able to use a.m. and p.m. and read the clock face accurately.

Real-life Application

Time is an important factor in our lives. We find time in all walks of our lives.

- Time management is important for students to do the study with focus and getting good grades.
- We mention time in occasions, events, functions, meetings, gathering, parties, and congregations.
- To be punctual is vital for a successful life.

Summary of Key Facts

- There are two types of clocks i.e. digital and analogue. Analogue clocks may have Roman numbers I to XII also. A digital clock has digits to tell the time.
- There are two types of calendars (solar and lunar). Solar calendar is based on the movement of the Sun. Lunar calendar is based on the movement of the Moon.
- January, March, May, July, August, October, and December have 31 days.
- February either has 28 days and 29 days in leap year.
- A leap year has 366 days and comes after every 4 years.
- 24 hours = 1 day
- 7 days = 1 week

- 14 days = 1 fortnight
- 30 days = 1 month
- 12 months =1 year
- 10 years = 1 decade
- 100 years = 1 century
- 1000 years = 1 millennium

Model Lesson Plan

Topic

Time

Duration

80 minutes

Specific Learning Objectives

Children learn to measure time by minutes and hours with the intervals of fives, and learn the use of a.m. and p.m.

Key Vocabulary

clock, hour, minute, past, p.m. (post meridiem), a.m. (ante meridiem)

Resource

Clock with the long, minute hand and the short, hour hand.

Strategy

Engagement Activity (10 mins)

Recapitulate the concepts of 'half past', 'quarter past' and 'quarter to' the hour. It will be helpful and serves as a base to start newer concepts.

Main Developmental Activity (30 mins)

- Point out the 60 small divisions on the clock.
- Now make them understand when the minute hand goes all around the clock face, 60 minutes have passed or an hour has passed. The minute hand goes once around the clock face in one hour.
- Show them the movement of the hour hand.
- Now explain that the numbers around the clock face act like numbers on a number line: they are always skip counting in 5s as it takes 5 minutes to move from one number to the other.
- Show them, if the minute hand is on 8, it means '40 minutes past the hour' revise 8 times 5s is 40.
- Now move the minutes hand on to different numbers, asking the students
- Explain that the time from 12 midnight to 12 noon is called a.m. which means

'in the morning' (in Latin, ante meridiem means 'before noon') and between 12 noon and 12 midnight is called p.m. (in Latin, post meridiem means after noon)

- Give them a list of exercises, where children use a.m. or p.m.
- Bath time: 7 (some might say 'a.m.' some might say 'p.m.')
- Bed time: 8 p.m. (cannot be 8 a.m.)
- Lunch time: 12 noon
- Play time: 4 p.m. (at 4 a.m. children should be asleep.)

6 Geometry

Suggested Time Frame

8-10 periods

Learning Curve

Students recognise 3-D objects and their names. They are aware of the number of faces, edges and vertices each shape has. At this level they are introduced to terms, such as parallel lines, points, line segments, and the calculation of the perimeter of shapes.

Real-life Application

- The global positioning system of satellites uses geometrical principles to calculate the position of the satellites. Geometry helps in the field of medicine e.g. X-ray and ultrasound. Geometry also helps in the accurate calculation of physical distances. It helps in the field of astronomy to map the distance between planets and stars. Geometry is used in computer aided designs, it entails lines, curves, and angles. Geometry plays an important role in designing buildings, walls, and doors.

Frequently Made Mistakes

- Incorrectly identifying the different types of lines.
- Getting confused when naming different shapes.

Summary of Key Facts

- A line is a set of points joining a straight path on both sides.
- A line segment is a line which joins 2 points together.
- A ray is similar to a line segment but one end point extends infinitely in one direction.
- Parallel lines are two lines which never meet. The distance between the two lines remains the same.

- Shapes with 3 sides are called triangles. They have 3 sides and 3 corners.
- Shapes with 4 sides and 4 corners are called quadrilaterals.
- There are different types of quadrilaterals: Square, rectangle, rhombus, parallelogram, and kite.
- Polygons are those figures which have many sides.
- A circle is a flat round closed shape with no corners or edges. The curved line is the boundary of the circle.
- The length of the boundary of a circle is called its circumference.
- A centre is a fixed point inside a circle which is equidistant from all the points on the circumference.
- A radius is a line joining the centre point and any point on the circumference of the circle.
- The diameter is a line passing through the centre and joining two different points on the circumference.

Model Lesson Plan

Topic

Quadrilaterals

Suggested Duration

80 minutes

Specific Learning Objectives

By the end of lessen students will be able to name 4-sided shapes and their properties.

Key Vocabulary

quadrilateral, parallel lines, rhombus, parallelogram, and vertices

Resources

Classroom objects, pictures of objects with parallel lines, and strips of paper.

Strategy

Engagement Activity (5 mins)

After a revision of 3-D shapes, discuss some examples of parallel lines from everyday life such as railway tracks, roller coaster tracks, and the two sides of a road or edges of a board, a TV screen, a desk or a door frame. Ask the students to observe that the railway lines are parallel because they never meet.

Main Developmental Activity

- Tell them that certain shapes too have parallel sides, such as squares, rectangles and diamonds. A triangle cannot have parallel sides.
- Assign the students to identify shapes and objects in the classroom which have parallel lines.

- Give them strips of paper to construct 4-sided shapes (quadrilaterals: quadri means ‘four’) with parallel sides.
- Introduce the names of some quadrilaterals, such as rhombus, parallelogram, and kite as they already know about square, and rectangle.
- Draw the above mentioned shapes on the board and teach them about the corners and the sides of each.
- Introduce the word ‘polygon‘ which isdefined as shapes with at least three sides or more.
- They know that a 4-sided figure is a quadrilateral. Tell them about the pentagon (5-sided), hexagon(6-sided), and octagon (7-sided).

7 Data Handling

Suggested Time Frame

4-6 periods

Learning Curve

This unit provides an introduction to data handling. The three steps of data handling are collection, organisation, and interpretation of data. In this unit, they are going to learn that a picture graph, or pictograph, is used to display information that uses images or symbols to represent data. Moreover, the students will also learn about the column graph in which the information from data is illustrated with horizontal columns.

Real-life Application

- Pictograph uses pictures and symbols to represent information or quantities.
- A column graph is used to show data comparison. For example, comparison of rainfall in different cities of a country or comparison of yields of a crop in the last two years.

Frequently Made Mistakes

- Students make mistakes in counting the objects.
- Sometimes they are note able to decide which quantity should be taken on vertical line and which quantity should be taken on horizontal line.

Summary of Key Facts

- A pictograph, or a picture graph, is a pictorial representation of data.
- Column graphs also represent data.

Model Lesson Plan

Topic

Graph

Suggested Duration

80 minutes

Specific Learning Objectives

By the end of the lesson students will be able to represent the information in a bar graph.

Key Vocabulary

data, bar graphs

Resources

Chart paper, markers

Strategy

Starter: Engagement Activity (5 min)

Ask the students to hold different colour pencils and make data of the number of pencils of each colour.

Main Developmental Activity (25 mis)

- Talk to your students about the importance of having breakfast in the morning. Discuss healthy options for breakfast.
- Give one paper plate to each student. Ask students to write down what they had for breakfast that morning, and to draw a picture of it.
- Ask the students who did not have breakfast to write 'nothing'.
- Group the breakfast items into categories such, as 'milk and cereal', 'fruits', 'toast', 'eggs', etc.
- Explain that a bar graph will make it easy to organise the students' responses.
- Divide the students into 4 groups. Each group will sort out and organise the data by gathering all plates which represent the same category of breakfast, for example milk and cereals by one group.
- Spread the chart paper on the board.
- Call out each group one by one. They will tell the data of the particular category which they had on their table.
- Draw a bar for the particular breakfast category on the chart paper.
- Repeat the same steps for each of the remaining categories. Analyse the bar graph and discuss the data.
- Write 5 questions on the board such as:

1) How many students had cereal in the morning?
2) Which food was liked by most of the students?
3) How many students did note have breakfast?

- Encourage students to find the answers from the graph, write them on whiteboards, and share with their partners.

MATHS WISE 3

Lesson plans to be used in conjunction with the Maths Wise book series.

UNIT 1

REVIEW AND ASSESS 1

Teaching objectives

- to revisit concepts and skills learnt in the previous year
- to revise addition, subtraction, multiplication, and division of numbers
- to work with basic concepts of fractions
- to solve time-related problems in daily life

Teaching materials:

- Additional worksheets

Learning activity

Lesson 1: 40 minutes

The beginning of the year is the time when it is essential to revisit the concepts that were covered in the previous year. This not only helps the students reconfirm the concepts but also helps a great deal in the settling-down process. Students get to know their new classmates thorough group work, too. They start to bond better with the teacher if the work done is familiar and they have a good grasp of it. It is also a very useful tool for you to use to judge the level of each student. You can assess the progress of each student through fun activities in a friendly ambience. Also, this will help you plan all future lessons and activities to facilitate the teaching/learning process.

It should be mentioned here that some students do not have such retentive memories as others, so go slowly with them until their work is of the required level.

For this purpose the worksheets, used as revision sheets at the beginning of the year, are useful and fun to work with. The students should enjoy doing them as a team as well as individually. The sheets need to be thought-provoking for this age group, rather than mathematically taxing. Students should be able to demonstrate their thinking and analysis skills, and at the same time recall concepts previously learnt.

Task: Students attempt pages 2 to 8.

UNIT 2

WHOLE NUMBERS

Teaching objectives

Roman numbers

i. Read Roman numbers up to 20
ii. Write Roman numbers up to 20

Even and odd numbers

i. Recognise even and odd numbers up to 99 within a given sequence
ii. Differentiate between even and odd numbers within a given sequence

Place values

i. Identify the place values of numbers up to 5 digits

Numbers up to 10,000

i. Read and write given numbers up to 10,000 (ten thousand) in numerals and words

Number Line

i. Represent a given number on number line up to 2-digit numbers
ii. Identify the value of a number from number line up to 2-digit numbers

Comparing and ordering numbers

i. Compare two numbers up to 3-digits using symbols “<”, “>”, or “=”
ii. Write the given set of numbers in ascending and descending order (numbers up to 3 digits)

Estimation

i. Round off a whole number to the nearest 10 and 100

Teaching materials:

- computer cut-outs of Roman numerals
- beads, wooden cubes
- board
- house board and counters of various colours

Learning activity

Lesson 1: 40 minutes

Look at the value of Roman numerals, which were used over 2000 years ago. Seven letters are used represent 7 different values:

Roman Numeral	Value
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

Today, the decimal system, which was motivated by the discovery of 0 and counting on the10 fingers of the hands, is used universally. But the students will be interested to work with Roman numbers too, because they do appear on old coins, the construction dates of old buildings, and the titles of royalty, such as King George V.

Have a stock of Roman numeral cut-outs. Use these as the lesson goes on.

Talk about the Roman numerals in a story telling session. These numerals were used in ancient Rome, many centuries ago, using 7 letters of the Latin alphabet. Different letters represent different numbers. The reason for the origin of each is still debated.

Using fingers, Roman numbers can be represented like this:

I is one finger up …. Hold up cut-out for Roman I

II is two fingers up … Hold up cut-outs for Roman II

III is three fingers up … and so on

V is the shape formed between the thumb and forefinger

X is crossing of two thumbs

Numbers are formed by placing 2 or more symbols next to each other, then adding the individual values. III (3), VI (6) and CCXVI (216)

I can be placed before V and X to signify '1 less than' V (5) and X (10)

IV = 4; IX = 9

C can be placed before D and M to signify '100 less than' 500 (D) and 1000 (M)

CD = 400 and CM = 900

Some people still write dates with the year written in Roman numerals:

20.12.2014 as 20.12. XXIV

Lower case letters are also used, e.g. i, ii, iv, v, ix, x, and c.

The reason for Roman numbers going out of use was that there was no 0, and therefore big numbers could not be written easily, and number operations were difficult to perform. Their use has reduced considerably in today's world.

However, Roman numerals are still used for special numbering: for example, to number additional pages in a book, to show numbers on old-style clock faces and watches, to number parts of a question, naming the Olympic Games (XXX Olympiad) and in the names of rulers, King George V, Queen Elizabeth II.

Basic combinations

1	2	3	4	5	6	7	8	9
I	II	III	IV	V	VI	VII	VIII	IX
10	20	30	40	50	60	70	80	90
X	XX	XXX	XL	L	LX	LXX	LXXX	XC
100	200	300	400	500	600	700	800	900
C	CC	CCC	CD	D	DC	DCC	DCCC	CM

Here is a method for writing big numbers:

$\overline{V}$ (for 5,000), $\overline{X}$ for (10,000), and $\overline{L}$ (50,000)

$\overline{ICI}$ (for 50,000), $\overline{IDI}$ (for 500,000) and $\overline{IMI}$ for (1,000,000)

5,000	10,000	50,000	100,000	500,000	1,000,000
$\overline{V}$	$\overline{X}$	$\overline{L}$	$\overline{C}$	$\overline{D}$	$\overline{M}$

Numbers are written horizontally, left to right.

ALL ROMAN NUMERALS ARE ADDED IN THESE NUMBERS

II I + I = 2

VI V + I = 6,

XII X + I + I = 12

To write 1236, break 1236 into 1000, 200, 30 and 6

MCCXXXVI M + C + C + X + X + X + V + I =1236

To write 1974, break 1974 into 1000, 900, 70 and 4

- 1000 = M
- 900 = CM
- 70 = LXX
- 4 = IV

So 1974 = MCMLXXVI Here is a mnemonic to remember the order of Roman numerals:

Look at the value of Roman numerals below: M e D i C a L X a V I e r

1000 500 100 50 10 5 1

EXCEPTIONS:

IX, represents I less than X, i.e. 9;

XL represents X less than L, i.e. 40

IV = V – I = 4
IX = X – I = 9
XL = L – X = 40
XC = C – X = 90
CD = D – C = 400
CM = M – C = 900

Sometimes in the past one number may have been written in two ways:

18 was written as IIXX OR XVIII
50 was written as XXXXX OR L
40 was written as XXXX OR XL
But this does not happen any longer; the format used in the text-book (the second one) is the commonly accepted format.

The year 2014 is written as MMXIV (Addition all the way, except V – I = 4).

Take the students outside and arrange them in 2 groups. One group holds up fingers IN ORDER to represent a Roman numeral and the other team guesses which number it is.

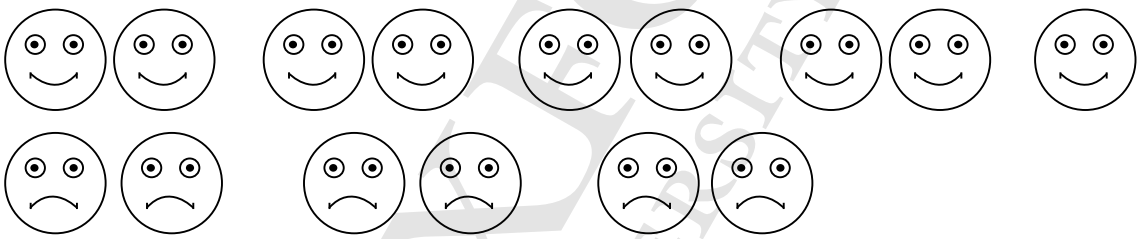
Task: Students attempt pages 11 to 15.

Lesson 2: 40 minutes

Give each student some beads or wooden cubes. Ask them to group them in pairs. Numbers which can be grouped in 'pairs' with none left over are called even numbers.

Numbers which, after being grouped in pairs, have a bead left over are called odd numbers.

odd number



even number

After doing a couple of examples with the beads, ask the students to observe the features of even numbers. Lead them towards the fact that an EVEN number will have the unit digit 0, 2, 4, 6, or 8. For example, 112, 398, 312, 274, 1996, and so on.

Odd numbers will have the unit digits 1,3,5,7, or 9. Numbers such as 223, 4449, 687 and 421 are odd numbers

There are some norms which apply when working with addition, subtraction, multiplication, and division of even and odd numbers. The numbers in consideration are whole numbers.

ADDITION AND SUBTRACTION
even ± even = even
even ± odd = odd
odd ± odd = even

MULTIPLICATION

(REMEMBER: multiplier × multiplicand = product)
even × even = even
odd × even = even
odd × odd = odd

3	×	5	=	15
Factor (multiplier)		Factor (multiplicand)		Product

DIVISION:

(REMEMBER: Dividend / Divisor = Quotient)
Odd/odd = odd (IF the dividend is a multiple of the divisor)
Even/odd = even (IF the dividend is a multiple of the divisor)
Odd/even will give a fraction.

Work with skip-counting with the class. Draw a number line on the board. Give each student a counter. Call each student to the board and ask him/her to place one counter on any number. Then, ask the student to skip count by 2's (Or repeated addition). Observe the numbers the counter lands on. Work in the same manner with division (as repeated subtraction).

IMPORTANT: Each group of alternate numbers on a number line, going up to infinity, will comprise of either ONLY odd numbers or ONLY even numbers.

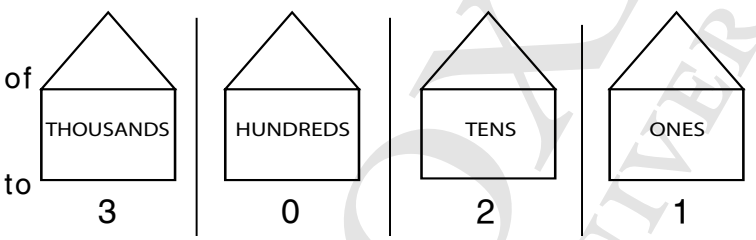
The students do skip counting with other numbers.

Task: Students attempt page 16.

Lesson 3: 40 minutes

Introduce the concept of place value using houses, as shown below.

Assign a house each to ones, tens, hundreds, thousands, and tens of thousands; explain that each house can hold only 9 members. When the 10th member comes in, it forms a group 10, and must move on to the next house, as ONE member of the new house. Now give out the counters and ask the students form numbers by placing the counters in the correct houses.



In a practical display, if there are 9 toothpicks in the ones house, and a 10th one is added, then take the 10 away in a bundle and place it the tens house, as one 'bundle of ten'.

It is useful to have bundles of toothpicks already tied in bundles of 10's or 100's in a box.Alternatively, you could use single squares, strips of 10 squares and large squares of 100 small squares

As the students fill in the houses with toothpicks or paper squares, ask them to call out the numbers represented.

For example: 43 = four tens and 3 ones;

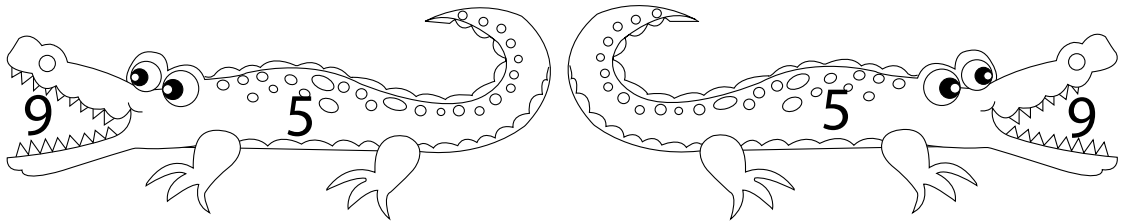
3021 = 3 thousands, 0 hundreds, 2 tens, and 1 one.

Once the concept is clear, the students will find it easy to extend to 5 or 6-digit numbers.

Task: Students attempt pages 17 to 27.

Lesson 4: **40 minutes**

The concept of > and < is best illustrated with the mouth of a greedy crocodile.



9>5 5<9

Compare numbers 5 and 9. Which is the bigger number or, which is the smaller number?

The crocodile has already eaten the smaller number (5 is in its stomach). But it is greedy animal, and wants to eat the bigger number too (9 is in the mouth).

9 > 5 5 < 9

9 is GREATER than 5 5 is LESS than 9

As the students do this activity, point out that the higher the value of a numeral in a particular house, the higher the value of the entire number. Also, numbers in houses to the left represent bigger numbers than those on the right. Hence introduce the students to the idea of ordering numbers by value.

213 > 199 and 579 < 821

Sequencing of numbers may be done using the same activity.

Task: Students attempt pages 28 and 31.

Lesson 5: **40 minutes**

Introduce the rounding of a number to the nearest hundred.

Tell them to look at the digit at tens place. If the digit at tens place is less than 5, it will remain same and digit at ones place will become 0. This is called rounded down. If the digit ant tens place is 5 to 9, number 1 is added to the digit at tens place and ones place will become 0. For example,

329 rounded to the nearest 100 will become 300. (rounded down)

497 rounded to the nearest 100 will become 500. (rounded up)

Group Activity

Divide the class in groups of four students.

Make several number cards with three- digit numbers.

Make number charts, with multiples of hundreds, one for each group.

Assign eight number cards to each group.

Ask them to round of the number on the card and place it on the number chart accordingly.

The group completing the task earliest wi ll be the winner.

100	400	200	600
500	700	300	500
100	600	800	900
600	200	900	100
200	100	800	400
800	500	300	400

715	435	635	860
845	534	567	908

Task: Students attempt pages 32 Exercise 21 and 22.

UNIT 3

NUMBER OPERATIONS

Addition

i. Add numbers up to 4-digits with and without carrying vertically and horizontally
ii. Add numbers up to 100 using mental calculation strategies
iii. Solve real life number stories up to 4-digits with and without carrying involving addition

Subtraction

i. Subtract numbers up to 4-digits with and without borrowing
ii. Subtract numbers up to 100 using mental calculation strategies
iii. Solve real life number stories up to 4-digits with and without borrowing involving subtraction

Multiplication

i. Develop multiplication tables for 6, 7, 8, and 9
ii. Multiply 2-digit number by 1-digit number
iii. Multiply a number by 0 and 1
iv. Apply mental mathematical strategies to multiply 1-digit numbers to1-digit numbers
v. Solve real life situations involving multiplication of 2-digit numbers by 1-digit numbers

Division

i. Divide 2-digit number by a 1-digit number (with zero remainder)
ii. Apply mental mathematical strategies to divide 1-digit number by a 1-digit number
iii. Solve real life situations involving division of 2-digit number by a 1-digit number

Teaching materials:

- Additional worksheets

Learning activity

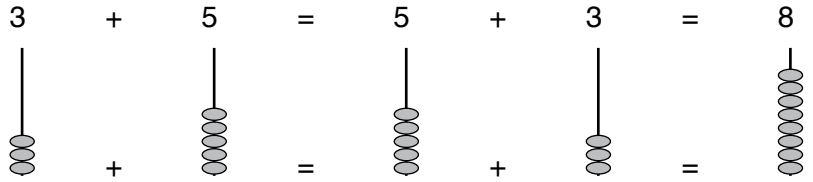
Lesson 1: **40 minutes**

The students used the 4 number operations +, – ,×, and ÷ in the previous year. They have handled 3 digit numbers. Handling larger numbers should not be difficult, as the concepts of number operations are the same. It may be a good idea to go over the concept of houses and groups of 10 again, before starting with larger numbers. Also, review number names and expanded forms of notation. Discuss the relevant phrases ‘addition’ and ‘sum of two or more numbers’; ‘subtraction’ and ‘the difference between two numbers’; ‘multiplication’ and ‘product of numbers’; and ‘division’ and ‘the quotient’ .

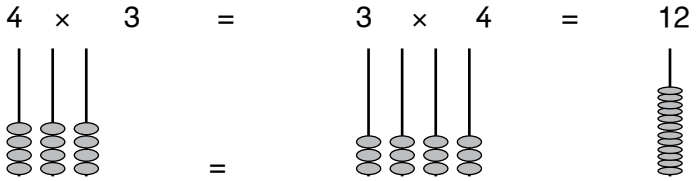
At this stage, introduce some general properties of the number operations.

Establish the following facts through practical exercise:

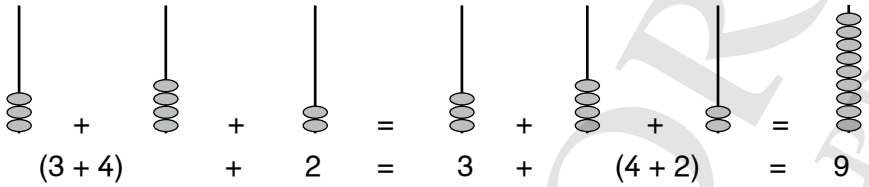
1. Commutative Law for Addition



2. Commutative Law for Multiplication



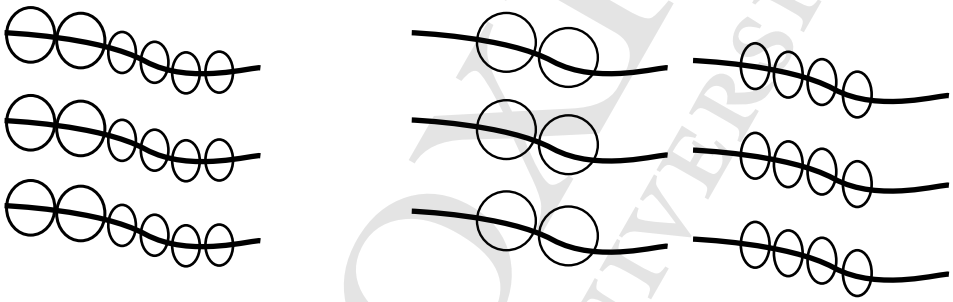
3. Associative Law for Addition:



4. Associative Law for Multiplication

$(2 \times 3) \times 4 = 2 \times (3 \times 4) = 24$

5. Distributive Law



Reasons for using commutative and associative properties:

Solve the following:

1. $24 + 16 + 37 = (24 + 16) + 37 = 40 + 37 = 77$
2. $29 + 42 + 8 = 29 + (42 + 8) = 28 + 50 = 79$
3. $4 \times 5 \times 13 = (4 \times 5) \times 13 = 20 \times 13 = 260$
4. $2 \times 12 \times 5 = (2 \times 5) \times 12 = 10 \times 12 = 120$

For perfection, number operations require a lot of practice, both written and practical. Emphasis must be placed on setting out the sums in neat, straight columns. Use exercise books with squared paper for this purpose.

Some students have difficulty in setting out sums involving large numbers. They may set out the digits the wrong columns if not guided properly.

Set out horizontally a number of addition, subtraction, multiplication, and division problems. Ask the students to arrange these vertically and work out the answers. Ensure that each student is able to arrange these in vertical columns correctly. Generally, if exercise books with squared paper are used, the students have no problems at all. But sometimes you may want to use colour-coding for the digits.

Task: Students attempt pages 34 to 47.

Lesson 2: 40 minutes

For multiplication, let the students work in groups of 8. Make circular discs of a convenient size, with concentric circles drawn on each of the discs. Use a protractor to divide the disc in 10 equal parts. These rings can be used for addition or multiplication.

This exercise helps the students to revise and memorize the tables through a fun activity. The middle ring is filled in with suitable numbers. The students find the answers (additions or multiplication) and write these in the outermost ring. Refer to worksheet 20.

Multiplication and division by 10 and 100 are explained with the help of a few examples. The students work out the answers to multiplication and division problems by 10 and 100. They often discover the pattern themselves, after a few examples. With your guidance, they come to the conclusion that adding one 0 or 00 on the right side of the ones digit gives the correct answers.

Multiplication by 0 is explained by examples such as:

1. Shamim adds 10 on her calculator 3 times; she gets 30. She adds 0 on her calculator 3 times; what answer does she get?
2. Raqib puts 20 sweets in a jar 10 times. He has 200 sweets. But, if he puts 20 sweets in the jar 0 times, how many sweets are in the jar?

Task: Students attempt pages 48 and 49.

Lesson 3: 40 minutes

The students work with some bracelets (say 15). Tara gives 5 bracelets to each of her friends; how many friends will get 5 bracelets each?

gives 5 to Najma. $15 - 5 = 10$

gives 5 to Waheeda $10 - 5 = 5$

gives 5 to Sharmila $5 - 5 = 0$

So, $15 \div 5 = 3$

3 friends get 5 bracelets each.

Salman needs to share 24 marbles amongst a group of 6. How many does each friend get?

Salman takes 6 marbles and gives 1 to each friend. $24 - 6 = 18$

Salman takes 6 more, and gives 1 marble to each friend. $18 - 6 = 12$

Salman takes 6 more, and gives 1 marble to each friend. $12 - 6 = 6$

Salman takes 6 more, and gives 1 marble to each friend. $6 - 6 = 0$

Salman's 6 friends, each have 4 marbles. $24 \div 6 = 4$

In the process, they discover the method of division. Even division with a remainder becomes clear

when they are left with some bracelets or marbles after they have distributed them equally and no more distribution is possible.

Long division becomes clear and easily mastered when the students record each step of their operation carefully. Start the process with known multiplication tables, and then move on to harder problems with remainders.

IMPORTANT: It is important to remember ….

1. $5 \times 3 = 15$, therefore $15 \div 5 = 3$; also $15 \div 3 = 5$
2. $24 \div 6 = 4$, therefore $4 \times 6 = 24$; also $6 \times 4 = 24$

Task: Students attempt pages 60 to 64.

UNIT 4

FRACTIONS

Common fractions

i. Express the fractions in figures and vice versa
ii. Match the fractions with related figures

Proper and improper fractions

i. Recognise proper and improper fractions
ii. Differentiate between proper and improper fractions

Equivalent fractions

i. Identify equivalent fractions from the given figures
ii. Write three equivalent fractions for a given fraction

Comparing fractions

i. Compare fractions with same denominators using symbols “<”, “>” ,or “=”

Addition of fractions

i. Add two fractions with same denominators
ii. Represent addition of fractions through figures

Subtraction of fractions

i. Subtract fractions with same denominators
ii. Represent subtraction of fractions through figures

Teaching materials:

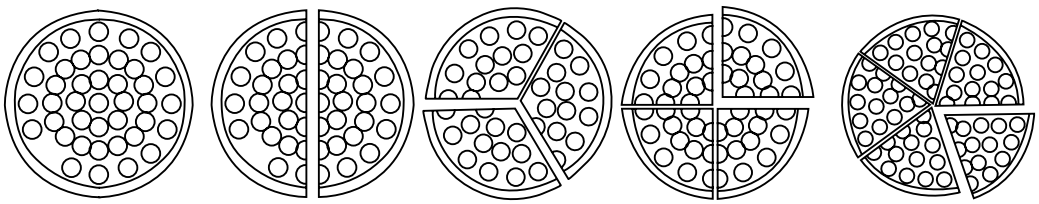
- fraction chart
- paper cups and some sand

Learning activity

Lesson 1: **40 minutes**

Students worked with simple fractions in the previous year. A fraction chart is a useful tool to explain various aspects of fractions, especially to review concepts such as finding parts of a whole, and equal fractions.

For example: Using a pizza, the chart shows that 2 halves make a whole, 3 thirds make a whole, 4 quarters make a whole, and so on.



1 whole Two $\frac{1}{2}$s Three $\frac{1}{3}$s Four $\frac{1}{4}$ s Five $\frac{1}{5}$s

Choice of language is also important for the introduction of numerator and denominator:

$\frac{1}{2}$ one part Numerator indicates number of parts taken from a whole.

total parts Denominator indicates number of parts in the whole.

A fraction wall is an interesting practical demonstration. Start on the floor, or in sand, and then on a chart.

1 Whole															
$\frac{1}{2}$															$\frac{1}{2}$
$\frac{1}{3}$														$\frac{1}{3}$	
$\frac{1}{4}$													$\frac{1}{4}$		
$\frac{1}{5}$												$\frac{1}{5}$			
$\frac{1}{8}$											$\frac{1}{8}$				
$\frac{1}{10}$										$\frac{1}{10}$					
$\frac{1}{15}$									$\frac{1}{15}$						
$\frac{1}{16}$								$\frac{1}{16}$							

Students make this chart by cutting strips of coloured paper into halves, thirds, and fifths.

Emphasis must be laid on the correct use of fraction terms such as one fifth as opposed to one over five or 99 hundredths instead of 99 over 100

Later, for fractions such as $\frac{3}{2000}$, it is acceptable to say 3 over 2000.

Task: Students attempt pages 68 to 72.

Lesson 2: 40 minutes

Give each student a square piece of paper (or a strip of paper) divided into 4 equal parts. Ask the students to colour $\frac{1}{4}$ of the shape.

Then, divide the square or the strip into 8 parts and ask them to colour one quarter. Then, give them a square or a strip divided into 16 parts. And ask them to colour one quarter.

The students should observe that the coloured parts are all equal. They should come to the conclusion that $\frac{1}{4} = \frac{2}{8} = \frac{4}{16}$.

Repeat the exercise with several shapes and different equivalent fractions.

Ladoos cut into $\frac{1}{2}$s and $\frac{1}{4}$s, chocolate bars (with already marked out fractions) and parathas cut into fractional portions are useful for showing equivalent fractions.

Task: Students attempt pages 72 to 76

Lesson 3: **40 minutes**

Introduction to fractions with sand or water is better done as an outdoor activity.

Introduction to improper fractions: Give each student two equal-sized paper cups and some sand, one and half times the capacity of the cup. Ask the students to use the cup to measure the amount of sand. Encourage them to think for themselves and come up with the idea that there is one full cup and the second cup is half full. (For later use, also discuss the fact that each of the two cups can be three-quarters full or 3 cups can be half full.)

Then, give them three paper cups, each with exactly half the capacity of the first cup. Discuss the capacity of each cup, by pouring sand from one large cup into two smaller cups. Elicit that the capacity of the smaller cup is exactly half that of the larger cup.

Ask them to measure the same amount of sand, using the new cups. Ask them to think about the implication of the result. Elicit that the 3 small cups held exactly the same amount of sand as one-and-a-half large cups, or the capacity of three small cups together is equivalent to the capacity of one whole cup and a half. Repeat the exercise with different quantities of sand (or coloured water) and various beach buckets with different capacities, and bigger bottles for liquids.

Introduce and explain the terms proper fraction, improper fraction, and mixed fraction.

PROPER FRACTIONS

A fraction which is less than one whole is a proper fraction: Examples: $\frac{1}{2}$, $\frac{3}{5}$, $\frac{6}{7}$ and so on. (The cup is never full.)

$\frac{2}{3} < 1$ OR $1 > \frac{2}{3}$

$\frac{5}{7} < 1$ OR $1 > \frac{5}{7}$

IMPROPER FRACTIONS

A fraction which is more than one whole is an improper fraction: Examples:$\frac{3}{2}$, $\frac{6}{5}$, $\frac{9}{7}$ and so on. (The cup is full, and there is some left over.)

$\frac{3}{2} > 1$ OR $1 < \frac{3}{2}$

$\frac{6}{5} > 1$ OR $1 < \frac{6}{5}$

$\frac{9}{7} > 1$ OR $1 < \frac{9}{7}$

MIXED FRACTION

In the experiment with sand in cups, the students observed that 3 half-sized cups held the same amount of sand as one full cup and one half cup.

So, $\frac{3}{2} = 1\ \frac{1}{2}$

$1\frac{1}{2}$is a mixed fraction. Liked an improper fraction, a mixed fraction is always more than one whole.

$\frac{3}{2} = 1\ \frac{1}{2}$ AND $1\ \frac{1}{2} > 1$ or, $1 < 1\ \frac{1}{2}$

The students can come to these conclusions through observation during their activity. They now learn the method of converting improper fractions to mixed fractions and back.

This is easily done with a few practical experiments with paper cups, beach buckets, and jars. Then, the method of conversion needs to be clearly explained.

Task: Students attempt pages 77 and 78.

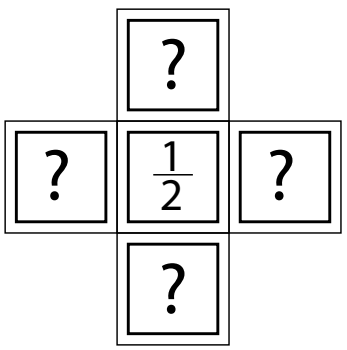
Lesson 4: **40 minutes**

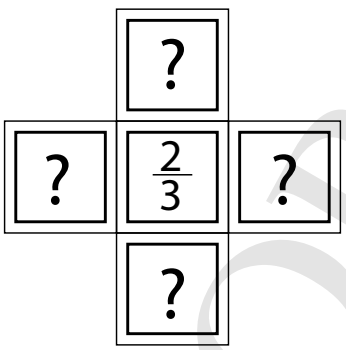
Start with addition and subtraction of fractions with same denominator during an outdoor activity session. Ask questions such as, 'What fraction of the chocolate did your group eat?' The students discuss among themselves and add up the equivalent fractions representing the bars of chocolate.

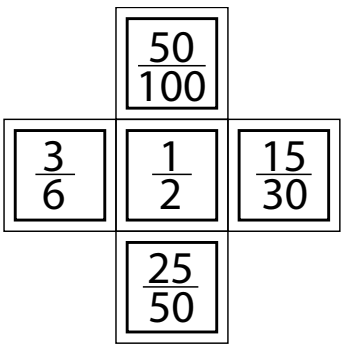
The answer may 5 whole bars of chocolate and 7 out of the 10 squares of the 6th bar (5 and $\frac{7}{10}$) 'What fraction of the juice cartons are left?' They work the figure out in a similar manner.

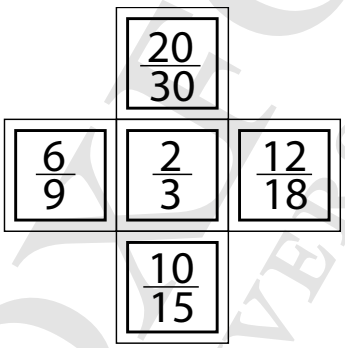
Discuss the reason for adding and subtracting fractions only when the denominators are the same (common). Discuss some common errors which might occur if we add fractions with different denominators.

Fractions in a cross will also be useful in finding equivalent fractions. In the centre square, put a fraction such as $\frac{1}{2}$ or $\frac{2}{3}$. The students find fractions equivalent to these and write them down in the empty crosses.









You may teach the rhyme below to help students remember addition/subtraction of fractions:

If adding or subtracting is your aim
The bottom numbers must be the same!

Changing bottom with multiply or divide,
The same to top must be applied,

And don't forget to simplify,
Before its time to say good bye

Task: Students attempt pages 79 to 82.

UNIT 5

MEASUREMENTS: LENGTH, MASS, AND CAPACITY

Length

i. Use standard metric units of length (kilometre, metre, and centimetre) including abbreviations
ii. Add measures of length in same units without carrying
iii. Solve real life situations involving same units of length for addition without carrying
iv. Subtract measures of length in same units without borrowing
v. Solve real life situations involving same units of length for subtraction without borrowing

Mass

i. Use standard metric units of mass (kilogram and gram) including abbreviations
ii. Add measures of mass in same units without carrying
iii. Solve real life situations involving same units of mass for addition without carrying
iv. Subtract measures of mass in same units without borrowing
v. Solve real life situations involving same units of mass for subtraction without borrowing

Capacity

i. Use standard metric units of Capacity (litre and millilitre) including abbreviations
ii. Add measures of capacity in same units without carrying
iii. Solve real life situations involving same units of capacity for addition without carrying
iv. Subtract measures of capacity in same units without borrowing
v. Solve real life situations involving same units of capacity for subtraction without borrowing

Teaching materials:

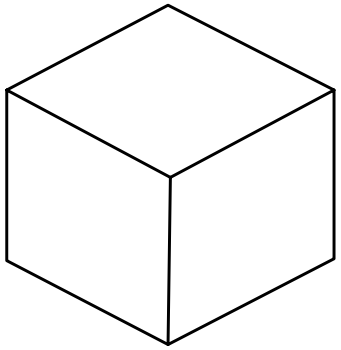
- computer
- measuring tape
- weighing scale
- measuring cylinder/cup
- articles to be measured

Learning activity

Lesson 1: 40 minutes

Metric system for measurement of physical quantities, such as length, weight, and capacity (except time) is the most commonly used system.
Length is measured in metres.
Weight is measured in grams.
Capacity is measured in litres.

The three measurements are related to one another.



The length of each edge of this cube is 10 cm.
The volume of this cube is 10 cm × 10 cm × 10 cm = 1000 cm^3
The capacity of this cube is 1 litre, which means that it can contain 1 litre of water.
The weight of this 1 litre of water will be 1 kilogram.
'kilo' as a prefix to any unit indicates 1000 such units.
One kilogram (1 kilo) is 1000 grams = 1 kg
One kilometre is 1000 metres = 1 km
One kilolitre is 1000 litres = 1 kl
One kilobyte is 1024 bytes (for memory in computers) = 1 KB
One kilocalorie is 1000 calories (unit of energy) = 1 kcal

In the following table, the units have the values shown below the line:

kilo	hecta	deca	unit	deci	centi	milli
× 1000	×100	×10	1	1/10	1/100	1/1000

Discuss the conversions and the conversion factors along with the meanings of the prefixes even before starting the concept of measurement. Let them be conversant and confident with conversions.

Concepts of length, weight, and capacity are introduced at 3 decimal places at this stage. The chapters have been designed in such a way that there is plenty of scope to relate this work to practical situations. A lot of field and group work is useful.

Length: Divide the students into groups. Give them rulers of different lengths: 1 m, 25 cm and 10 cm, a fabric tape measure, and a metal roller tape. Ask them to measure the following:

- the length and the width of the classroom
- the height of a desk, a chair, a cupboard, and the teacher's desk
- the length and width of the display board
- the length and the width of the Maths Wise text book
- the length of a pen
- the length of an eraser.

At the end, each team should presents the list of their measurements. Encourage them to talk about the units they chose to use, the different measuring rods or tapes that were used, and the reasons for their choices. Was there any argument about which equipment to choose? How did they reach the final decision?

Such activities help develop skills for team-work, problem solving, resolving differences among group members, and public speaking.

Ask questions such as:

1. Do you know the length of your bedroom? If you do not know, can you guess it? (The students get the actual measurements of their individual bedrooms the following day.)
2. Is the centimetre a good unit for measuring your bedroom? Why? Why not?
3. What fraction of its length is the width of the display board? (First, find the length of the display board, and then the width.)
4. What should be the dimensions of a new cupboard be if it has to be 40 cm higher than the current one?
5. Can a pen and an eraser be measured using the same measuring tool?

6. The new edition of Maths Wise 3 is 3 cm shorter than this edition, but has the same width. What are its dimensions?
7. If there are 4 rooms similar to this room along one side of the corridor, how long is the corridor?
8. Represent the above length in kilometres.
9. How much longer is the teacher's desk than a student's desk?

Task: Students attempt pages 84 to 92.

Lesson 2: 40 minutes

Take the class outside. Divide them into 2 groups. Give each group a weighing scale use different kinds: a spring balance, a double-pan balance, and a modern digital balance. If possible, show them a jeweller's weighing scales and the weights used. Discuss the reason for the size.

Let students hold different sizes of stones in one hand and guess the weight. Then, each stone is put on the scales to check who was right. Which is the balance they would use in the kitchen to bake a cake, in the warehouse to weigh a sack of rice, and in a jeweller's store to weigh gold and silver?

Discuss the reason why everything has weight…. The gravity of the Earth. Why does an apple fall down from the tree? Why does a ball thrown in the air, fall to the ground?

Newton and the apple story is very valid. Why do objects always fall down? Why does every object have weight? For example, 10 g of gold, 200 g of flour to bake a cake, or 50 kg of potatoes.

Why do astronauts find it hard to walk on the Moon? It is interesting to note that the weight of a person may somewhat reduce when the Moon is exactly above the Earth. The reason? The Moon's gravity pulls the person in a direction opposite to the gravity of the Earth.

Task: Students attempt pages 93 to 99.

Lesson 3: 40 minutes

Carry out activities similar to those used for length and weight using measuring cups or cylinders. The students should form clear ideas about a litre, kilolitre, and millilitre. Talk about practical situations, and discuss the unit which would be suitable for the situation. The students use calibrated cups and cylinders of different sizes to find the sum of two cups full of liquid or the difference between the two.

Show them how to find the sum and difference by adding liquids in a measuring cylinder.

Carry out 2 interesting experiments.

1. Pour 1 litre of water into a measuring cylinder. Now put a large stone into it. Observe the new water level. What does the rise of level signify?
2. Take 4 similar measuring cylinders. Pour a litre each of water, oil, kerosene, and glycerin in the various cyclinders.

Now weigh each cylinder. What do you observe?

The weight of 1 litre of water should be 1 kg. The volume will be approximately 1 cubic metre. That is the basis of the entire metric system.

If you were to weigh the water with 10 tablespoonfuls of salt (or sugar) dissolved in it, will the weight of the solution be more? Will the level of water rise?

Task: Students attempt pages 100 to 102.

UNIT 6

MEASUREMENT: TIME

Time

i. Use a.m. and p.m. to record the time from 12-hour clock
ii. Read and write time from analog and digital clocks
iii. Read and write days and dates from the calendar
iv. Add measures of time in hours
v. Solve real life situations involving measures of time for addition of hours
vi. Subtract measures of time in hours
vii. Solve real life situations involving subtraction of measures of time in hours

Teaching materials:

- wooden clock face
- stopwatch
- calendar for current year

Learning activity

Lesson 1: **40 minutes**

Time is the only form of measurement, be it years, months, days, minutes, or seconds, which cannot be measured using the decimal system. The number of days taken by the Earth to go around the Sun is 365 and $\frac{1}{4}$ days. This not a multiple of 10, and cannot be converted into tenths and hundredths. Because of the $\frac{1}{4}$, there are 365 days in a year for 3 consecutive years, and the four $\frac{1}{4}$ s make one day, which is accounted for as an extra day, giving 366 days in a leap year.

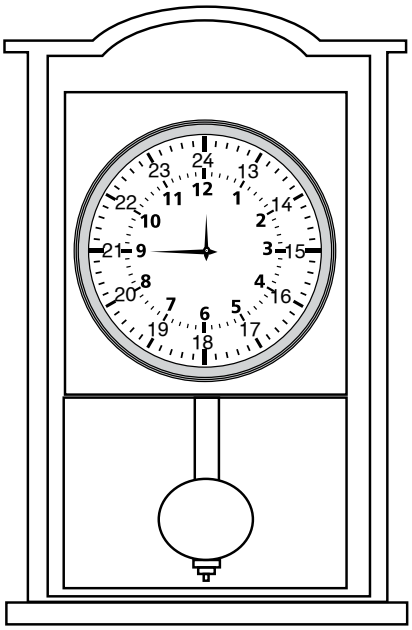
It is interesting to introduce more complex means of telling time; examples: pendulum clock, time-ball, stopwatch, etc.

A day is further divided into 24 hours, each hour into 60 minutes, and each minute into 60 seconds.

The students already know how to make a clock face by dividing the circular face of a clock into 4 parts and then dividing each quarter into 3 smaller units. (This can be done by paper-folding or with the help of a protractor.) Each unit represents 5 minutes. Time is read in jumps of 5. This has been done in Maths Wise 1 and Maths Wise 2 on a number line as well as on a clock face.

So, exact time can be told on an analogue watch by calculating the position of the minute hand.

The 24-hour clock can be introduced now. Make a special clock face with the usual 12 hours in the inner circle and 13 to 24-hour time in the outer circle, or vice versa. It is still possible to get a 24-hour face on clocks and wrist-watches. (please fill in all the numbers). Revise a.m. and p.m.



The concept of time is directly related to real life; problems can be easily developed to facilitate the student's perception and understanding of time. The students have heard about time management and the school timetable. Based on that, ask them to prepare a timetable of their daily activities at home.

The next day in class, compare these timetables for each student and discuss the amount of time spent per day on various activities. Also compare the time spent by different students doing the same activity. You may arrive at very interesting conclusions. They will discover the amount of time each one spends doing homework, watching TV, sleeping, doing household chores, and other activities. Involve them in a discussion on the optimal utilization of time.

Ask them to create a similar time-table for each parent and share these with the class. Point out the differences in the utilization of time by adults and students, under headings such as time spent in:

Prayer – before bedtime or after waking up
Sleeping
Changing clothes
In the kitchen
At the dining table
Swimming
In the office
In school
Learning music or art
Eating a family meal
Watching TV or playing games
Chatting
Playing games
Travelling to school
Watching a film
The longest innings any batsman has played
T20 cricket match

It is good exercise to discuss issues like excessive TV viewing or playing games, as a result of which actual responsibilities may be neglected.

Task: Students attempt pages 104 to 107.

Lesson 2: 40 minutes

At this stage, it is important for students to understand the concept of an hour, a minute and a second. They should form an idea about the actual sense of the units of time. 'Clap to a second', 'Clap every 5-seconds', 'Clap every 10 seconds', and so on. A stopwatch is useful in this case.

Divide the class into small groups. Give each group a stopwatch. One group challenges the other group to perform an activity (for example: run around the playground twice). As the other team tries to complete the activity in the allotted time one member of each team keeps track of the time using the

stopwatch. Repeat this activity several times keeping in mind the fact that each student gets to keep the time at least once and perform an activity at least once. This helps them develop a sense of time. At the end of the session ask them to make a list of tasks that can be done in a second, a minute, 5 minutes, 15 minutes, half an hour, an hour, more than an hour.

For example, how long does each of the following activities take?
Drinking a glass of milk
Eating a snack
A quick shower
Helping in the kitchen (or any other work)
A telephone call to a friend
An ad on the TV
Travelling from home to school and from school back home

Task: Students attempt pages 108 to 110**.**

Lesson 3: 40 minutes

The students have learnt about the calendar in previous years.

What is a year? A year is not only from 1st January to 31st December; from Christmas to the next Christmas, or from Boxing Day to the next Boxing Day is one year; from this birthday to your next birthday is one year.

Revise the months of the year. Ask them to find the dates from the current calendar. Talk about important events; ask the students the dates and months in which they take place.

It will be interesting for the students to learn a little about the Roman calendar.

What is the reason behind September (Septagon …7 sided figure) being the 9th month, October (Octopus … 8) being the 10th month, November (Novem ….9) being the 11th month and December (Decade …10) being the 12th month?

Task: Students attempt pages 111 to 114**.**

UNIT 7

GEOMETRY

Geometrical shapes

i. Draw and measure line segments to the nearest centimetre and millimetre
ii. Recognise point, line, ray and line segment
iii. Classify figures according to number of sides as quadrilaterals (rectangles, squares and triangles)
iv. Calculate perimeter of square, rectangle, and triangle
v. Identify center, radius and diameter of a circle

Symmetry

i. Identify reflective symmetry in two- dimensional (2D) shapes
ii. Identify and draw lines of symmetry

Three Dimensional (3D) objects

i. Describe 3D objects (cubes, cuboids, and pyramids) with respect to the number of edges and faces
ii. differentiate 3D objects (cubes, cuboids, and pyramids) with respect to the number of edges and faces

Teaching materials:

- geo boards
- a long piece of rope
- cardboard and scissors
- computer

Learning activity

Lesson 1: 40 minutes

Geometry is an important concept that students become familiar with at an early age, beginning with objects such as the spherical ball, the rectangular rim of a cot, the oval of the mother's eye, the circle of a moon, the rim of a glass or a bowl and mother's bangles. The concept of geometrical shapes and their properties is best introduced and explained with real life objects and hands-on activities in the classroom.

Read pages 114, 115, and 116. Give the students plenty of practice in drawing the various shapes and understanding the terms introduced.

Task: Students attempt pages 116 to 118.

Lesson 2: 40 minutes

Tangrams, excellent for recreational mathematics, are an excellent tool to help students familiarize themselves with the different shapes and their physical properties. They also help build the student's neuro-motor skills.

Take to class a tray of Tangram pieces or cardboard cut-outs of various triangles and quadrilaterals, as per the original Tangram square. Display a chart showing the various possible combinations.

Ask the students to use rulers, protractors, and compasses to draw the various quadrilaterals and triangles. The shapes can be cut out, measured, folded, compared, and even written upon. Practical work can be quite useful in teaching all sorts of concepts related to quadrilaterals and triangles.

Task: Students attempt pages 119 to 121.

Lesson 3: 40 minutes

Introduce symmetry by telling the students that something has symmetry if it can be split into two similar equal parts. For example, a butterfly is symmetrical because its picture can be folded in half such that both sides match.

When teaching beginners, show them that shapes on one side of a line are the same as on the other side of a line. This line is known as line of symmetry.

Young children begin to understand the concepts and vocabulary of symmetry if they are given opportunities to play symmetry games and experiment with symmetry drawings.

Take a sheet of paper and fold it vertically along the centre and fix it on the board. Draw a picture of half butterfly and paint it. Now turn the other plain half on the painted part and press a little. Open the fold and show them that that there is a symmetrical picture on the other side of paper completing the butterfly.

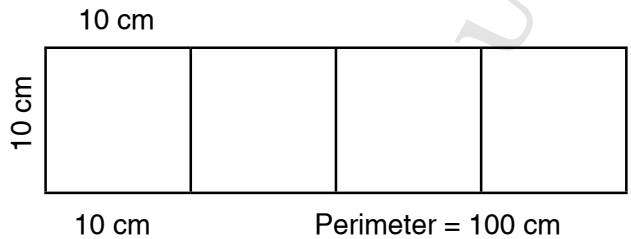
Give small sheets of papers to make their own symmetrical drawings.

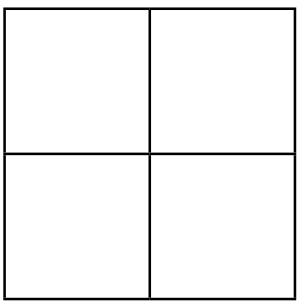
Task: Students attempt page 125 and 126

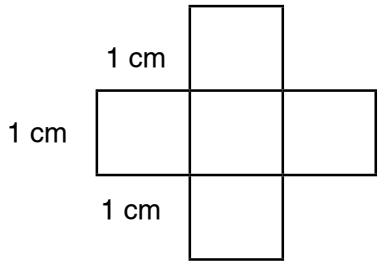
Lesson 4: 40 minutes

You could conduct several activities for teaching about properties of shapes and perimeter using the geo board. Divide the class into groups of 3 or 4 and give each group a geo board and some elastic bands. Ask the students to make shapes such as any quadrilateral, a triangle, a shape like a circle, an arrow shape, or an L shape on the geo board. They calculate the perimeter of any shape by counting the number of squares the rubber band has gone around. (Sometimes the rubber band stretches diagonally across a square, in which case the length is more than a side. Similarly, be aware of the fact that the areas of different shapes vary.)

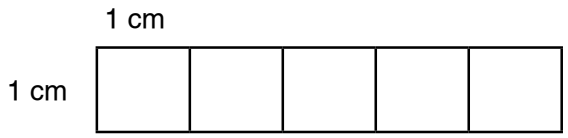
Take the students outside. With chalk dust, create a geo board on the ground. Divide the students into 2 groups. One group will stand on the dots holding a rope between them to form a shape. The second group has to name the shape, state 3 of its properties and find the perimeter of the shape. Repeat this exercise several times ensuring that every student gets a chance to make a shape as well as state its properties.




Perimeter = 80 cm

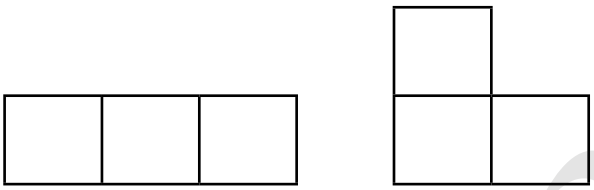


Perimeters = 12 cm

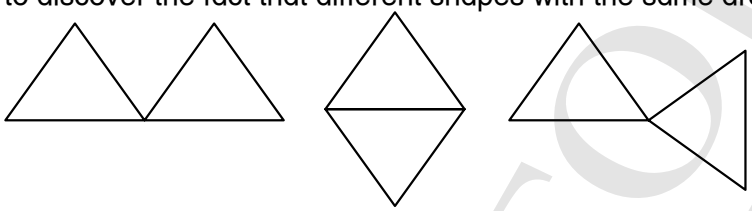


Perimeters = 12 cm

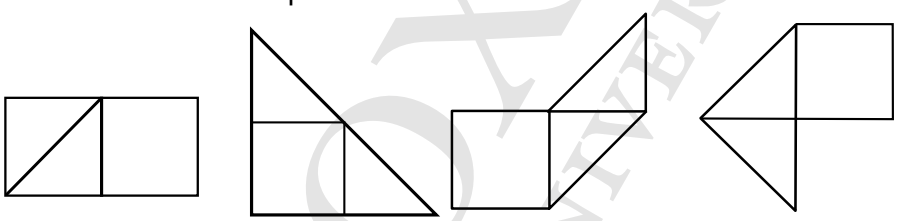
Work with 3 squares … put them in a row and in an L shape. Are the perimeters different in each case?



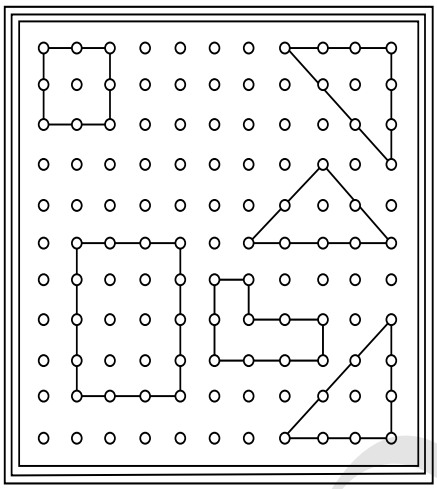
Work with equilateral triangles in a similar manner. The object of the exercise is to enable the students to discover the fact that different shapes with the same area can have different perimeters.



As the students work on the Tangrams, talk about the importance of these shapes, that they have the same area (as they are parts of the square from which the parts have been cut out) but they all have different shapes and hence different perimeters. You may also ask them to think about different shapes which have the same perimeter.



Different shapes can also be formed on a geoboard with non-stretch string.



Task: Students attempt pages 129 to 132.

Lesson 5: **40 minutes**

They have already been introduced to 3D shapes. Relate the shapes with objects around them.

Ask them to identify and relate the object from daily life with solid shapes.

Task: Students attempt page 127 and 128.

UNIT 8

DATA HANDLING

Data Representation

i. Representation of data by
   - Carroll diagram
   - Tally chart

ii. Read and interpret a Carroll diagram and Tally chart

iii. Read and interpret Picture Graph

Teaching materials:

- chart paper and coloured pencils
- newspaper clippings of graphs
- computer

Learning activity

Carroll diagram

Lesson 1: **40 minutes**

Tell them that a Carroll diagram is a way of sorting objects, numbers and shapes by their characteristics. It looks like a table in which we sort the data with more than two criteria into the boxes.

Task: Students attempt page 134.

Graphs

Lesson 2: **40 minutes**

A graph is a representation of a set of data on paper. Display an assortment of graphs (enlarged) on charts.

This is the students' first introduction to graphs, a concept they will refer to throughout their lives, so it is very important that they gain a good understanding at this stage.

Work with the graphs which relate to everyday topics such as runs scored by various cricketers, temperatures during various seasons, favourite sports of the students, and so on.

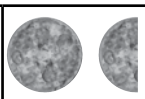
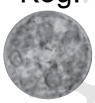
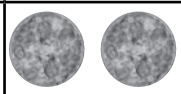
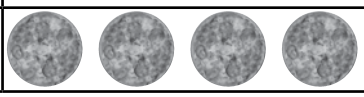
Show them clippings of graphs being used in every sector of life, be it sports, science, newspapers, advertisements, banks or even in their school. Show the advantage of representing information on a graph as opposed to in written form. The information on a graph is immediately visible.

Talk about the various forms of graphical representations the students can see around them: a bar graph, histogram, pie chart, scatter graph, and a line graph. Introduce the basic requirements to be shown on any graph: a set of axes to be labelled according to the type of data, and a scale or a legend. Even a map can be considered to be a graph, instead of the two axes, a map has direction: N to S, and E to W.

Divide the class into groups. Give each group a topic and ask them to conduct a survey in class and gather raw data. Explain how to sort out and arrange the data. Then, show them the steps for deciding a scale and a set of axes. Help them plot the data into a pictogram. Once the pictograms are ready, ask the groups to come up and present their graphs. During the presentation, ask them questions which have to be answered by referring to the graph

Pets	
Dogs	
Cat	
Rabbits	
Others	

This pictogram shows the number of pizzas eaten by four friends in the past month:

Zain		Key:  = 4
Ali		
Sara		

The Key tells you that one pizza on the pictogram represents 4 pizzas eaten so Zain ate 4 + 2 = 6 pizzas.

Task: Students attempt pages 135 and 136.

UNIT 9

REVIEW AND ASSESS 2

Teaching objectives

- to revise concepts learnt throughout the year

Teaching materials:

- Additional worksheets

Learning activity

Simple magic squares, for this age group, will be an interesting fun activity to be introduced. A magic square has numbers arranged inside a square (one number used once only) in such a manner that the sum of each row and each column is constant.

In the Magic Square given below, numbers from 1 to 9 have been used in such a manner that each row, each column and each diagonal has a sum of 15.

Introduce this concept. Draw the Magic Squares on the board, with a couple of numbers missing. Ask the class to fill in the numbers. Work out a couple of such squares before the class is asked to complete them. A few examples have been given below.

Each Magic Square below has been formed with consecutive numbers.

2	7	6
9	5	1
4	3	8
15	**15**	**15**

4	9	2
3	5	7
8	1	6

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

23	28	21
22	24	26
27	20	25

Do the work sheets with the students to review the concepts taught this year. You may add values to each of the problems on these sheets and use them according to your students' requirements. Repeated use is also possible.

Task: Students attempt pages 138 to 145.

Answers to Book 3

Unit 1: Assess and Review 1

Exercise 1

1. ones	2. tens	3. tens	4. hundreds
5. ones	6. ones	7. ones	8. tens
9. hundreds	10. ones		

Exercise 2

1. 36	2. 235	3. 519	4. 40	5. 176
6. 904	7. 21	8. 100	9. 998	10. 20
11. 508	12. 976	13. 710		

Exercise 3

1. 264, 265, 266, 267, 268, 269, 270
2. 599, 699, 799, 899
3. 37, 47, 57, 67, 77, 87, 97, 107
4. 62, 82
5. 152, 162,172, 182,192

Exercise 4

1. 07, 23, 61, 75, 82, 94 and 94, 82, 75, 61, 23, 07
2. 128, 287, 348, 475, 711 and 711, 475, 348, 287, 128
3. 504, 524, 554, 564, 594 and 594, 564, 554, 524, 504
4. 600, 601, 603, 606, 609 and 609, 606, 603, 601, 600
5. 227, 337, 777, 887, 997 and 997, 887, 777, 337, 227

Exercise 5

1. 247, two hundred and forty-seven
2. 617, six hundred and seventeen
3. 689, six hundred and eighty-nine
4. 495, four hundred and ninety-five
5. 944, nine hundred and forty-four
6. 160, one hundred and sixty
7. 926, nine hundred and twenty-six
8. 116, one hundred and sixteen
9. 600, six hundred
10. 1400, one thousand four hundred

Exercise 6

1. 12, twelve
2. 84, eighty-four
3. 393, three hundred and ninety-three
4. 432, four hundred and thirty-two
5. 386, three hundred and eight-six
6. 666, six hundred and sixty-six
7. 32, thirty-two

8. 106, one hundred and six
9. 47, forty-seven
10. 610, six hundred and ten

Exercise 7

1. 8	2. 21	3. 30	4. 60	5. 18
6. 20	7. 130	8. 60	9. 102	10. 120

Exercise 8

1. 2 cars each	2. 5 sweets each	3. 4 pencils each
4. 5 teddies each	5. 3 coins each	

Exercise 9

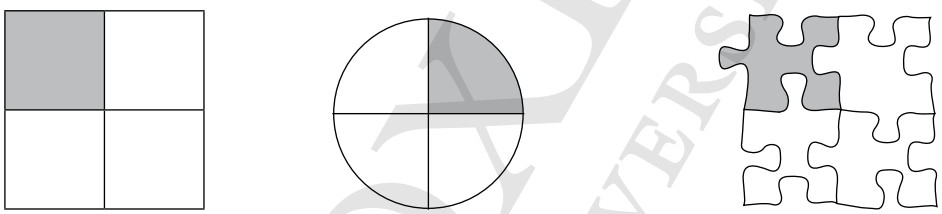
circle, square, triangle, rectangle

Exercise 10

cube, sphere, cuboid, cylinder, pyramid,

Exercise 11

Exercise 12



Exercise 13

1. 6.1 cm	2. 3.4 cm	3. 5.1 cm	4. 8 cm	5. 5.2 cm

Exercise 14

1. 5 minutes past 2	4. half past 9
2. 20 minutes past 3	5. 12 o'clock
3. 7 o'clock	6. quarter past 11

Exercise 15

1. 841 books	2. Rs 24	3. 182 days
4. Rs 18	5. answers will vary	6. 56 kg
7. 8 m	8. 3 hrs, evening	9. 4

10. 12 cans of juice, 30 sandwiches

Puzzle

There can be many combinations:
2 + 8, 5 +5, 6 + 4, 3 + 7, 7 + 3, 20 ÷ 2 etc.
Similarly, combinations can be made for other numbers.

Unit 2: Whole Numbers

Exercise 1

1. Children draw three flowers.
2. 2 marks
3. 5 marks

Exercise 2

2. III 3. V 4. IV 5. VIII

Exercise 3

1, 7, 4, 9
5, 2, 6, 10

Exercise 4

Roman					Words
X	+	I	=	XI	eleven
X	+	II	=	XII	twelve
X	+	III	=	XIII	thirteen
X	+	IV	=	XIV	fourteen
X	+	V	=	XV	fifteen
X	+	VI	=	XVI	sixteen
X	+	VII	=	XVII	seventeen
X	+	VIII	=	XVIII	eighteen
X	+	IX	=	XIX	nineteen

Exercise 5

1. XVI, 16 2. XX, 20

Exercise 6

1. VII seven
2. IX nine
3. XX twenty
4. XI eleven
5. IV four

Activity

- LID, MILD, DILL, MILL, CIVIC, CIVIL, etc.
- Cross out LONG, VI will be left.
- XI (It becomes eleven.)

Exercise 7

Students colour the grid as instructed.

Exercise 8

1. 56√, 57×, 58√, 59×, 60√
2. 87×, 88√, 89×, 90√, 91×
3. 201×, 202√, 203×, 204√, 205√
4. 444√, 445×, 446√, 447×, 448√
5. 1234√, 1235×, 1236√, 1237×, 1238√

Exercise 9

	HTh	TTh	Th	H	T	O	number names
1.			3,	1	7	4	three thousand, one hundred and seventy-four
2.			2,	0	5	8	two thousand and fifty-eight
3.		5	6,	3	6	7	fifty six thousand, three hundred and sixty-seven
4.		4	3,	0	9	8	forty-three thousand and ninety-eight
5.	8	7	0,	4	9	6	eight hundred and seventy thousand, four hundred and ninety-six

Exercise 10

2. 2 ones 3 tens 7 hundred 8 thousand 6 ten thousand 6 hundred thousand
   60,000 + 8000 + 700 + 30 + 2
3. 8 one 4 tens 9 hundreds 5 thousands
   5000 + 900 + 40 + 8
4. 2 ones 8 tens 9 hundreds 3 thousands
   4,000 + 3000 + 900 + 80 + 2
5. 8 ones 7 tens 2 hundreds 6 thousands 7 ten thousand
   70,000 + 6000 + 200 + 70 + 8
6. 7 ones 3 tens 4 hundreds 8 thousands 6 ten thousand 9 hundred thousand
   900,000 + 60,000 + 8000 + 400 + 30 + 7

Exercise 11

	HTh	TTh	Th	H	T	O	number names
2.			7	6	4	3	seven thousand six hundred and forty-three
3.		9	1	5	9	0	ninety one thousand five hundred and ninety
4.		8	1	2	0	7	eight-one thousands two hundred and seven

Exercise 12

1. H 2. TTh 3. Th 4. H
5. T 6. O

Exercise 13

Answers will vary.

Exercise 14

2. 3108; 3208; 3308; 3408; 3508; 3608
3. 13,009; 13,019; 13,029; 13,039; 13,049; 13,059
4. 35,909; 36,909; 37,909; 38,909; 39,909; 40,909
5. 6474, 6574, 6674, 6774, 6874, 6974

Exercise 15

4678	5678	6678	7678	8678	9678	
21	121	221	321	421	521	
18,101	19,101	20,101	21,101	22,101	23,101	24,101
7095	7105	7115	7125	7135	7145	
677	777	877	977	1077		
1500	2500	3500	4500	5500	6500	

Activity

Across

1. 53,067 4. 123 7. 897,653 9. 64,910
10. 5796 11. 6363

Down

2. 3527 3. 718,329 5. 300,000 6. 980,154 8. 66,666

Exercise 16

1. < 2. > 3. < 4. = 5. > 6. =

Exercise 17

Only the second pair is correct.

Exercise 18

1. ascending; 367; 368
2. descending; 249; 239
3. descending; 143, 43
4. ascending; 220, 230
5. ascending; 335,435

Exercise 19

1. 76,431 largest; 13,467 smallest
2. 98,620 largest; 20689 smallest
3. 94,210 largest; 10,249 smallest
4. 76,431; 13,467 smallest

Exercise 20

1. 1000 2. 9999 3. 99,999 4. 100 5. 10,000

Ascending order: 100; 1000; 9999; 10,000; 99,999

Unit 3: Number operations

Exercise 1

1. 9976 2. 5844 3. 8867 4. 6589
5. 4599 6. 9,983

Exercise 2

1. 9889 2. 3688 3. 8678 4. 3444

Exercise 3

1. 6230 2. 4968

Exercise 4

1. 7467 2. 9459 3. 9319 4. 9444
5. 4489 6. 2213

Exercise 5

1. 8139 2. 6919 3. 7493 4. 1494

Exercise 6

1. 6914 2. 6578 3. 3550 4. 9470 5. 7931

Exercise 7

1. 60 2. 70 3. 80 4. 60
5. 60 6. 65 7. 30 8. 39
9. 58 10. 95

Exercise 8

1. 62 2. 96 3. 76 4. 60 5. 83
6. 29 7. 92 8. 84 9. 40 10. 61

Activity

Hoopla	5 and 25; 10 and 20; 10, 10, 10;
Wheel of fortune	100, 100, 100, 100, 100, 100 100, 150, 250 200, 300 150, 350 100, 400
Darts	50, 150 50, 50, 100 100,100

Exercise 9

1. 4221 2. 2242 3. 8322 4. 4223 5. 4083 6. 6743
7. 5203 8. 2200 9. 3000

Exercise 10

1. 7051 bees 2. 1111 pages 3. 2413 men

Exercise 11

1. 2156 2. 2519 3. 4175 4. 7560 5. 3427 6. 5782

Exercise 12

1. 2744 2. 2950 3. 2881 4. 4203 5. 8775 6. 1652

Exercise 13

1. 882 cards 2. 1498 people 3. Rs 7024
4. 7095 bangles 5. 2486 bottles

Exercise 14

1. 40 2. 40 3. 40 4. 52 5. 25 6. 10
7. 14 8. 38 9. 7 10. 16 11. 38 12. 20
13. 32 14. 50

Exercise 15

1. 35 2. 56 3. 41 4. 48 5. 36

Activity

Spider with 8 legs is the correct choice, since in the first row each animal has legs in the multiples of 2. (snail, 0 legs; kiwi, 2 legs; squirrel, 4 legs; beetle, 6 legs)

Exercise 16

1. 16 2. 54 3. 7 4. 6 5. 11 6. 9 7. 9
8. 0 9. 7 10. 8 11. 6 12. 88 13. 64 14. 1

Exercise 17

1. 170 2. 402 3. 29 4. 712
6. 360 6. 245 7. 594 8. 328

Exercise 18

1. Rs 369 2. 160 legs 3. 72 students
4. 144 dozen 5. 100 crayons 6. 343 days

Exercise 19

1. 70 2. 830 3. 990 4. 340 5. 48 6. 93 7. 99
8. 88 9. 216 10. 108 11. 648 12. 189 13. 32 14. 0

Activity

5	×	2
×	10	×
2	×	5

4	×	8
×	32	×
8	×	4

5	×	9
×	45	×
9	×	5

6	×	4
×	24	×
4	×	6

7	×	9
×	63	×
9	×	7

10	×	10
×	100	×
10	×	10

Exercise 20

2. 10 ÷ 5 = 2
   5 × 2 = 10
3. 12 ÷ 6 = 2
   6 × 2 = 12
4. 14 ÷ 2 = 7
   2 × 7 = 14

Exercise 21

1. 5
2. 2
3. 4
4. 4
5. 6
6. 4

Exercise 22

2. 4, 6
3. 6, 5
4. 4, 12
5. 6, 8

Exercise 23

1. 2
2. 15
3. 13
4. 49
5. 12
6. 14
7. 8 R3
8. 64 R2

Exercise 24

1. 24
2. 17
3. 12
4. 26
5. 133 R1
6. 46 R7

Exercise 25

1. 6 seeds
2. 7 buttons
3. 12 kg
4. Rs 23
5. 152 students

Exercise 26

1. 21
2. 23
3. 11
4. 19
5. 27
6. 21
7. 16
8. 16
9. 9
10. 11
11. 247 R1
12. 44

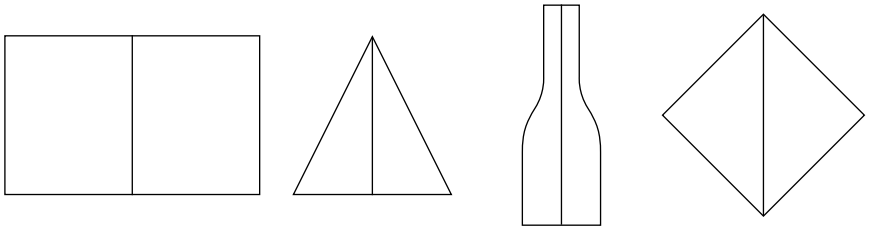
Activity

The secret message is:

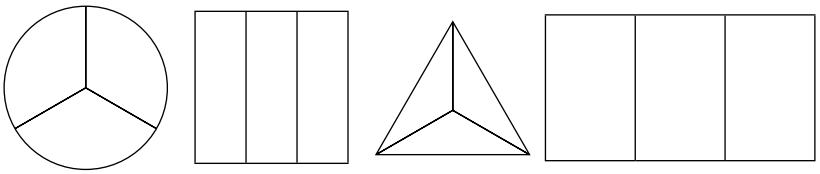
DIVISION IS FUN

Unit 4: Fractions

Exercise 1



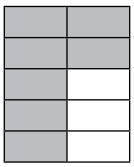
Exercise 2

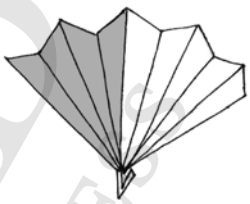
1. 

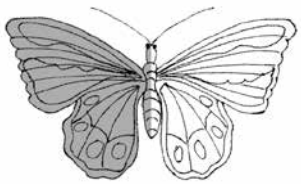
2. $\frac{2}{6} + \frac{2}{6} + \frac{2}{6} = 1$ whole

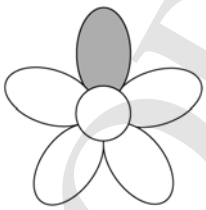
Exercise 3

2. 

3. 

4. 

5. 

6. 

Exercise 4

1. $\frac{1}{2}$ of 8 = 4
2. $\frac{1}{2}$ of 12 = 6
3. $\frac{1}{2}$ of 6 = 3
4. $\frac{1}{2}$ of 14 = 7
5. $\frac{1}{4}$ of 20 = 5
6. $\frac{1}{4}$ of 8 = 2
7. $\frac{1}{4}$ of 8 = 2
8. $\frac{1}{4}$ of 12 = 3
9. $\frac{2}{5}$ of 10 = 4
10. $\frac{2}{5}$ of 20 = 10
11. $\frac{2}{5}$ of 15 = 6
12. $\frac{2}{5}$ of 30 = 12

Exercise 5

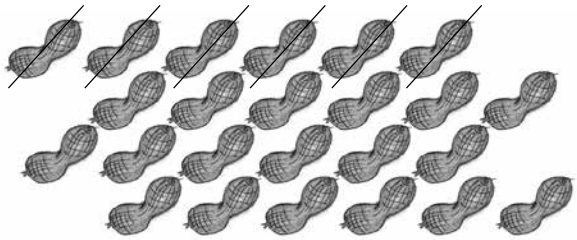
1. $\frac{2}{4}$
2. $\frac{2}{8}$
3. $\frac{3}{6}$
4. $\frac{1}{2}$
5. $\frac{2}{5}$
6. $\frac{5}{10}$

Exercise 6

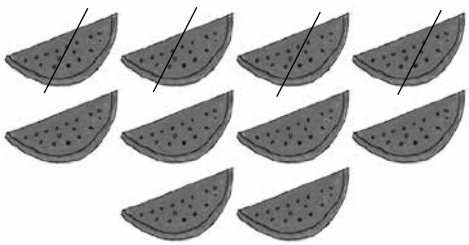
1. $\frac{3}{9} = \frac{1}{3}$
2. $\frac{10}{15} = \frac{2}{3}$
3. $\frac{2}{12} = \frac{1}{6}$
4. $\frac{4}{16} = \frac{1}{6}$

Exercise 7

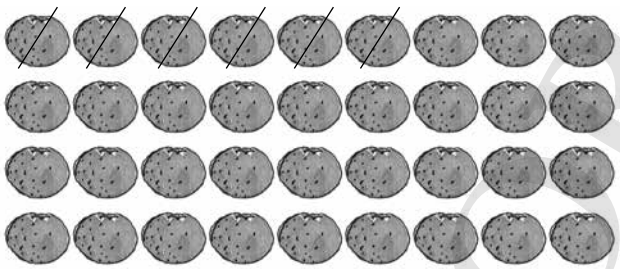
2. 6,



3. 4,



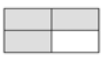
4. 6,



Exercise 8

$\frac{1}{3}$, one-third, $\frac{2}{3}$,  , 

 , one half, $\frac{4}{8}$,  , $\frac{1}{2}$

three quaters,  , $\frac{3}{4}$, three-fourths, $\frac{2}{3}$

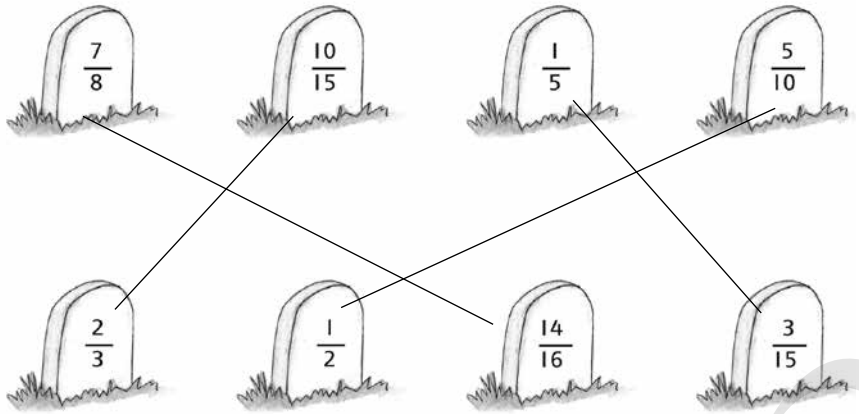
one whole, I, $\frac{6}{6}$,  , 

$\frac{4}{5}$,  ,  ,  , four-fifths.

Exercise 9

All fractions are equivalent except 2 and 5.

Exercise 10



Exercise 11

1. $\frac{2}{4}$ 2. $\frac{4}{6}$ 3. $\frac{6}{18}$ 4. $\frac{20}{24}$ 5. $\frac{2}{2}$

Exercise 12

Proper: $\frac{3}{8}$, $\frac{2}{66}$, $\frac{5}{67}$, $\frac{1}{56}$, $\frac{7}{68}$ Improper: $\frac{4}{3}$, $\frac{77}{5}$, $\frac{24}{9}$, $\frac{15}{7}$, $\frac{34}{6}$

Exercise 13

1. $\frac{3}{7} < \frac{5}{7}$ 2. $\frac{2}{9} < \frac{5}{9}$ 3. $\frac{10}{11} > \frac{7}{11}$ 4. $\frac{3}{5} > \frac{1}{5}$ 5. $\frac{2}{15} < \frac{6}{15}$

Exercise 14

1. $\frac{1}{4}, \frac{3}{4}, \frac{4}{4}$ 2. $0, \frac{4}{10}, \frac{5}{10}$ 3. $\frac{1}{5}, \frac{3}{5}, \frac{5}{5}$ 4. $\frac{1}{7}, \frac{4}{7}, \frac{8}{7}$ 5. $, \frac{1}{11}, \frac{4}{11}, \frac{5}{11}$

Exercise 15

1. $\frac{2}{2}$ 2. $\frac{3}{5}$ 3. $\frac{5}{8}$ 4. $\frac{5}{7}$

5. $\frac{6}{8}$ 6. $\frac{5}{10}$ 7. $\frac{4}{3}$ 8. $\frac{10}{11}$

9. $\frac{11}{12}$ 10. $\frac{10}{9}$

Exercise 16

1. $\frac{1}{4}$ 2. $\frac{1}{5}$ 3. $\frac{2}{7}$ 4. $\frac{6}{8}$

5. $\frac{1}{6}$ 6. $\frac{2}{11}$ 7. $\frac{1}{5}$ 8. $\frac{5}{12}$

9. $\frac{7}{13}$ 10. $\frac{3}{9}$

Exercise 17

1. + 2. – 3. – 4. + 5. +

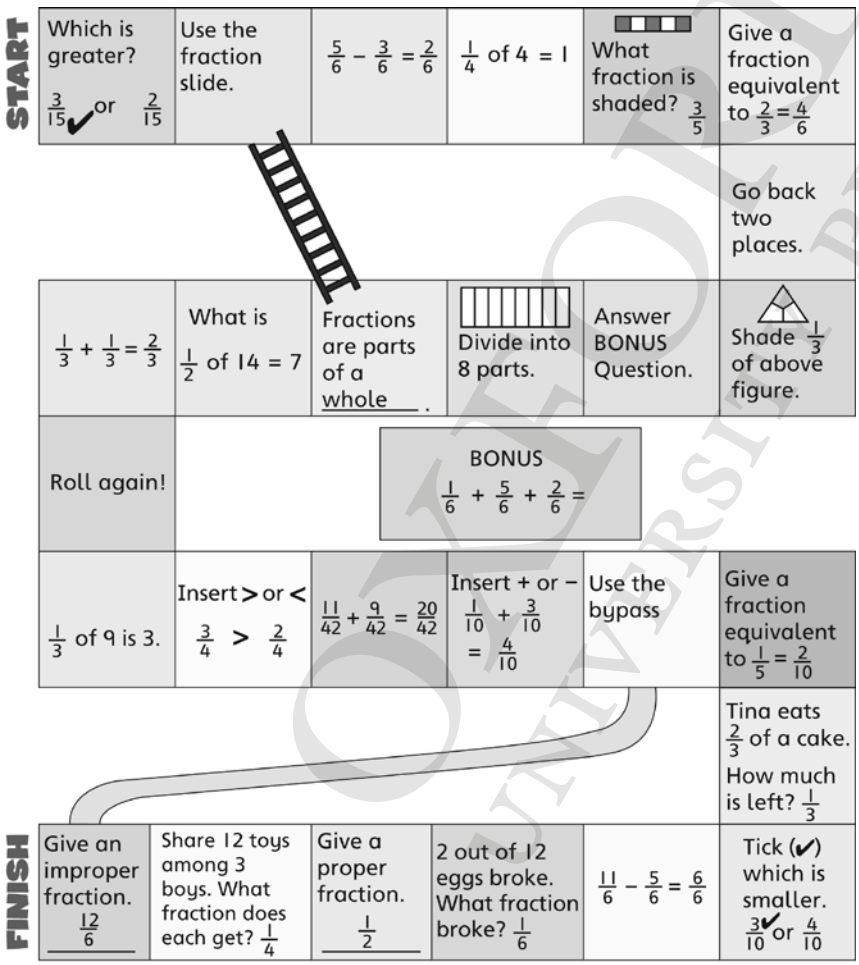
Exercise 18

1. $\frac{1}{4}$ eaten, $\frac{3}{4}$ left
2. $\frac{1}{6}$ eaten, $\frac{5}{6}$ left
3. $\frac{3}{8}$ eaten, $\frac{5}{8}$ left
4. $\frac{1}{3}$ eaten, $\frac{2}{3}$ left

Exercise 19

1. $\frac{3}{4}$ of the pencils remain.
2. Amir ate 4 pieces and 4 pieces are left.
3. 25 apples were unripe; 75 apples were ready to eat.

Game page 80



Unit 5: Measurements: Length, Mass, and Capacity

Exercise 1

1. metre 2. kilometre 3. centimetre
4. centimetre 5. centimetre 6. centimetre

Exercise 2

2. 80 m 3. 9 cm 4. 8 m 5. kilometre 6. kilometre

Exercise 3

1st section

1. 4.5 cm 2. 3.5 cm 3. 1.5 cm 4. 2.6 cm

2nd section

1. The example shows a ruler measuring the line as 6 cm, which is not drawn to scale. Allow the children to use their rulers to draw actual measurements as given for the next three exercises.

Exercise 4

1. 18 cm 2. 9 cm 3. 9 cm 4. 17 cm 5. 34 cm

Exercise 5

1. 7 m 2. 38 m 3. 17 m 4. 9 m 5. 13 m

hill, tower, lamp post, house, tree, ladder
ladder, tree, house, lamp post, tower, hill

Exercise 6

home ⟶ superstore ⟶ ice-cream parlour ⟶ school

Exercise 7

2. 349 m 3. 54 km 4. 118 cm 5. 139 m

Exercise 8

2. 222 m 3. 41 km 4. 23 cm 5. 112 m

Exercise 9

16 cm

Exercise 10

12 cm

Exercise 11

Children draw a line 5 cm long.

Exercise 12

2. 7 cm, 16 cm 3. 9 cm, 21cm 4. 79 cm, 171 cm 5. 27 cm, 64 cm

Exercise 13

2. car 3. truck 4. dog 5. can of juice 6. fox

Exercise 14

1. 4 kg 2. 450 g 3. 250 g 4. $3\frac{1}{2}$ kg
5. 25 g 6. 60 kg

Exercise 15

2. mg 3. g 4. kg 5. kg 6. g

Exercise 16

less than 1 kg: teddy, pencil, scissors, photo frame, jar of sweets, CDs
more than 1 kg: laptop, television, fish bowl, books

Exercise 17

The weights that the shopkeeper can use are:

2. 250 g, 10 g
3. 30 g, 20 g, 20 g, 10 g
4. 10 kg, 3 kg
5. 300 g, 25 g
6. 500 g, 250 g, 10 g

Exercise 18

2. 1102 g
3. 68 kg
4. 499 g
5. 178 g

Exercise 19

2. 130 g
3. 120 g
4. 4 kg
5. 37 g
6. 12 kg

Exercise 20

2. 16 kg
3. 512 g
4. 40 kg
5. 162 g

Exercise 21

Total = 187 kg; overweight by 81 kg

Exercise 22

1. jug
2. thermos
3. larger pack
4. bigger bowl
5. bottle
6. can of juice

Exercise 23

1. ml
2. litre
3. ml
4. litre
5. litre
6. ml

Exercise 24

1. 2 l
2. 250 ml
3. 25 l
4. 51 ml
5. 100 ml
6. 13 l

Exercise 25

2. 378 ml
3. 1299 ml
4. 15182 l
5. 59 l
6. 21l
7. 522 ml
8. 200 ml
9. 151 l
10. 32 l

Exercise 26

1. 32 l
2. 45 l
3. 19 ml, 10 ml
4. 1650 ml.

Unit 6: Measurement : Time

Exercise 1

1. 2 a.m., 4 a.m., 10 a.m., 12 noon, 3 p.m., 4 p.m., 5 p.m., 7 p.m.
2. a. a.m. b. p.m. c. p.m. d. a.m. e. a.m.
3. a. a.m. b. p.m. c. a.m. d. p.m. e. p.m.

Exercise 2

2. 5 minutes to 2
3. 30 minutes past 9 or 30 munites to 10
4. 15 minutes to 4
5. 15 minutes past 7
6. 10 minutes to 8

Exercise 3

2. eleven thirty
3. two twenty-eight
4. twelve three
5. six one
6. four fifty two

Exercise 4

1. 

2. 

Exercise 5

1. 

7:10

2. 

11:50

3. 

1:00

4. 

2:30

5. 

3:10

Exercise 6

1.   2:25

2.   3:45

3.   11:05

4.   8:40

5.   6:20

Exercise 7

2. 154 hours
3. 697 hours
4. 456 hours
5. 1746 hours
7. 43 hours
8. 29 hours
9. 26 hours
10. 105 hours

Exercise 8

1. 6 hours
2. 2 hours
3. 12 noon
4. 3 hours
5. Bilal, Emad, Amir, 8 minutes, 3 min

Exercise 9

1. January, June, July
2. 30
3. April
4. 366
5. Friday
6. 30
7. Friday, Monday, Saturday, Sunday, Thursday, Tuesday, Wednesday
8. 156

Exercise 10 and Exercise 11

The answers to these exercises would be best given using the current year's calendar. The teacher can adapt Exercise 11 to the current year's month of December.

Activity page 111

Similarly for this activity, use dates for the year in which the book is being taught.

Exercise 12

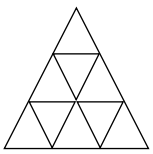
1. Naveen 2. Danish 3. June 4. 3 5. Naveen

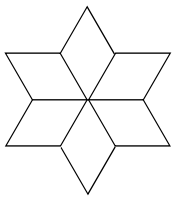
Unit 7: Geometry

Exercise 1

1. 6 cm 2. 27 mm 3. 38mm 4. 23 m

Activity page 117

1. 

2. 

Exercise 2

1. triangle 2. rectangle 3. oval 4. square

Exercise 3

kite 3, square 2, rectangle 1, diamond 1, arrowhead 2, triangle 5

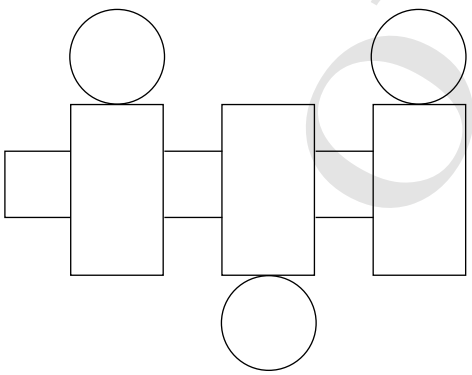
Exercise 4

Help the students draw the picture.

Exercise 5

Students colour as indicated.

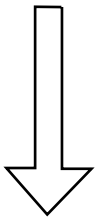
Exercise 6



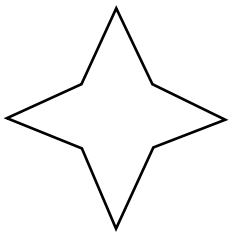
Exercise 7

1. Yes 2. No 3. No 4. Yes

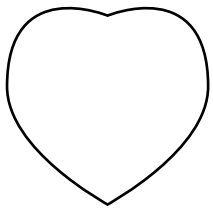
Exercise 8

1. 

1 line of symmetry

2. 

4 line of symmetry

3. 

1 line of symmetry

Exercise 9

1. line CD 2. line CD 3. line AB

Exercise 10

1. pyramid, cube, sphere

Exercise 11

1. 3 2 6, 12 3. same 4. 5, 8

Exercise 12

2. 5 + 3 + 5 + 3 = 16 cm
3. 5 + 2 + 3 + 2 + 2 + 4 = 18 cm
4. 3 + 2 + 3 + 4 + 6 + 2 = 19 cm

Exercise 13

perimeter = 44 m
distance covered = 176 m

Exercise 14

80 m

Exercise 15

24 cm

Exercise 16

1. 260 m 2. 70 m 3. 240 m 4. 110 m

Exercise 17

For questions 2 to 4, students draw different figures and calculate the perimeters accordingly.

Activity page 132

13.3 cm approximately

Unit 8: Data Handling

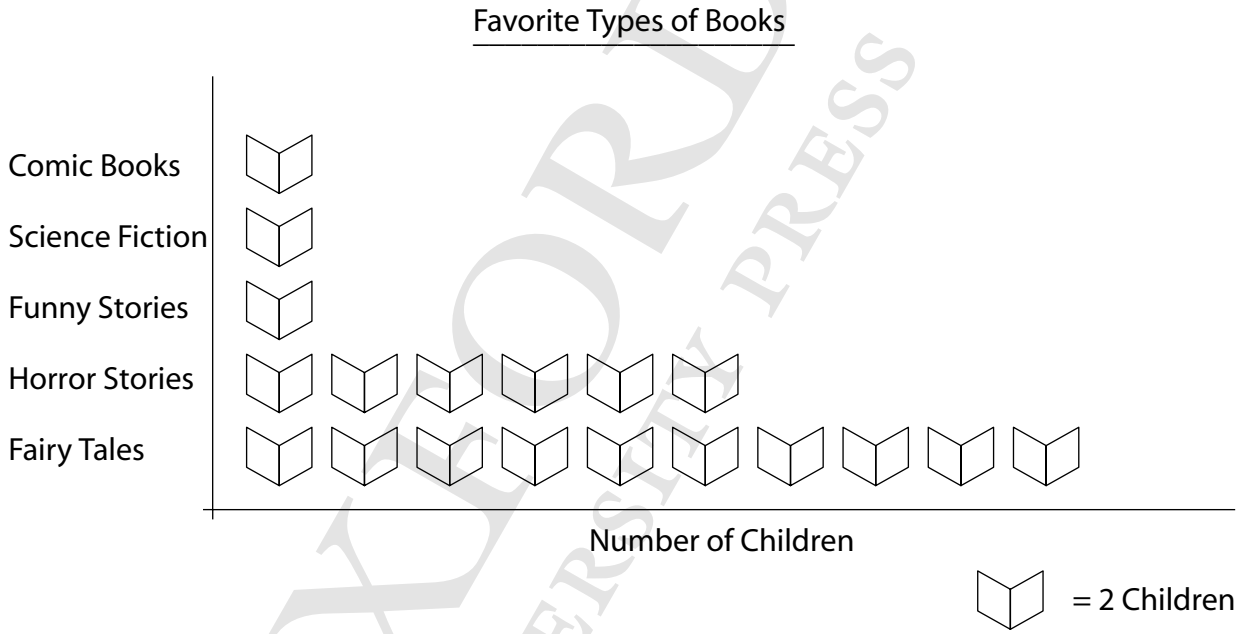
Exercise 1

1. favourite flavours of ice cream
2. an ice cream cone
3. 10 scoops
4. fruity
5. orange
6. six
7. 115

Exercise 2

1. favourite pet
2. a circle dived into quarters
3. 56
4. dog
5. 14
6. spider
7. rat and tortoise

Exercise 3



Unit 9: Assess and Review 2

Exercise 1

HTh	TTh	Th	H	T	O	Expanded Form	Number Names
2	7	0	6	9	2	200,000 + 70,000 + 600 + 90 + 2	two hundred and seventy thousand, six hundred and ninety two
	3	0	2	0	1	30,000 + 200 + 10 + 1	thirty thousand, two hundred and one
3	0	9	0	1	2	300,000 + 9000 + 10 + 2	three hundred and nine thousand and twelve
	4	0	1	9	3	40,000 + 100 + 90 + 3	forty thousand one hundred and three
2	0	4	0	0	7	200,000 + 4000 + 7	two hundred and four thousand and seven
		5	9	8	0	5000 + 900 + 8 + 0	five thousand, nine hundred and eighty
	6	6	4	7	9	60,000 + 6000 + 400 + 70 + 9	sixty-six thousand, four hundred and seventy-nine
9	0	0	0	9	8	900,000 + 90 + 8	nine hundred thousand and ninety-eight
7	4	5	8	3	9	700,000 + 40,000 + 5000 + 800 + 30 + 9	seven hundred and forty-five thousand, eight hundred and thirty-nine

Exercise 2

1. 654,426; 654,522; 654,562; 655,426; 655,466; 655,526
   655,526; 655,466; 655,426; 654,562; 654,522; 654,426

2. 30,039; 30,309; 33,009; 90,303; 93,300; 309,903
   309,903; 93,300; 90,303; 33,009; 30,009; 30,309; 30,039

3. 77,770; 707,070; 707,777; 770,770; 770,777; 777,707;
   777,707; 770,777; 770,770; 707,777; 707,070; 77,770

4. 23; 222; 232; 3323; 23,332; 223,323
   223, 323; 23,332; 3323; 332, 222, 23

5. 10; 100; 999; 1000; 99,999; 999,999
   999,999; 99,999; 1000; 999; 100; 10

Exercise 3

1. 19,104 2. 1858 3. 383 4. 113

5. 76,574 6. 403 7. 180 R = 4 8. 72,994
9. 7555 10. 96 11. 25437 12. 38524
13. 686 14. 56 R = 6

Exercise 4

1. $\frac{6}{9}, \frac{8}{12}, \frac{10}{15}, \frac{12}{18}, \frac{14}{21}$ 2. $\frac{8}{14}, \frac{12}{21}, \frac{16}{28}, \frac{20}{35}, \frac{24}{42}$
3. $\frac{22}{24}, \frac{33}{36}, \frac{44}{48}, \frac{55}{60}, \frac{66}{120}$ 4. $\frac{12}{26}, \frac{18}{39}, \frac{24}{52}, \frac{30}{65}, \frac{36}{78}$
5. $\frac{24}{40}, \frac{36}{60}, \frac{48}{80}, \frac{60}{100}, \frac{72}{120}$

Exercise 5

1. $\frac{6}{5}$ (I) 2. $\frac{4}{13}$ (P) 3. $\frac{12}{19}$ (P) 4. $\frac{7}{9}$ (P)
5. $\frac{13}{14}$ (P) 6. $\frac{11}{56}$ (P)

Exercise 6

1. $\frac{3}{4}, \frac{5}{6}, \frac{6}{7}, \frac{1}{3}$ 2. $\frac{9}{9}, \frac{12}{12}$

Exercise 7

1. length 2. straight line 3. point 4. two
5. triangle 6. sides, corners 7. square 8. opposite
9. curved 10. diameter 11. four

Exercise 8

Check the students' work.

Exercise 9

Check the students' work.

Exercise 10

1. 1289 km 2. Rs 43,508 3. 945 km, 4 p.m.
4. 72 m, 216 m 5. Rs 90 6. 730 kg
7. 115 cartons in each truck, 1035 bottles
8. $\frac{2}{5}$ 9. 50 ml 10. 2 June

Exercise 11

1. footfall in the cafeteria
2. days: horizontal axis; number of students: vertical axis
3. Friday
4. Saturday
5. 75
6. 675
7. 125

For questions 8 and 9, help the children to complete the graphs.

Exercise 12

kite, square, rectangle, circle, triangle, rectangle, arrowhead

Glossary

A

a.m.
we use a.m. to tell the time from 12 midnight to just before 12 noon

B

bar graph
the arrangement of data that represents a collection of things as rectangular bars

C

capacity
the greatest amount of three-dimensional space an object can hold

centimetre (cm)
a smaller unit of measure of length (see metre)

columns
the vertical lines in a grid

D

denominator
the number below the line in a fraction, showing the number of equal parts the whole is divided into

Example

$\frac{3}{4}$ ← denominator

difference
the result when we subtract or take away numbers

E

equivalent fractions
fractions with different numerators and denominators but are equal in size

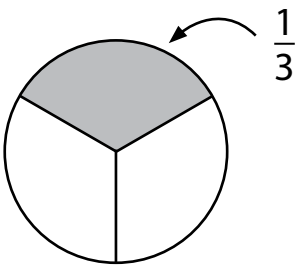
Example

$\frac{1}{3}$, $\frac{2}{6}$, $\frac{3}{9}$ and $\frac{4}{12}$ are equivalent fractions.

F

fraction
a part of a whole cut into equal parts

Example



G

gram (g)

a smaller unit of mass (see kilogram)

H

horizontal line

a line which runs from left to right

Example

A ———— B

Line AB is a horizontal line.

hundreds digit

the digit before the tens digit in a number

Example

In 439, '4' is the hundreds digit and it represents 4 hundreds or 400.

K

kilogram (kg)

a unit of measure of mass, where 1 kg = 1000 g

kilometre

a unit of measure of length, where 1 km = 1000 m

L

length

the measure of an object from one end to the other

litre (l)

a unit of measure of volume, where 1 l = 1000 ml

M

mass

the amount of matter in an object

metre (m)

a unit of measure of length, where 1 m = 100 cm

millilitre (ml)

a smaller unit of measure of volume (see litre)

multiplication table

shows the results of the same number multiplying a set of other numbers, usually in an increasing order numbers

Example

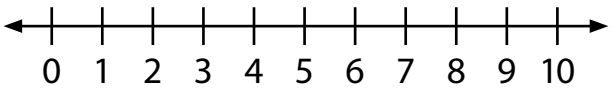
1 × 9 = 9
2 × 9 = 18
3 × 9 = 27
4 × 9 = 36
5 × 9 = 45
6 × 9 = 54
7 × 9 = 63
8 × 9 = 72
9 × 9 = 81
10 × 9 = 90

N

number line

the arrangement of numbers on a straight line where the numbers to the right are greater than the numbers to the left

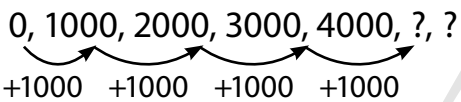
Example



number pattern

the arrangement of numbers that follow a fixed pattern

Example



From the number pattern above, the next two numbers are 28 and 26.

numerator

the number above the line in a fraction, showing the number of equal parts that are to be added together

Example

$\frac{3}{4}$ ← numerator

O

ordering of numbers

the comparison of numbers as greater than or less than

P

p.m.

we use p.m. to tell the time from 12 noon to just before 12 midnight

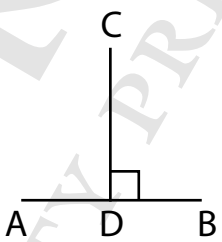
perimeter

the total length around each shape

perpendicular lines

two straight lines that meet at a right angle (see right angle)

Example



We write CD ⊥ AB or AB ⊥ CD.

R

remainder

the number left over when a number cannot be divided equally

rows

the horizontal lines in a grid

S

sum

the result when we add numbers

T

thousands digit

the digit before the hundreds digit in a number

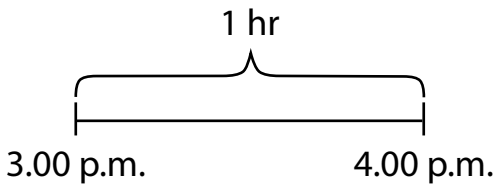
Example

In 2439, '2' is the thousands digit and it represents 2 thousands or 2000.

timeline

a model used to show the amount of time taken

Example

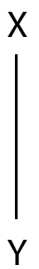


V

vertical line

a line which runs straight up and down

Example



Line XY is a vertical line.

W

weighing scale

an instrument that measures the mass of an object

Example