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TEACHER'S MANUAL

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

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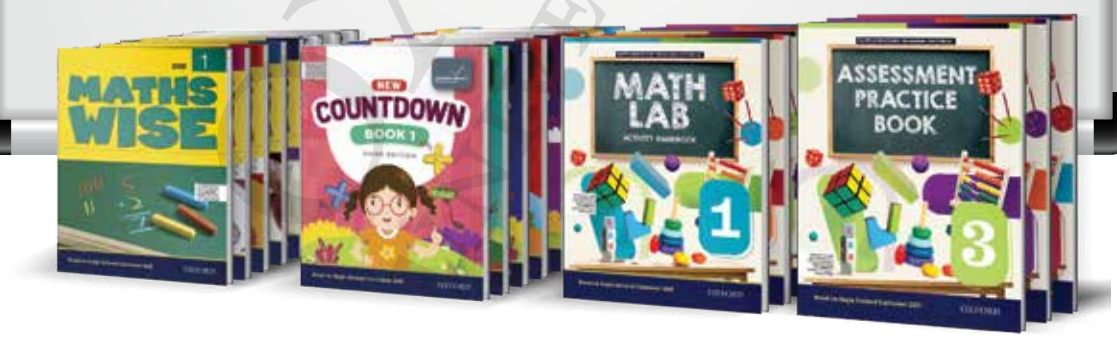


Contents

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.

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)

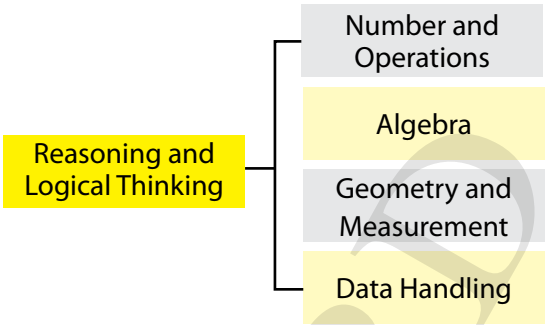
ADHD is a disorder that leads to problems paying attention, impulse control, and hyperactivity. While all children are easily distracted, it will be especially apparent in these children. Like Autism, a diagnosis can only be made by a professional, but since not all children will have that privilege, 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 and Operations

1.1 Whole Numbers

i. Identify the place values of numbers up to one hundred thousand (100 000).
ii. Read numbers up to one hundred thousand (100 000).
iii. Write numbers up to one hundred thousand (100 000).
iv. Write numbers in words up to one hundred thousand (100 000).
v. Compare and order numbers up to 5-digits .

1.2 Addition

i. Add numbers up to 5-digits.
ii. Solve real-life number stories involving addition of numbers up to 5-digits.

1.3 Subtraction

i. Subtract numbers up to 5-digits.
ii. Solve real-life number stories involving subtraction of numbers up to 5-digits.

1.4 Multiplication

i. Multiply numbers up to 4-digits by numbers up to 2-digits.
ii. Solve real-life situations involving multiplication of numbers up to 4-digit by 2-digit.

1.5 Division

i. Divide numbers up to 4-digits by numbers up to 2-digits.
ii. Solve real-life situations involving division of numbers up to 4-digit by a number up to 2-digits.
iii. Solve real-life situations involving division of 2-digit number by a 1-digit number.
iii. Solve real-life situations using appropriate operations of addition, subtraction, multiplication, and division of numbers up to 2-digits.

1.6 Number Patterns

i. Recognise a given increasing and decreasing pattern by stating a pattern rule.
ii. Describe the pattern found in a given table or chart.
iii. Complete the given increasing and decreasing number sequence.

Plan Ahead:

1.1 Whole Numbers
1.2 Addition
1.3 Subtraction
1.4 Multiplication
1.5 Division
1.6 Number Patterns

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

Before You Start:

Pupils have already learnt to identify the place value of numbers up to 5-digits. Now, they will learn to read and write numbers up to 6-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. Pupils are aware of comparing two numbers using symbols and ordering of a set of numbers in ascending and descending order. They are familiar with the idea of greater and lesser, so it shouldn't be too difficult for them.

Watch Out For:

Students generally get confused between the symbols of greater than and lesser than, while comparing numbers. 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 something they already know.

This Pairs with:

Math Lab 4, page 2 to 16.

Make Sure You Have:

Chart papers	Markers	Place value chart
White boards	Tape	counters
Activity cards	Two differently coloured highlighters	Bowl
Chit	Number cards with digits 0 to 100 000	

If They're Struggling:

Number patterns may be harder for the pupils to retain as they won't necessarily be recognising 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 to revise 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

In grade 3, pupils have learnt to read and write 5-digit numbers and to interpret the place values of each digit. The learning experiences in this unit will extend the number system to 6-digit numbers with the use of number cards and place value cards. Mastery of place value concept will facilitate their understanding of the four operations algorithms in the later units. To make sense of big numbers (up to 100 000), pupils could be asked to find real-life examples of such numbers. Pupils could also be given the opportunity to use number line to compare numbers.

Ask pupils why numbers are important. They will have many real-life examples of how and why they use numbers and see them being used in their lives. Ask the pupils if they think that numbers are complicated. They have, so far, learnt a lot about numbers, and they realise they have much more to learn. Ask them to justify their answers. Point out that everything they have learnt about numbers has been helpful for them when working with numbers. For example, knowing about place value made it much easier for them to add and subtract big numbers. Ask them to think out loud about how their knowledge of numbers improves the quality of their lives.

SLO

1.1
i
ii
iii

Activity 1
20 min

Prepare two sets of 6-digit number cards in numerals and words. Put these cards in two baskets. In one basket put cards with numbers and label it as NUMERALS, and in the other put cards with numbers written in words and label it as NUMBERS IN WORDS.

Divide the class into 4 groups A, B, C, and D. Tell pupils that the first competition will be between group A and group B. One member of group A will pick a card and read the number.

Group B will listen to it carefully, then discuss among themselves and choose a member to write that number in figures on the white board and show it to the class.

Now, group B will pick a card and group A will write the number in figures on the white board.

Three cards will be picked by each group. The group with all correct answers will be the winner.

Follow the same procedure for group C and group D.

Next the two winner groups will compete against each other. This time you will read a number and the group that writes all correct answers first, will be the winner.

Same activity can be carried out by reversing the process. This time group members will pick a card from the basket with numbers written in words. Instead of reading the number aloud, they will only show the card to the other group and ask them to write the number in figures.

Let's try it

Read out five 6-digit numbers, and after each number, say a place value up to hundred thousand. Ask pupils to write them down, in digits, and circle the stated place value. Ask them to peer review at the end.

1.2
i

Activity 2
10 min

This activity can be performed individually or in pairs. Prepare the activity cards for each student as the given sample.

Pupils will add the rows horizontally and columns vertically and write the answer in the given space. Get the activity cards peer checked.

Sample Activity Card

Complete these addition sums. Add the rows and columns to find the totals.		
35789	2954	
37820	26897	

Let's try it

Give pupils time at their desks to go through the activity cards in order to understand the given task well. This should be done silently. After, have pupils peer review, remind them to remember to write numbers in correct rows and columns.

SLO

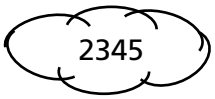
1.3
i

Activity 3
10 min

This activity can be performed individually or in pairs. Prepare the activity cards as the given sample. Provide each student with an activity card with subtraction sums of complex numbers. Time the activity and get the activity cards peer reviewed..

Sample Activity Card

Work out the difference between the pair of numbers:



Show working here:

Let's try it

Give pupils time at their desks to go through the activity cards to understand the given task well. This should be done silently. After, have pupils peer review, remind them to remember to write numbers in correct rows and columns.

1.4
ii
and
1.5
ii

Activity 4
20 min

This activity can be performed individually or in pairs. Pupils have already multiplied and divided smaller numbers, therefore, it will not be difficult for them to perform multiplication/ division of complex numbers. Prepare the activity cards as the given sample. Provide each student with an activity card with subtraction sums of complex numbers. Time the activity and get the activity cards peer checked. Sample activity card is given below:

Javeria has a bag of 45 cherries to evenly split up into her 3 school lunches for the week. How many cherries will she get to eat each week?	__ cherries each day.
Shahid started typing his story book over the weekend. He typed for 3 hours and completed 15 pages with 240 words on each page. How many words did he type in an hour?	____ words in an hour.

Ask the class to revise their spellings of numbers up to hundred thousand as homework so that you can have a spelling test. During the test, only do about thirty numbers.

Activity 5
10 min

Let the children work in pairs. Give A4 sheets to each pair. Ask each pair to prepare at least five sums of completing 3-digit number patterns with 5 to 10 terms. Then swap the sheet with his/her peer. Each partner will complete the sequence and define a rule how the next term is found.

Next tell them to write whether the sequence is in ascending or descending order.

Let's try it

Show them activity cards with simple multiplication and division word problems. Ask them to solve individually and write their answers on the white boards to share with other pupils.

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

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 of people, in buying and selling, measuring length, mass, and 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 pupils how they feel about learning different kind of numbers. 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 three. The way that this activity will work is that the team will come to the front of the class, and two members of each team will get one sheet one by one. The list will have ten numbers. 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. 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 Whole Numbers
1.2 Addition
1.3 Subtraction
1.4 Multiplication
1.5 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) What is the place value of 6 in the number 678 345?
   a) thousand
   b) hundred thousand
   c) tens
   d) ten thousand

2) Fill in the blank: 235 674 _____ 236 674.
   a) <
   b) >
   c) =
   d) none of the above

3) The population of two cities is 137 420. If City A has a population of 67 390 people. What is the population of City B?
   a) 169 129
   b) 70 030
   c) 29 965
   d) 145 894

Unit 2

Factors and Multiples

2.1 Divisibility Tests

I. Identify divisibility rules for 2, 3, 5, and 10.

ii. Use divisibility tests for 2, 3, 5 and 10 on numbers up to 5-digits.

2.2 Prime and Composite Numbers

i. Identify and differentiate 2-digit prime and composite numbers.

2.3 Factors and Multiples

i. Find factors of a number up to 50.

ii. List the first ten multiples of a 1-digit number.

iii. Differentiate between factors and multiples.

2.4 Prime Factorisation

i. Factorise a number by using prime factors.

ii. Determine common factors of two or more 2-digit numbers.

(iii) Determine common multiples of two or more 2- digit numbers.

Plan Ahead

2.1 Divisibility Tests

2.2 Prime and Composite Numbers

2.3 Factors and Multiples

2.4 Prime Factorization

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

Before You Start:

Pupils have already learnt the multiplication tables of 2 to 10. They can multiply 2-digit numbers with a 1-digit number. They can divide 2-digit numbers with 1-digit number.

Watch Out For:

Pupils might not remember the multiplication tables and they might confuse factors for multiples.

This Pairs with:

Math Lab 4, pages 17 to 21

Make Sure You Have:

Counters	Array cards, and multiplication table cards	Activity cards
Worksheets	Printer	Scissors
Cut-outs	Glue and sticks	Cards sheets in light colours.

If They're Struggling:

They pupils may face difficulties in recognising and calculating factors and multiples. They may apply rowing methods. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at 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

Introduce this unit as a continuation of multiplication and division. Before explaining the concept of factors and multiples reinforce multiplication tables of 2 to 10. Tell them that a factor of a number is a number which divides the number completely i.e. with no reminder. A multiple is a number that is attained by multiplying a number by another number. You can explain the topic by using multiplication and division facts. Like 3 x 2 = 6 means 6 is a multiple of 2 and 3. Now 6 ÷ 2 = 3 means 2 is a factor of 6, similarly 6 ÷ 3 = 2 means 3 is a factor of 6 .

SLO

2.1

i

ii

Activity 1

20 min

First revise the divisibility rules with the class. Let the pupils work in pairs. Provide each pair with an activity card (sample given below). Time the activity and announce the winning pair, who finished first with all correct answers.

Use the divisibility rules to check whether each given number is divisible by 2, 3, 5 or 10. Write Yes or No.

Number	Divisible by 2	Divisible by 3	Divisible by 5	Divisible by 10
18702	Yes	Yes	No	No
24900				
15672				
87534				
42207				
59345				

Let's try it

Write ten numbers on the board, all are divisible by only one number. Ask the pupils to use the divisibility rules and figure out which number these are a divisible of?

2.2

i

Activity 2

20 min

Each pupil will perform this activity independently. Provide students with the activity cards and allow them some time to solve the questions.

Activity Card

Identify the prime numbers and add them together

1 3 7 11 15 19 23 6 10 16 18 25

What is the total of all the prime numbers? _____

Complete the equations and circle the answers that are prime.

a) $7 \times 5 =$ b) $15 + 14 =$ c) $10 + 11 =$

d) $12 + 2 =$ e) $60 - 29 =$ f) $4 \times 8 =$

Let's try it

Ask students to share their results, discussing the rules they applied to find divisibility of given numbers. Acknowledge their background knowledge and emphasise on using only correct math terminologies.

2.3
i

Activity 3
20 min

Make plenty of cut-outs of multicolour flowers and place them in a basket. Make cut-outs of large flowerpots according to the number of students. On each flowerpot, paste different numbers that you want your pupils to find the factors of. Ensure the numbers are bold and clearly visible. For each number, ask the students to find all the factors for each of the numbers and write them over the flowers. Put the flowers back into the basket.

Now, give one flowerpot to each student and have them sort the flowers from the basket with correct factors of the numbers written on the flower pot. Ask them to paste the flowers on their flowerpots. You can make the activity more challenging by setting a time limit.

Ask the pupils to write down the completed sums in their notebooks.

Let's try it

Ask the pupil's to write four facts about factors of a number.

Activity 4
10 min

To find all possible factors of numbers and common factor of two or more numbers, prepare a worksheet as shown.

Same type of worksheet can be prepared for finding all possible factors of numbers and for finding common multiple of two or more numbers.

How many different numbers can you use to divide 12? Write the factors below:

How many different numbers can you use to divide 16? Write the factors below:

How many factors are common? Write them below:

Let's try it

Assign the pupils a list of five numbers by writing on the board and ask them to make factor tree of each number, using prime factors.

Let's talk Math

Ask pupils what they have learnt in this unit. Can they relate any of it to their daily lives? Tell them a number story and then encourage them to create their own. Allow them to move the conversation in whichever direction they please, but make sure it remains relevant to the unit, giving them cues where necessary. Ask the pupils how they might use factors and multiples in their daily lives from now on. Discuss with pupils if they found it hard to move from multiplication tables to factors and multiples. Spend 5 minutes on this discussion, and then give them 5 minutes to write a reflective paragraph.

Let's get practical

Divide the class into two. Provide each group with 12 pencils. Give each group 15 minutes to distribute the pencils into as many equal groups as possible.

Ask them to make a fact file for factor and multiples. Tell them we may not always recognise the facts in our surroundings as we get used to having them around us.

Self Assessment

2.1 Divisibility Tests

2.2 Prime and Composite Numbers

2.3 Factors and Multiples

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) Use the divisibility rule to figure out which of the following numbers are divisible by 3?

   a) 75, 84, 96

   b) 27, 61, 90

   c) 32, 55, 87

   d) 25, 73, 100

2) Which of the following numbers are the multiples of 8?
   a) 72, 112, 144
   b) 18, 27, 36
   c) 24, 32, 45
   d) 8, 56, 70

3) The numbers, 13, 17, and 19 are_____?
   a) Prime numbers
   b) Composite numbers
   c) None of the above

Unit 3

Fractions

3.1 Fractions

i. Recognise like and unlike fractions.
ii. Compare two unlike fractions by converting them to equivalent fractions with the same denominator.
iii. Simplify fractions to the lowest form.

3.2 Types of Fractions

i. Identify (unit, proper, improper) fractions and mixed numbers.
ii. Convert improper fractions to mixed numbers and vice versa.
iii. Arrange fractions in ascending and descending order.

3.3 Addition and Subtraction of Fractions

i. Add fractions with like denominators.
ii. Subtract fractions with like denominators.

3.4 Multiplication of Fractions

i. Multiply a fraction (proper, improper), and mixed number by a whole number.
ii. Multiply two fractions, proper, improper, and mixed numbers.

3.5 Division of Fractions

i. Divide a fraction (proper, improper) and mixed numbers by a whole number.
ii. Analyse real-life situations involving fractions by identifying appropriate number operations.

Plan Ahead:

3.1 Fractions
3.2 Types of Fractions
3.3 Addition and Subtraction of Fractions
3.4 Multiplication of Fractions
3.5 Division of Fractions

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

Before You Start:

Students already know that a fraction is a part of a whole. They are familiar with halves and quarters, as used in everyday life, as well as how to use number operations.

Watch Out For:

Pupils may need to revise terminology daily when being taught types of fractions. Also, division may take longer for pupils to understand as the concept of reciprocation will be difficult.

This Pairs with:

Math Lab 4, pages 22 to 43.

Make Sure You Have:

Blocks Rubber bands

Chits Bowls

If They're Struggling:

When introducing the concept of improper and mixed fractions, be sure to reproduce the diagrams on the board. This also helps to convey the point that improper fractions can be expressed as mixed numbers (and vice versa). Plenty of practice sums are provided for the addition and subtraction of mixed numbers (without and with regrouping), but you may wish to develop additional worksheets here. With practical work, addition and subtraction of like fractions are also introduced. 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 the class to discuss how one might use fractions in their real lives. Examples they might give you from what they have learnt in previous classes may include cooking, or for working with objects that have multiple parts. Ask them to think about why we use fractions, instead of using whole numbers. For example, saying three slices of pizza might be simpler then saying three-eighth of a pizza. As they discuss whether this would be workable, encourage them to use the real-life examples discussed earlier.

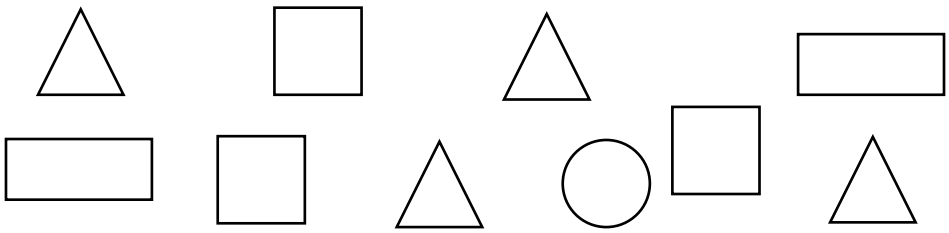
SLO		
3.1 i ii	**Activity 1** 20 min	Prepare chits with fractions, with varying denominators. Ask pupils to come up to the board in pairs and pick out a fraction chit each. If they get like fractions, ask them both to choose again. Once they have picked, they must both compare them by working out, on the board, to find who has the greater fraction and who has the lesser one, or, if they are equal. As soon as they work out the answer, ask the rest of the class to review their work. Allow up to seven pairs to have a go, and once you have at least five pairs of unlike fractions, make groups of five to seven, handing out blocks, rubber bands, and fraction charts. Ask pupils to work together to compare pairs of fractions. Remind them that if they do not find the blocks helpful, they may use fraction charts or if they prefer, can draw diagrams, and that they should try to simplify each fraction to its lowest form if they are stuck. They will know it is in its lowest form if it is denominator and numerator do not have a common factor. Encourage them to find the easiest way to make these calculations, keeping in mind that they may each have a different answer. Ask them to make note of any tricks they may want to share for later.

SLO

3.2
i

Activity 2
15 min

Prepare worksheet as shown. Use variety of interesting ideas for enhancing the concept of proper, improper fractions, unit fraction, and mixed numbers.



Look at the shapes and answer the questions given below.	Write the fraction here	Type of fraction
1. How many shapes are there?		
2. What fraction of the shapes are squares?		
3. What fraction of the shapes are rectangles?		
4. What fraction of the shapes are triangles?		
5. What fraction of the shapes is the circle?		
6. What fraction of the shapes are not triangles?		
7. What fraction do the triangles and the circle represent altogether?		
8. Which shape has the greatest fraction?		
9. Which shape has the smallest fraction?		

This pairs with Math Lab page 27

There are different types of fractions. Write unit, proper, improper fractions, and mixed numbers on the board. Ask pupils if they can explain what any of them are, if they cannot, put an example in front of each name, and ask them if they get any idea from them. Add two more examples to each type and prompt the class to discuss them. If they are not able to reach a conclusion, explain that in a proper fraction the numerator is always smaller than the denominator, while in an improper fraction the numerator is always equal to or bigger than the denominator. Mixed fraction is made up of a proper fraction and a whole number. Mixed fractions can easily be converted into improper fractions and vice versa.

3.2
i
ii

Activity 3
20 min

Unit fractions are fractions with one as a numerator. Remind pupils that a unit fraction is also a proper fraction. Go over this explanation a few times and ask the class to give you more examples of each type. Write the following fractions on board and ask the pupils to identify and make groups of proper, improper, and mixed fractions. Once they have sorted out different types of fractions, tell them their next task is to convert improper fractions to mixed fractions and vice versa.

1. $3\frac{2}{15}$, $\frac{7}{3}$
2. $\frac{1}{6}$, $2\frac{1}{5}$
3. $\frac{1}{7}$ $1\frac{4}{7}$
4. $\frac{16}{34}$, $2\frac{2}{17}$
5. $\frac{3}{8}$, $\frac{6}{4}$
6. $4\frac{16}{3}$, $\frac{17}{4}$
7. $1\frac{3}{25}$, $\frac{17}{5}$
8. $7\frac{1}{5}$, $\frac{2}{12}$
9. $\frac{21}{20}$, $\frac{13}{40}$
10. $\frac{14}{3}$, $\frac{2}{21}$

Let's try it

Ask the pupils to compare the following fractions individually, or in pairs if they are struggling, using the following symbols; <, >, =.

1. $\frac{2}{15}$ ☐ $\frac{5}{15}$
2. $\frac{1}{5}$ ☐ $\frac{2}{6}$
3. $\frac{1}{5}$ ☐ $\frac{13}{25}$
4. $\frac{15}{32}$ ☐ $\frac{2}{8}$
5. $\frac{3}{7}$ ☐ $\frac{6}{7}$
6. $\frac{16}{30}$ ☐ $\frac{16}{30}$
7. $\frac{3}{15}$ ☐ $\frac{7}{35}$
8. $\frac{1}{5}$ ☐ $\frac{2}{10}$
9. $\frac{21}{25}$ ☐ $\frac{13}{50}$
10. $\frac{4}{8}$ ☐ $\frac{2}{16}$

SLO

3.2

iii

Activity 4

20 min

Prepare a bowl full of various types of fractions. Make groups of at least six each and ask each pupil to pick out a fraction. Ask to pick out five fractions and arrange them in ascending order, within their groups. . Give them enough time to convert and remind them that even though converting fractions into their simplest form may be a good starting point when trying to order them sometimes more needs to be done. If any group is struggling, ask them to try to work it out on the board, and prompt the rest of the class to help out. Since this is a very new concept, allow pupils to try to work it out on their own, however if they. are stuck, help them get to the answer.

If all the groups are able to order their fractions, ask them to place their chits back into the bowl, shuffle them, and hand them out again so that the groups can arrange them in descending order.

Assign questions from the textbook so that pupils can get used to different types of fractions.

SLO

3.3
i
ii

This pairs with Math Lab page 27

Go through the following questions on the board with the class

1. $\frac{3}{9}+\frac{2}{9}$ 2. $\frac{9}{10}-\frac{1}{10}$ 3. $\frac{5}{15}+\frac{2}{15}$

If the class seems to be comfortable with adding and subtracting like fractions, introduce a set of blocks. Have at least ten pairs of blocks bound together with rubber bands beforehand. Write $\frac{2}{6}+\frac{1}{3}$ on the board. Explain that even though these fractions do not have the same denominator, they can still be added. Be sure to mention that they are called unlike fractions because like fractions have the same denominator. Place the blocks where everyone can see them, and draw the diagram on the board, matching the blocks to it.

Activity 5

20 min

Explain that the blocks that are bound together still represent one part. But also point out that the number of blocks for each fraction is the same. Then take apart the bound together blocks, writing on the board ($\frac{2}{6}=\frac{1}{3}$). Explain that although different numbers were used to represent these fractions, they have the same value. So while the fraction is $\frac{1}{3}$ it can also be expressed as $\frac{2}{6}$.

Similarly, $\frac{2}{6}$ can be simplified into $\frac{1}{3}$. Simplification means to simplify a fraction to its simplest form. This is often done to create like fractions so that they can be added or subtracted, but we may also simplify fractions just so that they were easier to remember. When working with objects like pizza, numbers remain one-digit, but if someone were to refer to thirty pages out of a one-hundred paged book will be written as $\frac{30}{100}$ or $\frac{3}{10}$ and would still be easier to say three-tenth of a book. Return to the question and ask pupils if they can add the two fractions now that they know that they can be simplified into like fractions.

Activity 6

20 min

Create groups of three to five each and ask them to solve the following questions using blocks and rubber bands, and any other manipulatives they think may be helpful.

1. $\frac{2}{15}+\frac{5}{15}$
2. $\frac{1}{6}+\frac{2}{6}$
3. $\frac{1}{5}+\frac{13}{5}$
4. $\frac{16}{32}+\frac{2}{32}$
5. $\frac{3}{7}+\frac{6}{7}$
6. $\frac{16}{30}-\frac{16}{30}$
7. $\frac{3}{15}-\frac{7}{15}$
8. $\frac{1}{5}-\frac{2}{5}$
9. $\frac{21}{25}-\frac{13}{25}$
10. $\frac{4}{8}-\frac{2}{8}$

SLO

3.4
i
ii

Activity 7
10 min

Reinforce the concept of four operations involving fractions before starting this activity.

Prepare the following activity card for each student.

Activity Card

1. Manahil loves jam and has a great jam recipe. She uses $\frac{3}{4}$ kg of strawberries and $\frac{1}{2}$kg of blueberries to make one bottle of jam. How many kilograms does she need altogether to make one bottle of jam?
2. Sabeen made 8 $\frac{5}{6}$litres of lemonade for a party. At the end of the party, she had 3 $\frac{1}{6}$ litres left. How many litres of lemonade were consumed? Show your working below:

Activity 8
15 min

Write on the board $\frac{2}{5} \times 2$ and draw a diagram to represent it. Ask pupil to raise their hands to try and solve it. They may guess that the numerator should be multiplied by the whole number or that fractions can only be multiplied by fractions, whereas whole numbers can only be multiplied by other whole numbers. Explain that since fractions are numbers too, they can certainly be multiplied by whole numbers. Point out that since we can use number operations with mixed numbers, we can use them with whole numbers as well. We can solve this question by looking at the whole number, 2, as an improper fraction, meaning $\frac{2}{1}$. Since the number 2 represents two wholes, $\frac{2}{1}$ is equal to it. Show this on the board with diagrams. Now that the question is $\frac{2}{5} \times 2$, explain that the numerator will be multiplied by the numerator, while the denominator will multiply with denominator, so the answer will be $\frac{4}{5}$. Unlike addition and subtraction, there is no need to simplify fractions when multiplying, but mixed numbers do need to be converted to improper fractions. If at the start, pupils had guessed that only the numerator would multiply, tell them that although they were technically right, they must keep in mind why that is.

Let's try it

Ask pupils to solve the following in pairs.

1. $\frac{2}{10} \times 5\frac{5}{10}$
2. $\frac{1}{6} \times \frac{2}{7}$
3. $\frac{1}{7} \times \frac{13}{2}$
4. $\frac{16}{3} \times \frac{3}{2}$
5. $\frac{3}{17} \times 4\frac{5}{3}$
6. $\frac{16}{30} \times 5\frac{16}{30}$
7. $1\frac{3}{15} \times \frac{7}{3}$
8. $\frac{1}{4} \times 2\frac{2}{6}$
9. $\frac{21}{5} \times 3\frac{13}{2}$
10. $\frac{3}{5} \times 8\frac{2}{3}$

SLO

3.4 i, ii and 3.5 i, ii

Activity 9

20 min

Reinforce the concept of four operations on fractions. Prepare a sample of an activity sheet as shown below. Give each pupil an A4 sheet, ask them to make a question involving multiplication division of fractions and related to real-life. Once they have written the questions ask them to swap the sheet and solve. When the task is complete, get it peer checked.

1. $12\frac{1}{2}$ kg of tomatoes are divided equally into 4 baskets. What will be the weight of tomatoes in each in one basket?
2. Faiz travelled $5\frac{1}{4}$ km in one day. If he travels the same distance every day, how many kilometres will he cover in 8 days?

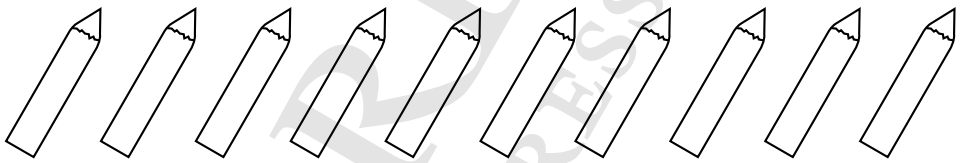
3.5 ii

Activity 10

20 min

Prepare the worksheet as given below.

Basim buys a new colouring box. He has a picture of 10 pencils. He colours the pencils as given below:



First, he colours $\frac{1}{10}$ of the pencils. (Colour them red).

Then, he colours $\frac{1}{3}$ of the remaining pencils. (Colour them blue).

Lastly, he colours half of the remaining pencils. (Colour them green).

How many pencils are left without colour? Write your answer as a fraction also.

_____

Let's talk Math

Fractions are used every day in our lives. Most times we use them indirectly. They are a vital part of measurements and are used in cooking, time, prescription of medicines, etc. Discuss with students different instances where they may have used or need to use proper and improper fractions. Ask them to make number stories about improper fractions. Allow them 5 minutes to discuss and come up with in a interesting real-life situations and then pair them up together so each student solve another student's number story.

Let's get practical

Make a basket of like fraction chits ample in quantity. Make group of 4 students. Call out first group in front of class and ask them to pick one chit each. Ask the first student to write his fraction on the board and make an equivalent fraction of it. Ask the other two to write their fractions on the board. Instruct one of them to add a the fraction to the previous fraction. The fourth student will arrange all the four fractions in ascending or descending order.

Self Assessment

3.1 Fractions
3.2 Types of Fractions
3.3 Addition and Subtraction of Fractions
3.4 Multiplication of Fractions
3.5 Division 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) To make $\frac{3}{7}$ equivalent to $\frac{21}{49}$, which number do you multiply it with?
   a) 4
   b) 7
   c) 2
   d) All of the above

2) If $\frac{1}{3}$ and $\frac{1}{2}$ are added, what will the sum result in?
   a) Proper fraction
   b) Improper fraction
   c) Whole number
   d) Mixed number

3) If two like fractions are subtracted, the result is?
   a) Proper fraction
   b) Improper fraction
   c) Whole number
   d) Mixed number

Unit 4

Decimals

4.1 Decimals

i. Recognise a decimal number as an alternative way of writing a fraction.
ii. Express a decimal number as a fraction whose denominator is 10, 100, or 1000.
iii. Identify and recognise the place value of a digit in decimals (up to 3-decimal places).

4.2 Conversion Between Fractions and Decimal

i. Convert a given fraction to a decimal if:
   - denominator of the fraction is 10, 100 or 1000.
   - denominator of the fraction is not 10, 100 or 1000 but can be converted to 10,100 or 1000.
ii. Convert a decimal (up to 3-decimal places) to fraction.

4.3 Basic Operations on Decimal Numbers

i. Add and subtract 3-digit numbers (up to 2 decimal places).
ii. Multiply a 2-digit number (up to 1 decimal place) by 10, 100, and1000.
iii. Multiply a 2-digit number with 1 decimal place by a 1-digit number.
iv. Divide a 2-digit number with 1 decimal place by a 1-digit number
v. Solve real-life situations involving 2-digit numbers with 1 decimal place using appropriate operations.

4.4 Estimation

i. Round off a whole number to the nearest 10, 100, and 1000.
ii. Round off decimal (with 1 or 2 decimal places) to the nearest whole number.

Plan Ahead:

4.1 Decimals
4.2 Conversion Between Fractions and Decimal Numbers
4.3 Basic Operations on Decimal Numbers
4.4 Estimation

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

Before You Start:

Pupils have already worked with whole numbers and fractions in their previous class. They are aware of addition and subtraction of numbers and this will lead them to adding and subtracting decimal numbers. Furthermore, the knowledge about division will help them convert fractions to decimals and vice versa. Next, they will recognise the place value of a digit in decimals. Pupils will be able to apply knowledge of decimals in real-life situations.

Watch Out For:

A common mistake while adding and subtracting decimals is that the pupils forget to put the decimal point under the decimal or place it incorrectly. The common misconception is that if there are more decimal places in a number, the greater in the number.

This Pairs with:

Math Lab 4, pages 44, 45, 46

Make Sure You Have:

Chart paper	Scissors	Colour pencils
White board	Fraction number cards	Decimal number cards
Marker		

If They're Struggling:

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 decimal is a fraction represented in a special form. Like the fraction $\frac{3}{5}$ can be written as 0.6, when 0 is in the ones place and 6 is in the tenth place. The point between 0 and 6 in known as decimal point. Explain that not all numbers are whole numbers but there are lots of members in between there. Decimal is a fraction whose denominator is 10, 100, or 1000. Decimals can be converted to common fractions and vice versa. They can be added, subtracted, multipled and divided using common methods of four operation but taking care of decimal point to be placed accurately.

SLOs

4.1 ii and 4.2 i

Activity 1

10 min

Each pupil should perform this activity individually. Prepare fraction number card and decimal number cards as shown.

Fraction number card	Decimal number card
$\frac{14}{100}$	0.14

Make fraction number cards with denominator 10, 100, and 1000 and respective decimal number cards. Place the piles of fraction number cards and decimal number cards upside down on the table. Tell the pupils to take out their white boards. Then call one pupil and ask him/her to pick up one card from either of the two piles and show it to the class. Ask the rest of the class to write the respective fraction or decimal number on white board. Meanwhile, the pupil who picked the card will also find the respective fraction or decimal card from the pile. Make sure that he/she picks the correct card. Ask the pupils to show their answer written on the white board. Thumbs up for the correct answers.

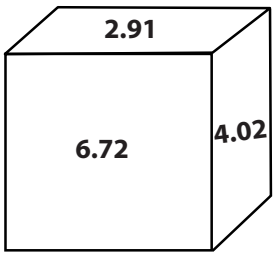
Assign classwork from the textbook to allow pupils to practice these skills.

SLOs

4.3
i

Activity 2
20 min

Make paper cubes with decimal numbers written on each face as shown above. Or if you have a dice, paste a sticker on each face with different decimal numbers written on it. Also prepare a worksheet as shown, for each pupil.



Add/Subtract Decimals	
1.	2.
3.	4.

.

Divide the class into 4 or 5 groups and distribute two dice to each group and worksheets for all members as this is activity is to be performed individually. Each pupil will roll two dice twice, note the decimal numbers in the decimal sheets, and then add and subtract them. Ask them to peer check the results. The group which completes the task first with all correct answers is the winner.

1.11

Assign classwork from the textbook to allow pupils to practice these skills.

Let's try it

Ask pupils to solve some realistic questions that involve decimals. Here are some examples of questions below:

1. Javeria and Tina drove to their aunt's house. Javeria drove 9.75 km. Tina drove 3.50 km before they arrived. How many kilometres had they driven altogether?

2. Mira drove 8.25 km to visit her uncle. Her uncle took her to a museum which was 20 km from his house. How many kilometres had Mira travelled altogether?

Assign classwork from the textbook to allow pupils to practice these skills.

Let's talk Math

Decimal are an extension of whole numbers while tenths and hundreds are linked to fractions. Pupils might not realise it, but they certainly must have made use of decimals in their lives at some point. Remind them that the introduction of the new concept does not change the math, and even if they haven't previously learned about decimals, they have still understood that a decimal number is often used to represent a fraction of whole.

Let's get practical

Divide the pupils into groups of three. Provide them with a digital weighing scale and objects with different masses, such as an apple, two strawberries, three keys, a stack of paper, and a pair of glasses. You may choose to change the objects according to their availability.
Ask the pupils to weigh all the objects and differentiate them into two categories; mass in whole numbers and mass in decimal numbers. Now, ask the students to round off the decimal numbers to the nearest whole number and arrange them in an ascending and descending order.

Self Assessment

4.1 Decimals
4.2 Conversion between Fractions and Decimal Numbers
4.3 Basic Operations on Decimal Numbers
4.4 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 is the place value of 5 in the number 4.759?
   a) ones
   b) tenth
   c) hundredth
   d) thousandth

2. The fraction 7/5 when converted into decimal with one decimal place is:
   a) 14
   b) 1.4
   c) 1.04
   d) 1.004
3. Multiplying 5.7 by 100 will be?
   a) 0.57
   b) 5.70
   c) 57
   d) 570

Unit 5

Measurements

5.1 Length

i. Use standard metric units to measure the length of different objects.

ii. Convert larger to smaller metric units (2-digit numbers with one decimal place).
- kilometres into metres
- metres into centimetres
- centimetres into millimetres

iii. Add and subtract measures of length in same units.

5.2 Mass

i. Use standard metric units to measure the mass of different objects.

ii. Convert larger to smaller metric units (2-digit numbers with one decimal place).
- Kilograms into grams
- Grams into milligrams

iii. Add and subtract measures of mass in same units.

5.3 Capacity

i. Use standard metric units to measure the capacity of different containers.

ii. Convert larger to smaller metric units (2-digit numbers with one decimal place) litres into millilitres.

iii. Add and subtract measure of capacity in same units.

iv. Solve real-life situations involving conversion, addition and subtraction of measures of length, mass and capacity.

5.4 Time

i. Read and write the time using digital and analogue clocks on 12-hour and 24-hour format.

ii. Convert hours to minutes and minutes to seconds.

iii. Convert years to months, months to days, and weeks to days.

iv. Add and subtract measures of time without carrying and borrowing.

v. Solve simple real-life situations involving conversion, addition, subtraction of measures of measures of time.

Plan Ahead:

5.1 Length
5.2 Mass
5.3 Capacity
5.4 Time
Allocate realistic time frame/ number of periods to each topic as per requirement.

Before You Start:

In their previous class students have already worked with units of length, mass/weight, and volume/ capacity. They are well aware of addition, subtraction and conversion of units of length, mass and capacity involving the same units. This will lead them to addition and subtraction of different units of measure.

Watch Out For:

Time is a very important factor and we find it inevitable in our daily life, for example, travelling, working and other activities involve time. Students make mistakes when they add or subtract the units of measures. They need to be careful to write the same units in one column while adding or subtracting.

This Pairs with:

Math Lab 4, pages 47, 48, 49.

Make Sure You Have:

Weighing scale	Chart paper	Digital clock
A4 paper	Ruler	Analogue clock

If They're Struggling:

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 move on to the next activity.

Let's Begin

Pupils are familiar with units from the previous class but have not converted them. Explain that certain number of smaller units make up one bigger unit. The system of measurement based on multiples of 10 is called the metric system. Explain that the standard units of length are kilometre (km), metre (m), and centimetre (cm), for mass they are kilogram (kg) and gram (g), and that of volume/capacity are litre (l) and millilitre (ml).

Conversion unit of each is

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

Make note of this on the board so that pupils can write it down. Prompt them to discuss when one would need to convert units, or how one would choose the right unit to make calculations with. Ask them for real-life examples of what they could measure.

The following activities will help pupils read the measuring scales to find lengths in kilometre, metre, centimetre and millimetre, to find masses in kilogram, gram, and milligram, and the measuring scales to find capacity in litre and millilitre.

Prepare a separate activity sheet for length, mass, and capacity.

SLO

5.1
i,
iii

Activity 1
10 min

Make sure every pupil has a ruler, or a measuring tape showing centimetres and millimetres, and tell them that they have 30 seconds to find something that is not too bulky that they want to measure the dimensions of. Examples include books, tabletops, pencils, erasers, or pencil cases. Once they have each selected an object, make groups of three, and ask them to help each other measure their objects' height and width in centimetres, rounding up to only use whole numbers. Explain that height is the length from top to bottom, and width is the length from side to side. If there are oddly shaped objects, encourage pupils to work together to work out the best ways to measure them. Ask each group to make a list of their objects with the measurements on A4 sheets, making sure to mention the units.

Activity 2
15 min

Shuffle the groups from the previous activity and redistribute the A4 sheets with the measurements. Once every group has a sheet, ask them to convert the measurements from previous activity (centimetres in decimals) into millimetres, and make note of the measurements in centimetres (in decimals). Once they have their measurements calculated, ask them to draw the objects in their notebooks, to scale. The scale should be one centimetre to one millimetre. For example, if the height of a book is three centimetres, the pupils should draw it as three millimetres high.

Let's try it

Ask pupils to solve the following individually, being sure to mention units in their answers.

1. 55 km – 34 km
2. 7292 mm + 381 mm
3. 291 cm + 201 cm
4. 3291 mm – 728 mm
5. 6820 km – 83 km
6. 2700 km – 829 km

5.2 i ii and iii

Activity 3
20 min

Create a real-life scenario involving mass. For example, tell pupils that you want to arrange some books on your shelf. There are only two shelves, which can each hold a total of three books. The total weight of the books must be exactly 20 kg.

The weight of individual books is given below.

Book 1: 8.23 kg	Book 2: 7.95 kg	Book 3: 5.58 kg
Book 4: 2.41 kg	Book 5: 6.47 kg	Book 6: 9.36 kg

Task 1: Which set of 3 books do I put on each shelf?

Shelf A: _____ kg + _____ kg + _____ kg = 20 kg

Shelf B: _____ kg + _____ kg + _____ kg = 20 kg

Task 2: Covert mass of each book into grams.

Book 1: 8.23 kg = _____ g

Book 2: 7.95 kg = _____ g

Book 3: 5.58 kg = _____ g

Book 4: 2.41 kg = _____ g

Book 5: 6.47 kg = _____ g

Book 6: 9.36 kg = _____ g

Let's try it

Ask pupils to solve the following individually, being sure to mention units in their answers.

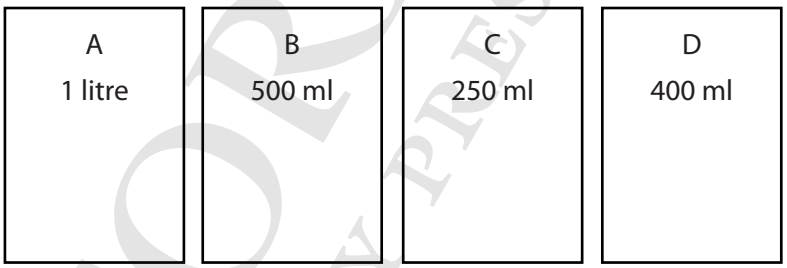
1. 892 kg – 63 kg
2. 729 g + 72 g
3. 1091 mg + 937 mg
4. 417 g + 124 g
5. 8025 kg – 112 kg
6. 3910 kg – 529 kg

SLO

5.3
i

Activity 4
20 min

Each sheet should have few pictures and some clues. For example, draw containers with different capacity and name them A, B, C, and D. Write some clues and ask children to read the clues carefully and identify who has which container.



Clues:

Arif: I have 1000 ml. Answer: Container_____

Azam: I have exactly quarter of a litre. Answer: Container _____

Amina: I have more than 300 ml but less than 500 ml Answer: Container _____

Saba: I have exactly half a litre. Answer: Container _____

Activity 5
20 min

Take the pupils out of the classroom in the play area.

Arrange 4 buckets or any other containers of capacity 4 litres and small jugs or containers of capacity 100 ml, 200 ml, 300 ml, and 500 ml respectively. Fill two buckets with water. Divide the pupils in four groups.

Ask one group to fill one bucket with water using 500 ml jug.

Ask another group to choose any small container to fill the other bucket.

Instruct them to count carefully, the number of times they have used the small container to pour water in the bucket. Ask the two groups how many jugs they poured to fill their bucket.

Repeat the activity with other two groups. Compare their results.

Let's try it

Ask pupils to solve the following individually, being sure to mention units in their answers.

1. 505 *l* – 234 *l*
2. 729 ml + 108 ml
3. 913 ml + 341 ml
4. 22 *l* – 438 *l*
5. 820 ml + 2921 ml
6. 2032 *l* – 99 *l*

5.3
iv

Activity 6
15 min

Ask children to make recipes for different food items required for a birthday party. For example, a fruit punch. Write a few questions, swap with their partner to solve these real-life story sums.

To make fruit punch for two friends you need:

500 ml of orange juice

150 ml of lemonade

400 ml of pineapple juice

1. What is the total amount of liquid used to make a fruit punch for two people?
2. How much orange juice would be needed to make enough for four people?

Activity 7
15 min

To begin with, tell the pupils that as a class activity, you will read out number stories involving measurement units (km, m, cm, mm, kg, g, mg, litre, and millilitre). Pupils should listen carefully and make note of the number sentences and then solve the sum. Tell pupils to come up with their own real-life number stories as realistic as possible and should involve addition or subtraction without grouping. After listening and making note of the number sentences, they should solve the sum in their notebooks.

5.4
i

Activity 8
10 min

Ask the pupils to prepare a list of activities they do from morning till night. Swap their worksheet with their partner to write whether the time is a.m. or p.m.

Activityre	Time	a.m. or p.m.
Wake up at	6:30	
Breakfast	7:15	

5.4
ii

Activity 9
20 min

Divide the pupils in pairs. Distribute the time sheet to each pair. Display digital clocks with different timings and ask pupils to choose any clock and start the activity. Tell them to first note down the starting time in the sheet and then write the time after every 5 minutes. They must start converting the time in minutes as soon as they note down a new time. If two or more pairs have chosen the same clock, then ask them to exchange their sheets and peer check the results.

Time (in hrs and min) after every 5 minutes	Time in minutes
Starting time:	

Example: Starting time: 11:15

Time in minutes: (11 x 60) min + 15 min = (660 +15) min = 675 min

5.4
iv

Activity 10
20 min

Prepare an activity sheet as shown below. Pupils can work independently or in pairs for this activity.

Telling Time Through Tick Tock

Rabia wants to go to her aunt's house. She is timing how long it takes her to reach there.
Write the time in the blank as time passes.

Rabia starts her journey at 11.30 a.m.
Tick tock 5 minutes have passed. _____
Tick tock 8 more minutes have gone by. _____
Tick tock 11 more minutes have gone by. _____
Tick tock 3 minutes have passed. _____
Tick tock 22 minutes have passed. _____
Tick tock 17 minutes have gone by. _____
Tick tock 21 more minutes have passed. _____
She has now reached her aunt's house. How long did she take to reach there? _____ hrs _____min

Activity 11
15 min

For this activity, set a time on an analogue clock. Ask pupils what time it shows. Once they give you the answer, ask them what time it would be after two hours. Then point at another number on the clock and ask what time it would be after four hours. Tell them that calculating a later time is the same as addition. Continue pointing at different time on clock and adding few hours to it.

Similarly, explain that just like addition, where they counted forward on the clock, to subtract they just need to count backwards on the clock for subtraction.

Ask pupils to prepare few questions based on addition and subtraction for their partner to solve. For example, 4 o'clock + 3 hours, 6 o'clock + 6 hours, 9 o'clock –3 hours, 8 o'clock – 6 hours.

Activity 12
10 min

Compile a list of birthdays of all the pupils' and paste it on the board. Ask each pupil to use a calendar to find out what day of the week each of their classmates' birthdays fall on. Ask pupils to calculate the difference in their and partners age. Or calculate how many months or days are left to celebrate the birthday of their classmate.

Activity 13
10 min

Ask pupils to compile a list of events happening in school. Mention the date and day. Tell them to calculate how many months or days are left to celebrate the next event.

Let's talk Math

Time is a very important factor and we find it inevitable in our daily life, for example, travelling, working and other activities involve time. Length, mass, and capacity are important in day to day life. The long and short distances (km and m), weighing grocery (kg and g), measuring liquid (l and ml) are units of measurements used in our daily life. The schedules, events, programmes, appointments, and meetings etc. involve time as the basic factor. Ask pupils what they think their daily lives would look like without all of these and how their lives are dependent on measurements. At the end of the discussion give them 5 minutes to write a reflective paragraph about they unit.

Let's get practical

Ask pupils, in groups, to create maps. Each group may pick a room, or a building, and draw a map to scale. If they should pick the classroom to create a map of, they may choose a scale of metres to centimetres, meaning that a wall that is really 3 metres wide, will on the map be drawn as 3 centimetres. Tell each group that they will have to decide the right scale for their own map. Once they have chosen their scale, they will need to measure the room they are drawing and calculate what size it will be in the map, which should fit onto a chart paper.

Self Assessment

5.1 Length

5.2 Mass

5.3 Capacity

5.4 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. What is 100 km in m?
   a) 100000 m
   b) 10000 m
   c) 0.00001 m
   d) 0.0001 m

2) What is 90 g in kg?
   a) 90000 g
   b) 900g
   c) 0.0009 g
   d) 0.09 g

3) Sara took 1 hr and 17 mins to finish her maths homework. She then took 2 hr 42 mins to complete her other homework. How much time did she take to finish all her homework?
   a) 4 hours
   b) 3 hours 59 mins
   c) 4 hours 59 mins
   d) 3 hours

Unit 6

Geometry

6.1 Lines

i. Recognise and identify parallel and non-parallel lines.

6.2 Angle

i. Recognise an angle formed by intersection of two rays.
ii. Measure angles in degree ( ) by using protractor.
iii. Draw an angle of given measurement and use the symbol ( ) to represent it.
iv. Differentiate acute, obtuse and right angles.
v. Measure angles using protractor where
   - Upper scale of protractor reads the measure of angle from left to right.
   - Lower scale of protractor reads the measure of angle from right to left.

vi. Identify right angles in 2-D shapes.

6.3 Circle

i. Describe radius, diameter and circumference of a circle.

6.4 Perimeter and Area

i. Find perimeter of a 2-D figures on a square grid.
ii. Recognise that perimeter is measured in units of length.
iii. Find area of 2-D figures on a square grid.
iv. Recognise that area of a square is measured in meter square (m^2)and centimetre square (cm^2)

6.5 Symmetry

i. Recognise lines of symmetry in two-dimensional (2-D) shapes.
ii. Complete a symmetrical figure with respect to a given line of symmetry on square grid/dot pattern.

6.6 Three-dimensional (3-D) Objects

i. Compare and sort 3-D objects (cubes, cuboids, pyramids, cylinder, cone, sphere)

Plan Ahead:

6.1 Lines	6.4 Perimeter and Area
6.2 Angles	6.5 Symmetry
6.3 Circle	6.6 Three-dimensional (3-D) Object

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

Before You Start:

Students are familiar with 3-D and 2-D shapes from their daily life. They have seen and held objects, such as a ball (a sphere), a dice (a cube), a toothpaste box or a lunch box (a cuboid), an ice cream cone (a cone), etc. They have also felt the flatness of shapes, such as a floor tile (a square) or a windowpane (a rectangular), a round plate (a circle. They have a visual idea of what each looks like, but often get confused with names. At this level their knowledge of shapes takes a slightly more formal shape.

Watch Out For:

Make sure to give plenty of time for pupils to get used to names, especially when introducing the 3-D shapes at the end of the unit.

This Pairs with:

Math Lab 1, pages 50 to 56.

Make Sure You Have:

Acting sheets	Scissors	Protractor	Paper chits
Markers	Ruler	Geometry box	
A4 Sheets	Playdough	Empty baskets	

If They're Struggling:

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 the class to volunteer any information they remember about shapes, and which shapes they can name. As they name them, ask them to come up to the board and draw them. Write the name of each shape down next to them. When they are done, if there is a circle, a square, a rectangle, and a triangle on the board, group them together, and tell the class that these are the shapes they should focus on. If one of them is missing, add it, and explain to the class what it is called. For this activity, include all the shapes on the board. Ask pupils if they see any similarities, or differences. Try to prompt them to be aware of the lines. Which ones are curved, and which ones are straight, even if the circle is the only shape on the board that does have a curved line.

SLO

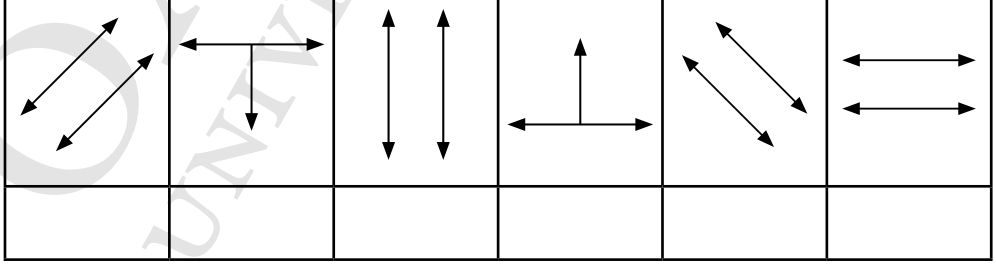
6.1
i

Activity 1
15 min

Have a short discussion about parallel and perpendicular lines with the students. Draw few lines on the board and ask them to identify. Give them the activity sheet and explain the task.

Activity Sheet

Identify the parallel and perpendicular lines and write their names in the space given.



Let's try it

Present each pupil with a picture, possibly from a colouring book, that includes straight lines and curved lines. Ideally, it will be very simple, and will not confuse pupils. If such a picture cannot be found, make a simple drawing and photocopy it. Ask the pupils, in pairs, to go observe the picture and identify as many curved and straight lines, by outlining them with differently coloured highlighters, or markers. Use as many pictures as necessary for them to spend at least 10 minutes on this exercise.

SLO

6.2
iv

Activity 2
15 min

Divide the class into group of 3 to 5 pupils each. Distribute activity sheets to the pupils.

Allow pupils to move around their school and spend 10 minutes looking for different kinds of angles that they can identify in their surrounding. Ask them to note down their findings in the activity sheet.

For example, they may spot a tree branch making an obtuse or an acute angle with the tree trunk etc.

Pupils only need to identify the kind of angle that the object is making and not calculate it.

Activity Sheet	
Objects	Type of angles

SLOs

6.1
i
and
6.2
v

Activity 3
20 min

Distribute the following activity sheet to each student. Have a short discussion about the angles and lines with the whole class, and then let them solve the worksheet independently.

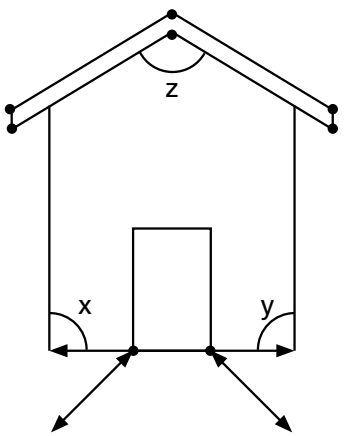
Look at the house and answer the following questions.

1. Identify a line segment in the given figure and mark it AB.
2. How many rays can you find in the given picture?
3. Find a pair of parallel lines and mark them CD and EF.
4. Find a pair of non-parallel lines and mark them PQ and ST.
5. Measure the following angles:

∠X =

∠Y =

∠Z =



SLO

Activity 4
20 min

The following will help you to assess if the pupils know what acute and obtuse angles are. Distribute blank paper chits to all pupils. Ask the pupils to write one measure of their choice for acute angle and one for obtuse angle on the paper chit given to them. Now ask the pupils to fold their chit and put them in the empty basket. Distribute blank A4 sheets to all pupils. Shuffle the chits, pass the basket around, and ask each pupil to draw a chit from it. They will now be required to draw the acute and obtuse angles written on the chit in their respective activity sheet. Spot check the measures of the angles for correction. At the end, let the pupils peer check the activity sheets.

6.3
i

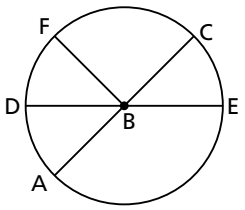
Activity 5
15 min

Have a short discussion about the parts of a circle with the whole class. Distribute the activity sheet and explain the task to them.

Activity Sheet

Look the circle and write the answers.

1. Name the centre of the circle. _____
2. How many radii are shown in the given circle?
   _____
3. Name the diameters shown in the circle.
   _____



Activity 6
10 min

Plan this activity a day or two before teaching it. To start with, divide the class into groups of 4 pupils each. Ask each group to discuss among themselves and decide which different circular objects they can and will bring from their homes. The objects may include, paper plate, bottle cap, CD, and disc etc.
When the objects are brought in the class, call one group at a time in front along with their resources. Each group member will show their circular objects and identify only one part of the circle that is: circumference, center, radius, and diameter.
This activity will enable them to identify circles and their parts in real-life.
Ask them to draw their object on the paper and label its radius, diameter, and circumference individually.

6.4
i
and
iii

Activity 7
20 min

Provide each pupil with a centimetre grid and ask them to draw a square using any measurements of their choice. Ask them to calculate the area and perimeter of their drawn squares. The pupils may then compare the area and perimeter with that of their classmates and find out whose square has the largest area.
Next ask pupils to prepare a question related to use of perimeter and area in real-life.

Activity Sheet

Your school's football association just built a new practice field that is 100 m long and 67 m wide. What is the perimeter and area of the new field?

Perimeter = _____ Area = _____

SLO		
6.5 i and ii	**Activity 8** 10 min	On a sheet of paper paste a shape and draw a line of symmetry. Ask the children to try to copy the exact shape on the other side of the line.
	Activity 9 10 min	If available, use geoboards and coloured rubber bands for this activity. You can also make them yourself using pieces of wood with iron nails inserted into them. Mark a line in the middle and then using a rubber band make a square or any shape. Ask the children to try to copy the exact shape on the other side of the line.
6.6 i	**Activity 10** 15 min	Ask pupils to identify and sort 2D and 3-D shapes and objects (squares, rectangles, cubes, cuboid, cone, cylinders) in the classroom. Ask them to share their findings with their partner. Call one pair to stand in front of the class and describe how 2D shapes can be linked with 3-D shapes/ objects.
	Activity 11 10 min	Put different 3-D objects in a basket and cover it with a piece of cloth. Call one pupil at a time, ask him/her to put both hands in the basket, pick up one object and without lifting the cloth, try to identify it by calling out its properties for the class. (For example, it has six faces, opposite two faces are equal, it has eight edges, or it has a curved surface etc.) Then allow the child to show the object to the class. If the object is identified correctly then the class appreciates by showing thumbs up.
	Activity 12 10 min	Give play dough to children and ask them to make 3-D objects. Then ask one pupil at random to show their object to the class and recall its properties. They must mention where do they see these objects in real-life.

Let's talk Math	Let's get practical
Ask pupils to look around them and spot where they find uses of geometry. Guide them to observe different geometrical shapes and patterns in leaves, flowers, stamps, and so on. Discuss with them the constructionist of buildings, bridges, and monuments are based on geometrical concepts. Discuss with students how different lines and angles are used to form figures and shapes. Allow 5 minutes to the students to write a reflective essay on the importance of geometry in daily lives.	Provide the pupils with tangrams made out of coloured paper and ask them to make as many shapes and objects as possible. This will allow students to make modifications with different shapes and use them in such a manner that the revision of all the properties of different shape is done.

Self Assessment

6.1 Lines
6.2 Angles
6.3 Circle
6.4 Perimeter and Area
6.5 Symmetry
6.6 Three Dimensional (3-D) Object

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. 'I am a point that extends in one direction infinitely'. What am I?
   a) Line
   b) Line segment
   c) Ray
   d) Point
2. 'I am three vertices, three angles, and three edges'. What am I?
   a) Triangle
   b) Square
   c) Circle
   d) Rectangle
3. 'I am a point, directly above the base, where two or more lines meet'. What am I?
   a) base
   b) apex
   c) edge
   d) vertex

Unit 7

Data Handling

7.1 Bar Graph	7.2 Line Graph	7.3 Pie Chart
i. Read simple bar graphs given in horizontal and vertical form. ii. Interpret real-life situations using data presented in bar graphs.	i. Read line graphs. ii. Interpret real-life situations using data using data presented in line graphs.	i. Read pie chart. ii. Interpret real-life situations using data presented in pie chart.

Plan Ahead:

7.1 Bar Graph

7.2 Line Graph

7.3 Pie Chart

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

Before You Start:

Pupils should be well-versed with tally charts and representing data in tabular form. They have learnt to interpret picture graph and will apply this knowledge to interpret bar or line graphs by counting the intervals, on horizontal and vertical axes.

Watch Out For:

Pupils may make error in drawing and counting tally masks. They should be guided that total number of tally marks are equal to the told number of observation in the given data. By matching these two quantities they can avoid this error.

This Pairs with:

Math Lab 4 pages 57 – 59

Let's Begin

Recap the use of tally marking and completing a table of given data. Inform them that when information is organised in a table, it becomes useful to draw bar graphs. At this level, they do not need to draw bar or line graph, however, they can be shown several bar and line graphs to make them familiar with the presentation of to types of graphs, it will make the interpretation easier for them.

SLO

7.1

Activity 1
15 min

To begin with, talk about the importance of having healthy breakfast in the morning. Distribute paper plates to each pupil. Ask pupils to write down what they had for breakfast that morning, and to draw a picture of it on the plate. If a pupil says he/she did not have breakfast, then they must write 'nothing'.

Write few breakfast items such as milk, juice, cereal, fruits, toast, and eggs, etc. on board. Next ask pupils to read their list one by one. Use tally marks for each item (if a new item comes up add it to the list). Represent the data on a bar chart drawn on the board. Discuss the data and analyse the bar graph. Write few related questions on the board and encourage pupils to find the answers from the bar chart and write them on whiteboards. For example:

1. How many pupils had milk in the morning?
2. Which food is liked by most of the pupils?
3. Which food is least favourite of the pupils?
4. How many pupils did note have breakfast?

Activity 2
10 min

Divide the class into groups. Ask each group to discuss among themselves and decide on something that they think they could use to create a collection of data. Encourage pupils to be creative and use their imagination. For example, how many family members do they have, what is their favourite fruit, or colour or sports. Once they have collected their information by using tally marks, tell them to represent this information on a bar chart. Next call each group in front of the class to explain what data they collected and what is their findings.

Activity 3
15 min

Provide A4 sheet to each pupil. Ask them to make a daily temperature chart. A sample is given below.

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Temperature (°C)							

Ask the pupils to note daily temperature in the chart. After a week, guide them to represent the information on the same sheet by making bars. Next call few pupils randomly in front of the class to explain their findings about the temperature during the whole week. Guide them to ask questions, such as 'identify the highest and the lowest temperature'.

Let's try it

Pupils have already learnt three types of graphs; bar graph, line graph, and pie chart. Ask following questions to improve their understanding using different type of graphs for different data.

1. Which is the most appropriate type of graph to represent number of students liking different sports?
2. Which type of graph should be chosen to show the proportion of people having a cat, dog, rabbit, or birds as their pet?
3. Which type of graph would you select to record changes over a period of time?
   for example, growth of a plant in six months?

Let's talk Math

Data interpenetration is important because it helps make decisions. This skill enhances logical thinking and critical analysis of data given in the form of line graph or bar graph. Bar and line graphs exhibit relationships between two or more values. Line graphs give a quick analysis of data. Bar graph summarises a big data to visualise them easily . Ask the students if they have ever seen or used graphs as a way of handling data in their daily lives. Where have they seen the graphs being used. How can they make information accessible and easier for everyone with graphs? Allow 5 minutes to the students to write a reflective essay on the importance of graphs.

Let's get practical

Gathering data enables us to store and analyse important information from some source. Make a bar graph presentation on a big chart paper and paste it on the board in the classroom. Give time to pupils to look at it, think its topic and quantities on vertical and horizontal axes.

Now display a bar graph representing the information about their school, for examples number of classroom music rooms, staff rooms wash rooms, library, and rest rooms etc. Ask the pupils to make their own questions to interpret the data.

Self Assessment

7.1 Bar Graph

7.2 Line Graph

7.3 Pie Chart

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. A headmistress wants to represent the total population of girls in her school. Which graph/chart will she use?
   a) Bar graph
   b) Line graph
   c) Pie chart
   d) Tally chart

2. A restaurant owner wants to know which food dish is the best selling amongst his customers. Which graph will we use?
   a) Bar graph
   b) Line graph
   c) Pie chart
   d) Tally chart
3. An economist want to know the changes in gold prices for 15 days. Which graph will he use?
   a) Bar graph
   b) Line graph
   c) Pie chart
   d) Tally chart

NEW

COUNTDOWN

BOOK 4

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 and Operations

Suggested Time Frame

6-8 periods

Learning Curve

Students have already worked with numbers up to 5 digits. Here, they will deal with numbers up to 6 digits. Previously they have added and subtracted numbers up to 5-digits, this will lead them to add and subtract numbers up to 6 digits. Students are familiar with multiplication and division (2-digit number by a 1 digit number) now they will be dealing with multiplication and division of 4-digit numbers by 2-digit numbers. They will be able to apply this knowledge to solve daily life problems involving four operations.

Real-life Application

We have numbers all around us. We use them in different ways.

- Maths helps in building things. For constructing a building we find the area of each space and estimate the expenditure.
- In the grocery store we purchase things and use mathematics to pay for them.
- While baking in the kitchen we use numbers and operations to mix the correct amounts of ingredients.
- If we plan a journey we need to estimate the expenses of tickets, accommodation, and food.
- Saving money also needs mathematical operations.

Frequently Made Mistakes

- The students mix in place values while dealing with bigger numbers.
- They make mistakes in writing numbers in the correct columns while adding or] subtracting.

- They get confused in distinguishing between the dividend and divisor.
- They make mistakes in multiplication and division sums because they do not recall the times tables.

Summary of Key Facts

- Comparing numbers is the same as knowing which number is smaller and which number is bigger.
- Symbolically, a smaller sign is denoted as '< ' and a greater sign is denoted as '>'.
- The multiplicand is the number or quantity to be multiplied. The multiplier is the number or quantity by which the multiplicand is to be multiplied. The product is simply the end result of the multiplication.
- The dividend is the number or quantity to be divided. The divisor is the number or quantity by which the dividend is to be divided. The quotient is simply the answer of the division.
- 'Remainder' is the quantity which is left after division.

Model Lesson Plan

Topic

Introduction of numbers up to 6-digits.

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson, students will be able to identify place values of digits up to the hundred millions.

Key Vocabulary

million, place value

Resources

Place value chart on small cards, a big place value chart.

Strategy

Engagement Activity (5 mins)

Write a number on the board, for example, 909 437. Ask the students the place value of each digit.

Help the students if there is any ambiguity.

Main Developmental Activity (20 mins)

Distribute place value chart cards to the students and ask them to paste in their notebooks.

Thousands			Ones		
HTh	TTh	Th	H	T	U

Tell them to write 10 00 in the place value chart.

Ask the students to guess the biggest 5-digit number i.e. 99 999.

Tell them that the next number will be 100 000 which is a 6-digit number. Ask them to put this number in the place value chart.

Highlight that the number of digits moves one column towards the left increasing the value of the number.

Give them several examples of 4, 5, and 6-digit numbers by writing on the board emphasising the place value of a unit, ten, hundred, thousand, ten hundred thousand, and thousands.

Tell them that ordering and comparing of 6-digit numbers follows the same rule as for 5-digit numbers.

Pair work (10 mins)

Write some 5 and 6 digit numbers on the board with a ringed/bold digit. Ask the students to identify their value by writing them in the provided place value chart. For example: **9**52 602; 90**2** 185; 7**3**2 415; **5**3 465.

Written Assignments (40 mins)

Ex 1a Q (7, 10,11, and 12)

Wrap up (5 mins)

Give them three 6-digit numbers in words on the board and ask them to write them in numerals in the place value chart given to them.

2 Factors and Multiples

Suggested Time Frame

12-14 periods

Learning Curve

The students already know about multiples of 10. Here they find out the multiples of other numbers and then common multiples between two or more numbers. Thereafter, they find the LCM. Next, the students list the factors of a number and identify the common factors between the two numbers. In this way they identify the HCF. To make the calculation of LCM and HCF easy, students are introduced to co-prime numbers, prime numbers, composite numbers, and prime factors.

Real-life Application

HCF is used to:

- split things into smaller sections.
- equally distribute 2 or more sets of items into their largest grouping.
- figure out how many people can be accommodated in a place.
- arrange objects into rows or columns.

LCM is used to:

- tell about an event that is or will be repeating over and over.
- purchase or get multiple items in order to have enough.
- figure out when something will happen again at the same time.

Frequently Made Mistakes

- Students get confused in identifying factors and multiples.
- Errors due to not remembering the times tables.

Summary of Key Facts

- Any number with 0, 2, 4, 6, 8 at the unit place is divisible by 2.
- If the digits of any number add up to a number which is divisible by 3, then the original number is also divisible by 3.
- Any number with 0 or 5 at the unit place is divisible by 5.
- Any number with 0 at the unit place is divisible by 10.
- A prime number has only two factors that is 1 and the number itself.
- Composite numbers have more than two factors.
- Factors of a number are limited.
- Multiples of a number are unlimited.
- Every number is a factor of itself.
- 1 is a factor of every number.
- Composite numbers can always be arranged in exact rectangles.

Model Lesson Plan

Topic: Common factors

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson students will be able to find Common Factors.

Key Vocabulary

factors, common factors

Resources

Worksheets, cut-outs, glue stick.

Strategy

Engagement Activity (5 mins)

Ask multiplication facts randomly involving the whole class. For example, what is four times five, what is 8 × 4, or what is product of 3 and 2? This activity will reinforce the vocabulary related to multiplication and help the students recall the multiples and factors.

Main Developmental Activity (20 mins)

Write 3 numbers on the board. As students are already familiar with finding factors, ask them to find the factors of the given numbers in their notebooks.

Factors of 6 = 1, 2, 3, and 6 Factors of 4 = 1, 2, and 4 Factors of 8 = 1, 2, 4, and 8

Ask them to point out the factors which are common to all the given numbers. Tell them that the common factors of 6, 4, and 8 are 1 and 2.

Now write three 2-digit numbers on the board and ask the students to find out the common factors of the given numbers. Help them in calculating the factors. Then ask them to write the common factor on the white board and show it to you. For any wrong answer help the student in finding the correct answer.

Written Assignment (35 mins)

Ex 2 e. Q (5 and 6).

Wrap up (10 mins)

Ask the students, what will be the common factor of any three prime numbers?

3 Fractions

Suggested Time Frame

12-14 periods

Learning Curve

The students already know how to add and subtract 'like' fractions. They have learnt mixed fractions, equivalent fractions, ordering and comparing of like fractions. Here, students will deal with unlike fractions to:

- Identify and compare two fractions.
- arrange fractions in ascending and descending order.
- simplify fractions to the lowest form.
- verify the commutative and associative law of addition and multiplication of like fractions. Furthermore, they will apply their knowledge to solve real life problems involving fractions.

Real-life Application

Fraction plays an important role in daily life. Fractions are used:

- in baking to tell how much of an ingredient to use.
- in telling time; each minute is a fraction of the hour.
- to determine discounts when there's a sale going on.

Summary of Key Facts

- Like fractions have the same denominator and unlike fractions have different denominators.
- Equivalent fractions are obtained by multiplying or dividing the numerator and the denominator of a fraction by the same number (not 0).
- A fraction with the numerator 1 is known as a unit fraction.
- A fraction having numerator smaller than the denominator is called a proper fraction.
- A fraction having numerator equal to or greater than the denominator is called an improper fraction.
- A mixed fraction is made up of a whole number and a proper fraction.

- When a fraction is multiplied by its reciprocal, the product is always 1.
- Two numbers whose product is 1 are the reciprocal of each other.
- Dividing a whole number by a fraction: change the division sign to a multiplication sign and take the reciprocal of the fraction and simplify.

Model Lesson Plan

Topic

Ordering fractions

Duration

80 (mins)

Specific Learning Objectives

By the end of the lesson, students will be able to arrange the given fractions in ascending order.

Key Vocabulary

fraction, ascending, descending ,order, like, and unlike

Resources

Worksheet

Strategy

Engagement Activity

Recall (5 mins)

Start your lesson with a recall of different types of fractions. Discuss the rule of making equivalent fractions. Recall that when denominators are the same, the fraction with the greater numerator is greater.

Main Developmental Activity (20 mins)

Reinforce the concept of like and unlike fractions and revise rules for comparing unlike fractions. Write some fractions on the board. Call a few students one by one to convert them into equivalent fractions.

Provide each student with one of the activity cards given below. Solve the first question on the board involving the students. They will solve the second question on their own

Feedback (10 mins)

Worksheets will be checked by peers. Then ask the students what they learned?

Written Assignments (40 mins)

Ex 3a Q (8).

Wrap up (5 mins)

Ask the students which one is the greatest of $\frac{1}{3}$, $\frac{1}{6}$, and $\frac{1}{9}$.

4 Decimals

Suggested Time Frame

8-10 periods

Learning Curve

In this book, students will learn about decimal places: tenths, hundredths, and thousandths and carry out the four basic mathematical operations with decimal fractions. Decimals have lots of importance in real life, especially when we purchase commodities or deal with interest rates of credit cards or see the average of any cricketer's striking rate or run rate.

Frequently Made Mistakes

- Students do not align the decimal point, while adding or subtracting decimals numbers.
- They forget to put the decimal point while adding, subtracting, multiplying, or dividing the numbers.

Summary of Key Facts

- The decimal point is a point that separates whole numbers from decimal fractions.
- The number of digits after the decimal point gives the number of places in a decimal number.
- Zeros to the right of a decimal point after the digits have no value.
- Zeros to the left of a decimal point before the digits have no value.
- Fractions can easily be converted to decimals, provided their denominators are multiples of 10 or 100.
- When we change a decimal into a fraction, we may need to reduce the fraction to its lowest terms.
- While adding and subtracting decimal numbers, keep the decimal points in the same column.

- When we multiply a decimal number by 10, 100, 1000, the value of the number increases by 10 times, 100 times, and 1000 times.
- When we divide a decimal number by 10, 100, 1000 the value of the number decreases by 10 times, 100 times, and 1000 times.

Model Lesson Plan

Topic

Addition and subtraction of decimals involving real-life situations.

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson, students will be able solve real-life problems involving decimals up to two decimal places.

Key Vocabulary

Decimals

Resources

Activity worksheet, gardening tools (toys).

Strategy

Engagement Activity (5 mins)

Ask the students where they find decimals in real-life? Start jotting down their responses on the board. Recalling their previous knowledge, proceed to the following activity. They have done addition subtraction, and multiplication of decimals.

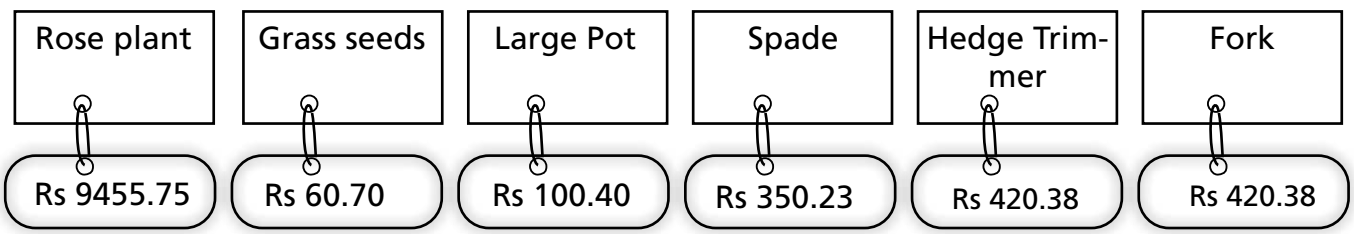
Main Developmental Activity (20 mins)

You should have already collected the toy gardening tools as mentioned below. Tie a washing line in the classroom and hang the tools with price tags on them.

Divide the class into groups of 5. Provide the activity sheet to each group and ask them to check the price on washing line and solve the questions on the sheet. Ensure equal participation among the students.

Get the sheets peer checked in the end.

1. Price Tags will be as follows:



Look at the price tags answer the following questions.

1. What is the cost of a spade, a fork and some grass seeds?	
2. How much change from Rs. 1000 would there be if you bought a spade?	
3. What is the cost of two pots and a hedge trimmer?	
4. What would be the total cost of 5 packets of grass seeds? What change would there be from Rs 500?	
5. What is the difference in price between the lawn mower and hedge trimmer?	

Feedback (10 mins)

Ask each group to share the findings of their activity worksheet.

Written Assignments (40 mins)

Pg.103 word problem Q1, 2, and 4.

Wrap up (5 mins)

Ask the students to see the price of their Maths book and divide it by 100. What would be the result?

5 Measurements

Suggested Time Frame

16-18 periods

Learning Curve

In their previous class students have already worked with units of length, mass and volume/capacity. They are well aware of addition, subtraction and conversion of units of length, mass and capacity involving the same units. This will lead them to addition and subtraction of different units of measure. They also have knowledge of how to use a.m. and p.m. to record time in analogue and digital clocks. The previous knowledge of conversion of units of time will help them to make conversions with years, months, weeks, days. This knowledge will enable them to solve real life problems including length, mass, capacity, and time.

Real-life Application

Time is a very important factor and we find it inevitable in our daily life, for example, travelling, working and other activities involve time. Length, mass, and capacity are important in day to day life. The long and short distances (km and m), weighing grocery (kg and g), measuring liquid (l and ml) are units of measurements used in our daily life. The schedules, events, programmes, appointments, and meetings etc. involve time as the basic factor.

Frequently Made Mistakes

Students make mistakes when they add or subtract the units of measures. They need to be careful to write the same units in one column while adding or subtracting.

Summary of Key Facts

- The system of measurement based on multiples of 10 is called the metric system.
- The standard units of weight are kilograms (kg) and grams (g).
- The standard unit of volume/capacity is litres (l) and millilitres (ml).

  1 km = 1000 m 1 kg = 1000 g 1 l = 1000 m

Model Lesson Plan

Topic

Conversion of units of length

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson students will be able to convert different units of length.

Key Vocabulary

units of lengths, stair diagram, km, m, cm, mm

Resources

Worksheet

Strategy (5 mins)

Engagement Activity

Ask the students: What are the units of measurement for length?

Is it possible to convert units of measurement of length? Like km into m or m into km.

Main Developmental Activity

Teacher's Exposition (10 mins)

Ask the students the factors of conversion from km to m, m to cm, and cm to mm. Reinforce the multiplication and division of numbers by powers of tens, then write a few conversion sums on the board and write the answers, taking students' feedback.

Now give them the following activity sheet to work in pairs or independently.

Individual Activity (25 mins)

Instructions:

Jawad, Taha, and Jibran were competing to see how far they could run in 10 minutes. They did not record their distance in the same units. Convert the units into other units as asked

Written Assignments (30 mins)

Ex 5 a Q.4, 5, 6, and 8

Wrap up (10 mins)

Give a quick recap of the lesson to the class and discuss the following two questions

1. Which is the biggest unit of length and which is the smallest unit of length?
2. Where do we see these units of length in our daily lives?

6 Perimeter and Area

Suggested Time Frame

8-10 periods

Learning Curve

In previous classes, students have calculated perimeter of a square and a rectangle (by using the formula). Now, they will calculate the area of some simple shapes i.e. square and rectangle. They will further move on to calculate areas of some composite shapes also.

Real-life Application

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.

Frequently Made Mistakes

Students often confuse area with perimeter. Area and perimeter deal with 2-D shapes, but sometimes students associate area and perimeter with 3 D shapes, which is not correct.

Summary of Key Facts

- 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 clock-wise until you reach the point from where you started.
- The amount of surface a shape covers is called its area.

Model Lesson Plan

Topic

Area and perimeter

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson, students will be able to calculate area and perimeter of a rectangle. They will also find the unknown length or breadth of the rectangle.

Key Vocabulary

area, perimeter, rectangle, length, and breadth

Resources

White boards, ruler, measuring tape, and activity sheets.

Strategy

Engagement Activity (5 mins)

Recall: Write down the following questions on the board.

1. What is the formula for the area of a square and a rectangle?
2. What is the formula for the perimeter of a square and a rectangle?

Students will write the answers of the above questions on the white boards. Ask students to raise their white board so that you can see their work.

Main Developmental Activity

Pair Activity (20 mins)

Instructions:

- Divide your class into pairs and ask them to walk around in the class and find one rectangular object.
- It can be their whiteboard, class door, the soft board, their lunch box, class window etc.
- Each pair will then measure the sides of their chosen rectangular object and calculate its area and perimeter in the given activity sheet.

Activity sheet:

Shape	l = length	b = breadth	perimeter (P)	area (A)

Now tell the students that they can find the unknown length or breadth of a rectangle by using the formula. Tell them that if area and length is given, breadth can be found by dividing the area by the length. Similarly, length can be found by dividing the area by the breadth.

Give them some examples on the board.

Feedback (10 mins)

Take feedback from each pair about their findings and share with the whole class.

Written Assignments (40 mins)

Ex 6 Q 14, 15 and 18

Wrap up (5 mins)

Have a short discussion on the importance of area and perimeter of simple shapes (square and rectangle) in practical life.

7 Geometry

Suggested Time Frame

10-12 periods

Learning Curve

Students already know 2-D and 3-D shapes. They have dealt with triangles and quadrilaterals. They know what parallel lines are and they have also worked with line segments. Here, they learn how to draw different types of lines which include straight, curved, vertical, and parallel lines. They will learn to draw angles using protractor. They will construct squares and rectangles with sides of given measures. They will learn centre, radius, diameter, and circumference of a circle.

Real-life Application

- The global positioning system uses geometrical principles to locate a position, navigate from one location to another, and tracking objects or persona movements.
- Geometry helps in the accurate calculation of physical distances.
- Geometry is used by astronomers to map the distance between planets and stars.
- Geometry also helps in computer aided designs; it entails lines, curves, and angles.
- Geometry is used in designing buildings, walls, and doors.
- Video games also include the concepts of geometry.

Frequently Made Mistakes

Students usually make mistakes when they measure angles with a protractor.

Summary of Key Facts

- A line is a set of points, placed together.
- A line segment is the shortest distance between two points.
- A ray has one end point only, and goes on and on, in the direction of the arrow.

- There are 5 types of angles:
  Right angle
  Acute angle
  Obtuse angle
  Straight angle
  Reflex angle
- A circle has a complete turn of 360°.
- Half of a circle is called a semi-circle.
- The line joining two points on the circumference and passing through the centre of a circle is called the diameter.
- Half of the diameter is called the radius.
- There are many special kinds of quadrilaterals, for example, a square, a rectangle, a parallelogram, a trapezium, and a rhombus.

Model Lesson Plan

Topic

Construction and measurement of angles.

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson, students should be able to construct an acute angle.:

Key Vocabulary

straight line, line segment, angle, protractor

Resources

Big geometry box, Japanese fan and A4 size sheet.

Strategy

Engagement Activity (10 mins)

Draw two lines AB and CD of different length on the board.

Start your lesson by giving a challenge to your students. Ask them if they can tell without measuring which line is longer, AB or CD?

Once they have made a guess, tell them to measure each line and check whether they guessed approximately the correct length. Next ask them to draw five lines, using measurements of their choice (cm or mm).

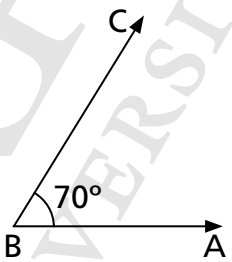
Main Developmental Activity

Take a Japanese fan to introduce the lesson on angles. Turn one arm of the fan so that the gap between the two arms increases. Tell them angle is the special word used to describe the amount of turn between the two arms and its symbol is °. The unit to measure angles is called degree and is written as °.

Now widen the gaps between the two arms of the fan, naming the different angles:

1. When one arm is horizontally straight and the other is vertically straight, a right angle is formed.
2. When the angle is smaller than a right angle, it is called an acute angle.
3. When an angle is bigger than a right angle, but not big enough to form a straight line, it is called an obtuse angle.
4. When the angle goes beyond the straight line, it is called a reflex angle.
    - Use wooden geometry box and demonstrate on the board, how to construct and measure the angle.
    - Distribute white A4 size paper to individual students and ask them to follow your demonstration.

In order to construct an angle, draw a horizontal, straight line AB first. Place the protractor in such a way that the middle of its bottom line is exactly on A. Call out a number, say 70. Put a point, say C, on the board, and see the number 70 on the protractor and then join the points A and C to make the arm AC of the resulting angle. The measure of this angle is 70° and we write, $\angle CAB = 70°$.



Thereafter, the teacher demonstrates that when the fan makes a complete turn, a circle is constructed and the central angle of a circle is 360°.

Written Assignments (20 mins)

Ex 7 c Q11, 12, 13, 14

Wrap up (10 mins)

End your lesson by asking students if the clock shows 3 o'clock, which angle is it? And if it shows quarter past 1, then which angle is it?

8 Data Handling

Suggested Time Frame

4-6 periods

Learning Curve

In Class 3, children have worked with pictographs, they know how to read and interpret it. Here, they read and interpret bar and line graphs.

Real-life Application

Bar diagrams and line graphs are useful while interpreting rainfall records, people preferences, cost price analysis, temperature, and census.

Frequently Made Mistakes

Students often make mistakes while drawing bar graphs, they leave no space between the bars and confuse bar graphs with histogram.

Summary of Key Facts

- A bar graph or bar chart is a graphical presentation of data using bars of different heights or lengths.
- Bar graphs can be drawn vertically or horizontally.
- Line graphs are useful when we want to measure something which is gradually changing.

Model Lesson Plan

Topic

Bar graphs

Duration

80 minutes

Specific Learning Objectives

By the end of the lesson, students should be able to read and interpret bar graphs.

Key Vocabulary

data, information, and bar graph or bar diagrams

Resources

Chart paper with a bar graph drawn on it.

Strategy

Engagement Activity (5 mins)

Display a chart paper showing the bar graph of students and their favourite subjects. Ask the students whether they understand what information is given in this bar graph? Can they think of the most favourite and least favourite subjects? Help them out if there is any difficulty or confusion.

Main Developmental Activity (10 mins)

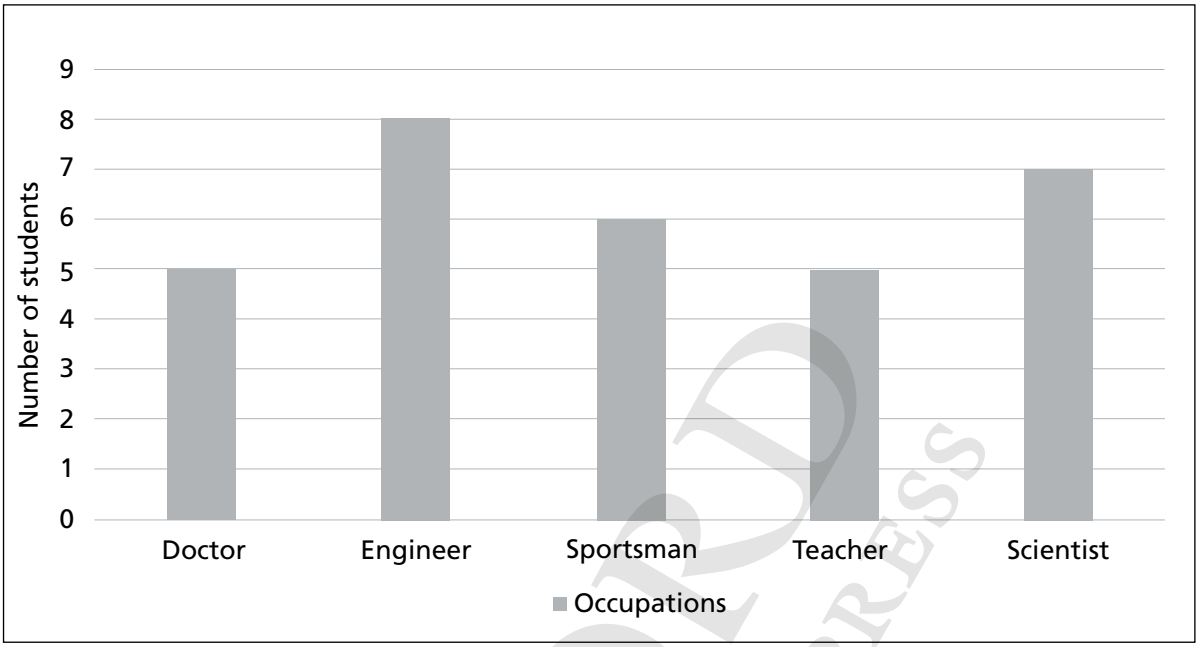
Conduct a whole class discussion recalling the prior knowledge of data handling.

Pair Work (10 mins)

The same chart paper will remain on display, ask the following questions and try to involve each and every student and make them clear on each and every point.

1. Which subject is the most popular among students? Why do you think so?
2. Which subject is least popular among students? Why do you think so?
3. How many students are there in total?
4. How many students liked the subject English?
5. How many students liked the subject Urdu?

Students of grade 4 were asked about what they want to be when they grow up. Their responses are recorded in the given bar graph. Read the graph carefully and answer the questions given below:



How many students want to be scientists? _____

How many students have chosen engineering as their future career? _____

How many students are interested in sports? _____

How many students want to take up the same career as their teachers? _____

Which two occupations have the same number of votes? _____

How many students were present on the day of this survey? _____

Written Assignments (30 mins)

Ex 8a Q 1, 2.

Wrap up (5 mins)

Ask students where they apply bar graphs in their daily life?

MATHS WISE 4

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

UNIT 1

REVIEW AND ASSESS 1

Teaching Objectives

- To revise concepts and skills learnt during the previous year

Teaching materials:

- additional worksheets

Learning activity

Lesson 1: **40 minutes**

As mentioned in the Teaching Guide for Maths Wise 3, at the beginning of the year it is important to revise and work with the concepts that were covered during the previous year. The students are more relaxed when revising old topics in an informal, fun way, than when they are using that extra energy to battle with new concepts. In that more relaxed atmosphere it is easier for them to bond better with each other, and with the teacher.

This period of revision will give you greater scope to plan future lessons and activities to facilitate the teaching process for optimum learning of new topics.

For this reason, the worksheets are used as revision sheets at the beginning of the year. The students enjoy working on these as a team, as well as individually. It is easy to make more work sheets and make copies to distribute amongst the children.

The sheets should be easy, but should be aimed at using lateral thinking rather than repetition of straight forward mathematical concepts. The students should have scope to demonstrate their thinking and analytical skills, and simultaneously recall the concepts learnt.

Revision of previously-learnt concepts can be done on a lighter note, through oral work or a small quiz. The students will enjoy the lesson and the purpose will be served too. While conducting a quiz, if you find any of the concepts to be a problem for many students in the class, you should plan to revise it with the class as a whole.

Some suggestion for the types of questions have been given in the worksheets which could be used in the quiz. You could improvise on these and build a question bank of your own. This bank of questions can also be easily used at any time during the year for any unplanned revision work.

UNIT 2
WHOLE NUMBERS AND OPERATIONS

Teaching objective:

Whole Numbers
i. Identify place values of digits up to one hundred thousand (100,000)
ii. Read numbers up to one hundred thousand (100,000)
iii. Write numbers up to one hundred thousand (100,000)
iv. Write numbers in words up to one hundred thousand (100,000)
v. Compare and order numbers up to 5 digits

Addition
i. Add numbers up to 5 digits
ii. Solve real life number stories involving addition of numbers up to 5 digits

Subtraction
i. Subtract numbers up to 5 digits
ii. Solve real life situations involving subtraction of numbers up to 5 digits

Multiplication
i. Multiply numbers up to 5 digits by numbers up to 3 digits
ii. Solve real life situations involving multiplication of numbers up to 5 digits by 3 digits

Division
i. Divide numbers up to 4 digits by numbers up to 2 digits
ii. Solve real life situations involving division of numbers up to 4 digits by a number up to 2 digits
iii. Solve real life situations using appropriate operations of addition, subtraction, multiplication and division of numbers up to 2 digits

Number Patterns
i. Recognise a given increasing and decreasing pattern by stating a pattern rule
ii. Describe the pattern found in a given table or chart
iii. Complete the given increasing & decreasing number sequence

Teaching materials:
- place value charts of both international and Pakistan systems
- counters
- alphabet blocks

Learning activity

Lesson 1: 40 minutes

Step by step, 5-digit numbers were introduced in MW 3 based on the students' previous knowledge of smaller numbers. Comparison of place value was done pictorially.

It must be emphasized here that, if a student is working well with 4-digit numbers, going on to 5-or 6-digit numbers will be quite simple. The language used, the methodology and the techniques are the same. The same terminology should be used, as for the lessons for the houses of hundreds and thousands: terms include groups of 10, carry over, borrowing, and others.

This is the first time the students will be introduced to the concept of the international system of writing numbers. It is a good idea to compare the same number in both writing styles. Take enough time to explain to the student that the same number may be written in 2 different styles. This does not change the value of the number. It is just 2 different ways of representing the same quantity.

Task: Students attempt page 8.

Lesson 2: 40 minutes

Divide the students into 2 groups. One group writes a 6-digit number using the international number system on a slate, and holds it up for the other group to see. The second group reads it out aloud.

Then the second group writes another 6-digit number using the international system and holds it up for the first group, who reads it out aloud, and writes it in wards using the Pakistani system.

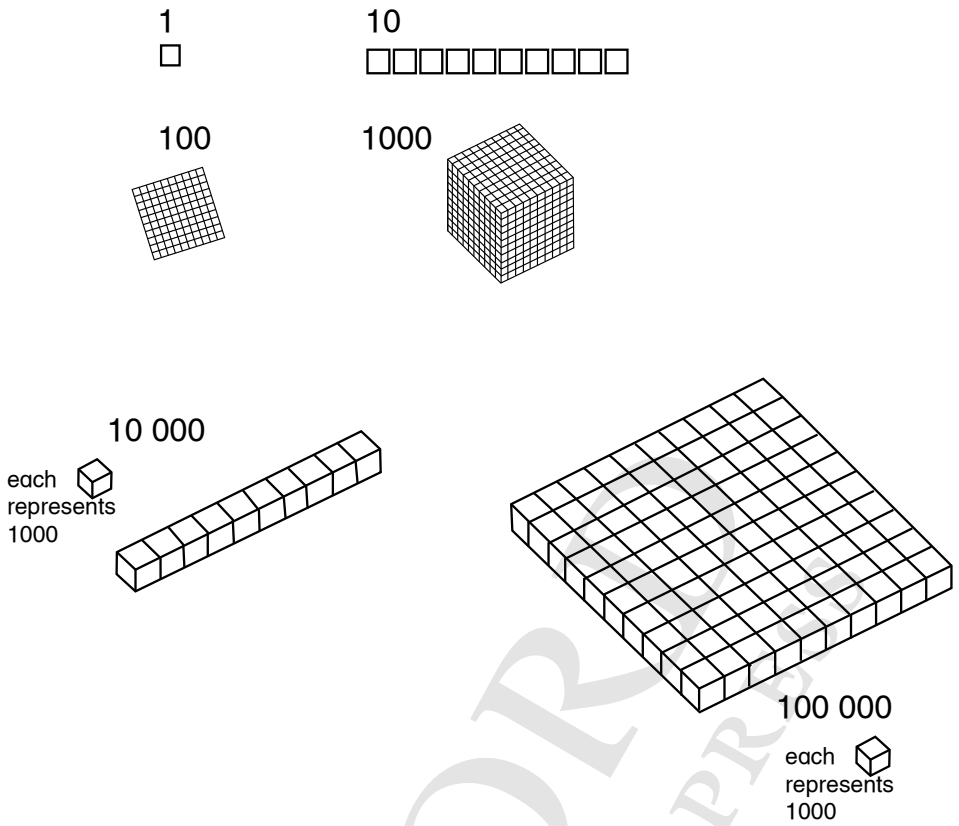
Task: Students attempt page 9.

Lesson 3: 40 minutes

The students worked with the four number operations, +, –, x and ÷, with 4– and 5–digit numbers in MW 3. Handling larger numbers will not be difficult. Explain terms such as 'sum', 'difference', 'product', and 'quotient' before starting on the problems. Revisit the associative, commutative, and distributive properties as you take them through the exercises. Remember, this topic requires a lot of practice.

Team games are always an excellent way to present problems involving the large numbers in expanded form, ascending and descending orders, identifying number sequences, and skip counting.

When you start this topic, it is a good idea to revise the place values of numbers up to ten thousands. 99,999 1,00,000, 1,00,001…



H Th	T Th	Th	H	T	U
0	0	0	0	0	0
1	0	0	0	0	0
0	1	0	0	0	0
0	0	1	0	0	0
0	0	0	1	0	0
0	0	0	0	1	0
0	0	0	0	0	1

Paper dots, lines, squares, cubes, a row of 10 cubes, and so on, can be formed or cut out from paper and hung by a rod on the wall, with Units, Tens, Hundreds, and Thousands …written above them, as shown above.

If students are working well with 5-digit numbers, going up to 6-digit numbers will be simple. Keep the language used, the methodology, and the techniques the same. Use the same terminology: houses of tens, hundreds, thousands, carry over, grouping, borrowing, and so on and, there should be no problems with larger numbers. If some students wish to use their fingers to start with it is not a problem.

One half of the class could collect statistical data containing large numbers, such as populations of countries, heights of mountain peaks, sales figures of MNCs, depths below sea level at which various life forms exist, the distances between the different cities in the world. These figures are written on the board. The other group reads them out aloud using the international system. Alternatively each student can look up the statistics and take turns to write and read out the numbers.

Task: Students attempt page 10.

Lesson 4: **40 minutes**

Write on the board the letters of the alphabets and assign different values to each letter, according to its place in the alphabet.

A (1)	1	J (10)	1	S (19)	1
B (2)	2	K (11)	2	T (20)	2
C (3)	3	L (12)	3	U (21)	3
D (4)	4	M (13)	4	V (22)	4
E (5)	5	N (14)	5	W (23)	5
F (6)	6	O (15)	6	X (24)	6
G (7)	7	P (16)	7	Y (25)	7
H (8)	8	Q (17)	8	Z (26)	8
I (9)	9	R (18)	9		

Ask students to form words using the letters and find the value for each word.

For example: CAT= 312, or three hundred and twelve.

FLOWER = 636,559,

Six hundred and thirty-six thousand, five hundred and fifty-nine

The same code can be used for addition, subtraction, multiplication, and division. For example:

1. Arrange the following words in ascending order according to the coded values:
   DREAM, FUDGE, DROWN, FREEZE, APPLE
2. Work out the following:
   - Add OCTOPUS and FATHER
   - Take away BASKET from TWELVE
   - Multiply PILLOW by BE
   - Divide REFUSE by OF
   - Add ZERO and NOUGHT

Make sure that addition, subtraction, multiplication, and division start with the units, and carries on to tens, hundreds and so on, as happens with all number operations.

Ask the students to find 2 words with the same number value such as, **GAG** and **SAD**.

SAD and **CAT** have the same value…find the reason for this.

Encourage the students to find 2 or 3 words with the same number value, using words with 3-letters, 4-letters or more.

Letters can be used with their original values, such as

A = 1, B = 2, K = 11, L = 12, M = 13, X = 24, Y = 25, Z = 26

SKY has the value of 19 + 11 + 25 = 55

To form words with the same value, letters will need to be found from the lower end of the alphabet.

For a bit of fun: Using only one of each letter in the alphabet (without looking at the value), what are the smallest and the largest numbers you can spell?

Answer:

ZERO or NOUGHT FIVE THOUSAND

Task: Students attempt pages 14 to 24.

UNIT 3

FACTORS AND MULTIPLES

Teaching objective:

Divisibility Tests

i. Identify divisibility rules for 2, 3, 5, and 10
ii. Use divisibility tests for 2, 3, 5 and 10 on numbers up to 5 digits

Prime and composite numbers

i. Identify and differentiate 2-digit prime and composite numbers

Factors and multiples

i. Find factors of a number up to 50
ii. List the first ten multiples of a 1-digit number
iii. Differentiate between factors and multiples

Prime Factorisation

i. Factorise a number by using prime factors
ii. Determine common factors of two or more 2-digit numbers
iii. Determine common multiples of two or more 2-digit numbers

Teaching materials:

- board and charts
- Cuisenaire rods

Learning Activity

Lesson 1: **40 minutes**

What is 'divisibility'?

Children's Cuisenaire rods illustrate divisibility very well:

<table>
<tr><td colspan="6">1</td></tr>
<tr><td colspan="3">$\frac{1}{2}$</td><td colspan="3">$\frac{1}{2}$</td></tr>
<tr><td colspan="2">$\frac{1}{3}$</td><td colspan="2">$\frac{1}{3}$</td><td colspan="2">$\frac{1}{3}$</td></tr>
<tr><td>$\frac{1}{6}$</td><td>$\frac{1}{6}$</td><td>$\frac{1}{6}$</td><td>$\frac{1}{6}$</td><td>$\frac{1}{6}$</td><td>$\frac{1}{6}$</td></tr>
</table>

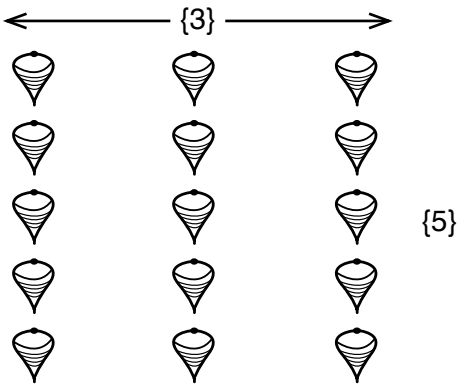
Working with these rods, the students can actually see that:

$1 = \frac{2}{2}$

$1 = \frac{3}{3}$

$1 = \frac{6}{6}$

$6 \div 2 = 3$, and $6 \div 3 = 2$
All numbers are divisible by 1
6 is divisible by 1, 2, and 3



15 tops

$15 \div 3 = 5$ and $15 \div 5 = 3$

This shows that 15 is divisible by 5 and 3

Work with other numbers such as 10, 12, and 15. The factors will be quite obvious, and the concept of divisibility will become clear.

Divisibility rules: Despite the use of calculators and mobile calculators, it is very important for the students to know their tables and work out multiplication, division, and factorization mentally as far as possible. Mental arithmetic adds to mental discipline and flexibility in reasoning.

Divisibility rules are important concepts that will be very useful in carrying out the LCM and factorization. What might seem minor steps in comparison to the speed of computers, are actually useful in the later stages of learning. Understanding of factorization and divisibility will add to the learning capability towards a higher level.

Therefore, it is advisable to spend sufficient time on every new concept, mentioned in this chapter (and later).

MULTIPLES OF 2:

The last digit in the number must be 0, 2, 4, 6, or 8.

Examples: A few multiples of 2 are 50, 42, 74, 36, 18

MULTIPLES OF 3:

The sum of all digits in the number must be divisible by 3.
Examples: A few multiples of 3 are 81, 72, 123, 3234
81 (8 + 1 = 9)
72 (7 + 2 = 9)

123 (1 + 2 + 3 = 6)
3234 (3 + 2 + 3 + 4 = 12)

MULTIPLES OF 5:

The unit digit must be either 0 or 5.
The reason:
All 10's are divisible by 5, and the unit digit being 5 makes the whole number a multiple of 5.

MULTIPLE OF 10:

The unit digit is always 0.

MULTIPLES OF 11:

The sums of alternate digits must HAVE A DIFFERENCE OF 0, 11, 22, 33 and so on.

Examples:

i) 3 9 8 7 6 5 4

(9 + 7 + 5) – (3 + 8 + 6 + 4) = 21 – 21 = 0
So, 3 9 8 7 6 5 4 is divisible by 11
3 9 8 7 6 5 4 ÷ 11 = 3 6 2 5 1 4

ii) 7 2 3 1 4 ÷11 = 6574
(7 + 3 + 4) – (2 + 1) = 14 – 3 = 11
So, 7 2 3 1 4 is divisible by 11.
7 2 3 1 4 ÷ 11 = 6 5 7 4

The following game will be fun:

Form two groups of students. Let them have a fake Snowball fight – Instruct students to write numbers on post-it notes according to the following directions:

- On TWO post-it notes, write a 2-digit number greater than 50.
- On TWO post-it notes, write a 3-digit number.
- On ONE post-it note, write a 4-digit number.

The students crumple up the post-it notes and have a fake snowball fight, by throwing each post-it note only once.

Ask the students to pick up 5 post-it notes and go back to their seats. Students open the 5 notes and test the divisibility of each number (using rules for 2, 3, 5, and 10).

On a sheet of paper, students test each number to see if it's divisible by 2, 3, 5, and 10.

Then they share their findings with the rest of the class.

Task: Students attempt page 26.

Lesson 3: 40 minutes

Prime and composite numbers:

Work with several charts showing numbers from 1 to 100.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Ask two students at a time to go mark multiples of different numbers with different coloured pencils.

Multiples of 2: 2, 4, 6, 8, 10, 12,…100 (red)

Multiples of 3: 3, 6, 9, 12, 15, 18,…99 (blue)

Multiples of 5: 5, 10, 15, 20,… 95,…100 (green)

Multiples of 7: 7, 14, 21,…98 (yellow)

Multiples of 11: 11, 22, 33,…99 (black)

Eventually, the numbers left without any markings are the prime numbers. 2, 3, 5, 7, 11, 13, 17, 19… are prime numbers. There will be 25 prime numbers left uncoloured on the chart.

These the prime numbers:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

Explain the meaning of prime and composite numbers. A natural number greater than 1 that is not a prime number is called a composite number.

2 is a multiple of 2 (2 × 1), but is a prime number.

3 is a multiple of 3 (3 × 1), but is a prime number.

5 is a multiple of 5 (5 × 1), but is a prime number.

Listed below are the first 100 composite numbers:

4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 28, 30, 32, 33, 34, 35, 36, 38, 39, 40, 42, 44, 45, 46, 48, 49, 50, 51, 52, 54, 55, 56, 57, 58, 60, 62, 63, 64, 65, 66, 68, 69, 70, 72, 74, 75, 76, 77, 78, 80, 81, 82, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96, 98, 99, 100, 102, 104, 105, 106, 108, 110, 111, 112, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 128, 129, 130, 132, 133

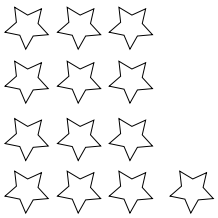
The chart showing prime numbers is called the Sieve of Eratosthenes. Eratosthenes was a Greek scholar…a mathematician, an astronomer, a geographer, a poet and a musician …who created the concept of the Sieve.

It is important to remember what a prime number is. It is a number which is divisible by no other numbers except 1 and itself. A prime number has 2 factors, 1 and the number itself. *1 is not considered to be a prime number.*

The students work with numbers from 1 to 20, dividing each number by the prime numbers given above.

$14 = 7 \times 2$

14 is not a prime number



$3 \times 4 + 1 = 13$

13 is a prime number

$2 \times 6 + 1 = 13$

They discuss among themselves and, with your help, find answers to the following questions:

- How many natural numbers are there?
- Which is an even prime number? Why is it the only even prime number?
- What are composite numbers?

List the differences between prime and composite numbers. (Remember, apart from the number 2, no other prime number has 0 or an even number as the units digit.)

No prime number greater than 5 ends in 5. Why?

Which is the smallest prime number? Can you find the greatest prime number?

How many prime numbers are there?

Task: Students attempt page 27.

Lesson 4: 40 minutes

Factors and multiples:

Look at number 6:

$6 = 2 \times 3$

2 and 3 are factors of 6

6, the product of 2 and 3, is a multiple of 2 and 3.

$6 \div 1 = 6$

$6 \div 2 = 3$

$6 \div 3 = 2$

$6 \div 6 = 1$

Factors of 6 are 1, 2, 3 and 6.

Look at the number 48:

48 ÷ 1 = 48
48 ÷ 2 = 24
48 ÷ 3 = 16
48 ÷ 4 = 12
48 ÷ 6 = 8
48 ÷ 8 = 6
48 ÷ 12 = 4
48 ÷ 16 = 3
48 ÷ 24 = 2
48 ÷ 48 = 1

Factors of 48 are: 1, 2, 3, 4, 6, 8, 12, 16, 24, and 48.

Factors of any number are numbers which will divide into that number without leaving a remainder.

Every number has at least two factors, 1 and the number itself. Look at these numbers:

2 = 1 × 2

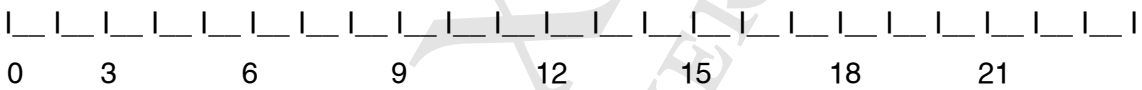
3 = 1 × 3

5 = 1 × 5

Such numbers with only two factors: such 2, 3, 5,…are called prime numbers. This is a concept that has been taught earlier.

On the other hand, multiples are numbers where the same number is repeated, as if you were counting by that number. For example, the multiples of 2 start with 2 and are: 2, 4, 6, 8, 10…and so on. Each additional number is a multiple of 2. Multiples of 3 are: 3, 6, 9, 12, 15 and so on.

This can be illustrated on a number line:



Factors and multiples are especially important in working with expanding and reducing fractions, as well as finding patterns in numbers. Finding the greatest common factor, the least common multiple, and prime factors of a number are important skills you will impart to the students in this section.

Task: Students attempt pages 29 and 30.

Lesson 5: 40 minutes

Ask the students to play the following game for better understanding of the concepts. You already have a grid of numbers from 1 to 100. Work with the number 24.

The first player chooses a positive number which is either a factor or a multiple of 24, and crosses the number out on the number grid.

The second player also chooses a different number, which is a factor or a multiple of 24 and crosses that out.

Players continue to take it in turns to cross out a number (either a factor or a multiple) at each stage. The first student unable to cross out a number on the grid loses.

This guessing game may also be of interest:

'I think of a number. Its factor is 2.'

'Write down the possible answers: 2, 4, 6, 8, 10,….312,…596…'.

'What are these number called?'

'Can you guess the number conclusively? Why not?'

'Is there a largest possible answer? Why not?'

Then, give them another clue:

'It is a factor of 24.'

Ask them for the possible answers: 4, 6, 8, 12. Can they come to a conclusion?

Then, give them a third hint: 'It is between 10 and 15.'

The answer is 12. The students work out the answer themselves.

For example, a Pakistan Airlines aircraft leaves the airport every 30 minutes, and a British Airways plane leaves every 45 minutes. If the aeroplanes leave together at 6 am, when will two next leave together?

UNIT 4

FRACTIONS

Teaching objective:

Fractions

i. Recognise like and unlike fractions
ii. Compare two unlike fractions by converting them to equivalent fractions with the same denominator
iii. Simplify fractions to the lowest form

Types of Fractions

i. Identify (unit, proper, improper) fractions and mixed numbers
ii. Convert improper fractions to mixed numbers and vice versa
iii. Arrange fractions in ascending and descending order

Addition and Subtraction of fractions

i. Add fractions with like denominators
ii. Subtract fractions with like denominators

Multiplication of fractions

i. Multiply a fraction (proper, Improper) and mixed number by a whole number
ii. Multiply two fractions (proper, Improper) and mixed numbers

Division of Fractions

i. Divide a fraction(proper, Improper) and mixed numbers by a whole number
ii. Analyse real life situations involving fractions by identifying appropriate number operations

Teaching materials:

- rangometry pieces
- sand and some containers
- board and markers or chalk

Learning activity

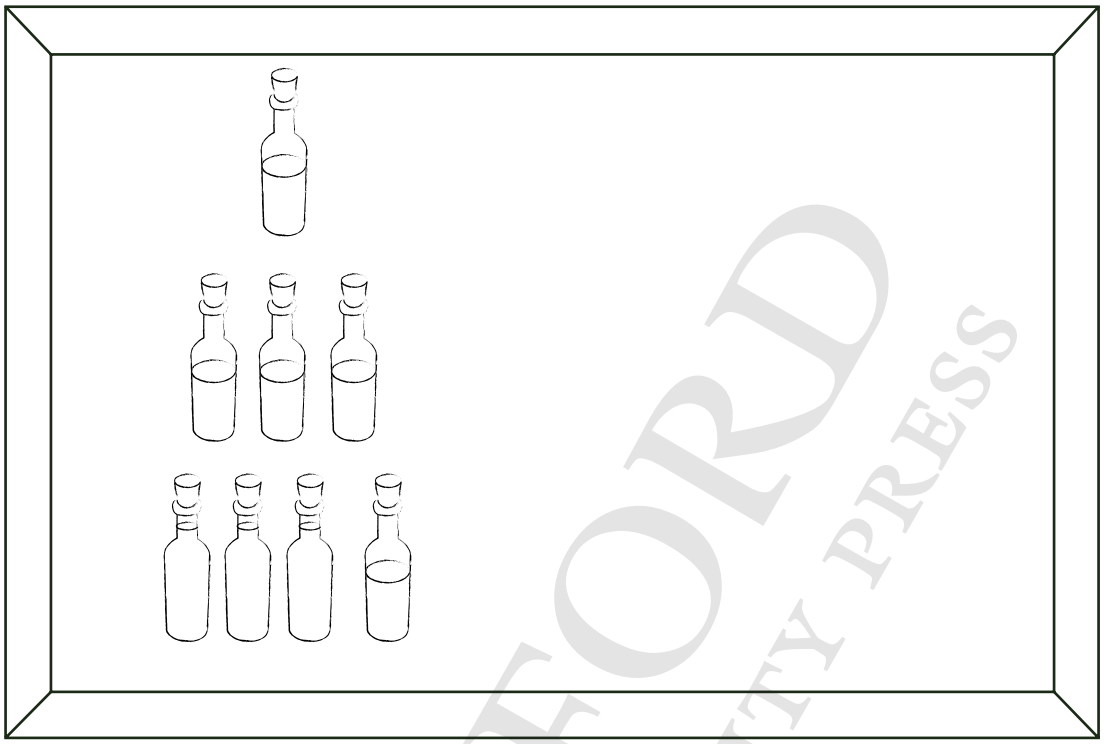
Lesson 1: **40 minutes**

The students worked with fractions in the previous year. Begin the lesson by revising the concepts of fractions learned earlier. A fraction chart may be helpful, too. In this book the concepts are expanded and the students are introduced to a wider variety of fractions. It is important at this stage that the students understand the concepts clearly. Involve a lot of hands-on-activity to facilitate understanding, and help them develop the required skills.

Improper fractions: Shehla made strawberry jam and poured it into a jar. The jar was full, and there was some jam left. She poured the remaining jam into a similar jar. The second jar was half full. How many jars of jam did Shehla have? One-and-a-half.

Referring to the previous year's work, talk about the idea of one whole, parts of a whole, and more than a whole. Give them some sand and a couple of containers of the same shape and size.

Illustrate each activity on the board:



One group of students fills half a bottle with sand: $\frac{1}{2}$

$\frac{1}{2}$…This is a proper fraction; the numerator is smaller than the denominator

(draw on the board: three bottles, each $\frac{1}{2}$ full of sand: write $\frac{3}{2}$)

Another group fills up 3 halves of bottles with sand: $\frac{3}{2}$

$\frac{3}{2}$ is an improper fraction; the numerator is bigger than the denominator.

(Draw on the board 3 full bottles and one half full: write $3\frac{1}{2}$)

The 3rd group of students fills 3 whole bottles and one half a bottle

$3\frac{1}{2}$…This is a mixed number.

After a few more practical examples, the students write down proper and improper fractions and mixed numbers.

Task: Students attempt pages 39 and 40.

Lesson 2: 40 minutes

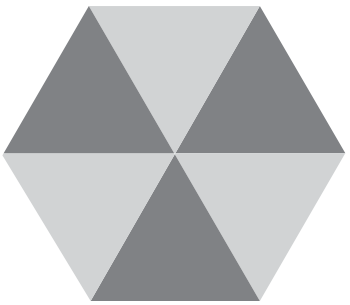
Why is it necessary to convert fractions to the same base before addition or subtraction? The exercise in the previous lesson explains the method of adding fractions. Repeat the exercises several times till the concepts are understood.

Further practical examples with tiles of different shapes such as squares, rectangles, and octagons need to be worked out.

Some students encounter a problem in multiplication and division of fractions. A great deal of confusion can be overcome by paying close attention to the language in which the concepts are introduced. When the students start multiplication it is essential that they understand what exactly is happening.

What is half of a hexagon (or a square)?

What is $\frac{1}{3}$ of $\frac{1}{2}$ of a hexagon?



$\frac{1}{3}$ of $\frac{1}{2} = \frac{1}{6}$

$\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

'×' translates into the same operation as 'of'.

Rules are to be looked at after each student has understood the concept clearly. Here,

Task: Students attempt pages 55 and 56.

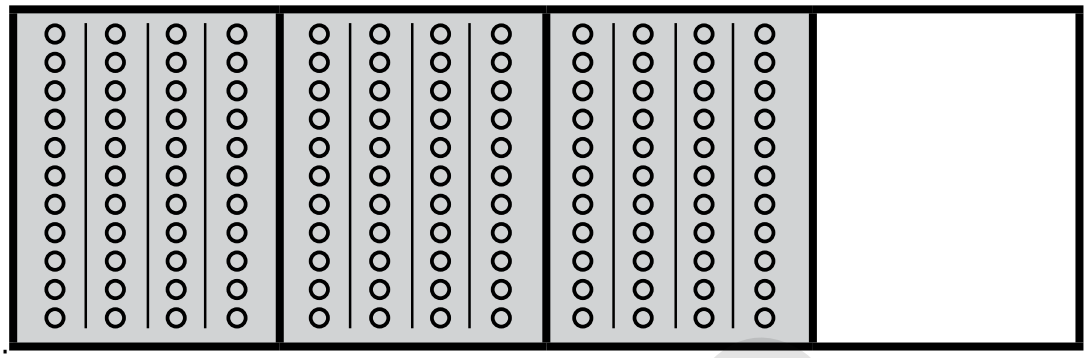
Lesson 3: 40 minutes

Recap the previous lesson. Give further examples.

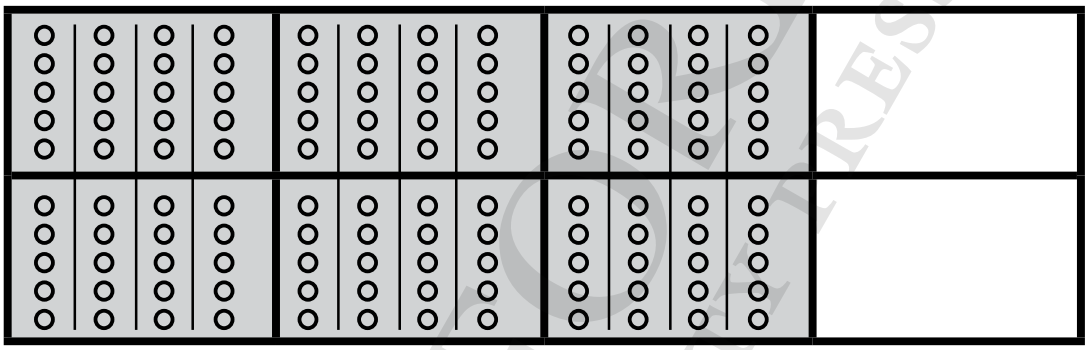
$\frac{1}{2}$ of $\frac{3}{4}$ and $\frac{2}{3}$ of $\frac{5}{7}$

Work the following out on A (below), or have a chart ready.

1. Rectangle A is divided into 4 quarters. 3 quarters ($\frac{3}{4}$) of the rectangle are dotted and striped.
   A.



2. Rectangle B is divided into 8 eighths.
   B.



   $\frac{3}{4}$ or $\frac{6}{8}$ (6 of the eighths) of the rectangle are dotted and striped.
   How many quarters of the whole are dotted and striped?

   3 of 4 quarters OR $\frac{3}{4}$ are dotted and striped.
   OR

   6 of the eighths OR $\frac{6}{8}$ of the rectangle is dotted and striped.
   Therefore:

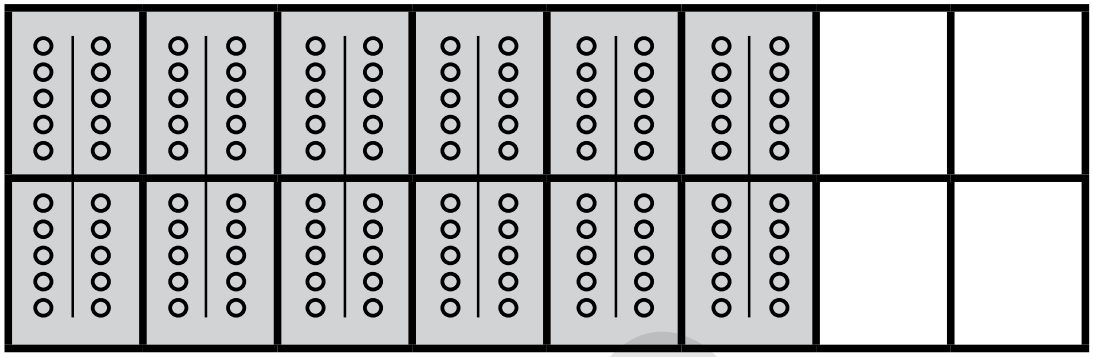
   $1 = \frac{4}{4} = \frac{8}{8}$ $\frac{3}{4} = \frac{6}{8}$

3. Now, look at the following (Rectangle C):
   The rectangle is divided into 4 quarters, each quarter is further divided into quarters: 16 parts in all.

12 of the sixteenths are dotted and striped.

Rectangle

C.



16 parts, 12 dotted and striped

In rectangle B each quarter of Rectangle A is further halved, i.e. 8 pieces of the whole rectangle. 6 parts are dotted and striped as well. The dotted ones represent 6 out of 8 rectangles.

Hence,

$\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8} = \frac{6}{16}$

Do several examples on the above lines to explain the concept of multiplication. Then introduce the rules of multiplication.

Task: Students attempt pages 57 and 58.

UNIT 5

DECIMALS

Teaching objective:

Decimals

i. Recognise a decimal number as an alternative way of writing a fraction
ii. Express a decimal number as a fraction whose denominator is 10, 100 or 1000
iii. Identify and recognise the place value of a digit in decimals (up to 3-decimal places)

Conversion between fractions and decimal numbers

i. Convert a given fraction to a decimal if
   • Denominator of the fraction is 10, 100 or 1000
   • Denominator of the fraction is not 10, 100 or 1000 but can be converted to 10,100 or 1000
ii. Convert a decimal (up to 3-decimal places) to fraction

Basic operations on decimal numbers

i. Add and subtract 3-digit numbers (up to 2 decimal places)
ii. Multiply a 2-digit number (up to 1 decimal place) by 10, 100, and 1000
iii. Multiply a 2-digit number with 1decimal place by a 1-digit number
iv. Divide a 2-digit number with 1decimalplace by a 1-digit number
v. Solve real life situations involving 2-digit numbers with 1 decimal place using appropriate operations

Estimation

i. Round off a whole number to the nearest 10, 100, and 1000
ii. Round off decimal (with 1 or 2 decimal places) to the nearest whole number

Teaching materials:

- square grid paper (10 by 10)
- different objects that can be sliced easily (loaf of bread, cheese, cake, cucumber, etc.)
- cubes (10 × 10 × 10) divided into 1,000 smaller cubes (1 × 1 × 1), which can be put together to make 1 cube

Learning activity

Lesson 1: **40 minutes**

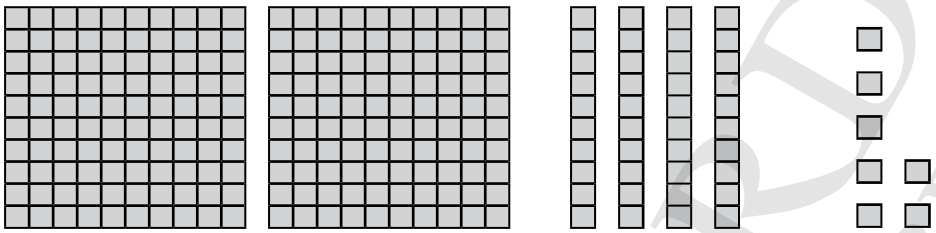
Decimals are a very important concept which the students will have to use in every sphere through out their lives. To use decimals confidently, the students have to be familiar with decimal notation, what each position signifies, its implications, vulgar equivalences and the place value of each number in decimal representation.

Start the lesson by talking about the significance of the fact that the decimal number system is based on 10. Also, expose them to the idea that this is not the only system used by man, there is the binary system (base of 2) used by computers, hexadecimal system (base of 6), octal system (base of 8), etc. The Mayans used the base of 20 as there are 20 toes and fingers. The Yuki language has an 8 base counting system as the speakers count by using the gaps between the fingers instead of the fingers themselves.

Talk about the reason for using the base of 10. The most significant aspect of 10 is the 0. All other numbers were displayed in nature in some form or another. Man found a way to form a symbol for 'nothing' or 'nil'. Then followed 10 and the place values of units, tens, hundreds and so on, before going into decimal fractions.

Once the place value of 0 was established, the concept of 10 came very naturally to men, as they had 10 fingers to count on.

To revise whole numbers, ask 'What number does this diagram illustrate?'



200 40 7

The answer, of course, is 247

Start the lesson about decimals, by dividing the students into groups of 3 or 4 each. Give group an object (such as slabs of chocolate with 10 pieces in each, or bracelets with 10 beads each, or packets of biscuits with 10 biscuits in each, or strips of clips each with 10 clips on it) that can easily be divided into 10. Ask them to divide each item into 10 parts. Then ask each group to hold up different portions of the whole. For example, 3 tenths of a whole strip of clips written as $\frac{3}{10}$. Students are familiar with the fact that each of the parts is $\frac{1}{10}$ or one-tenth of the whole.

Explain that another method of writing the same fraction $\frac{1}{10}$ is known as the decimal numeral system (or base 10, or denary). $\frac{1}{10}$ is written as 0.1.

A decimal fraction is a form of writing fractions where the denominator of the fraction is a multiple of 10, such as 100, 1000…i.e. the fraction is written in the form of $\frac{3}{10}$, $\frac{7}{100}$ or $\frac{9}{1000}$.

It is an extension of the number system (where we count in tens) to the right, getting $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$, of the number as you move to the right of the decimal point.

REMEMBER: The number on the left of the decimal point shows whole numbers with which the students are familiar. The first number on the right side of the decimal points signifies tenths, the next digit is hundredths, the next digit is thousandths and so on.

thousands	hundreds	tens	units	.	tenths	hundreds	thousandths
1000	100	10	1	.	10	100	1000

As the students hold up different parts of the whole, such as $\frac{9}{10}$, write the decimal representation of the vulgar fraction on the board: 0.9. As you write the decimal fraction, explain the significance of the *DOT*. A dot is used to separate the decimal fractions from the whole numbers.

Also, explain and practise the correct method of reading a decimal number.

One-tenth or $\frac{1}{10}$ is written as 0.1 and read as 'zero point one'. The place value of 1 as the 1st digit to the right of the decimal point signifies '1 divided by 10' or $\frac{1}{10}$.

Similarly, $\frac{2}{10}$ signifies two-tenths, and can be written as 0.2 and said as 'zero point two'. The place value of 2 is tenths, i.e. 2 parts of 10 parts of the whole. The prefix deci-stands for 10.

For example: 2.5 is read as two point five; 2 wholes and 5 tenths. It means 2 wholes and 5 parts out of 10. Similarly, $\frac{10}{10}$ is one whole and the decimal representation would be 1.0.

1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8. 1.9 2 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3

Th_____H_____T_____ U____.____t_____h_____th

	1	0	
		1 .	1
		1 .	2

Draw a diagram like this on the board, and ask the students to call out the value of the positions as you point to each one.

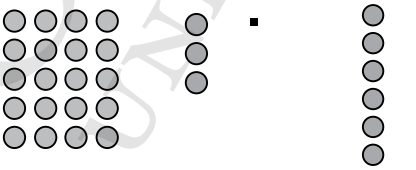
Remember: The decimal point goes between units and tenths.

Another example: Twenty three and six tenths

23.6 has 2 tens, 3 units and 6 tenths, like this:

23.6
Decimal Number

$= 20 + 3 + \frac{6}{10}$

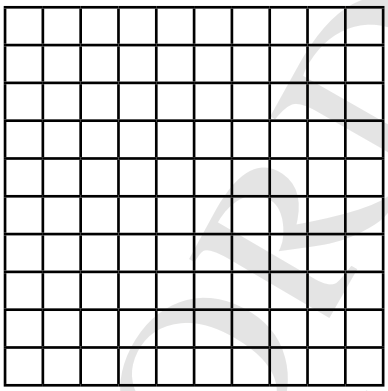


Work with sheets of a grid paper with 100 small squares, marked in strips. Students colour 1 strip and write 0.1 on the strip; or 2 strips and write 0.2 on it; or 3 strips and so on.

$$0.34 = 0 + \frac{3}{10} + \frac{4}{100}$$

Then, extend the idea to a base of 100. Give each child a similar grid, with 100 small boxes, and ask them to colour any number of boxes.

3 tenths and 4 hundredths

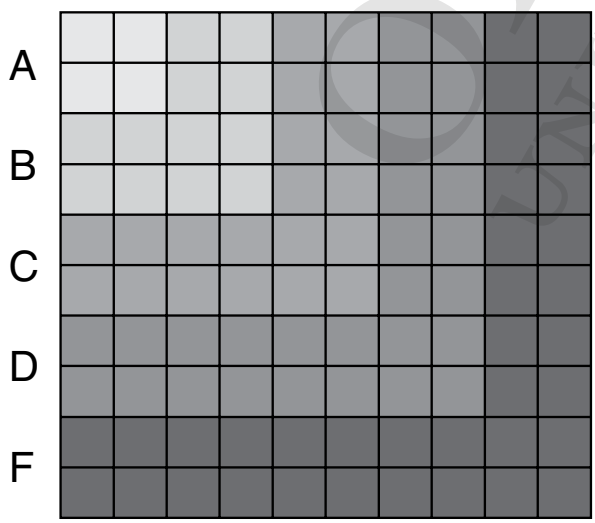


Ask Ramila to hold up her paper and tell the class how many boxes are coloured. She is likely to say that she has coloured 34 boxes out of the 100. You say that she has coloured the following fraction of the grid:

3 tenths and 4 hundredths = 30 hundredths and 4 hundredths = 0.34

Similarly, if Zain has coloured 4 boxes, he has coloured $\frac{4}{100}$ th of the grid. The decimal form of the fraction is 0.04, and the place value of 4 is hundredths.

A chart like this is useful. Students call out the value of the A, B and so on.



What fractions are each portion of the square?

A is 0.04

B is 0.12

C is 0.20

D is 0.28

E is 0.36

Show the students a few squares with different areas coloured, ask them to compare and say which fraction is greater.

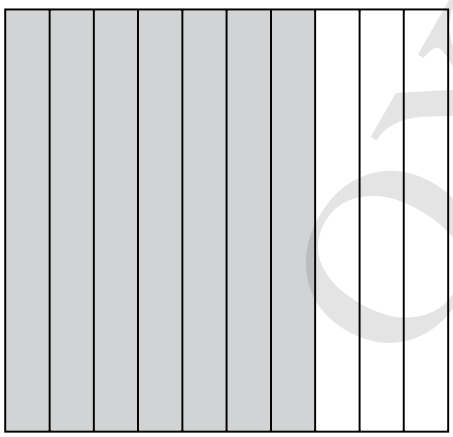
As they continue with the exercise, they should realise that they can compare the decimal forms to arrive at the conclusion. The student with a higher value in the tenths place has coloured more boxes.

For example, 0.52 > 0.49

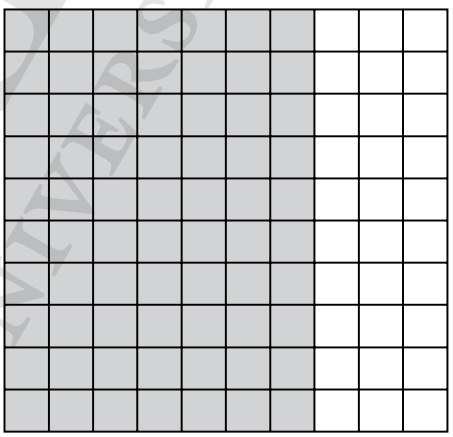
They should soon realise that if the number in the tenths place is the same they will have to consider the number in the hundredths place to compare the numbers. A few repeat exercises help. 4.3 > 4.28

units		tenths	hundredths	thousandths
0	.	4	5	9
0	.	4	9	5

0.495 > 0.459



0.7
seven tenths

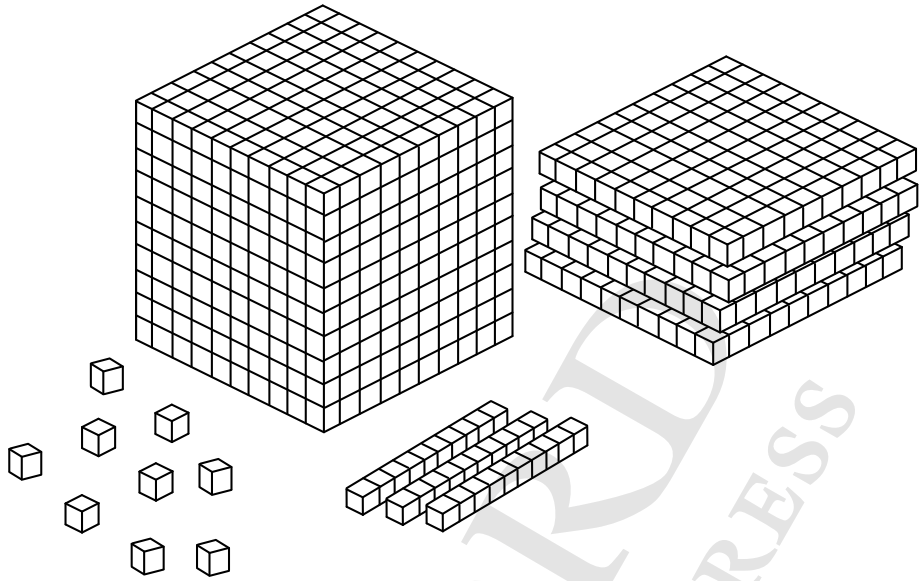


0.70
seventy hundredths

Now give the students a cube and ask them to mark each face into a 10 × 10 grid. How many small squares have they made on ONE face? 100.

Cut the cube along each marking, there will be 10 slabs. Each slab will represent $\frac{1}{10^{th}}$ of the cube, and is written as 0.1.

1 whole 4 tenths = 0.4



9 thousandths 3 hundredths

0.009 0.03

Mark each slab into 10 equal parts. Cut each slab along each marking. There will be 10 bars. Each bar will represent $\frac{1}{100^{th}}$ of the cube, and is written as 0.01.

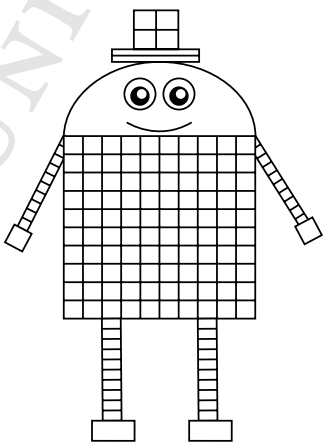
Mark each bar into 10 equal parts. Cut each bar along each marking. There will be 10 small cubes. Each cube will represent $\frac{1}{1000^{th}}$ of the BIG cube, and is written as 0.001.

4^{th} and 5^{th} decimal places can also be shown practically, but is not necessary at this level.

To sum up, ask the students to write out 3 places of decimals and ask them to represent the numbers using grids or cubes drawn on the board. They might enjoy drawing fun figures using the grid or cubes. An example is illustrated below.

ones	tenths	hundredths	thousandths
5	4	8	1

5.481



However, understanding the mathematical concept of decimals is not enough: the students need to know where they will have to apply the concept, and how it is an extension of what they already know: the number system.

Ask them to name some measures which may not be whole numbers. For example, the height of a child, the weight of a watermelon at the market, the time margin by which Schumacher may win a race, or the amount of water a bottle can hold.

Each student has a geometry box; ask them to look at the ruler carefully. Each centimetre is divided into 10 smaller parts. Each part is called a millimetre. So a millimetre is $\frac{1}{10}$ of a centimetre. Hence, the length of a line 5 cm and 3 mm will be written as 5.3 cm.

Once the value of each position is clearly understood, addition and subtraction should not be a problem.

Which number is bigger: 0.459 or 0.495? Can you subtract 0.395 from 0.359? Can you add the 2 numbers?

Multiplication is a little more complex.

If 4 children eat 1.5 bars of chocolates each, how many bars of chocolates were eaten?

This means:

4 × 1.5 = 4 times 15 tenths = 60 tenths = 6 whole bars

OR

4 × 1.5 = 4 times 1 whole + 4 times 5 tenths = 4 wholes and 2 wholes = 6 whole bars

Written vertically:

$$\begin{array}{r} 1.5 \\ \times \quad 4 \end{array}$$

The decimal point in the multiplicand and the product must be placed one below the other. This will be explained more clearly with more than 1 place of decimal later.

Conversely, if 6 bars of chocolates were to be divided amongst 10, or 4 children, how much chocolate would each child get?

Practical work like this helps.

6 whole bars = 60 tenths

For 10 children:

$\frac{60}{10}$ = 6 tenths = 0.6 bar for each child

For 4 children:

$\frac{60}{4}$ = tenths = 15 tenths = 1.5 bars for each child

$\frac{6}{4} = \frac{60 \text{ tenths}}{4}$ = 15 tenths = 1.5 bars.

REMEMBER: At his level: ONLY the multiplicand has a decimal point

(NOT THE MULTIPLIER)

$$\begin{array}{r} 20.5 \\ \times \quad 4 \end{array}$$

ONLY the dividend has a decimal point (NOT THE DIVISOR)

$\frac{36.55}{10}$

Task: Students attempt pages 61, 64, 65 and 66.

UNIT 6
MEASUREMENT: LENGTH, MASS, AND CAPACITY

Teaching objective:

Length

i. Use standard metric units to measure the length of different objects
ii. Convert larger to smaller metric units (2-digits numbers with one decimal place)
    - kilometres into metres
    - metres into centimetres
    - centimetres into millimetres
iii. Add and subtract measures of length in same units

Mass

i. Use standard metric units to measure the mass of different objects
ii. Convert larger to smaller metric units (2-digits numbers with one decimal place)
    - Kilograms into grams
    - Grams into milligrams
iii. Add and subtract measures of mass in same units

Capacity

i. Use standard metric units to measure the capacity of different containers
ii. Convert larger to smaller metric units (2-digit numbers with one decimal place) litres into millilitres
iii. Add and subtract measure of capacity in same units
iv. Solve real life situations involving conversion, addition and subtraction of measures of length, mass and capacity

Time

i. Read and write the time using digital and analogue clocks on12 -hour and 24-hour format
ii. Convert hours to minutes and minutes to seconds
iii. Convert years to months, months to days, and weeks to days
iv. Add and subtract measures of time without carrying and borrowing
v. Solve simple real-life situations involving conversion, addition and subtraction of measures of time

Teaching materials:

- 5 articles of daily use
- measuring tape/metre ruler/cm ruler
- measuring cylinders of various capacities
- different weights
- balance

Learning activity

Lesson 1: 40 minutes

The concepts of length, mass, and capacity, have already been introduced in the earlier books.

In this book the idea is formalized and the students are introduced to the units of measurement and inter-conversion of units. Choosing the right measuring unit for a particular object has already been dealt with in the previous book. The students have learnt how to convert a given measurement to a suitable unit.

To start the lesson, revise the various units of measurements with the class. Make it into a fun quiz. Bring 10 objects of daily use to the class, such as a plastic spoon, a plastic fork, a large bottle, a 10 to12 cm stone, a brick, a book, a metal cup, a greetings card, a thimble, a small nail, a guitar, and so on. Number them 1 to 10. Place them on the teacher's desk and cover them with a piece of cloth. Ask the students to write down numbers 1 to 10 in their exercise books.

Remove the objects from under the cover one by one, and ask the students to write down the particular unit of measurement that they think is suitable to measure the length, weight, or volume of each object.

Points to talk about are:

1. A brick will have a weight.	kilogram
2. A thimble will have volume.	millilitres
3. A bottle has volume and length.	litre and metre or centimetre
4. A plastic fork has length.	centimetres
5. A nail has length.	millimetres
6. A guitar has length and width.	metre

As the students work on the assignment, write on the board the various units of measurement. Ask each student to call out their answer and encourage the class to participate in a discussion; do they agree or disagree with the answer and the reason for it? Once the class reaches a consensus, strike out the unit from the board. For the units that remain on the board at the end of the exercise, ask the class to suggest objects that could be measured using them.

Introduce the idea of conversion with a brain-teaser:

You go to the market to buy a carton of juice. The carton has 1 l marked on it, but you want to buy 1000 ml of juice. How many cartons do you buy?

Shamim jogged for 1 km and Rahim jogged for 2000 m. Which distance was longer?

These problems explain the need for conversion of litres into millilitres and vice versa. This arouses students' interest in the various objects around them, and they gradually learn to compare and find alternatives. This makes the job of the teacher much easier, and retention is better.

Introduce the prefixes along with their mathematical significance and meaning. These prefixes are commonly used in units of measurement in the metric system. Since thousandths and hundredths were introduced in the previous chapter, converting the units should not pose a problem.

PREFIX	MEANING	SYMBOL	MULTIPLE
kilo-	thousand	k	× 1000
centi-	hundredth	c	÷ 100
milli-	thousandth	m	÷ 1000

Although the students will gradually become familiar with the numerical part of the concepts, most of them have no idea as to how long a kilometre or a centimetre is, how heavy a gram or a kilogram is or what the capacity of a bottle is. Ensure that the students are exposed to both the mathematical and the practical aspect of the concept. You may try the following activities:

- take the class for a 1km walk
- have a long jump competition of 1m
- have them jump over obstacles of height 25 cm
- measure the length of their fingers nails
- find the volume of a medicine dropper
- find the weight of a pair of glasses
- measure the thickness of a piece of cardboard
- count the number of grains of *kabuli channa* in 100 gm
- compare the weights of rubber slippers and heavy walking shoes

Discuss other objects which the students may come across in their homes and discuss the units of measurement useful for those.

Students easily become familiar with cm and mm as they can see these lengths on a ruler. Give them different objects and scales. Let them experiment and get an idea of kg, g, and mg. Similarly, give them measuring cylinders of various capacities and ask them to measure a l and ml. It is interesting to guess first, and then find the actual measurement.

Task: Students attempt pages 77, 78, 80, 81, 83.

Lesson 2: **40 minutes**

Try the following activity with the class. Divide the students into groups of 5 or 6. Give each group a timetable of railways, airlines, TV programmes, or films. Ask each group questions that which will require addition or subtraction of time.

- Mr. Bean starts at 12:00 noon; the show runs for 45 min. What time does it end?
- The flight from Karachi to Lahore takes off at 23:30 hours. The flight takes 1 hour 20 minutes. When does the flight land?
- An express train leaves Rawalpindi at 14:13 hours. It travels for 5 hours 30 minutes to reach Lahore. What time does it arrive?
- X-Men starts at a theatre at 4:40 p.m. The film has a 2 hours 46 minutes running time. When does it end?
- A carousel (or a merry-go-round) takes 2 minutes to go around once. A ticket for one ride entitles you to 6 rounds. How long does one ride take?

Each unit has a different conversion factor. The students must be very familiar and confident about the conversion factors before they move on to the operations.

Task: Students attempt pages 88 and 89.

UNIT 7

GEOMETRY

Teaching objective:

Lines

i. Recognise and identify parallel and non-parallel lines

Angle

i. Recognise an angle formed by intersection of two rays
ii. Measure angles in degree (˚) by using protractor
iii. Draw an angle of given measurement and use the symbol (˚) to represent it
iv. Differentiate acute, obtuse and right angles
v. Measure angles using protractor where
   - Upper scale of protractor reads the measure of angle from left to right
   - Lower scale of protractor reads the measure of angle from right to left

vi. Identify right angles in 2D shapes

Circle

i. Describe radius, diameter and circumference of a circle

Perimeter and Area

i. Find perimeter of a 2D figures on a square grid
ii. Recognise that perimeter is measured in units of length
iii. Find area of 2D figures on a square grid.
iv. Recognise that area of a square is measured in meter square (m^2) and centimeter square (cm^2)

Symmetry

i. Recognise lines of symmetry in two-dimensional (2D) shapes
ii. Complete a symmetrical figure with respect to a given line of symmetry on square grid/dot pattern

Three Dimensional (3D) objects

i. Compare and sort 3D objects (cubes, cuboids, pyramids, cylinder, cone, sphere)

Teaching materials:

- flippers, Japanese fans, clock face
- pair of sticks
- string with a sponge attached to its end
- geo□board
- geometry box with its instruments

Learning activities

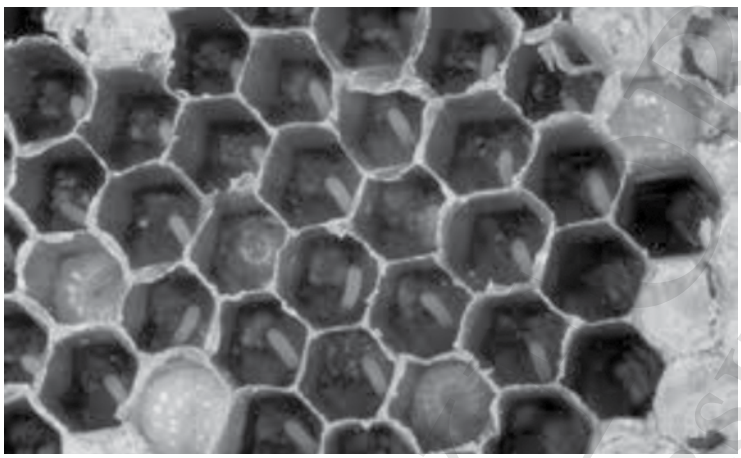
Lesson 1: 40 minutes

Start the lesson by asking the students to open their geometry boxes. Identify all the instruments. Discuss straight and wavy lines. Only straight lines can be measured accurately with a ruler.

Introduce parallel and non-parallel lines. Identify parallel and intersecting lines from objects and pictures in the classroom. Help the students draw parallel lines…for example, two lines along the edges of the ruler, a book, a geometry box or a pencil.

Man knew parallel lines from nature…

- the two 'sides' of some tree trunks run parallel for a distance
- the edges of a river in some places are parallel
- the stripes on the backs of a squirrel or a tiger in some areas are parallel
- the opposite edges of a hexagon in a beehive
- the ripples in a pond (when you throw a stone)
- the colour bands in a rainbow



Talk about different planes. The four walls of a room, the ceiling and the floor are 6 different planes. The walls are vertical; the floor and the ceiling are horizontal.

The following are parallel planes, which will not meet:

- the front and the back covers of a book
- the lid and the base of a geometry box
- the ceiling and the floor OR the two opposite walls of a room

The ceiling and the floor, or the floor and the wall are intersecting planes, perpendicular to each other.

Discuss horizontal and vertical lines. Remember, if a horizontal line and a vertical line are on the same plane, they cross at right angles.

Not all vertical and horizontal lines intersect. Give plenty of examples; they should be able to identify the lines from the objects around them. Look at the picture of this table.

None of the four legs of the table will cross each other because they are parallel. The front edge of a bed (a line) and the vertical edges of the back (lines) of the bed are perpendicular to each other, but will never cross each other.

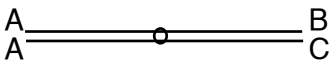
Task: Students attempt pages 101 to 104.

Lesson 2: **40 minutes**

Now, introduce the formation of angles.

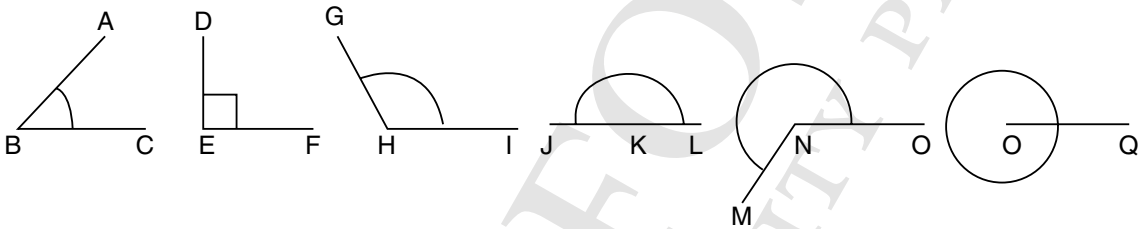
Take 2 sticks and tie them together at the middle (at any convenient angle) with a piece of string. Keep the sticks one on top of the other.

When the two sticks of are one on top of another, the angle formed is 0°.



Now, turn one stick in an anti-clockwise direction.

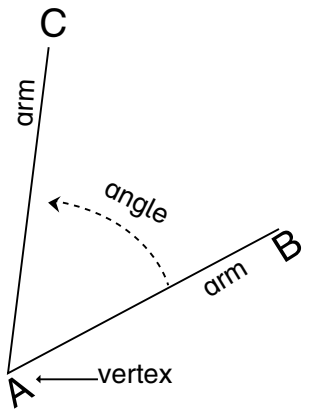
Name of angle		Size of angle
acute angle	< ABC…	less than 90°
right angle	< DEF…	90°
obtuse angle	< GHI…	more than 90° but less that 180°
straight angle	< JKL…	180°
reflex angle	< MNO…	more than 180°, but less than 360°
full circle		360° (full rotation)

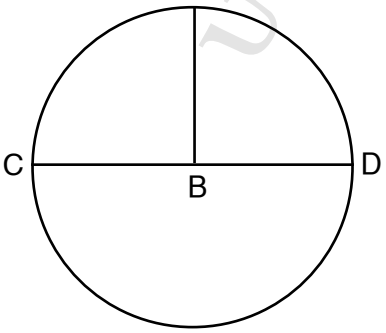


Continue the lesson by demonstrating and explaining different types of angles. A Japanese fan is ideal for showing 0° to 360°; a closed fan to a fully open fan.

A clock face or 2 sticks attached at one end are also useful. Keep one arm fixed and turn the other arm to trace out different angles.

Students see that when 2 straight lines intersect, they form 2 pairs of angles. Introduce the term arms and vertex of an angle. Also, explain how angles are labelled. Give each student a pair of sticks, graduating in size from toothpicks to metre rulers and let them repeat the process. They compare each other's work.





Special mention must be made of a right angle and a straight angle CBD (2 right angles). A full rotation is equal to 4 right angles.

Make several angles by folding a sheet of paper, or use a pair of lollipop sticks tied at one end.

Keep a right angle for reference. If the angle is smaller than a right angle, it is an acute angle. Compare the acute angles with the right angle and show the students that they are smaller than right angles.

Angles greater than a right angle but smaller than a straight angle are obtuse angles. Similarly, compare obtuse angles to the size of a right angle and show students an obtuse, larger than a right angle, being formed when one of the lollipop sticks moves to a position of 'more than a right angle'. Reflex angles are greater than 2 right angles.

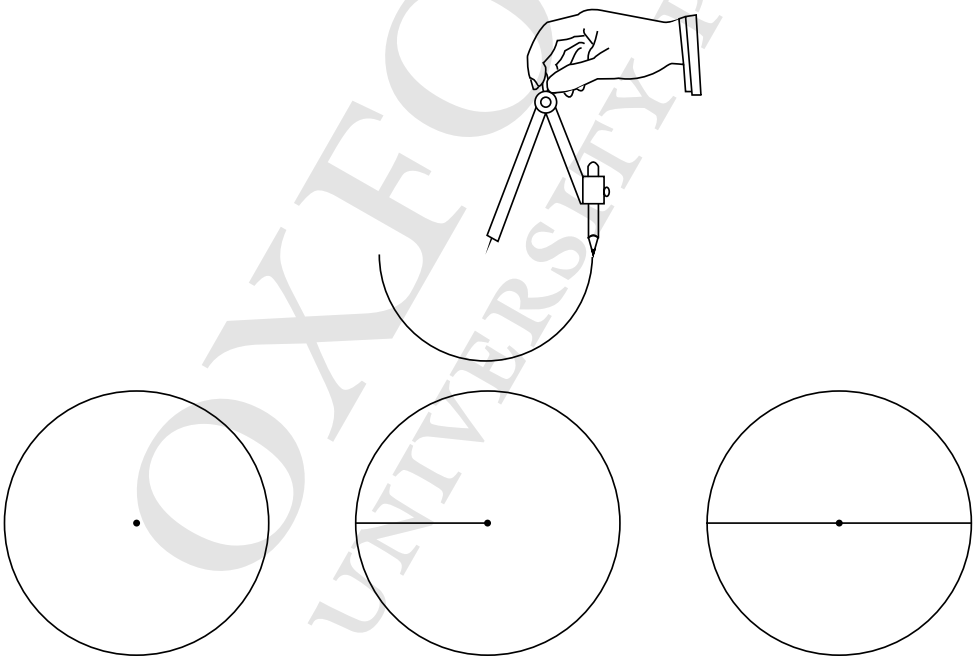
A full rotation is 4 right angles, which is achieved when one of the arms rotates and comes back to its original starting position. Students form angles using their own flippers and call out the names of the different angles. They could stick the different positions made from lollipop sticks or folded paper angles onto chart papers and display them on the board.

Ask a student to stand in front of the class, and rotate his or her arms to display zero degrees, an acute angle, a right angle, an obtuse angle, and a reflex angle. (A complete rotation is possible when the student turns a full circle on his/her feet).

Task: Students attempt pages 110, 113, 114, and 116.

Lesson 3: 40 minutes

Take the students out into the playground or courtyard. Attach a piece of chalk to the end of a length of a string and demonstrate how to trace a circle on the ground. Explain how a circle is drawn and identify the different parts of the circle. Then let the students draw their own colourful circles on the floor. It can make a wonderful original art work! Back in the classroom demonstrate how to use a compass. A large compass can be used on the board to repeat the above exercise. Then, different words related to a circle are explained… centre, radius, diameter, circumference, and arc.



Centre: the central point from which a circle is drawn

Radius: distance from the centre to the circumference

Diameter: twice the radius; starts from one point on the circumference, goes through the centre to the point on the circumference opposite the starting point

Circumference: starting at one point on the circle, the distance around the edge of the circle

Students use their own compasses to draw a circle in their books and measure the radius. It must be emphasized here that, a compass can be a dangerous instrument…all caution must be exercised.

Task: Students attempt pages 123.

Lesson 4: 40 minutes

By now students should recognize quadrilaterals: closed shapes with 4 sides and 4 corners (vertices). The next step is for them to associate the corners (or vertices) with angles. Two straight lines (in this case, two adjacent sides) cross each other and an angle is formed. This can be illustrated with quadrilaterals cut out from sheets of paper, or from the seats of school chairs, or tables.

The four angles from the paper quadrilaterals are torn and put together at a point so that it becomes obvious that the angles at the 4 vertices of a quadrilateral add up to 360°.

Student can practice measuring angles of a quadrilateral on the board, using a large protractor, and then, draw angles in their exercise books using their own protractors.

By working with the four angles at a point drawn on the board, measured with a protractor and a rotating lollipop stick, they arrive at the fact that the four angles of a quadrilateral add up to 360°.

Students work with geo boards, in groups, in the maths lab. Give them rubber bands and let them form quadrilaterals themselves. Then call up each group to show their boards and ask them questions about the properties of the quadrilateral. Talk about the special properties of squares and rectangles. If none of the groups have made a square or a rectangle, make one and let the students observe the properties for themselves.

UNIT 8

DATA HANDLING

Teaching objective:

Bar Graph

i. Read simple bar graphs given in horizontal and vertical form
ii. Interpret real life situations using data presented in bar graphs

Line Graph

i. Read line graph
ii. Interpret real life situations using data presented in line graphs

Pie Chart

i. Read Pie Chart
ii. Interpret real life situations using data presented in Pie Chart

Teaching material:

- sample graphs from newspapers, Internet, and magazines
- charts attached here with excel sheets

Learning activity

Lesson 1: **40 minutes**

The students worked with pictograms in the previous year. They already have some idea about the different parts of a graph and how to represent information on a graph and to draw conclusions from them.

Students come across graphs in every sphere of their daily life, be it in the supermarket (comparison of sales of different objects and choices of different products), in school (board results of the last few years, number of students admitted to the school in the last few years), on TV (comparison of cricket scores or run rates), in magazines, on advertisement hoardings.

Start the lesson by discussing the importance of graphs and why they are necessary and more convenient than actual numerical data. Talk to them about the uses of graphs in various sectors of life. Then show them a sample graph, maybe from a newspaper about temperatures for a week, or the Internet, and explain the different parts of a graph.

Draw two perpendicular lines (axes) on the board. Label them the *x-axis* (horizontal) and the *y-axis* (vertical).

Explain that the different quantities are usually marked on the *x-axis* and their corresponding frequencies along the *y-axis*. Show them the scale and how it is important for proper representation of the information. If there are any symbols used in the graph, there must be a key explaining the meanings of the symbols.

Once you have discussed and revised the basics, give the students an interesting topic and ask them to conduct a small survey on it.

For example 'The months in which students were born'.

Below is a sample set of data for the topic.

Birth months of children in class 4 (all sections)

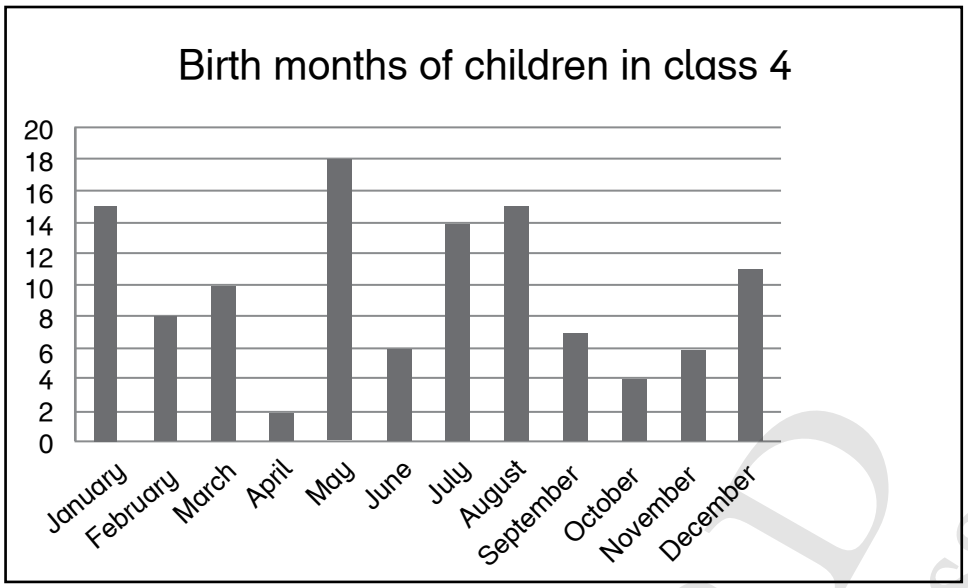
Data/month	frequency of births
January	15
February	8
March	10
April	2
May	18
June	6
July	14
August	15
September	7
October	4
November	6
December	11

Now ask the students to represent this information on the various types of graphs:

1. BAR GRAPHS

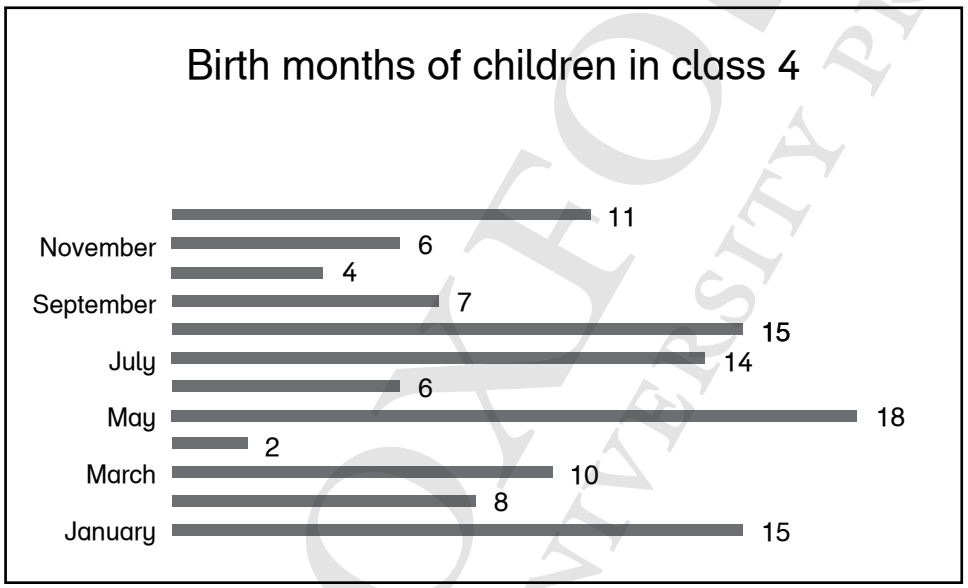
A bar graph representing the above data set is given below. The length of each bar is proportional to the raw data. Show the class a template and ask them to follow it.

a) VERTICAL BAR GRAPH



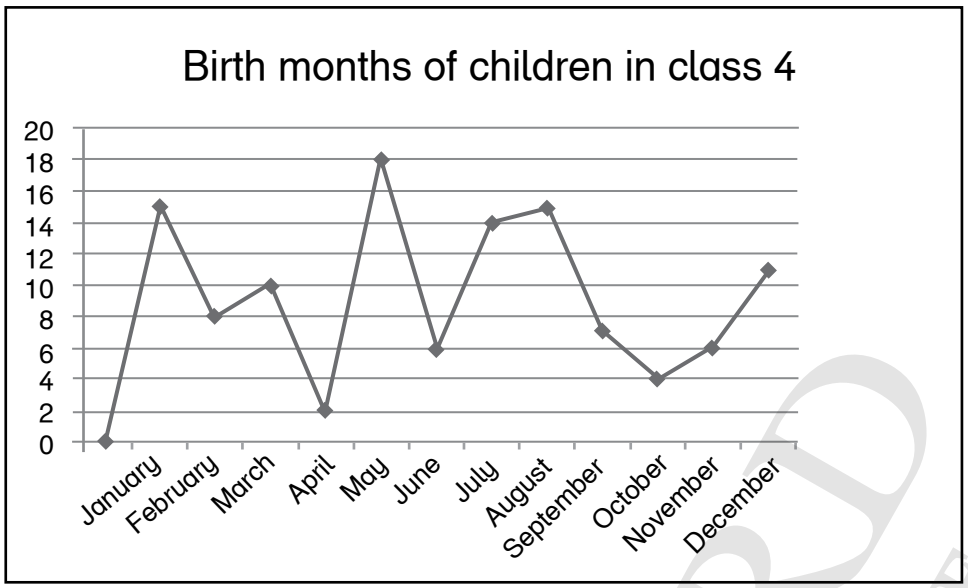
b) HORIZONTAL BAR GRAPH:

The bars may also be draw horizontally.



2. LINE GRAPHS

The same information can be plotted on a line graph.



3. PIE CHARTS

A pie chart, as the name suggests, is a circular chart divided into sectors. The information is represented as sectors of the circle. A pie chart has been named for its resemblance to a pie, with slices cut from it.

A pie chart is not as simple to draw as the bar graph or a line graph. Here, every piece of information has to be converted into a percentage. Look at a simple pie chart:

In a girls' school in Lahore, in there are 60 girls in Class VI. Extra curricular activities are undertaken by various girls, as per the table below:

12 girls do music

3 girls play football

8 girls play basketball

7 girls learn skating

11 girls play tennis

9 girls do swimming

10 girls learn cooking

Each of these figures needs to be converted into a percentage:

12 girls do music = 12 out of 60 of 360° = 72°

3 girls play football = 3 out of 60 of 360° = 18°

8 girls play basketball = 8 out of 60 of 360° = 48°

7 girls learn skating = 7 out of 60 of 360° = 48°

11 girls play tennis = 11 out of 60 of 360° = 35°

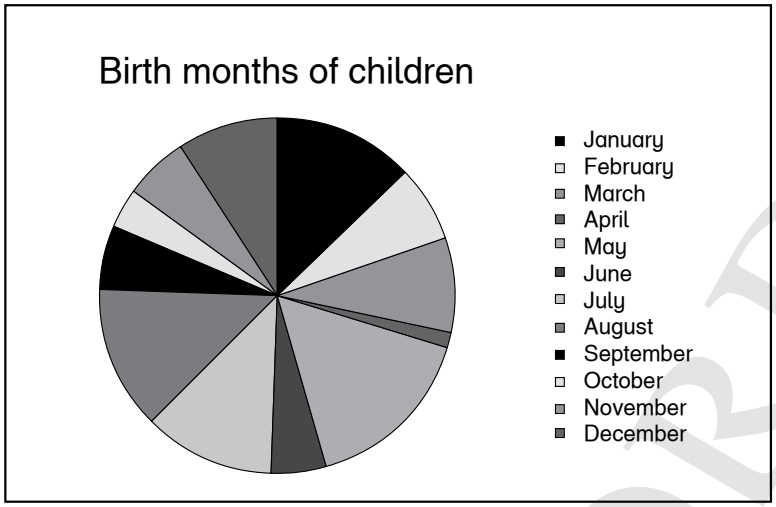
9 girls do swimming = 9 out of 60 of 360° = 54°

10 girls learn cooking = 10 out of 60 of 360° = 35°

10 girls learn cooking = 10 out of 60 of 360° = 60 °

Start drawing on the board with a wooden protractor:

As an example, this pie chart below represents birthdays (the figures for the data are not given here).



Take up several topics of interest to the students, such as comparison of runs scored by various cricketers of repute, populations of different countries, numbers of children playing different sports are good examples which can be represented by pie charts.

REMEMBER: In cases of random data, the number of degrees for the section of the pie chart may not be whole numbers work out in decimals. You need to work on figures in advance, before presenting it to the class.

Task: Students attempt pages 130, 133 –136.

UNIT 9

REVIEW AND ASSESS 2

Teaching Objectives

- To revise concepts and skills learnt during the entire year

Teaching materials:

- worksheets

Learning Activity

Lesson: **40 minutes**

The review and assessment can take place over a couple of days. If required, several lessons can be spent on revision. Worksheets and interactive games can be used for assessment.

NUMBER GAME:

Remember, the place value of the letters of the alphabet:

A = 1	G = 7	M = 13	S = 19
B = 2	H = 8	N = 14	T = 20
C = 3	I = 9	O = 15	U = 21
D = 4	J = 10	P = 16	V = 22
E = 5	K = 11	Q = 17	W = 23
F = 6	L = 12	R = 19	X = 24
	Y = 24	Z = 26	

Find the value of:

HARDWORK, KNOWLEDGE and LOVE OF GOD

Answers:

H-A-R-D-W-O-R-K

8 + 1 + 18 + 4 + 23 + 15 + 18 + 11 = 98

K-N-O-W-L-E-D-G-E

11 + 14 + 15 + 23 + 12 + 5 + 4 + 7 + 5 = 96

L-O-V-E-O-F-G-O-D

12 + 15 + 22 + 5 + 15 + 6 + 7 + 15 + 4 = 101

Answers to Book 4

Unit 1: Review and Assess

HTh	TTh	Th	H	T	O	Expanded Form	Number Names
3	7	0	8	9	2	300000 + 70000 + 800 + 90 + 2	three hundred and seventy thousand eight hundred and ninety-five
	3	0	2	1	1	30,000 + 200 + 10 + 1	thirty thousand two hundred and eleven
3	0	0	0	4	6	300000 + 40 + 6	–
						800000 + 9000 + 10 + 2	eight hundred and nine thousand and twelve
	4	0	1	2	3	40,000 + 100 + 20 + 3	–
	2	4	0	0	7	–	twenty-four thousand and seven
		5	9	8	6	5000 + 900 + 80 + 6	–
						60,000 + 6000 + 400 + 70 + 9	six hundred and six thousand, four hundred and seventy-nine
	9	0	0	0	9	–	ninety thousand and nine
7	4	5	8	3	9	–	seven hundred forty-five thousand eight hundred and thirty-nine

Exercise 2

1. 650,426; 650,522; 654,502; 655406; 655,506
2. 300,390; 303,090; 309,030; 309,903; 330,090
3. 77,777; 77,707; 70,777; 70,770; 7770
4. 3320; 22,332; 23,232, 23,332; 230,222
5. greatest 6D, greatest 5D, smallest 4D, greatest 3D, smallest 3D

Exercise 3

1. 19,104	2. 1,611	3. 4,620	4. 111 R = 1
5. 30,096	6. 8,454	7. 780, R = 4	8. 18,844
9. 78,040	10. 810 R = 2	11. 25,699	12. 18,716
13. 11,067	14. 167 R = 7		

Exercise 4

1. $\frac{4}{6}$ 2. $\frac{8}{14}$ 3. $\frac{22}{24}$ 4. $\frac{2}{39}$ 5. $\frac{24}{40}$

Exercise 5

1. $\frac{5}{5}$ (unit) 2. $\frac{9}{13}$ (P) 3. $\frac{2}{19}$ (P) 4. $\frac{9}{9}$ (unit)

5. $\frac{3}{14}$ (P) 6. $\frac{47}{56}$ (P)

Exercise 6

1. $\frac{6}{7}, \frac{7}{7}$ and $\frac{2}{7}, \frac{3}{7}, \frac{4}{7},$ 2. $\frac{2}{2}, \frac{3}{3}$

Exercise 7

1. 51 2. 60 3. 200 4. 217 5. 126

Exercise 8

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

Exercise 9

Check that the students mark the correct components of the circle.

Exercise 10

1. 1289 km
2. Rs 44,506, Rs 44,256
3. 1,035 km, 9 p.m.
4. 72 m, 360 m
5. Rs 90, equal amounts were contributed by the boys and girls
6. 1,600 kg
7. 1,150 crates each, 20,200 cans
8. $\frac{6}{15'} = \frac{2}{5}$
9. 50 ml, 16 pens, 2 ml left
10. 9th June, Monday

Unit 2: Numbers and Arithmetic Operations

Exercise 1

1. 645,762, 645,000
2. 500,000 + 60,000 + 1000 + 90 + 7
3. 82,511
4. thousands
5. four hundred and fifty-six thousand, eight hundred and seven

Activity

999,999 place value: hundred thousand

Exercise 2

1. 453,298 2. 6,710 3. 97,012 4. 337,027

Exercise 3

1. two million nine hundred and sixty-six thousand eight hundred and fifty
2. seven hundred and seventy-six thousand, two hundred and twenty-five
3. eight hundred and seventy-three thousand, three hundred
4. two hundred and thirty-eight thousand four hundred and fifty

Exercise 4

2. 1,88,004 (one lac, eighty-eight thousand and four)
3. 5,43,098 (five lac, forty-three thousand and ninety eight)
4. 7,63,005 (seven lac, sixty-three thousand and five)

Exercise 5

1. < 2. > 3. > 4. <

Exercise 6

1. 4,300; 20,200; 30,450
2. 16,019; 32,481; 73,694
3. 751; 40,715; 48,517
4. 40,358; 40,536; 45,302

Activity

The given activities require students to search for the figures on the internet or in the school library.

Exercise 7

1. 12,14; Add 2
2. 18, 21; Add 3
3. 5, 0; subtract 5
4. 55, 66; Add 11
5. 50, 60; Add 10

Exercise 8

1. 99,699	2. 43,577	3. 100,811
4. 61,911	5. 99,962	6. 98,959
7. 79,167	8. 29,085	9. 58953
10. 54,137	11. 160,126	12. 166,234
13. 33,998	14. 97,480	15. 224,498

Exercise 9

1. 62,000	2. 110,801	3. 171,257
4. 172,204	5. 111,500	6. 64,464
7. 122,200	8. 185,750	9. 14,328
10. 40,100		

Exercise 10

1. 21,162	2. 13520	3. 28016
4. 39799	5. 26182	6. 40795
7. 43495	8. 53720	9. 10113
10. 13518	11. 52960	12. 53030

Exercise 11

1. 676,400 2. 853,200 3. 747,500

Exercise 12

1. 64,319 2. 72,711

Exercise 13

1. 27,765
2. 30,464
3. 20,778
4. 16,745
5. 45,049
6. 42,599
7. 38,690
8. 64,319
9. 48,834
10. 6500

Exercise 14

1. 27,184,815
2. 33,316,650
3. 47,574,135
4. 22,756,000
5. 23,909,904

Exercise 15

1. 15,237,600
2. Rs 6500
3. 9,424,250 m or 9424 km
4. 276,480
5. Rs 28,050
6. 127,020
7. Rs 9,088,625
8. 80,000
9. Rs 202,080
10. 4,657,500

Exercise 16

1. 533 R = 9
2. 155 R = 41
3. 153, R = 6
4. 100 R = 9

Exercise 17

2. Rs 470
3. 82 km
4. 65
5. 1030
6. 73, 16 left
7. 200, 15
8. Rs 102
9. 302
10. 550

Number Puzzle: a dozen

Unit 3: Factors and Multiples

Exercise 1

2. NYN
3. NYN
4. YYY
5. YYY

Exercise 2

1. 2,5,10
2. odd
3. remainder
4. 3
5. 10

Exercise 3

Solved table from the book

YNY, NYY, NNN, NYY, NNN, YYY, YNN, YNY

Exercise 4

1. 2
2. 12 (42, 44, 46, 48, 50, 51, 52, 54, 55, 56, 57, 58)
3. 83, 89
4. 97 – 2 = 95
5. 101
6. 2
7. 28
8. 2303
9. 132
10. No, it is divisible by 3

Exercise 5

1. a. 1, 3, 5, 15
   b. 1, 20, 2, 10, 4, 5
   c. 1, 21, 3, 7
   d. 1, 35, 5, 7
   e. 1, 18, 2, 9, 3, 6

2. a. 1, 5
   b. 1, 12, 3, 4, 2, 6
   c. 1, 16, 2, 8, 4
   d. 1, 27, 3, 9
   e. 1, 30, 2, 15, 3, 5, 6
   f. 1, 32, 2, 16, 4, 8
   g. 1, 36, 2, 18, 9, 4, 6
   h. 1, 40, 2, 10, 8, 5, 4
   i. 1, 48, 2, 24, 6, 8, 3, 4, 12
   j. 1, 2, 5, 10, 25, 50

3. yes 4. no 5. no

Exercise 6

1. 3, 6, 9, 12, 15 2. 24, 30, 36, 42, 48 3. 196

Exercise 7

1. multiples of 4
2. multiples of 10
3. multiples of 8
4. multiples of 9

Exercise 8

1. a. 1, 2 , 3 , 6, 9, 18
   b. 1, 2 , 11, 22
   c. 1, 2 , 3 , 4, 6, 9, 12, 18, 36
   d. 1, 2 , 3 , 4, 6, 8, 12, 16, 24, 48
   e. 1, 2 , 5 , 10, 25, 50

2. a. 1, 11 b. 2, 3 c. 2 d. 7, 5 e. 5, 2
3. a. 3, 5 b. 3, 2 c. 2, 3 d. 7 e. 2, 3, 5

Unit 4: Fractions

Exercise 1

1. $\frac{1}{4}$ 2. $\frac{5}{16}$ 3. $\frac{3}{8}$ 4. $\frac{3}{8}$ 5. $\frac{3}{4}$

Exercise 2

1. Colour 6 boxes
2. Colour 8 boxes
3. Colour 7 boxes
4. Colour 3 boxes
5. Colour 1 box

Exercise 3

1. unit fractions: $\frac{1}{5}$, $\frac{1}{4}$ proper fractions: $\frac{2}{4}$, $\frac{3}{4}$, $\frac{5}{7}$, $\frac{1}{5}$, $\frac{1}{4}$

   improper fractions: $\frac{5}{4}$, $\frac{7}{3}$, $\frac{3}{2}$ mixed fractions: $1\frac{2}{3}$, $5\frac{7}{12}$, $2\frac{1}{2}$,

2. a. $2\frac{2}{3}$ b. $3\frac{1}{3}$ c. $4\frac{1}{3}$ d. $2\frac{1}{5}$

e. $1\frac{4}{5}$ f. $4\frac{2}{3}$ g. $3\frac{3}{4}$ h. $3\frac{2}{5}$

i. $3\frac{2}{3}$ j. $2\frac{3}{5}$

3. a. $\frac{11}{3}$ b. $\frac{21}{4}$ c. $\frac{16}{3}$ d. $\frac{5}{2}$

e. $\frac{19}{4}$ f. $\frac{4}{3}$ g. $\frac{17}{4}$ h. $\frac{13}{2}$

i. $\frac{9}{4}$ j. $\frac{21}{5}$

Exercise 4

1. $\frac{3}{9}$ 2. $\frac{12}{16}$ 3. $\frac{27}{90}$ 4. $\frac{1}{1}$

5. $\frac{1}{2}$ 6. $\frac{3}{5}$ 7. $\frac{4}{5}$ 8. $\frac{10}{15}$

Exercise 5

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

5. $\frac{3}{5}$ 6. $\frac{1}{2}$ 7. $\frac{2}{3}$ 8. $\frac{8}{9}$

9. $\frac{2}{3}$ 10. $\frac{1}{2}$ 11. $\frac{3}{8}$

Exercise 6

1. 1, 6, 30, 3, 2, 5
2. 24, 4, 9, 24, 18, 60
3. 30, 10, 12, 60, 6, 20
4. 7, 36, 56, 9, 21, 54
5. 16, 6, 24, 18, 6, 3

Activity

Sidra: $\frac{4}{6}$ Nadir: $\frac{2}{3}$

Exercise 7

1. $\frac{7}{9} = \frac{63}{48}$, $\frac{4}{6} = \frac{2}{3}$, $\frac{90}{100} = \frac{9}{10}$, $\frac{2}{5} = \frac{10}{25}$, $\frac{6}{8} = \frac{3}{4}$

2. Hammad

3. a. $\frac{1}{4}, \frac{2}{5}, \frac{7}{10}$ b. $\frac{2}{7}, \frac{8}{14}, \frac{3}{4}$

4. a. $\frac{5}{6}, \frac{2}{3}, \frac{5}{9}$ b. $\frac{4}{5}, \frac{7}{10}, \frac{2}{2}$

Exercise 8

1. $\frac{2}{2} = 1$
2. $\frac{3}{5}$
3. $\frac{5}{8}$
4. $\frac{5}{7}$
5. $\frac{6}{8} = \frac{3}{4}$
6. $\frac{5}{10} = \frac{1}{2}$
7. $\frac{4}{3}$
8. $\frac{8}{11}$
9. $\frac{8}{12} = \frac{2}{3}$
10. $\frac{5}{9}$

Exercise 9

1. $\frac{5}{6}$
2. $\frac{4}{12} = \frac{1}{3}$
3. $\frac{3}{9} = \frac{1}{3}$
4. $\frac{6}{7}$
5. $\frac{3}{5}$
6. $\frac{6}{8} = \frac{3}{4}$
7. $\frac{4}{6} = \frac{2}{3}$
8. $\frac{2}{3}$
9. $\frac{8}{8} = 1$
10. $\frac{7}{6}$

Exercise 10

1. $\frac{3}{5}$
2. $\frac{3}{7}$
3. $\frac{5}{7}, \frac{2}{7}$
4. $\frac{5}{10} = \frac{1}{2}$
5. $\frac{29}{30}$

Exercise 11

1. $\frac{1}{4}$
2. $\frac{1}{5}$
3. $\frac{2}{7}$
4. $\frac{6}{8} = \frac{3}{4}$
5. $\frac{1}{6}$
6. $\frac{2}{11}$
7. $\frac{1}{5}$
8. $\frac{5}{12}$
9. $\frac{9}{13}$
10. $\frac{3}{9} = \frac{1}{3}$

Exercise 12

1. $\frac{6}{11}$
2. $\frac{8}{10} = \frac{4}{5}$
3. $\frac{4}{8} = \frac{1}{2}$
4. $\frac{17}{20}$
5. $\frac{4}{10} = \frac{2}{5}$
6. $\frac{13}{18}$
7. $\frac{3}{9} = \frac{1}{3}$
8. $\frac{1}{4}$
9. $\frac{4}{12} = \frac{1}{3}$
10. $\frac{4}{18} = \frac{2}{9}$

Exercise 13

1. $\frac{2}{5}$
2. $\frac{4}{8} = \frac{1}{2}$
3. $\frac{4}{7}$
4. $\frac{2}{7}$
6. $\frac{3}{9} = \frac{1}{3}$

Challenge:

1.

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

2.

$\frac{1}{2}$	$\frac{1}{3}$	$\frac{5}{6}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$
$\frac{2}{6}$	$\frac{1}{6}$	$\frac{3}{6}$

Exercise 14

1. $\frac{4}{35}$ (P) 2. $\frac{35}{12}$ (I) 3. $\frac{1}{21}$ (P) 4. $\frac{1}{24}$ (P)

5. $\frac{1}{6}$ (P) 6. $\frac{13}{77}$ (P) 7. $\frac{1}{10}$ (P) 8. $\frac{3}{40}$ (P)

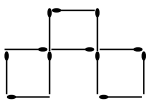
9. $\frac{1}{3}$ (P) 10. $\frac{3}{4}$ (P) 11. $\frac{2}{35}$ (P) 12. $\frac{3}{7}$ (P)

13. $\frac{1}{6}$ (P) 14. $\frac{5}{63}$ (P) 15. $\frac{3}{8}$ (P)

Exercise 15

1. 40, 60 2. 9 3. Rs $\frac{1}{6}$ 4. $\frac{1}{8}$ 5. $\frac{3}{10}$

Activity



$\frac{5}{17}$; $\frac{12}{17}$

Exercise 16

1. $\frac{3}{2}$ 2. 1 3. $\frac{3}{1}$ 4. $\frac{5}{1}$ 5. $\frac{1}{14}$

Exercise 17

1. $\frac{7}{72}$ 2. $\frac{1}{16}$ 3. $\frac{1}{21}$ 4. $\frac{2}{7}$

5. $\frac{1}{12}$ 6. $\frac{1}{4}$ 7. $\frac{2}{7}$ 8. $\frac{2}{9}$ 9. $\frac{1}{6}$

Exercise 18

1. $\frac{8}{9}$ 2. $\frac{62}{15}$ 3. $1\frac{6}{7}$ 4. $\frac{2}{3}$ 5. $\frac{1}{2}$

Activity

26 branches

Unit 5: Decimals

Exercise 1

1. $\frac{3}{10}$, 0.3
2. $\frac{5}{10}$, 0.5
3. $\frac{8}{10} = 0.8$
4. $\frac{6}{10}$, 0.60

Exercise 2

1. 0.1
2. 0.4
3. 1.3
4. 5.9

Exercise 3

1. $\frac{2}{10}$, 0.2 cm
2. $\frac{6}{10}$, 0.6 cm
3. $\frac{7}{10}$, 0.7 cm
4. $\frac{3}{10}$, 0.3 cm

Exercise 4

0.3, 0.5, 0.8, 1.2, 1.5

Exercise 5

1. 0.34
2. 0.52
3. 0.79
4. 0.91

Exercise 6

1. 18 boxes shaded 0.82 unshaded
2. 51 boxes shaded, 0.49 unshaded
3. 7 boxes shaded, 0.93 unshaded
4. 150 boxes shaded, $\frac{50}{200}$ unshaded
5. 217 boxes shaded, $\frac{83}{300}$ unshaded

Exercise 7

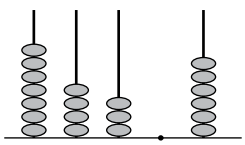
2. 0.45
3. 1.33
4. 0.07
5. 2.45
6. 0.62

Exercise 8

1. $\frac{15}{100} = \frac{3}{30}$
2. $\frac{5}{100} = \frac{1}{20}$
3. $\frac{150}{100} = \frac{3}{2}$
4. $\frac{2}{100} = \frac{1}{50}$
5. $\frac{375}{100} = \frac{15}{4}$

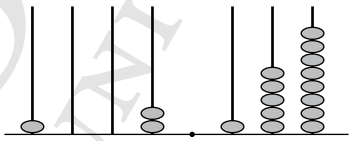
Exercise 9

1.



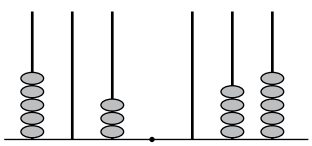
H	T	U	.	t
7	4	3	.	6

2.



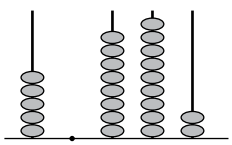
Th	H	T	U	.	t	h	th
1	0	0	2	.	1	5	8

3.



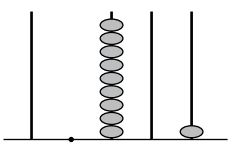
H	T	U	.	t	h	th
5	0	3	.	0	4	5

4.



U	.	t	h	th
0	.	8	9	2

5.



U	.	t	h	th
0	.	9	0	1

Exercise 10

1. < 2. < 3. < 4. < 5. <

Exercise 11

2. 1.4, 1.5, 1.6, 1.7
3. 8.81, 8.82, 8.83, 8.84, 8.85, 8.86
4. 3.010, 3.011, 3.012, 3.013, 3.014
5. 7.17, 7.18, 7.19
6. 100.09, 100.10, 100.11

Activity

Different solutions are possible.

Exercise 12

1. 70 2. 6000 3. hundreds 4. 11 5.125

Exercise 13

1. 0.85 2. 11.45 3. 7.84 4. 57.95
5. 7.98 6. 94.55

Exercise 14

1. 2.84 2. 19.9 3. 2.78 4. 85.22
5. 11.51 6. 76.01

Exercise 15

1. 2.84 2. 4.26 3. 79.6 4. 12. 84

Exercise 16

1. 13.99 2. 21.8 3. 1.55 4. Rs 2.85
5 2.12 kg 6. 43.66 l 7. 3.27 km 8. Rs 113.57

Challenge

0.56	0.3	0.59
0.76	0.84	1.60
1.32	1.14	2.46

4.8	2.9	7.7
6.3	7.4	13.7
11.1	10.3	21.4

Exercise 17

1. 8.4 2. 32.2 3. 3 4. 1.8 5. 2.4

Exercise 18

1. 16.8 2. 3.6 3. 19.2 4. 24.5 5. 51.6

Exercise 19

1. 348.76 2. 193.7 3. 0.98 4. 345
5. 0.1

Exercise 20

1. 18.4 m 2. Rs 68 3. 122.2 MB 4. Rs 25.9

Unit 6: Measurement: Length, Mass, Capacity, and Time

Exercise 1

1 cm 2. m 3. km 4. m
5. m

Exercise 2

1. 1.55 m	2. 2.5 m	3. 13.04 m	4. 1209 m
5. 3569 m	6. 0.034 km	7. 5.679 km	8. 0.283 km
9. 8.006 km	10. 29.109 km	11. 3.4 cm	12. 5.12 cm
13. 6.1 cm	14. 2372 cm	15. 45601 cm	16. 230 mm
17. 7 mm	18. 361 mm	19. 128 mm	20. 429 mm

Exercise 3

1. 1.68 m 2. 29.12 m 3. 5.16 m 4. 247.69 m

Exercise 4

home to city X to city Z to city D

Exercise 5

1. 680000 m, 2770 m, 51500 m 2. 2.77 km 3. 680 km
4. 734.27 km 5. same

Exercise 6

50.42 m

Exercise 7

1 m 62 cm

Exercise 8

1. a. 1.342 kg b. 34.742 kg c. 0.889 kg d. 2.067 kg
   e. 67.005 kg
2. a. 5000 g b. 8341 g c. 4091 g d. 56725 g
   e. 3005 g
3. a. 9.779 kg b. 1.152 kg c. 12.832 kg d. 0.1 kg
   e. 8.024 kg

Exercise 9

1. 39.11 kg 2. 74.018 kg 3. 6.3 kg 4. 0.41 g
5. 42.482 kg 6. 1 kg 500 g + 750 g + 250 g

Exercise 10

1. a. 4900 ml b. 3834 ml c. 7035 ml d. 46400 ml
   e. 7482 ml
2. a. 0.49 l b. 2.222 l c. 0.098 l d. 75.806 l
   e. 126.004 l
3. a. 25.562 b. 2.456 l c. 8.376 l d. 43.594 l
   e. 16.186 l

Exercise 11

1. 2.89 l 2. 446.5 l 3. 571.5 ml

Exercise 12

1. 10:55 2. 4:25 3. 6:00 4. 2:15
5. 7:05 6. 12:40

Exercise 13

1. a. 180 sec b. 265 sec c. 1920 sec d. 402 sec
2. a. 5 min b. 240 min c. 9 min 2 sec d. 225 min
3. a. 9 hr b. 72 hr c. 119 hr d. 1 hr
4. a. 3 days b. 120 days c. 32 days d. 75 days
5. a. 2 months b. 3 months 18 days
   c. 41 months d. 84 months
6. a. 3 years b. 7 years c. 1 year 2 months
   d. 3 years 9 months

Exercise 14

Students' answers may vary; help them write the correct a.m. or p.m. times.

Exercise 15

1. 19 min 53 sec 2. 3 hr 22 min 3. 10 days 20 hrs
4. 8 min 8 sec 5. 52 hr 27 min 6. 2 days 11 hr
7. 8 week 3 days 8. 4 years 3 months

Exercise 16

1. 6:50 a.m. 2. 3:00 p.m. 3. 10:36 a.m. 4. 7:45 p.m.
5. 2:21 a.m.

Exercise 17

1. 11:20 a.m. in hall 2 2. 3 hr 40 min 3. 1 hr 15 min
4. 2 hrs 50 min 5. 7:40 p.m.

Exercise 18

1. 7:35 a.m. 2. 10 hr 52 min 3. 8:12 a.m.
4. 14 min 21 sec

Unit 7: Geometry

Exercise 1

1. 5.5 cm
2. 5.1 cm
3. 2.6 cm
4. 10.2 cm
5 7.7 cm
6. 9.0 cm
7. 12.1 cm
8. 7.4 cm
9. 11.8 cm
10. 11 cm

Exercise 2

Help the students with this exercise and check their work.

Exercise 3

1. 9.7 cm
2. 6.3 cm
3. 7 cm
4. 13 cm
5. 9.9 (all approximate measures)

Exercises 4, 5, and 6

Help the students with these exercises and check their work.

Exercise 7

Parallel: 1, 4, 5, 8, 9; non-parallel : 2, 3, 6, 7

Exercise 8 and 9

Help the students with these exercises and check their work.

Exercise 10

The dotted lines on D, U, V, W, H, and Y represent lines of symmetry.

Exercise 11

Help the students with this execrise and check their work.

Exercise 12

1. right angle
2. obtuse
3. acute
4. straight
5. acute
6. complete
7. obtuse
8. reflex
9. obtuse

Exercise 13

1. 55°
2. 15°
3. 80°
4. 102°
5. 146°
6. 45°

Exercise 14

1. 45°
2. 122°
3. 140°
4. 50°
5. 25°
6. 152°

Exercise 15

1. a. acute b. obtuse c. obtuse d. right
   e. acute f. obtuse g. obtuse h. straight
   i. acute j. obtuse
2. a. 80°/acute b. 110°/obtuse c. 90°/right
   d. 145°/obtusee. 10°/acute f. 170°/obtuse

3. a. 30°, 60° (acute, acute)
   b. 75°, 150° (acute, obtuse)
   c. 90°, 180° (right, straight)
4. a. 20°, 80°, 100° (obtuse)
   b. 45°, 85°, 130° (obtuse)
   c. 110°, 10°, 120° (obtuse)
   d. 145°, 15°, 160° (obtuse)

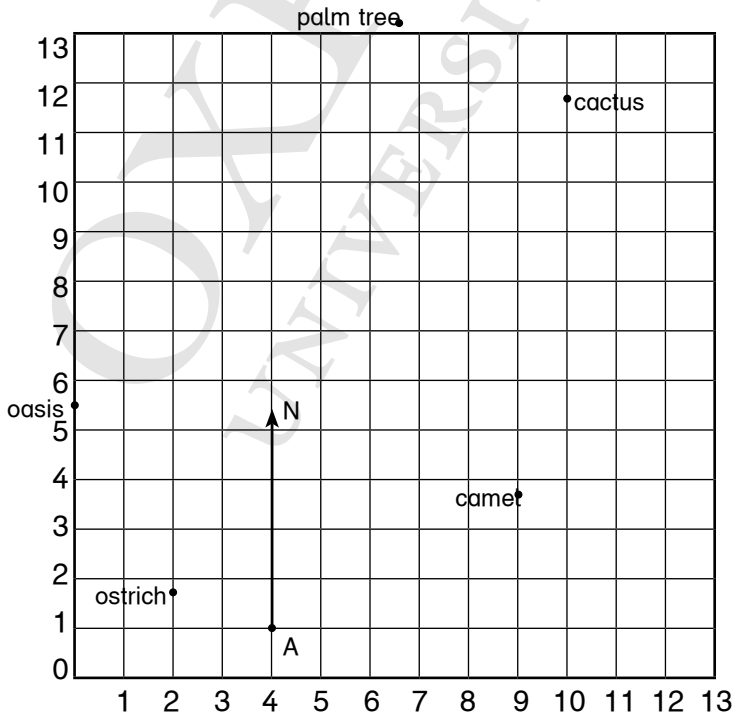
Activity

1. a. 
   b. 
   c. 
   d. 

Help the students measure the angles the clock hands make.

2. 3 o'clock and 9 o'clock
3. 6 o'clock

Activity



Exercise 16

1. AE, EC, EB EW, EZ, EY, EX
2. DG CD, XY, AB
3. 1.8 cm 2 cm

Exercise 17

1. radius 2. circumference 3. diameter 4. circumference

Exercise 18

1. Check the circles that students draw.
2. a. 7.9 cm b. 15.3 cm c. 5.2 cm
3. a. 11.6 cm b. 7.4 cm c. 9.8 cm

Exercise 19

Check the students' work.

Unit 8: Data Handling

Exercise 1

1. There are 5 names, therefore 5 bars
2. Fluffy
3. Bobo
4. 5 + 8 + 6 + 2 + 1 = 22
5. 1
6. 1
7. Roger

Exercise 2

1. a. cricket b. tennis
2. a. 12 b. 14 c. 6
3. hockey
4. 2
5. Favourite Sports of the Maths Class
   y-axis: number of students
   x-axis: favourite sports

Exercise 3

1. a. 14 b. 19 c. 14
2. a. Science b. Language
3. Mathematics & Social Studies
4. 68
5. 3

Exercise 4

1. Jan, 20; Feb, 55; Mar, 30; Apr, 45; May, 10; Jun, 25
   July, 30; Aug, 75; Sept, 60; Oct, 30
2. a. August b. May
3. July, 10
4. 380

5. 30
6. 15
7. 270

Exercise 5

1. Croissants
2. 20%
3. banana bread
4. No
5. 36%

Unit 10: Assess and review 2

Exercise 1

1. 40 million
2. ten thousand
3. 48
4. 2
5. 97

Exercise 2

1. 891 2. 3003 3. 2004 4. 999,999

Exercise 3

1. 63024 + 34871 = 97895 2. 87967 – 40300 = 47667

Exercise 4

1. > 2. > 3. <

Exercise 5

1. 8 2. 0

Exercise 6

1. 397.6 2. 0.037875 3. 5.94 4 4.324 5. 1.445 6. 4.249

Exercise 7

1. forty five point and zero nine six
2. three hundred and forty-four million, eight hundred and ninety-three thousand, nine hundred and eighty
3. zero point zero zero four
4. three hundred million, four thousand and ten

Exercise 8

1. 1 2. $\frac{3}{2}$ 3. $\frac{9}{2}$ 4. $\frac{4}{63}$

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

Exercise 9

1. 6.4 2. 600.203 3. 2004.07 4. 45020.009

Exercise 10

1. $\frac{345}{1000}$ 2. $23\frac{65}{100}$ 3. $\frac{25}{100}$ 4. $6\frac{1}{2}$

Exercise 11

19,000

Exercise 12

1. 763,566 2. 514,383

Exercise 13

79

Exercise 14

60

Exercise 15

19 jugs

Exercise 16

975,430

Exercise 17

1. 17,089 ml 2. 800 m 3. 60 months 4. 7.006 km
5. 48 6. 7 7. 704 cm 8. 25,050 g
9. 0.75 10. $\frac{15}{100}$

Exercise 18

∠AOD, ∠AOB, ∠BOC, ∠COD, ∠AOC, ∠BOD

Exercise 19

1. 67° 2. 145° 3. 35° 4. 108°

Exercise 20

Check students' answers.

Exercise 21

1. 9:35 p.m. 2. 12:00 p.m. 3. 12:10 a.m. 4. 4:30 p.m.

Exercise 22

1. 3.059 km 2. 3.721 km

Exercise 23

24 litres

Exercise 24

Check the students' work.

Exercise 25

1. 2 2. 2 3. Tuesday & Saturday
4. cloudy 5. True

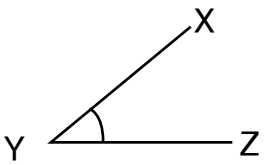
Glossary

A

Angle

An angle is formed by two rays. It is measured in degrees.

Example



$\angle XYZ = 45°$.

Anticlockwise turn

It is a movement in a curve opposite to the movement of the hands of the clock.

Area

The amount of flat surface around a boundary of a figure.

It is measured in square units.

C

Clockwise turn

It is a movement in a curve corresponding to the movement of the hands of the clock.

Composite figure

A figure that is made of more than one basic figure.

D

Decimal

A decimal has whole number and its fractional part of a whole is placed after the decimal point.

Example

22.34 and 0.5 are decimals.

F

Factor

A number that divides a number completely without a remainder.

Example

5 is a factor of 20.

H

Hundredth

A hundredth is one out of 100 equal parts.

It is placed second to the right of the decimal point.

Example

There are 3 hundredths in 40.73.

L

Line graph

A data representation where the coordinates are joined by ruled lines.

Line of symmetry

A mirror image line that cuts a figure into equal halves.

Example

vertical line of symmetry

horizontal line of symmetry

diagonal line of symmetry

M

Mixed number

A number consisting of a whole number and a proper fraction.

Example

$3\frac{1}{4}$ is a mixed number.

Multiple

A number is a multiple of a number when it is multiplied by an integer.

Example

20 is a multiple of 5.

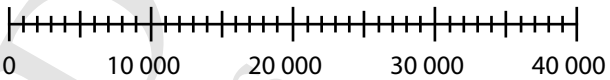
N

Number line

A line on which numbers are marked at scaled intervals.

It is used to illustrate simple numerical operations.

Example



Number pattern

A repetitive arrangement of numbers following a specific sequence.

Example

3400, 4400, 5400, 6400, 7400 is a number pattern.

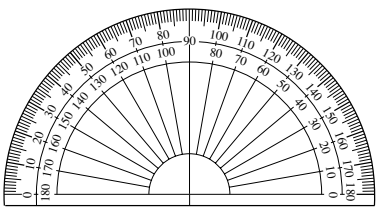
P

Perimeter

The perimeter is the total distance around a figure.

Protractor

A mathematical instrument for measuring angles.

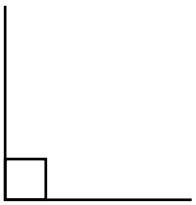


R

Right angle

Two lines perpendicular to each other form a right angle.

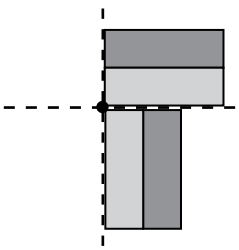
It is equal to 90°.



Rotation

When an object is turned about a point and of a certain degree.

Example



Rotation at 90°

Rounding numbers

Rounding off numbers means keeping a simpler value closer to the exact answer.

Example

When rounding to the nearest ten, 7996 ≈ 8000.

S

Symmetric figure

A figure that can be folded or divided into equal halves.

T

Tenth

A tenth is one out of 10 equal parts.

It is placed right after the decimal point.

Example

There are 2 tenths in 5.2.

Translation

A periodic repetitive pattern of figures without any gap.