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TEACHER'S MANUAL

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

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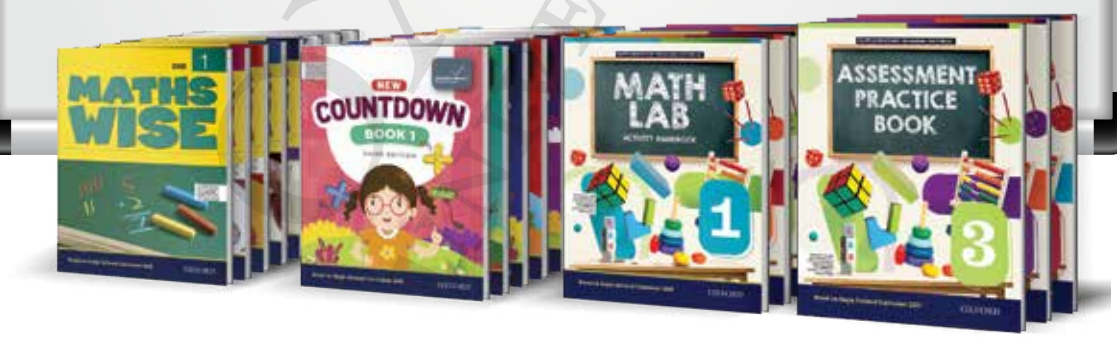


Contents

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 just aren't able to comprehend ideas so complex because they're 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 and like they are looking for reasons to leave the class. It might look like they would prefer anything to actually trying to learn the material. It will seem like they are lazy or naughty, but the fact is, these children are likely just looking for an escape from a stressful situation. They don't ask for help or guidance because they don't believe that 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 this 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's why it is important to never present the subject as something that students should worry about. Don't tell your students that the next unit is hard. Instead, give them the lesson, and let them ask questions so they know that it is not a big deal to need 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 tend not to volunteer, check their written work to see how they're performing. If they're doing well, then they're simply not comfortable speaking up in front of their classmates and maybe just need a confidence boost. If they're not performing well, then you are 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 won't 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're trying to explain. Keep in mind that anxieties are impacting students' comprehension skills, so your approach must be something that helps students feel like their 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 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 doing 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 will likely 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 won't 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)

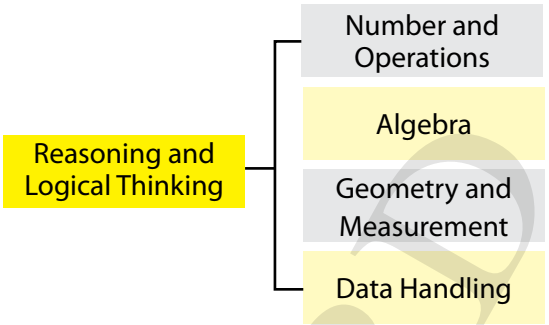
ADHD is a disorder that leads to problems paying attention, impulse control, and hyperactivity. While all children are easily distracted, it will be especially apparent in these children. Like Autism, a diagnosis can only be made by a professional, but since not all children will have that privilege,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

i. Read numbers up to 1,000,000 (one million) in numerals and words.
ii. Write numbers up to 1,000,000 (one million) in numerals and words.

1.2 Addition and Subtraction

i. Add numbers up to 6-digit numbers.
ii. Subtract numbers up to 6-digit numbers.

1.3 Multiplication and Division

i. Multiply numbers, up to 5-digit, by 10, 100, and 1000.
ii. Multiply numbers, up to 5-digit, by a number up to 3-digit numbers.
iii. Divide a number up to 5 -digit numbers by 10,100 and 1000.
iv. Divide numbers up to 5-digit numbers by a number up to 2-digit numbers.
v. Solve real-life situations involving operations of addition, subtraction, multiplication, and division.

1.4 Number Patterns

i. Identify and apply a pattern rule to determine missing elements for a given pattern.
ii. Identify the pattern rule of a given increasing and decreasing pattern and extend the pattern for the next three terms.
iii. Describe the pattern found in a given table or chart.

Plan Ahead:

1.1 Numbers up to One Million
1.2 Addition and Subtraction
1.3 Multiplication and Division
1.4 Number Patterns
Allocate realistic time frame/ number of periods to each topic as per requirement.

Before You Start:

Pupils have already worked with numbers up to 6-digits. Here they will deal with up to 7-digit numbers. This lesson will lead them to add and subtract numbers of greater complexity. Pupils have already learnt about multiplication and division, now they will apply this knowledge to solve daily life problems involving mixed operations.

Watch Out For:

Students generally make mistakes when they add bigger numbers in expanded form, that is most times, they start the addition from the left side when it should be start from the right side (ones column). Students also struggle with placing the numbers under the correct place value column. This lead to mistakes when carrying out addition and subtraction. In case of subtraction given in words, the word 'from' causes confusion, and students generally write the subtrahend from the minuend first.

This Pairs with:

Math Lab 5, pages 2, 3, 4, 5, 7, 11, 13, 15, 17, 19, 20, 21

Make Sure You Have:

Bowl

Chits

If They're Struggling:

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

Ask pupils if working with bigger numbers is more challenging than working with small numbers. If they say yes, ask them why that is, since they know how to work with numbers digit by digit. Prompt them to discuss what they find difficult and what is simple, so that you can use this information to inform your approach to the unit. Ask the class if anyone has ever had to use very large numbers for number operations in real-life. If anyone has, allow them to share with the class, but if not, ask if they think that being comfortable with could be helpful in real-life. How do they think it could potentially help them in their lives?

SLOs

1.1
i
ii

Activity 1
15 min

This pairs with Math Lab page 2

Hold a spelling test with random numbers, not going higher than one million. Ask pupils to write the numbers in words, as well as numerals, and ask them to peer review after.

Activity 2
10 min

Prepare two sets of number cards. Write 6 or 7-digit numbers in figures on one set and the same number in words on the other set. Distribute number cards among the pupils. Ask one pupil to show his/her card to the class. If the card has a number written in figures tell other pupils to quickly check who has a matching card of the same number written in words and read it loud and clear. Similarly, if the number is written in words, pupils will find a matching card of the same number written in figures. Stick the pair of cards on the board. Repeat the activity till all cards have been paired.

1.2
i
ii

Activity 3
15 min

Create groups of up to 3 pupils each. Ask each group to come to the front of the class and pick out two chits from a bowl. These chits should have numbers up to 6-digits. A coin should be flipped, and heads will be addition, and tails will be subtraction. If it is addition, the group will have to do the addition of the two numbers on the board, and if it is subtraction, they will subtract the smaller number from the larger. Each group should get one turn, unless they come to the wrong answer, in which case they should be allowed to try again, after they understand where they went wrong.

1.2
i
ii
1.3
i
iii

Activity 4
10 min

Provide each pupil with an activity card with questions on any of the four operations. This activity can be used for addition or subtraction of complex numbers and multiplication/ division of numbers up to 6-digits by 10, 100, and 1000. Time the activity and get the activity cards peer checked.

Sample Activity Cards:

Add the rows and columns to find the total of addition square		
198462	201546	
340786		
	137419	

Find the difference between these two of numbers:

149695 205343

Write the missing numbers:

a) 486238 × _____ = 48623800 b) 0.07 × _____ = 7

c) _____ ÷ 1000 = 0.0069432 d) 387200 ÷ 10 = _____

e) _____ × 100 = 9413

1.3 i ii	**Activity 5** 10 min	Write a 5-digit number on the board. For example, 29261. Ask pupils what will happen when you multiply this number by 10. Ask a volunteer to come to the board and solve this using long multiplication. When they have the answer, 292610, ask them if they notice how a number is affected when multiplied by 10. Then ask another volunteer to come to the board and multiply the original number by 100. When they come up with 2926100, the example should be clearer. Ask them to make note of the fact that when a number is multiplied by 10, one simply needs to write a zero to the right of the number to get to the correct answer, and when a number is multiplied by 100, then 2 zeros must be written on the right of the number. Ask the class if they can guess what the answer to 29261 multiplied by 1000 is. Ask a volunteer to come to the board and write down their guess without doing any working. To test this theory, ask each pupil, individually to choose any 5-digit number and multiply it by 10/100/1000 using long multiplication, and checking if it holds true. Explain that this can be seen in single digit numbers as well.

Let's try it

Ask pupils to individually attempt some multiplication. Here are examples of some questions they should be able to solve:

1) 2614×252
2) 25132×911
3) 8292×261
4) 72528×10
5) 70067×100
6) 25276×1000

1.3 iii	**Activity 6** 20 min	Write a 5-digit number on the board. For example, 90000. Ask pupils what will happen when you divide this number by 10. Ask a volunteer to come to the board and solve this using long division. When they have the answer, which should be 9000, ask them if they notice how a number is affected when divided by ten. Now ask another volunteer to come to the board and divide the original number by 100. When they come up with 900, the example should be clearer. Ask them to make note of the fact that when a number with 0 at its ones place is divided by 10, we simply need to remove a zero to get to the right answer, and when a number with 00 at its tens and ones place is divided by 100, then two zeros must be removed. Ask the class if they can guess what the answer to 29000 divided by 1000 is. Ask a volunteer to come to the board and write down their guess without doing any working with zeros at tens, hundreds, and thousands places. To test this theory, ask each pupil, individually to choose any 5-digit number and divide it by 10/100/1000 using long division, and checking if it holds true.

Let's try it

Ask pupils to individually attempt some division. Here are examples of some questions they should be able to solve:

1) $2614 \div 22$
2) $25132 \div 11$
3) $98292 \div 21$
4) $2575 \div 25$
5) $70067 \div 30$
6) $25276 \div 19$

Assign classwork from the textbook.

1.3
v

Activity 7
20 min

Ask pupils, to come up with a number story for any of the four number operations, in pairs, based on their daily lives to make it realistic. Give the class five minutes, and then have each pair come to the front of the class to read out their number story. The rest of the class will have to work out how to use number operations to solve and convert it to a number sentence. These can either be solved on the board, or pupils can make note of them to solve individually.

1.4
i
ii

Activity 8
10 min

Prepare work sheets as shown in sample. Write different rules (using any of the four operations) for finding the number pattern in ascending or descending order. Give random numbers in rows which satisfy these rules. Give one sheet to each pupil. Tell them to find number patterns as instructed.

Look at the number patterns and encircle them as shown.							
Count by 1s from 32 to 37				Count by 2s from 100 to 88			
Count by 2s from 2 to 12				Count by 3s from 41 to 53			
Count by 10s from 10 to 50				Count by 5s from 15 to 45			
32	33	34	35	36	37	44	67
100	98	96	94	92	90	88	86
23	14	95	90	85	80	75	70
39	41	44	47	50	53	56	59
25	57	58	59	60	61	62	80
30	10	20	30	40	50	43	85
15	20	25	30	35	40	45	67
15	20	25	30	35	40	45	67

Let's talk Math

It would be useful to discuss some interesting situations where we may have to deal with big numbers in real-life. For example, finding the number of words in a 200 page book with 37 lines per page and 8 words per line. With multiplication, we find that there would be $200 \times 37 \times 8 = 59200$ words in the book. Finding the number of minutes a 97 year old man has lived. On multiplication, we find the number of minutes to be $97 \times 365 \times 24 \times 60 = 50983200$. Along with that, discussing large scale things in general, like the height of a certain mountain in inches would certainly require one to be comfortable with large numbers. At the end of the discussion, give pupils 5 minutes to write a reflective paragraph.

Let's get practical

Ask pupils to fill in the blanks of a receipt. Connect it to real-life by asking the pupils to develop a story around the receipt and who would need all these items. Below is a template you could use, after removing some of the numbers for the pupils to calculate and fill in. Explain to pupils that when dealing with large sums of money, it is always important to keep track, especially when doing business. The given receipt could be one of a party planning service, so engage pupils by asking them why it would be so important for them to keep track of their expenses.

Item	Cost (Rs)	Quantity	Total
Transport rental/ hour	999	6	5994
Space rental/ hour	4500	5	22500
Paper Plates	45	20	900
Fizzy Drink	120	40	4800
Plastic cups	65	50	3250
Pack of Balloons	315	15	4725
Pizza sauce	345	50	17250
Mushrooms	455	20	9100
Chicken	1500	15	22500
Pizza Crusts	670	50	33500
Block of cheese	800	14	11200
Fresh Herbs	400	20	8000
		Total	**143719**

Self Assessment

1.1 Numbers up to one million
1.2 Addition and subtraction
1.3 Multiplication and division
1.4 Number Patterns

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

Multiple Choice Questions

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

1. If we take around 1000 breaths an hour, how many breaths do we take in a year?
   a) 8760000
   b) 2264000
   c) 8670000
   d) 2642000
2. What is the place value of 9 in the number 2492585?
   a) thousandth
   b) hundred thousandth
   c) ten thousandth
   d) million
3. What is 2000 less than 840328?
   a) 839218
   b) 838328
   c) 838330
   d) 837328

Unit 2

Highest Common Factor (HCF) and Least Common Multiple (LCM)

2.1 Highest Common Factor

i. Find HCF of
- two numbers up to 2-digit numbers
- three numbers up to 2-digit numbers using
- prime factorization method
- division method.

2.2 Least Common Multiple

i. Find LCM of
- two numbers up to 2-digit numbers
- three numbers up to 2-digit numbers using
- prime factorization method
- division method.

ii. Solve real-life situations involving HCF and LCM.

Plan Ahead:

2.1 Highest Common Factor

2.2 Least Common Multiple

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

Before You Start:

Students already know how to find common multiples of numbers. Thereafter, they will now find the LCM by the division method. Students have already learned how to find common factors of a number by prime factorisation. They will now learn to find the HCF by the long division method and prime factorisation. Students will further apply the knowledge of LCM and HCF to solve real-life problems.

Watch Out For:

Students often get confused in recognising events which are related to HCF and LCM in real-life story sums.

This Pairs With:

Math Lab 5, pages 22, 23, 24

Make Sure You Have:

Dice	A4 paper
Two coloured counters	Quiz cards

If They're Struggling:

Have as much class discussion as possible relating to why using HCF and LCM is the right way to answer certain questions. 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

Students already know how to find factors and multiples of a number. They are aware of factorising a number by using prime factors. They can determine common factors and common multiples of two or more numbers. Now they will learn to find highest common factor and least common multiple using prime factorisation and long division method.

SLOs

2.1
i

Activity 1
10 min

Provide each pupil or each pair with a quiz card. Time the pupils and then swap the cards with other pupil or pair for peer checking. This activity saves time and is helpful for quick revision of prior concepts.

Quiz Card Sample:

1. The prime factors of 24 are _____
2. 5^3 = _____
3. Circle the number which is not a factor of 40.
   2 4 5 6 8 10
4. List all the prime numbers between 20 and 40.
5. Which number can evenly divide 81?

Assign classwork form the textbook.

2.1
i

Activity 2

20 min

Use two sets of counters, each of a different colour, for the two given numbers. Arrange the two sets of counters on either side of a demarcation line: for convenience, we may take the smaller number of counters on the left and the larger on the right. Arrange the counters on the left in a vertical line. Ask the children to justify this arrangement. The reason, as we know, is that HCF is always lesser than or equal to the greatest factor of the smaller number. Now arrange the ones on the right in as many rows as there are on the left. If you can arrange these in a rectangle, then the number of rows in the arrangement is the required HCF. If such an arrangement is not possible, change the arrangement on the left to the next possible rectangular arrangement, and then accordingly change the arrangement on the right as well. When both the sides are in a rectangular arrangement with the same number of rows, the number of rows is the HCF. For example, let us try to find the HCF of two numbers, 6 and 20.

In the first step, we arrange 6 counters in a vertical line to the left of the demarcation line (Line of Control!).

We now arrange the 20 other counters on the right. We find that we cannot arrange these in a rectangle (Fig. 1). So 6 is not the HCF of 6 and 20.

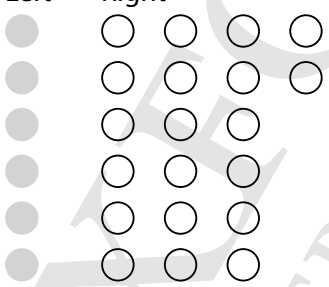


Fig. 1

We now change the arrangement on the left to three rows of two counters each.

Then we change the arrangement of the 20 counters.

Again we find that these do not form a rectangle (Fig. 2).

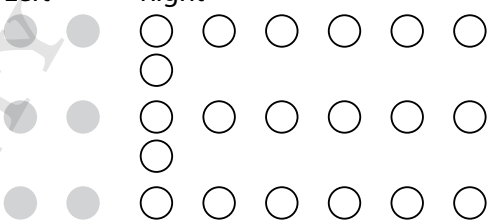


Fig. 2

The next step is to change the arrangement on the left yet again into two rows of three counters each.
Now we find that we can arrange the 20 counters in two rows.

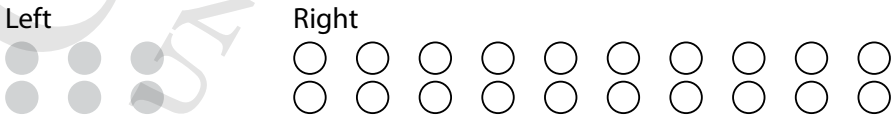


Fig. 3

Assign classwork form the textbook.

2.1
i

Activity 3

10 min

Collect and bring lots of bottle tops to the class. Give each pupil a specific number of bottle tops.

Ask pupils to arrange them in all possible rectangular arrays. The bottle tops should be arranged in rows. Single straight lines, both horizontal and vertical, are also acceptable. Each time a rectangle is formed, the number of rows is a factor of the given number. When it is not possible to arrange the given bottle tops in a rectangular form, shift bottle tops one by one from the end to form a new row.

For example, to find all possible factors of six, we arrange the bottle tops as shown in the following figures.

Fig. 1 shows six bottle tops in a single row. Therefore, 1 is a factor of 6.

Fig. 2 shows two rows with 3 tops in each row. A rectangle is formed therefore, 2 is a factor of 6.

Fig. 3 shows 3 rows with 2 tops in each row. Since a rectangle is formed with three rows, 3 is a factor of 6.

Fig. 4 shows no rectangle is formed with 4 tops in a column and 2 tops in a row, therefore, 4 is not a factor of 6.

Fig. 5 shows 2 bottle tops in the first row and 1 in each of the remaining rows. No rectangle is formed, therefore, 5 is not a factor of 6.

Fig. 6 The next possible rectangular arrangement is a vertical line with six rows. Therefore, 6 is a factor of 6.

Extended Work: We can also ask the pupils to check whether a given number is prime or not using this method. The reason is that no rectangular form other than a single horizontal or vertical line is possible for a prime number.

2.2
i

Activity 4
10 min

Divide the pupils into pairs. Give each pair two dice. Instruct each pupil to roll the pair of dice and form a 2-digit number. Ask the pupils to find all the factors for their numbers and write them down on a sheet of paper.

Next ask them to compare their factors and calculate the HCF of the two numbers. Let the pupils follow the same steps for more numbers.

The same activity can be used for LCM as well. In this case pupil will roll only on dice and first find 10 multiples of the number and then the common multiple and LCM of two or more numbers.

Activity 5
10 min

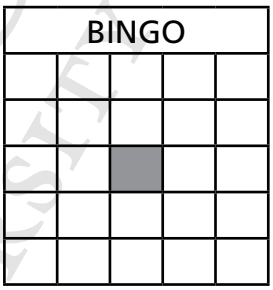
Give one blank bingo card to each pupil. Ask them to fill in their card with numbers from 1 to 25. Ensure they use a pen or marker so that numbers cannot be changed during the game. Make sure each child has filled in his/her card before you start the game.

Play the game by calling out pairs of numbers and instructing pupils to cross out the HCF of this pair. Make sure that the HCF of numbers you call out does not exceed 25. You might want to prepare the list of numbers beforehand so that you do not end up with the same HCF for multiple pairs.

Make sure that pupils note down the numbers and their HCF as you call them out so you can use it to cross-check the pupils' bingo cards when they are done.

Give the pupils time to calculate the HCF for each pair as you play the game.

The first pupil to cross out all four numbers in a row or column wins the game.



Activity 6
10 min

Write 3, 4, and 6 on board and ask the pupils to find the numbers which are divisible by all these numbers. (Hints: When we find the product of all three numbers i.e. $3 \times 4 \times 6 = 72$, it is clear that 72 is divisible by 3, 4, and 6 since 72 is the product of these numbers.) Ask the pupils, "Is 72 the smallest number that is divisible by 3, 4, and 6?" After collecting response from pupils, explain how 12 is the smallest number that is divisible by 3, 4, and 6 simultaneously. Hence, conclude that the smallest number that is divisible by all given numbers is called LCM or least common multiple. Introduce the two ways by which we can find the LCM of the given numbers i.e. prime factorisation method and division method by solving examples on the board. Later on, give them practice questions to solve and assess their understanding.

2.1
i
2.2
i

Activity 7
10 min

Provide a dice to every pupil in the class. You may also ask them to bring one from home. Instruct each pupil to roll the dice and to pair up and the first ten multiples for their numbers. Ask them to write the multiples down on a sheet of paper. Repeat the activity three times. Ask the pupil to compare and find the lowest common multiple of the three numbers. Let the pupils follow the same steps for more numbers.

Let's try it

Present pupils with questions to be solved individually. These questions should be based on real-life situations that require them to find the LCM and/or the HCF. Try to keep numbers 2-digit or less.

Assign classwork form the textbook.

Let's talk Math

Invite pupils to discuss the practical uses to these methods. HCF is used to find whether an event will repeat again and again. HCF is also used to divide two or more objects into equal points or split things into smaller equal sections. LCM is used to find whether two or more events will happen repeatedly at the same time. LCM is important to solve problems related to racetracks, traffic lights and load shedding etc. For example, if there is a race among three students on a circular track, and student A covers the track in 4 minutes, student B covers the track in 5 minutes and student C covers the track in 10 minutes, all starting from the same point, after what time will all three of them be at the starting point again? At the end of this discussion allow 5 minutes so that pupils may write a reflective paragraph about the unit.

Let's get practical

Ask pupils to use HCF or LCM to figure out how many times in 20 years their birthday will fall on a Saturday. They should assume the number of days between their birthdays are 365 days, unless they are born on a leap year, and days between Saturdays are 7.

Self Assessment

2.1 Highest Common Factor

2.2 Least Common Multiple

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. The prime factors of 195 are?
   a) 3 and 5
   b) 6 and 13
   c) 3, 5, and 13
   d) 15 and 13
2. If a number is even and divisible by 3, it is also a divisible of ____.
   a) 2
   b) 5
   c) 4
   d) 6
3. LCM of two prime numbers is _____.
   a) product of the numbers
   b) one of the two numbers
   c) sum of the numbers
   d) equal to the HCF of the numbers.

Unit 3

Fractions

3.1 Addition and Subtraction of Fractions

i. Add and subtract two or three fractions with different denominators.

3.2 Multiplication of Fractions

i. Multiply a fraction by a 1-digit numbers and demonstrate with the help of diagram.

ii. Multiply two or three fractions involving proper, improper fractions, and mixed numbers.

iii. Solve real-life situations involving multiplication of fractions.

3.3 Division of Fractions

i. Divide a fraction by another fraction involving proper, improper fraction, and mixed numbers.

ii. Solve real-life situations involving division of fractions.

Plan Ahead:

3.1 Addition and Subtraction of Fractions

3.2 Multiplication of Fractions

3.3 Division of Fractions

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

Before You Start:

Pupils are familiar with fractions but will need revision. If they start with simpler questions they should be able to solve them with little guidance.

Watch Out For:

While simplifying fractions students sometimes use two different factors of the same number for cancellation. When multiplying two fractions they cancel both numerators or both denominators by the same factor, instead of cancelling the numerator with the denominator. When dividing fractions, they find the reciprocal of the first fraction instead of the second fraction.

This Pairs with:

Math Lab 5, pages 25-28

Make Sure You Have:

Bowls Chits

A4 sheets

If They're Struggling:

Based on how much support your pupils need, use real-life examples and diagrams, like fraction discs or bars. Try to keep the class from seeing fractions as solely numerical and get them to visualise the quantity that each fraction represents. When your students begin to multiply with common fractions, it is essential that they understand exactly what is happening. Language, therefore, should be kept simple, and there should be no rush to impose 'rules' which may make little sense to students. 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

Pupils are aware of fractions according to their own understanding. They are aware of applying four operations on fractional numbers, ask them how they use fractions in their daily life.

SLO

3.1
i

Activity 1
10 min

Ask the class to pair up and pass around a bowl filled with chits. Each chit should have a fraction on it, using numbers with not more than 2-digits. Try to keep all the denominators of the fractions as different as possible to minimise overlap. Ask each pair to pick out three chits. After they all have their fractions, pick out three fractions for yourself. Write these fractions on the board and show the process of adding them together step by step making the denominator common. Once this is done, show them how to simplify the answer. After this is explained, return to the original three fractions. Ask pupils to help you so that they can be arranged biggest to smallest. Once they are arranged, subtract the in this order, and show pupils the process here as well. Now, ask each pair to do the exact same with their three fractions. Emphasise the importance of always making sure a fraction is simplified.

Assign 15 minutes of classwork from the textbook.

Activity 2
10 min

Before starting addition and subtraction of fractions, revise like and unlike fraction/ through this 5 minutes activity. Give each pupil an activity card to gauge their prior knowledge about fractions.

Sample activity card			
Draw a line to join the matching pairs of fractions.			
$1\frac{1}{3}$	$\frac{8}{5}$	$2\frac{2}{3}$	$\frac{6}{5}$
$2\frac{1}{3}$	$\frac{11}{5}$	$2\frac{1}{5}$	$\frac{8}{3}$
$1\frac{3}{5}$	$\frac{7}{3}$	$1\frac{1}{5}$	$\frac{4}{3}$

Once the pupils are confident in converting improper fractions into mix numbers and vice versa, next step is to find the lowest common denominator. For this 10 minutes, prepare index cards for each pupil. Write 20 different fractions on as many index cards, but most of these numbers should NOT be prime numbers. Mix up smaller numbers (within 1 and 20) with a few larger ones with a lot of factors. Divide the cards into 2 piles of 10 and give them to each pair. Tell the pupil to be alert and at the word "Go!" each player turns up one card in their pile and places it in the centre of the table.

The goal of the game is to calculate the lowest common denominator of both cards and say it aloud. The first player to call out the correct numbers wins the round. Repeat the above steps for subsequent rounds.

To add and subtract fractions with different denominators first recall how to add and subtract fractions with same denominators by writing questions on the board as shown in the given examples. Remind pupils to reduce their answers to the lowest terms. Examples:

Addition:

1. $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$

2. $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6}$ or $\frac{1}{2}$

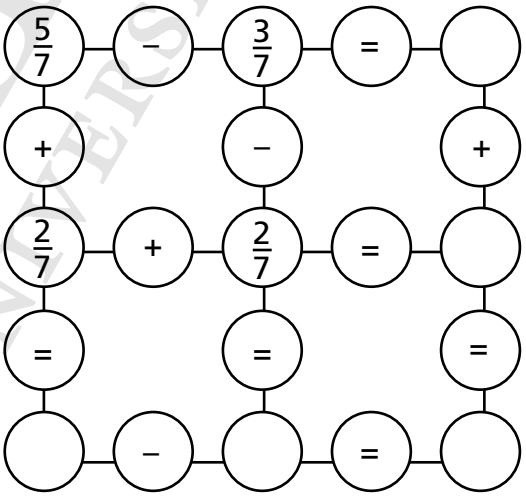
Subtraction:

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

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

Prepare a puzzle activity sheet and distribute to each pupil. Explain that they should solve the puzzle by adding or subtracting fractions across and down. When everyone is done with their work, discuss the answers as pupils check their work.

Fraction Puzzle



Same type of puzzle can be made for fractions with different denominators.

3.2
i

Activity 3
10 min

On the board, work through the following questions with pupils.
$\frac{2}{5} \times 10$ $\frac{6}{15} \times 50$ $\frac{4}{7} \times 77$

Instead of focusing on the math, draw fraction discs to show the fractions. The way to work out the answer is to multiply 10 by 2, the numerator, and then divide the answer by 5, the denominator. Your answer will be 4. You will notice now, that if you were to draw $\frac{4}{10}$ as a fraction disc, it would look identical to the fraction disc for $\frac{2}{5}$. This is how you can tell that this is the right answer. Go through the other two questions in this way, making use of diagrams like fraction discs and fraction bars to help pupils grasp the concept.

Assign 25 minutes of classwork from the textbook.

Let's Pause

Language is important at every stage of your discussion; when looking at the example: $\frac{3}{4} \times \frac{3}{5}$, emphasise that this multiplication asks us to find 'three-quarters of three-fifths', and draw a diagram on the board to illustrate the point. Multiplication with mixed numbers is the ideal moment for you to bring in the idea of cancelling, since numerators become large and unwieldy at this stage, and the purpose of cancelling—making multiplication simpler and quicker—is easily demonstrated.

3.2
ii

Activity 4
10 min

Make three bowls of chits. One of proper fractions, one of improper fractions, and one of mixed numbers. Place these in the front of the class and pick one chit out of each bowl. Write them on the board like so
$\frac{12}{7} \times 8$ $10 \times \frac{16}{3}$
Ask pupils if they have any idea how to carry out this multiplication. They are familiar with the idea of changing unlike fractions to like fractions and adding and subtracting them, but may not be sure about approaching the mixed number. Explain that a mixed number is simply another form of a fraction. An improper fraction has a bigger numerator than denominator, so it can be converted into a mixed number, and similarly, a mixed number can be converted into an improper fraction.
Show this with the fractions you are using. Write out your improper fraction, in this case, $\frac{16}{3}$ and explain that the closest multiple of three to sixteen is fifteen. Since 5 threes are 15, we can look at 15 in the case of this fraction as five wholes. Therefore $\frac{16}{3}$ can also be written as $5\frac{1}{3}$. We get the $\frac{1}{3}$ because 1 is what is remaining after we remove 15 from the numerator, and 3 because the denominator stays the same. Ask pupils now if they have any idea how to convert the mixed number into an improper fraction. Allow them to attempt it, but if they can not figure it out, explain, using $1\frac{5}{7}$ as an example, that we have to see this fraction as one whole, and five parts of seven. Draw two circles and divide them each into seven segments, colouring one completely, and only five segments in the other to create a diagram for this mixed number. Using the diagrams, one could simply count the total number of coloured segments, and knowing the denominator would remain the same, deduce that the answer is $\frac{12}{7}$. The mathematical way to do this is to multiply the denominator 7 by the whole number 1, and add the numerator 5 to the answer 7. This gives us the numerator, which is 12. Go over this a few times and allow pupils to ask questions. Once the concept is clear to them, come back to the original question that is.

$\frac{12}{7} \times 8 \quad 10 \times \frac{16}{3}$

Ask pupils to help you multiply this on the board. Then, ask them each to pick a chit out of each bowl and solve them as homework to work out the answer to the multiplication question they get. Tell them they must draw fraction discs for all three fractions, and the answer they get. Remind them to make sure the answer is simplified.

Let's Pause

Your success in teaching 'division by fraction' depends largely on the extent to which your students understand the concept and language of division. Return briefly to the beginner's language of division and put students through some very simple exercises just to remind them of exactly what they do when they divide. This division language is then applied to a simple problem involving a common fraction divisor: $1 \div \frac{1}{4}$. If you ask, 'how many quarters make a whole?', the answer will come back loud and clear!

3.3
i

Activity 5

10 min

After reminding pupils about the concept of reciprocating when dividing fractions, ask them to write out the fractions used for the previous activity. On the board, write down the fractions that you used as below:

$\frac{12}{7} \div \frac{8}{10} \div \frac{16}{3}$

Ask the class to follow along in their notebooks but using their own fractions. The division should go as follows:

$\frac{12}{7} \div \frac{16}{3}$

$\frac{12}{7} \times \frac{3}{16}$

$\frac{36}{112} = \frac{18}{56} = \frac{9}{28}$

Once every pupil has individually reached an answer, ask them to draw fraction discs for their answer. Ask them how dividing a fraction affects that coloured portion. Does the fraction get bigger or smaller? And is that the same as when you multiply it?

Assign 25 minutes of classwork from the textbook.

3.2
iii
3.3
ii

Activity 6

10 min

Ask pupils if they have ever used or seen anyone use fractions in their lives. If most of them answer no, it is probably because they do not realise. Point out that every time they are given a slice of cake, or pizza, that is a real-life application of fractions. Even deciding how much time they want to spend on a certain activity involves planning a fraction of a day. Go around the class and ask pupils to each discuss a part of their lives where they think fractions are or could be used. Once they have presented a real-life situation, ask what number operation they think they would need when handling this situation, and why. Ask them to help you form a statement that you can write out on the board. Once it is written down, the other pupils will have to help solve it.

Let's talk Math

In the last activity, each pupil found fractions in their own lives, so now ask them to discuss why it might be easier to navigate these things with a more comprehensive idea of what fractions are, as opposed to thinking of things as a quarter, or a half, which are concepts that everyone is familiar with. Lead them to the conclusion that fractions are ideal for situations that call for precision. Perhaps when planning your day, it is not necessary to use fractions (although you could) because most days don't need to be planned in that way, and people find it easier to say a number of minutes than to create a fraction for everything, but in situations where specification is key, proper use of fractions is helpful. Fractions are used in baking to tell what quantity of an ingredient to use, in telling time; each minute is a fraction of the hour., and on a doctor's prescription to tell how much of a medicine should be taken. Give pupils 5 minutes to write a reflective essay about what they learnt and understood while studying this unit.

Let's get practical

Present pupils with this ingredient list for a 2 pounds vanilla cake which can serve 12 people.

Recipe:

All purpose flour	$\frac{3}{4}$ cups
Baking soda	2 teaspoons
Salt	$\frac{1}{4}$ teaspoons
Softened butter	$\frac{3}{4}$ cup
Regular sugar	$\frac{3}{4}$ cup
Milk	$\frac{2}{3}$ cup
Eggs	2
Vanilla essence	$\frac{1}{2}$ teaspoon

Rewrite the list of ingredient which will be needed to make one pound cake?

How many people will it serve? work out which number operation will be necessary?

Self Assessment

3.1 Addition and Subtraction of Fractions

3.2 Multiplication of Fractions

3.3 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. Change into mixed fraction.

   Write $\frac{51}{16}$ on the board)

   a) $3\frac{3}{16}$

   b) $4\frac{3}{16}$

   c) $3\frac{4}{16}$

   d) $4\frac{4}{16}$

2. Add the fractions: $\frac{4}{11} + \frac{3}{22}$.

   a) $\frac{7}{11}$

   b) $\frac{7}{22}$

   c) $\frac{1}{2}$

   d) $\frac{22}{11}$

3. To get the product 1, what will be multiplied by $\frac{4}{5}$?

   a) $\frac{4}{5}$

   b) $\frac{5}{4}$

   c) $\frac{1}{1}$

   d) 0

Unit 4

Decimal Numbers and Percentages

4.1 Decimal Numbers

i. Compare numbers up to 3-digits with 2 decimal places using signs <, >, or =.

ii. Arrange numbers up to 3-digit numbers with 2 decimal places in ascending and descending order.

iii. Add and subtract 4-digit numbers up to 3-decimal places.

iv. Multiply a 3-digit number up to 2 decimal places by 10, 100, and 1000.

v. Multiply a 3-digit number up to 2 decimal places by a whole number up to 2-digit.

vi. Multiply a 3-digit number up to 2 decimal places by a 3-digit number up to 2 decimal places.

vii. Divide a 3-digit number up to 2 decimal places by 10, 100, and 1000

ix. Divide a 3-digit number up to 2 decimal places by a 2-digit number up to 1 decimal place.

x. Convert fractions to decimals using division.

xi. Solve real life situations involving division of 3-digit numbers up to 2 decimal places.

4.2 Estimation

i. Round off a 4-digit number up to 3-decimal places to the nearest tenth or hundredth.

ii. Estimate sum or difference of the numbers (up to 4 digits).

4.3 Percentages

i. Recognise percentage as a special kind of fraction.

iii. Solve real life situations involving percentages.

Plan Ahead:

4.1 Decimal Numbers

4.2 Estimation

4.3 Percentages

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

Before You Start:

Pupils have already learnt about decimals in previous year. They learnt to express decimal numbers to fractions and fractions to decimal numbers and applied basic operations on decimal numbers. They also learnt to estimate decimal numbers to whole numbers. Now, they will perform four operations on decimals with greater number of decimal places. They will learn to convert fractions into decimals using division. They know how to round off the decimal numbers to the nearest whole numbers, now they will round off numbers with 3 decimal places to the nearest tenth or hundredth.

Percentages will be a new topic for them. Tell them the importance and uses of this topic in real-life.

Watch Out For:

Students tend to make errors in placing decimal points on its exact place. often carry out addition and subtraction of percentages, without finding its actual value. They can not recall percentage formula exactly.

This Pairs with:

Math Lab 5, pages 29-33, 36

Make Sure You Have:

100 square grid sheet

Colour pencils

Paper chits with addition and subtraction sums

A basket

If They're Struggling:

Conversion of fractions may be harder for the pupils. They might get confused when percentages are in fractions or decimals. When you see the confusion bar, take note of how many pupils fall under each level. If the 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 to the next activity.

Let's Begin

Recall the concept of addition and subtraction of decimal numbers as they have done in previous class.

Introduce the symbol of %. Tell them that percentage is a part out of 100, so 40% means $\frac{40}{100} = 0.4$ percentages can be converted to fractions or decimals and vice versa.

Also, have a detailed discussion about estimation and rounding off decimal numbers. Tell them that we follow the same rule for rounding off decimal numbers as we do for whole numbers.

SLO

4.1

iii

Activity 1

5 min

Provide each pupil with a magic number puzzle as shown in the given sample. Let them figure out on their own how to solve the puzzle.

Ask them to solve the magic number puzzle below, in which each row, column, and diagonal line must add up to 5.5.

2.4		
1.2	2.7	

Activity 2

10 min

Make decimal activity sheets as shown in sample. Write as many sums as you want.

Distribute one sheet to each pair. Tell them that one child will round off the given decimal numbers and give an estimated answer. The second one will calculate the exact answer and check whether the estimate is correct or not. Then they switch the task.

#	Questions	Estimation	Original Answer
1	0.75 + 1.23	1 + 1.23 = 2.23	1.98
2	99.8 – 65.7	100 – 68 = 32	34.1
3	43.89 + 0. 66	44 + 1 = 45	44.55
4	21. 03 – 15.44	21 – 15 = 6	5.56

Let's try it

Ask pupil to solve the given word problem. I had Rs 54.93. I earned Rs 340.25. Then I spent Rs 246.79. How much is left with me now?

4.3

ii

Activity 3

10 min

Provide the following activity sheet to each pupil to solve individually first and then get it peer checked.

Percentage	Fraction	Decimal
50%		
	$\frac{3}{4}$	
		8.5
20%		

Activity 4

15 min

Ask pupils to work in pairs. Prepare and distribute Number cards (1 to 9) to each pair. Calculate percentage of the given number Ask them to Shuffle the card and place then face down in the centre of the table. Then one player must turn over a card. Explain that the players must add zero to the digit to calculate the percentage. For example, if they draw a 9, they need to calculate 90%. Now, invite the second player to roll the dice.

Next, the players must quickly add up the total of the 2 dice and calculate the appropriate percentage. For instance, if the total of the dice is 8, they must calculate 80% of 8.

The player who arrives at the correct answer first wins the round.

4.3 iii	**Activity 5** 10 min	Prepare worksheets with questions involving percentages in real-life. Ask the pupils to research about their favourite cricketer and bring information related to his number of matches played, runs scored, wickets taken in different test and one day matches. Then ask them to express their findings in terms of percentages. For example: Samiullah took 364 wickets in test matches and 182 wickets in other matches, overall in his career. The percentage of his wickets taken in the test matches is: 364/544 = × 100 = 66.91% or 67% And that of his wickets taken in others is: = 100 – 67 = 33% Example: Sara gets a monthly pocket money of Rs 2000. She keeps half of it for her daily expenses and decides to go shopping with the rest. She liked a dress on a 35% sale, originally worth Rs 1500. Can Sara afford the dress on sale?

Let's try it

Ask pupils to solve some realistic questions that involve percentages.

Here are some examples of questions given below.

- In a class of 30 students, 70% are present on a particular day. Find the number of students absent in the class that day?
- Ashir covered 35% of his journey in the morning. If he had to travel 1500 km, which percentage of the journey is left?

Assign 25 minutes of classwork from the textbook.

Let's talk Math

Decimal are a way of representing numbers. Every fraction can be represented as a decimal, but not always every decimal is a fraction. Decimals are used in a variety of range in daily life or real world situations to express money, mass, height, and capacity of object. Decimals are used in measuring different physical and chemical quantities. They can also be represented on number line. The decimal value for $\frac{1}{2}$ is 0.5, for quarter is 0.25 and for three quarters is 0.75. Ask the students where they have observed the usage of decimals as well as percentages and how it helps them conduct their daily life affairs. Allow the student 5 minutes to write a reflective paragraph.

Let's get practical

Provide a digital mass balance to the class. Allow each student to weigh three small objects they bring from home. Ask them to write the mass of each object to two decimal places. Once all students are done weighing their objects, ask them to estimate the sum of their weighed objects and then find the actual sum.

Self Assessment

4.1 Decimal Numbers
4.2 Estimation
4.3 Percentages

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. 0.06×1000 is?
   a) 6.00
   b) 60.00
   c) 600.00
   d) 6000.00
2. Estimate the sum of 3689 and 2508.
   a) 6197
   b) 6180
   c) 6200
   d) 5000
3. Percentage means:
   a) per thousand
   b) per hundred
   c) per ten
   d) per hundredth

Unit 5

Distance and Time

5.1 Distance

i. Convert measures given in
   - kilometers to meters and vice versa
   - meters to centimeters and vice versa
   - Centimeters to millimeters and vice versa.

ii. Solve real-life situations involving conversion, addition and subtraction of measures of distance.

5.2 Time

i. Convert
   - hours to minutes and vice versa
   - minutes to seconds and vice versa.

ii. Convert years to months and vice versa, months to days and vice versa, weeks to days and vice versa.

iii. Add and subtract intervals of time in hours and minutes with carrying and borrowing.

iv. Solve real-life situations involving conversion, addition and subtraction of intervals of time.

Plan Ahead:

5.1 Distance

5.2 Time

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

Before You Start:

Students have already worked with units of length and time in their previous class. They are well aware of addition, subtraction and conversion of units of length and this will lead them to add and subtract measure of distance. Furthermore, the knowledge about conversion of units of time will help them to add, subtract, and convert years to months, months to weeks, weeks to days, and vice versa.

Watch Out For:

A common mistake while converting one unit to the other, students use the wrong conversion unit and the wrong operation. Students forget that we 'multiply' when converting a bigger unit to a smaller unit (e.g. 5 m = 5 x 100 = 500 cm). On the other hand we 'divide' when converting a smaller unit to a bigger units (e.g. 200 cm = 200 ÷ 100 = 2 m)

This Pairs with:

Math Lab 5, pages 39, 40

Make Sure You Have:

Chart paper Scissors Colour pencils

If They're Struggling:

The students when converting might struggle a bit. Therefore, keep revising the conversion tables and find ways for the students to remember it easily. 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

Kilo means 1000, centi means 100, and milli means 1/1000. When a bigger unit is converted to a smaller unit: we multiply with the conversion factor. When a smaller unit is to be converted to a bigger unit; we divide with the conversion factor. 1 km = 1000 m 1 m = 100 cm, and 1 cm = 10 mm.

When hours are converted to minutes multiply by 60. When minutes are converted to hours divide by 60. When minutes are converted to seconds multiply by 60. When seconds are converted to minutes divide by 60. One hour = 60 minutes, half an hour = 30 minutes, quarter of an hour = 15 minutes and three quarters of an hour = 45 minutes. Midnight to noon makes 12 hours. There are 24 hours in a day, 7 days in a week, 52 weeks in a year and 12 months in a year. Two common calendars are solar and lunar calendars. April, June, September and November have 30 days, the rest of the months have 31 days except February which has 28 days, and 29 in each leap year.

SLO

5.1

i

ii

Activity 1

10 min

Having given pupils a breakdown of all the conversions, give them some real-life examples of distance and ask them to help you do some conversion on the board. Here are some examples of questions you can use.

Jawad is going to distribute Eid sweets in his neighborhood. He walks 20 metres to the first house. How many centimetres did he walk?

He walks 100 metres to the next house. How many centimetres did he walk? How many millimetres did he walk?

He walks 4500 centimetres to the next house. How many metres did he walk?

He can't make it to the next house because it is 2000 metres away. How many kilometres is it?

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

SLO		
	Activity 2 15 min	Take the pupils to the play area. Divide them in groups. At random distance, mark 4 to 5 points A, B, C, and D on the ground. Provide measuring tape to each group and ask them to measure and note the distance between the marked points. Bring the pupils back to class, provide them with A4 sheets and give them two tasks. One to convert each length into centimetres and millimetres, and second to write real-life sum involving the measurements they already have. Make sure that each pupil makes an addition and subtraction sum.
	Activity 3 10 min	Similarly, ask pupil to research at home and find distance between the city they are residing and any three cities of their choice, or the distance of their native country and any three countries of their choice. Once they have the information, let them work in pairs. Pupils must share their findings with their peer. Then prepare sums involving conversion, addition, and subtraction of units of distance, swap their sheets with their partner who will solve these questions. Example: Javeria lives in Dubai. In July, she flew to Karachi to spend vacations with her family. Her cousin, Tina, lives in Lahore. They both decided to visit their grand parents who live in Islamabad. Calculate the total distance they both travelled for this trip.
		Assign classwork from the textbook to allow pupils to practice these skills.
5.2 i	**Activity 4** 15 min	Make groups of 4 to 6 pupils. Give each group chart paper and child-friendly scissors. Ask them to cut their chart paper in a circle or any shape that they choose (or they can leave it in it is original shape). Now ask them to draw lines on the shape dividing it into ten equal parts. Tell pupils that they will have to do this before they cut out their shape so that they do not choose a complicated shape. Once the paper is divided into ten parts, ask them to divide each of the ten parts into six, and colour the paper in. Before they colour, ask them to make sure the dividing lines stay visible. When they are done, explain that each one-sixtieth of the chart paper is as a minute of an hour and also as a second of a minute. Link this to fraction discs or bars. Ask pupils to put their chart papers up around the class, and use them as a visual aid when doing classwork.

5.2
iii
iv

Activity 5
10 min

Draw this activity sheet on the board to be copied out, or make a worksheet of it. Ask pupils to fill them out in groups of three.

1. Yousuf decides to start practising for his Maths exam on Friday at 3:15 p.m. which is due after the weekend. Day: Friday Time: 3:15 p.m.	2. 5 hours later he gets bored and decides to take a break for dinner. Day: Time:	3. 15 hours later he picks up his science book and starts reading the new topic his teacher gave him for homework. Day: Time:
After 2 hours he decides to take a break for lunch. Day: Time:	Half an hour later he takes a nap for 45 minutes. Day: Time:	Then he goes for a bicycle ride with his friends for an hour. What time is it now? Day: Time:

Ask them to peer review at the end.

Let's try it

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

- Javeria and Tina drove to their aunt's house. Javeria drove 9 ¾ kilometres. Tina drove 3500 meters before they arrived. How many kilometres had they driven in all?
- Mira flew 1234 kilometres to Lahore to visit her uncle. After picking up Mira, her uncle drove 20 kilometres to his house from the airport. How many kilometres had Mira travelled in all?
- Nobody wanted to ride the 22 kilometres back to town after the family reunion. So relatives rode 10 kilometres to the nearest hotel. How many kilometres did the family ride in all?

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

Let's talk Math

Distance is a numeral measurement which can be used to tell how far one object is from other. It is used for jogging on a path, travelling, races, bicycle riding, distance between the earth and planets etc. We need time to calculate the duration of any work done. It is also needed to find the rate of speed of vehicles. Time is used everywhere while travelling, working and cooking. Ask the pupil what if there no no multiple units for measurement, but only one unit. For example, only km for length, kg for mass, l for capacity, and hours for time. How would our lives be different then? Will we have difficult measuring the distance, mass, capacity or time? Allow the students 5 minutes to write a reflective essay.

Let's get Practical

While travelling by road, pupils must have seen the sign boards telling the distance from one city to other city. Let's consider the following problem. A train travels 120 km/hr, How far will it travel in 30 minutes. Ask the pupils to find the answer without calculating on papers. Guide them that 30 minutes is half of an hour, so the train will travel half of the distance.

Self Assessment

5.1 Distance

5.2 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. Convert 893.2 m into km.
   a) 0.8932 km
   b) 8932 km
   c) 8.932 km
   d) 89.32 km
2. Convert 4 hours and 10 minutes into minutes.
   a) 50 minutes
   b) 500 minutes
   c) 250 minutes
   d) 410 minutes
3. Convert 200 minutes into hours.
   a) 2 hours 60 minutes
   b) 3 hours 20 minutes
   c) 4 hours
   d) 2 hours 20 minutes

Unit 6

Unitary Method

6.1 Unitary Method

i. Calculate the value of many objects of the same kind when the value of one of these objects is given.

ii. Calculate the value of one object of the same kind when value of many of these objects are given.

iii. Calculate the value of many objects of the same kind when the value of some of these is given.

Plan Ahead:

6.1 Unitary Method

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

Before You Start:

Students are familiar with the four operations. Here, they will learn to use appropriate operations to find the value of one or more than one object. They will deal with larger amounts using measurements of mass and capacity together in a bill. They will be able to solve real-life problems involving unitary methods.

Watch Out For:

Students only tend to make mistakes when they are unable to understand the language of the word problems, leading them to performing incorrect operations.

This Pairs with:

Math Lab 5, pages 41, 42

Make Sure You Have:

Books Recipe Cards

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

Explain that unitary method is a process by which we find the value of a single unit using the values of multiple units and the value of multiple units using the value of single unit. Unitary method is used in solving variation problem in our daily life. For example to find the number of people required to completes a given task.

SLO

6.1 i

Activity 1

15 min

Collect at least ten copies of the same book. This can be one of the class textbooks, but it is not necessary. Place one book in front of the class and ask pupils to find out how many pages there are. Once they have checked, write the number on the board, and then place four books on top of the first one. Suppose the book has 100 pages. Ask pupils how many pages there are now in the pile. Since there are five books, the class should be able to deduce that there are 500 pages. Explain that this calculation that they have just made involved, or at least should have involved, the unitary method. Write number of pages : number of books on the board. So when you multiply the number of books by 5, you also multiply the number of pages. Now add three more books to the pile. And write 8 under number of books. Ask a pupil to come to the board to explain to their peers how to calculate how many pages 8 books would have.

6.1 ii

Activity 2

10 min

Prepare an activity sheet as shown. Distribute the activity sheet to each pupil to work individually.

Activity Sheet
Task 1: 1. 40 copies in 8 minutes = 40 ÷ 8 = 5 copies per minute 2. 30 pints of juice in 5 containers = _____÷ _____ = _____.pints per container 3. 5 tanks with 265 fish = _____÷ _____ = _____ fish per tank 4. 4 trays with 48 ice cubes = _____÷ _____ = _____ ice cubes per tray 5. 4 boxes can hold 40 books = _____÷ _____ = _____ books per box 6. 5 game controllers had 25 buttons = _____÷_____ = _____ buttons per
Task 2: Next ask pupils to make their own list of items of their choice along with their price. Swap the sheet with their peer, who will solve it. Peer check answers.

Let's try it

Provide a list of 5 grocery items to each group of students. State the unit price of each item and ask the students to calculate the amount needed to buy these grocery items. Ask each student of the group to calculate the price of each item, if pupils were to buy one for each person in their household. Here is an example below:

Price List	Grocery List
cost of 1 egg Rs 8	1 dozen eggs
cost of 1 banana Rs 10	2 dozen bananas
cost of 1 kg sugar Rs 80	2 kg sugar
cost of 1 litre of milk Rs 90	5 liters of milk
cost of 1 kg of flour Rs 45	3 kgs of flour

Ask them to use unitary method to find the price of unit item.

6.1
iii

Activity 3
10 min

Divide the class into pairs. Explain how to calculate and find of different quantities, using unitary method. Each pair should be given a recipe card and a worksheet related to the recipe card. Responses are to be shared with the rest of the class.

RECIPE CARD

TOMATO SOUP

To make tomato soup for 4 people, I need:	To make tomato soup for 8 people, I need:
6 tomatoes	_____ tomatoes
1 potato	_____ potato
1 onion	_____onion
1 carrot	_____ carrot
2 table spoon of olive oil	_____ table spoon of olive oil
2 cups of vegetable stock	_____ cups of vegetable stock
4 pieces of bread	_____ pieces of bread

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

Let's talk Math

The unitary method is important when it comes to cooking and baking as recipes require specific ratios of different ingredients. When we go shopping we buy things in bulk. Using the unitary method unable us to find the price of one unit or any quantity we require. Ask pupils why the unitary method might be the best for calculating instead of just using fractions or simply numbers. Lead them to the conclusion that unitary method is one that makes calculations easier when working with several number of items, and also lets us work with two numbers at a time. At the end of this discussion give them 5 minutes to write a reflective paragraph.

Let's get Practical

Set up a small market in the classroom and assign students different roles, such as shopkeeper and customer (tell students before conducting the lesson to bring empty boxes of the below mentioned items or any other, so that they can easily set up the market).

The class will be divided into groups. One group will be playing the role of the shopkeepers, others will be buyers. Students prepare the bill based on the shopping lists for a number of problems given to them. Give them the following important hints;

- The value of many quantities is calculated by multiplying the value of one quantity by the number of quantities.
- The value of one quantities calculated by dividing the value of many quantities by the number quantities.

Self Assessment

6.1 Unitary Method

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. In unitary method, we need to find the cost of _____ item first.
   a) few
   b) many
   c) two
   d) one
2. If 5 pairs of shoes cost Rs 3000, find the price of 12 pair of shoes.
   a) Rs 6000
   b) Rs 5000
   c) Rs 7200
   d) Rs 6500
3. If 36 men complete a job in 25 days, how many days will it take for 15 men to complete the job?
   a) 7 days
   b) 22 days
   c) 50 days
   d) 60 days

Unit 7

Geometry

7.1 Angles

i. Recognise straight and reflex angle.
ii. Recognise the standard units for measuring angles is 1˚, which is defined as 1/360 of a complete revolution.
iii. Identify, describe and estimate the size of angles
iv Classify them as acute, right or obtuse.
v. Compare angles with right angles and recognize that a straight line is equivalent to two right angles.
vi. Use protractor and ruler to construct:
- a right angle
- a straight angle
- reflex angles of different measures.

vii. Describe adjacent, complementary, and supplementary angles.

7.2 Triangles

i. Identify and describe triangles with respect to their angles. (Acute angled triangle, Obtuse angled triangle and right-angled triangles).
ii. Use protractor and ruler to construct a triangle when
- two angles and their included side is given.
- two sides and included angle is given.

ii. Measure the lengths of the remaining two sides and one angle of the triangle.

7.3 Quadrilaterals

i. Recognise the kinds of quadrilateral (square, rectangle, parallelogram, rhombus, trapezium, and kite).
ii. Identify and describe properties of quadrilaterals including square, rectangle, parallelogram, rhombus, trapezium, and kite, and classify those using parallel sides, equal sides and equal angles.
iii. Use protractor and ruler to construct square and rectangle when lengths of sides are given.

7.4 Symmetry

i. Recognise different types of symmetry (reflective and Rotational) in 2-D figures.
ii. Identify lines of symmetry for given 2-D figures.
iii. Find point of rotation and order of rotational symmetry of given 2-D figures.

7.5 Three Dimensional (3-D) Objects

i. Identify cubes, cuboids and pyramids from their nets.
ii. Describe and make 3- D objects (cubes, cuboids, cylinder, cone, sphere, pyramids).

Plan Ahead:

7.1 Angles
7.2 Triangles
7.3 Quadrilaterals
7.4 Symmetry
7.5 Three Dimensional Objects

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

Before You Start:

Students have learnt to draw vertical and horizontal lines, they also know that angles are measured and named according to their sizes (acute, right, obtuse, straight, and reflex angles) with a protractor and according to their positions (adjacent, complementary, and supplementary). In this unit, students will identify different triangles according to their sides and angles, and the hypotenuse of a right-angled triangle. Students will also identify and name different types of quadrilaterals. They will now use compasses and rulers to construct triangles.

Students are familiar with 3D and 2D 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 a confused with names. At this level their knowledge of shapes takes a slightly more formal shape.

Watch Out For:

Students enjoy the topic of geometry at this level and make very few mistakes. They only sometimes are unable to identify or name angles and triangles according to their sides or angles.
Make sure to give plenty of time for pupils to get used to names, especially when introducing the 3D shapes at the end of the unit.

This Pairs with:

Math Lab 5, pages 43-50, 52-61.

Make Sure You Have:

Foam sheets	Rulers	Scissor
A4 Sheets	Markers	Playdough

If They're Struggling:

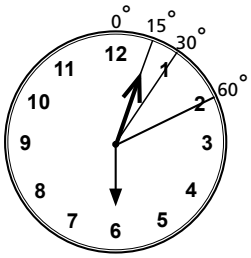
When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at level 4 or above, move on to the next activity.

Let's Begin

Ask students to bring pictures of different items or objects (easily available at home), on which they can identify and make angles. For example, a fork in a glass or a table and chair, clock, flag, or any geometrical shape. Ask them to identify the type of angle. (This task can be given to students as homework also). They may bring a picture of a clock with angles marked as shown. Ask the students to share their findings with the rest of the class and display their work in the class.

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 the purpose of 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.

SLOs		
7.1 iv	**Activity 1** 10 min	Ask pupils to bring pictures of different items or objects (easily available at home), on which they can identify and make angles. For example, a fork in a glass or a table and chain, clock, flag, or any geometrical shape. Ask them to identify the type of angle. (This task can be given to pupils as homework also). They may bring a picture of a clock with angles marked as shown. Ask the pupils to share their findings with the rest of the class and display their work in the class.



Let's try it

Distribute half sheet of A4 paper to each pupil. Ask them to write their name in capital letters using straight lines. Ask them to mark angles (as many as possible) on each alphabet of their name. Then name each angle according to its size.

7.2 i ii		Assign 15 minutes of classwork from the textbook so that pupils can revise these concepts Assign 15 minutes of homework from your textbook
	Activity 2 10 min	Explain the properties of different triangles before starting this activity. Let pupils work in pairs. Provide each pupil with an A4 sheet. Ask them to draw triangles of different sizes and different angles. Once they have drawn their triangles, tell them to swap their sheet with their partner, who will identify and classify triangles according to sides and angles. Ask pupils to name each one of them and give a reason for it.

Let's try it

Classify the given triangles according to their angles:

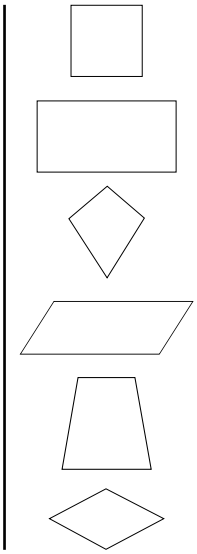
Acute-angled triangle, Obtuse-angled triangle, Right-angled triangle

a) 40°, 50°, 90°

b) 25°, 48°, 107°

c) 60°, 50°, 70°

7.3 i ii		Assign 15 minutes of classwork from the textbook so that pupils can revise these concepts Assign 15 minutes of homework from your textbook
	Activity 3 10 min	Explain the properties of different quadrilaterals before starting this activity. Let pupils work in pairs. Provide each pupil with an A4 sheet. Ask them to draw different quadrilaterals. Once they have drawn their quadrilaterals, tell them to swap their sheet with their partner, who will identify and classify quadrilaterals according to their properties. Ask pupils to name each one of them and give a reason for it. Sample worksheet is shown below.



_____ Reason: _____

_____ Reason: _____

_____ Reason: _____

_____ Reason: _____

_____ Reason: _____

_____ Reason: _____

Let's try it

Distribute two cut-outs of different quadrilaterals to each pupil. Ask them to write the properties of the shapes on the cut-outs with respect to the sides and angles and hand it over to the teacher.

Assign 15 minutes of classwork from the textbook so that pupils can revise these concepts

Assign 15 minutes of homework from your textbook

7.4
i
iii

Activity 4
15 min

This activity needs pre-planning. Make cut-outs of simple geometrical shapes from chart paper, and activity sheets (as shown in sample) with as many shapes as you want.

Name of the shape	Has reflective symmetry? Write YES or NO	Has rotational symmetry? Write YES or NO	Order of rotational symmetry

Bring these cut-outs, tracing paper sheet, and paper plates in the class for the activity. Let pupil's work in pairs. Distribute three or four cut-outs, tracing paper, paper plates and one activity sheet to each child. Tell them to trace the shape using the tracing paper, place it on the shape and then rotate it to find the order of the rotational symmetry.

Assign 15 minutes of classwork from the textbook so that pupils can revise these concepts

Assign 15 minutes of homework from your textbook

Let's talk Math

Discuss how every aspect of our lives has geometry or a part of geometry in it. Talk about how we are surrounded by different lines, angles, and shapes. Ask the students to point our places where different 3-D shapes, lines, and angles commonly found. Allow the students 5 minutes to write a reflective essay about how their understanding of geometry changed this year as compared to previous years.

Moving further, ask the students to observe symmetrical objects. On an A4 sheet, ask the students to draw the symmetrical object and find the total lines of symmetry. Also conclude if the object has reflective symmetry or rotational symmetry.

Let's get Practical

Take the students out in the playground and allow them to observe geometry in the environment. Ask them to point out the use of angles and once they do, ask them which kind of angle it is. They may also observe curved and straight lines all around them.

Self Assessment

7.1 Angles

7.2 Triangles

7.3 Quadrilaterals

7.4 Symmetry

7.5 Three Dimensional Objects

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

Multiple Choice Questions

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

1. An angle less than 90° is called?
   a) Acute angle
   b) Obtuse angle
   c) Right angle
   d) Reflex angle
2. Two angles that give a sum of 180° are called?
   a) Adjacent angles
   b) Complementary angles
   c) Supplementary angles
   d) Right angles
3. Triangles that have all three equal sides are called?
   a) Right angled triangle
   b) Equilateral triangle
   c) Isosceles triangle
   d) Scalene triangle

Unit 8

Perimeter and Area

8.1. Perimeter and Area

i. Differentiate between perimeter and area of a square and rectangular region.
ii. Identify the units for measurement of perimeter and area.
iii. Find and apply formulas to find perimeter and area of a square and rectangular region.
iv. Solve real-life situations involving perimeter and area of square and rectangular regions.

Plan Ahead:

8.1 Area and Perimeter

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

Before You Start:

Student have learnt to find perimeter and area of 2-D shapes on a square grid. They also know the units used for area and perimeter. Now they with learn to find area and perimeter of a square and rectangular to real-life situation.

Watch Out For:

Children make mistakes in choosing correct formula for area and perimeter. They need to understand why and when a particular formula has to be applied.

This Pairs with:

Math Lab 5, pages 62, 63

Make Sure You Have:

Bowl	Chits
Grid paper	Chart paper

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

Provide each student with cut-outs of square and rectangular shapes. Ask them to write the name of the shape on each cut-out. Paste cut-outs of rectangle and square on the board. Make them understand the difference between length and breadth. Measure the length and breadth using a ruler introduce the formula and find the area and perimeter of the two shapes in front of them. Ask random questions to identify the sides of the shapes.s

SLO

8.1

iii

Activity 1

20 min

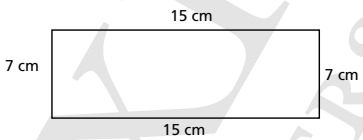
Take the pupils in the play area. Tell them to work in pairs and assign an alphabet for example, A, B, C, ... to each pair. Provide chalk, measuring tape or metre ruler to them. Ask each pair to draw a square and a rectangle of any measurement (preferably in whole numbers) on the ground using the resources provided and write the assigned alphabet in the centre of the figure drawn. Once all pupils have drawn the figures, then ask them to move around and start finding the perimeters and areas of the squares and rectangles drawn by their peers. Remind them to write the correct alphabet of the figure whose perimeter and area they have found. Bring the pupils back to class. Now ask them to swap their answer sheets with their peers. Let one pupil call out the answer of perimeter and area of figure A and ask the others to check whether their answer is correct or not. Repeat the process till answers of all figures are checked.

Activity 2

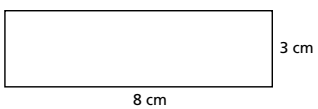
20 min

Draw the following figures on the board, one by one, and ask pupils to come to the front of the class to help you find the area or perimeter. Try not to use the same pupils for both so that more children can have a turn. Explain that area is finding how much space a shape has internally, and perimeter is more about the borders.

1. What is the length and breadth of each side?

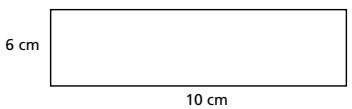


2. What is the perimeter?



3. What is the area?

4. What is the area?



At the end of this activity, Ask them all to draw their own square in their notebooks, and assign measurements. Then swap work with a partner and proceed to find the dimensions of each other's squares. End this activity with a class discussion. Ask pupils to put the difference in between area and perimeter into their own words.

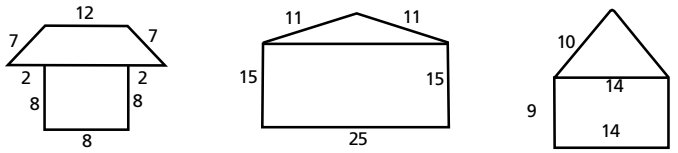
8.1
iii

Activity 3

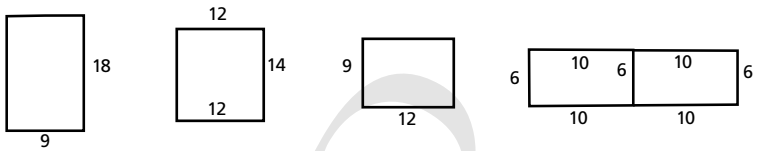
20 min

Having explained area and perimeter to the class, as well as the methods for finding them, draw the following figures on the board. Divide the class into groups of five, and ask them to see which group can find the area and perimeter of the following.

Find the perimeter.



Find the area.



Point out how the measurements of the shapes have no units. Remind pupils that if there was a unit, they would have to mention it in their answers as well.

8.1
iv

Activity 4

20 min

Hand out chart paper and ask pupils to design their dream house. Remind them to make a rough sketch in their notebooks before using the chart paper. Tell them that there must only be straight lines, and they must only make shapes that are square or rectangular. They may assign their own measurements but will have to think realistically about what units to use. Once they are done, put the chart papers up around the class. Using these as an example, start a class discussion about how, even if it seems a shape is not taking up so much space, it can take up a large area. At random, choose chart papers and start to solve them on the board. Ask pupils to think about the formulas that are used to find area and perimeter. Ask them what rules they have noticed when working with area and perimeter. Spend about fifteen minutes using the chart papers to set an example, but as you do so, collect rules and ideas about the unit from the pupils and write them on the board. Make sure that they copy it down before the activity ends.

Let's try it

Write the following questions on the board.

Find the perimeter and area of the following shapes using the formula.

1) A square with each side 15 cm

2) A rectangular lawn with length of 85 m and breadth of 10 m

Let's talk Math

Geometry helps in the field of medicine e.g. X-ray and ultrasound, in the accurate calculation of physical distances. In the field of astronomy to map the distance between planets and stars, with in computer aided designs, it entails lines, curves, and angles, and in designing buildings, bridges, and furniture, patterns, and geometrical designs.

Let's get practical

Ask pupils to make groups of up to 5. Each group may choose a room in the school, and using what they have learnt in this unit, they must collect data, like the dimensions of the room, and use it to calculate the area and perimeter.

Self Assessment

8.1 Perimeter and Area

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. The perimeter of a square of side 'l' is measured by?
   a) $l + l$
   b) $4l$
   c) l^2
   d) $4l^2$
2. The enclosed space within the shape of an object is it _____?
   a) area
   b) perimeter
   c) mass
   d) volume
3. If the perimeter of a square s 16cm. its area is?
   a) 8 cm^2
   b) 12 cm^2
   c) 16 cm^2
   d) 32 cm^2

Unit 9

Data Handling

9.1 Average

i. Find and describe average of given quantities in the data.
ii. Solve real-life situations involving average.

9.2 Bar Graphs

i. Organise the given data using bar graph.
ii. Read and interpret a bar graph given in horizontal and vertical form.
iii. Draw horizontal and vertical bar graphs for given data.
iv. Solve real-life situations using data presented in bar graphs.

Plan Ahead:

9.1 Average
9.2 Bar Graphs

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

Before You Start:

Students will work on their previous knowledge of how to read and interpret block graphs and line graphs. They will draw block graphs and column graphs in horizontal and vertical form. Furthermore, they will also learn to calculate the average of given data.

Watch Out For:

Students often make mistakes when drawing bar graphs, where they don't leave a gap between the two bars (there should be a gap between the two bars).

This Pairs with:

Math Lab 5, pages 64, 65

Make Sure You Have:

Number cards

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 a 4 or above, move on to the next activity.

Let's Begin

To find the average of a set of quantities, add them together, then divide the total by the number of quantities. Block graphs are used to represent data. Types of items are indicated on the horizontal axis and the number of items is presented on the vertical axis. A bar graph is a representation of data which helps us compare information. A collection of facts and statistics gathered or available for analysis and calculation about a specific topic is called data. Show pupils examples of bar graphs on the board, and ask them for examples of the kind of data one could show in a bar graph.

SLOs		
9.1 i ii	**Activity 1** 10 min	Let the pupils work in pairs. Various resources, for example number cards, newspaper, books, etc. can be used for this activity. If they chose number cards, provide each pair with the cards. Ask them to pick any number of cards randomly out of the pile. One pupil will arrange the cards and the other will add all the numbers to find the total value of the numbers written on these cards. Another peer will check the total and then both will find the average of these numbers. If they chose a book, then one pupil will open the book randomly and the other will write the page numbers. They must choose at least 10 to 15 terms. Then both will find the total value of the numbers written on these pages and average of these numbers. Take feedback from each pair, ask them how they calculated the average. Some pupils may not have gotten to the right answer, so using the cards from one of the pairs, do it on the board. Some pupils may have gotten to the right answer without the right method. Ask them to discuss how they came up with the right answer.
9.1 ii	**Activity 2** 10 min	Ask ten pupils how old they are and ask a volunteer to collect the answers on the board. Discuss the concept of averages and ask pupils to try to estimate what the average might be. After they have explored their ideas, explain that to find the average of a set of quantities, add them and then divide the total by the number of quantities. You have taken the data of 10 students, now find the sum of their ages and divide by the number of students (10). $\frac{10+8+9+9+8+10+9+10+8+9}{10} = \frac{90}{10}$ = 9 years This means that there may be some students around 10 years of age and some may be of 8 years of age, but the average tells us that the maximum number of students are 9 years old.

9.2
i
ii
iii
iv

Activity 3
20 min

Talk to pupils about the importance of having breakfast in the morning. Discuss healthy options for breakfast. Give one paper plate to each pupil. Ask pupils to write down what they had for breakfast that morning. Tell them pupils who did not have breakfast should just write 'nothing'. Group the breakfast items into categories such as 'milk and cereal', 'fruits', 'toast', 'eggs', etc.

Divide the pupils into groups. Each group will sort out and organise the data by gathering all plates which represents the same category of breakfast, for example, milk and cereals at one table.

Explain that a bar graph will make it easy to organise the pupils' responses, therefore, each group will draw a bar graph on a chart paper of the data that they have collected of the breakfast category assigned to them.

Once the pupils have completed the task, call each group one by one in front of the class to explain their findings. Repeat the same steps for each of the remaining categories. Analyse the bar graph and discuss the data.

Let's try it

Ask each pupil to draw bar graphs to show how many people like something. Ask them to make a list of anything they choose, perhaps colours, or movie titles, and then go around the class asking their classmates to each choose one. They should then construct a bar graph to show how many pupils chose each object. Remind them that they can make this bar graph vertically or horizontally but do remind them of the importance of labelling both axes.

Let's talk Math

Ask pupils how can the information provided in this unit can be helpful to people. Data is useful for a census which gives the government the facts and figures about the population. Bar graphs tells you about the preferences of different groups of people. Averages can be used to calculate the average rainfall in a region or the rate of a batsman in a cricket match (which tells us about his performance) Averages help people predict the annual, semi or quarterly performance of a company. Are they also useful in any way that the pupils could use, maybe if not now, in their adult lives? At the end of this discussion, allow 5 minutes for the class to write a reflective paragraph.

Let's get practical

Ask each student to develop their own survey. They should come up with a question to ask two large quantity of people for example, which subject do you think is the hardest. Once they have collected the data, they should construct a bar chart to represent their findings. Each student should then be able to present his or her findings to the class.

Self Assessment

9.1 Average

9.2 Bar Graphs

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 find the average of 2.5, 3.5, 4.5, 5.5, and 6.5, we divide the sum by?
   a) 2
   b) 4
   c) 5.5
   d) 6.5
2. The collection of information, facts, and statistics gathered for analysis and calculation is called?
   a) Data
   b) Probability
   c) Bar graphs
3. What is the average of the first five numbers?
   a) 3
   b) 4
   c) 5
   d) 6

NEW

COUNTDOWN

BOOK 5

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

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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

10-12 periods

Learning Curve

Students will deal with up

to 10 digit numbers. Previously they have added and subtracted numbers up to 6-digit numbers. This lesson will lead them to add and subtract numbers of greater complexity. Students have already learnt about multiplication and division, now they will apply this knowledge to solve daily life problems involving mixed operations. They will also apply BODMAS rule to carry out combined operations.

Real-life Application

It would be useful to discuss some interesting situations where we may have to deal with big numbers in real-life. For example,

- Finding the number of words in a 200 page book with 37 lines per page and 8 words per line. On multiplication, we find that there would be 200 × 37 × 8 = 59 200 words in the book.
- Finding the number of minutes a 97 year old man has lived. On multiplication, we find the number of minutes to be 97 × 365 × 24 × 60 = 5 09 83 200
- Finding the height of a certain mountain in inches! etc.

Frequently Made Mistakes

- Students add bigger numbers in expanded form, as they start the addition from the left side despite the fact addition should start from the right side i.e. from the ones column.
- Get confused by the BODMAS rule and its application with the arithmetic operation rule.
- Mix up the order of operations when using BODMAS to solve problems.

Summary of Key Facts

- According to International Place Value Chart, commas are replaced by spaces.
- Zeros should be placed on the right and move the number towards the left, while multiplying a number with powers of 10.
- When a number is multiplied by 0, the result is 0, and when a number is multiplied by 1, it remains the same.
- When we have problems with two or more of the four operations without
- brackets, the rule of DMAS should be used for simplification.
- Brackets are also called grouping symbols, brackets help us to solve problems involving two or more operations by telling which part to simplify first.

Model Lesson Plan

Topic
Place value

Duration
2 periods

Specific Learning Objectives
By the end of the lesson, students will be able to add and subtract numbers of complexity.

Key Vocabulary
addition, subtraction

Resources
Whiteboard, marker

Strategy
Engagement Activity (5 mins)

Math Game Double Trouble

Tell students to use their whiteboards for this activity. Call out a 4-digit number and ask them to double it. Once they have, tell them to double the answer. Repeat doubling of numbers till they a reach a 7 or 8 digit number.

Main Developmental Activity
Teacher's Exposition (20 mins)

Explain that when we buy or sell expensive things, such as property or prepare a budget for government projects, we deal in bigger numbers.

Example:
Sana bought property worth Rs 315360 and her brother, Ali, bought property worth Rs 313412. Who has spent more money and how much more?

Rs 315360
– Rs 313412
Rs 1948

Sana spent Rs 1948 more than her brother.

Activity (10 mins)

Tell students to work in pairs.

Give newspaper cutting to them which have bigger number used in daily life situation.

Ask them to choose any to 5 or 6-digit numbers and add and subtract them.

Written Assignments (40 mins)

Ex 1b Q4 (a, b, c), Q7 (a, b, c), Q11

Wrap up (5 mins)

End the lesson by asking students, where do they see addition and subtraction of complex numbers in real-life? Give any two examples.

2 HCF and LCM

Suggested Time Frame

10-12 periods

Learning Curve

Students already know how to find common multiples of numbers and least common multiple by prime factorisation. Thereafter, they will now find the LCM by the division method. Students have already learned how to find common factors of a number and the highest common factor by prime factorisation. They will now learn to find the HCF by the long division method. Students will further apply the knowledge of LCM and HCF to solve real-life problems.

Real-life Application

- HCF is used to find whether an event will repeat again and again. HCF is also used to divide two or more objects into equal points or split things into smaller equal sections. For example, if there are 21 students from Grade 4 and 28 students in Grade 5 and the teacher wants to arrange students in minimum rows, she/he will calculate the HCF of 21 and 28. Since the HCF is 7, Grade 4 students will be arranged in 3 rows and Grade 5 in 4 rows.
- LCM is used to find whether an event will happen repeatedly at the same time.
- LCM is important to solve problems related to racetracks, traffic lights, and load shedding etc. For example, if there is a race among three students on a circular track, and student A covers the track in 4 minutes, student B covers the track in 5 minutes and student C covers the track in 10 minutes, all starting from the same point, after what time will all three of them be at the starting point again?

Frequently Made Mistakes

Students often get confused in recognising events which are related to HCF and LCM in word problems.

Summary of Key Facts

- A number is divisible by 4 if the number formed by the last two digits of the number is divisible by 4.
- A number is divisible by 6, if it is an even number and the sum of its digits is divisible by 3.
- A number is divisible by 8, if the number formed by the last three digits is a multiple of 8 or there are zeros at its hundreds, tens and ones places.
- If the digits of any number add up to a number which is exactly divisible by 9, then the original number is also divisible by 9.
- HCF and LCM can be found by prime factorisation and division methods.
- The LCM of the given numbers is the product of all the prime factors including the common factors used only once.
- The product of two numbers is equal to the product of their HCF and LCM.

Model Lesson Plan

Topic

Highest Common Factor (HCF)

Duration

2 periods

Specific Learning Objectives

By the end of the lesson, students will be able to find the HCF of three sets of 2-digit numbers using the long division method.

Key Vocabulary

factors, common factors, highest common factors (HCF)

Resources

Chart papers, markers

Strategy

Engagement Activity

Mental maths (5 mins)

A quick recall of dodging times-tables up to 12, orally.

Begin the lesson with small numbers and counters. Tell the students that any number of counters that can be grouped in smaller sets (without leaving a remainder) is a factor of the larger number. For example, 15 counters can be arranged in either of the following ways:

1	○○○ ○○○ ○○○ ○○○ ○○○	5 × 3 = 15
2	○○○○○ ○○○○○ ○○○○○	3 × 5 = 15
3	○○○○○○○○○○○○○○○	1 × 15 = 15
4	○○○○○○○○○○○○○○○	15 × 1 = 15

Children 'see' how the numbers 3 and 5, 1 and 15, are factors of 15. Several similar examples will serve to make the concept clearer.

Main Developmental Activity

Group Work (20 mins)

Divide the class into groups and provide each group with three sets of 2-digit numbers and the following rules or steps to find out the HCF. For example:

Group 1: Find the HCF of 18, 27, and 45.

Instructions:

Step 1: Taking the bigger number 27 as the dividend and the smaller number 18 as the divisor, division is carried out:

```
    1
18 ) 27
   −18
     9 remainder
```

Step 2: The remainder 9 obtained in the previous step becomes the new divisor and the old divisor 18 becomes the new dividend and division is carried out again. There is no remainder here.

```
    2
9 ) 18
   −18
     0 remainder
```

Step 3: Step 2 is repeated. Since there is no remainder of division is carried out with the biggest number 45 as a dividend and 9 as a divisor.

```
    5
9 ) 45
   −45
     00 remainder
```

Hence, the HCF of 18, 27, and 45 is 9.

Feedback (10 mins)

Ask each group to share their solution and explain each step in detail. Discuss the practical application of HCF in daily life.

Written Assignments (40 mins)

Ex 2b Q6 (a to e)

Wrap up (5 mins)

1. Is there any other method to find the HCF?
2. Give one example of HCF from daily life.

3 Fractions

Suggested Time Frame

8-10 periods

Learning Curve

Students already know how to apply four operations on 'like fractions' and they have also verified the commutative and associative law of addition and multiplication. Here, they will apply the four operations on 'unlike fractions', which will lead them to solve real-life problems involving fractions. They will be also be able to apply the BODMAS rule while simplifying expressions involving fractions.

Real-life Application

Fractions are used:

- while cooking to understand and use particular amount of ingredients.
- to tell the time, as a second is a fraction of a minute and a minute is a fraction of an hour.
- during sales to determine the amount of discount that is to be given on a product.

Frequently Made Mistakes

- While simplifying fractions, students sometimes use two different factors of the same number for cancellation.
- When multiplying two fractions. they cancel both numerators or both denominators by the same factor, instead of can celling the numerator with the denominator.
- When dividing fractions, they find the reciprocal of the first fraction instead of the second fraction.

Summary of Key Facts

- A fraction can be reduced to the lowest term by dividing the numerator and denominator by the common factor.
- To add and subtract, make the denominators the same.
- To multiply fractions, reduce them to the lowest term, then multiply the numerator with the numerator and the denominator with the denominator.
- Commutative, associated, and distributive laws are true and can be verified for fractions.

Model Lesson Plan

Topic

Fractions

Duration

2 periods

Specific Learning Objectives

By the end of the lesson, students will be able to add and subtract fractions with different denominators.

Key Vocabulary

numerator, denominator, like fractions, unlike fraction

Resources

Worksheet

Strategy

Engagement Activity (5 mins)

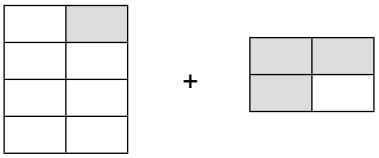
Recall

Write two fractions on the board $\frac{1}{8}$, $\frac{2}{4}$ and ask students which fraction is bigger and why?

Main Developmental Activity

Teacher's Exposition (15 mins)

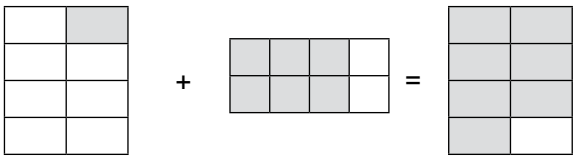
Draw the following diagram on the board and explain to the students that they cannot add or subtract these fractions because they have different denominators. In order to add these fractions we need to make the denominators the same; we need to take out the LCM. Hence the LCM of 8 and 4 is 8.



$\frac{1}{8}$ + $\frac{3}{4}$ $\quad\quad$ $\frac{1 \times 1}{8 \times 1}$ + $\frac{3 \times 2}{4 \times 2}$

$\frac{1}{8}$ + $\frac{6}{8}$

Since, the two fractions now have the same denominator, they can easily be added together.



$\frac{1}{8}$ + $\frac{6}{8}$ = $\frac{7}{8}$

Individual Work (15 mins)

- Write down a few sets of fraction sums on the board.
- Let the student work in pairs. For example,

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

- Tell each pair to choose two different sums and that both of them should solve one each on the worksheet.

Instructions	**Solution**
1. Write down the question. 2. Make the denominator the same. 3. Add the fractions 4. Simplify your final answer.	

Peer Checking

Worksheets will be checked by peers. While the students are peer checking, the teacher solves the sums on the board. Discuss possible errors and answer their queries. Students will do the correction on their own worksheet.

Written Assignments (40 mins)

Ex 3a Q4 (a, c, e) Q5 (a, c, e).

Wrap up (5 mins)

Ali and Sana bought two medium size pizzas. Ali cuts his pizza into 4 equal slices and Sana cuts the pizza into 3 equal slices. Ali ate two slices and Sana ate two slices, who is left with more pizza? Discuss the strategies to solve the problem.

4 Decimals and Percentages

Suggested Time Frame

8-10 periods

Learning Curve

In the previous grade, students have already used the decimal point when working with money. They have also learnt to apply four operations on decimal numbers and can convert them into fractions and vice versa. This knowledge will further lead them to add and subtract decimal numbers, and multiply and divide a decimal number by 10, 100, and 1000 and with a whole number. Furthermore, they will use division to change fractions into decimal numbers, simplify decimal expressions involving brackets, and round off decimals. They will be able to recognise percentage as a special kind of fraction and convert percentages to fractions and to decimals and vice versa. Students will be applying all the above mentioned knowledge when they solve real-life problems.

Real-life Application

- We use decimals in every day life while dealing with money, weight, length etc.
- Decimal numbers are used in situations where more precision is required than the whole numbers can provide. For example, when we calculate our weight and height.
- Rounding off and approximation is especially useful when adding, subtracting, multiplying, and dividing a group of numbers in order to get an idea of something.
- Shops advertise discounts on products. These discounts are in percentages.
- Banks quote interest charged to the clients on loans, or interest paid for money invested, as a percentage.
- Companies describe their success or failure as an increase or decrease in percentage of their profits.
- Marks sheets also represent students' marks in percentages.
- Antiques or jewellery may increase in value as time goes by; we usually express that increase as a percentage.
- Items, such as equipment and machinery, usually decrease in value. We express that decrease as a percentage.

Frequently Made Mistakes

- When applying operations of decimal numbers, students often do not align the the decimal point and the columns properly.
- When adding or subtracting decimal numbers, students forget to put the decimal point in the correct place.
- When multiplying or dividing fractions they do not remember whether the decimal appear to move towards the right or left (although the decimal point does not move).

Summary of Key Facts

- Numbers with the same number of decimal places can be easily added or subtracted by writing each digit under the other.
- Multiplication gives a bigger number as the answer while division gives a smaller number as the answer. So, decimal point is moved accordingly.
- In order to multiply two numbers with decimals, it is easy to change the numbers into common fractions and then multiply them.
- In order to divide two numbers with decimals, it is easy to first change the numbers into common fractions and continue dividing, as would be done in the case of fractions.
- The same number of decimal places in the numerator and denominator means that the 'decimal points' can be ignored. In other cases, we multiply the dividend and the divisor with 10s or 100s, as need be, to change them into whole numbers and then proceed to divide them as usual. But, we need to re-introduce the decimal and decimal place numbers after the calculations.
- When a decimal number is multiplied by 10, 100, and 1000, apply the same rule as for whole numbers; move one column to the left.
- When a decimal number is divided by 10, 100, and 1000, count the zeros in the divisor, then shift the dividend the same number of columns to the right.
- Rounding off means making an estimate but maintaining its value close to the original figure.
- Half-way numbers are always rounded off upwards.
- The word 'percentage' is based on the Latin word 'Centum'. A percentage is a special kind of a fraction with 100 as a denominator.
- The symbol used for percentage is %, which means 'per cent' or 'upon 100'.
- To change a percentage into a decimal, first convert it into a common fraction and then express it as a decimal.

Model Lesson Plan

Topic

Percentage

Duration

2 periods

Specific Learning Objectives

By the end of the lesson, students will be able to convert fractions into decimals and percentages.

Resources

Grids with 100 squares (10 × 10), coloured buttons

Key Vocabulary

percentage, fraction, decimal

Strategy

Engagement Activity (5 mins)

The teacher can start the lesson by distributing counters (equal amounts to each group) and 100-square grids among groups of students. The students in each group first segregate the counters according to their individual colour preference and then fill up each small square on the grid with a counter.

Main Developmental Activity

Teacher's Exposition (15 mins)

Once students are done with the engagement activity, ask each group to write down the number of squares occupied by each colour as a fraction by preparing a table in the format shown below. Since any fraction with a denominator of 100 can be expressed as a percentage, all these fractions can be easily expressed as a percentage.

Now explain that if we divide the numerator by the denominator we will get a decimal number and if we multiply the fraction by 100, we have expressed it as a percentage.

For example,

$\frac{15}{100} \times 100 = 15\ \%$

Group Work (10 mins)

	Fraction	Decimal Fraction	Percentage
Red: 15 out of 100	$\frac{15}{100}$	0.15	15%
Yellow: 20 out of 100	$\frac{20}{100}$	0.20	20%
Blue: 17 out of 100	$\frac{17}{100}$	0.17	18%
Pink: 35 out of 100	$\frac{35}{100}$	0.35	35%
White: 13 out of 100	$\frac{13}{100}$	0.13	13%

Percentages are useful while comparing unlike fractions. These fractions are converted into equivalent fractions having 100 as their denominator.

Written Assignments (40 mins)

Ex 4c Q6 (a to f), Q7 (a to f)

Wrap up (5 mins)

Discuss what steps are needed to calculate percentages from fractions. Ask if Ali scores 20 marks out of 25 in maths, what is his percentage in mathematics? Can we convert percentages into decimals? If yes, then how?

5 Distance and Time

Suggested Time Frame

8-10 periods

Learning Curve

Students have already worked with units of length in their previous class. They are well aware of addition, subtraction and conversion of units of length and this will lead them to add and subtract measure of distance. Furthermore, the knowledge about conversion of units of time will help them to add, subtract and convert years to months, months to weeks, weeks to days, and vice versa. Next, they will recognise units of temperature in Fahrenheit and Celsius. Students will be able to apply the knowledge of conversion, of units of distance, time and temperature, in real-life situation.

Real-life Application

- Distance is a numeral measurement which can be used to tell how far one object is from other. It is use for navigation. For example: a driver calculate the amount of distance he has to travel from one place to another. It is also used to determine how near or far something is from us.
- Time is used everywhere while travelling, working and cooking. We measure time to determine how long something would take.
- Time and distance are also used together, for example, we measure the amount f time it would require from us to cover certain distance.

Frequently Made Mistakes

- A common mistake while converting one unit to the other, students use the wrong conversion unit and the wrong operation.
- Students forget that we 'multiply' while converting a bigger unit to a smaller unit and we 'divide' when converting a smaller unit to a bigger units.

Summary of Key Facts

- Kilo means 1000, centi means 1/100, and milli means 1/1000.
- 1 km = 1000 m , 1 m = 100 cm and 1 cm = 10 mm.
- When hours are converted to minutes multiply by 60. When minutes are converted to hours divide by 60.

- When minutes are converted to seconds, we multiply by 60. When seconds are converted to minutes, we divide by 60.

Model Lesson Plan

Topic
Conversion of units of distance

Duration
2 periods

Specific Learning Objectives
By the end of the lesson, students will be able to convert units of measures of length/ distance.

Key Vocabulary
millimetre, centimetre, kilometre, convert, conversion, conversion factor

Resources
Activity cards

Strategy
Engagement Activity

Whole class discussion (5 mins)

Start the lesson by asking questions related to units of measures of length/ distance. For example, which unit will be used to measure the length and breadth of a book or the height of a room or distance between two cities?

Main Developmental Activity
Demonstration (10 mins)

A conversation with the students is useful to gauge their knowledge about units of measurement.

This may be followed up with a little discussion on how to decide what unit will be used to measure different objects (long and short) and long distances. All units of measurement are useful in a real-life.

Explain how to convert the two units of measurement by using the following conversion factors:

To convert a bigger unit to a smaller unit To convert a smaller unit to a bigger unit

Kilometre × 1000 = Metre

Metre × 100 = Centimetre

Centimetre × 10 = Milimetre Milimetre ÷ 10 = Centimetre

Centimetre ÷ 100 = Metre

Metre ÷ 1000 = Kilometre

Instructions:
Provide the Activity Card to each student and write the conversion table on the board.

Conversion of measures of distance

Activity Card

Conversion of measures of distance

1. Jawad is going to distribute sweets in his neighbourhood on Eid. He walks 20 metres to the first house. How many centimetres did he walk?

Answer: _____

2. He walks 100 metres to the next house. How many centimetres did he walk? How many millimetres did he walk?

Answer: _____

3. He walks 4500 centimetres to the next house. How many metres did he walk?

Answer: _____

4. He can't make it to the next house because it is 2000 metres away. How many kilometres is it?

Answer: _____

5. Javeria and Tina drove to their aunt's house. Javeria drove 9 ¾ kilometres. Tina drove 3500 metres before they arrived. Convert kilometres to metres and metres to kilometres.

Answer: _____

6. Mira flew 1234 kilometres to Lahore to visit her uncle. After picking up Mira, her uncle drove 20 kilometres to his house from the airport. How many metres had Mira travelled in all?

Answer: _____

7. Nobody wanted to ride the 22 kilometers back to town after the family reunion. So, relatives rode 10 kilometres to the nearest hotel. How many kilometres did the family ride in all?

Answer: _____

Addition work (optional)

The students can carry out a fun activity where they find out distances between different cities of Pakistan from their own city. Keep a record and then discuss in class how they found the distance. Then compare results with their peers and find out:

- Which city is the closest to their city?
- Which city is the farthest from their city?
- Which two cities have the minimum or maximum distance between them?
- What is the different between the maximum and the minimum distances?
- Arrange these distances in ascending or descending order.

Written Assignment (30 min)

Ex 5a Q 1 to 6

Wrap up (5 min)

Can we calculate the distance between two planets? If yes, then how and what unit of measure will we use?

6 Unitary Method

Suggested Time Frame

8-10 periods

Learning Curve

Students will become familiar with the unitary method and know how to prepare bills. Here, they will learn to prepare bills of larger amounts using measurements of weight and capacity together in a bill.

Real-life Application

The unitary method is important when it comes to cooking and baking as recipes require specific ratios of different ingredients. When we go shopping we buy things in bulk. Using the unitary method unable us to find the price of one unit or any quantity we require.

Frequently Made Mistakes

Students only tend to make mistakes when they are unable to understand the language of the word problems, leading them to performing incorrect operations.

Summary of Key Facts

- The value of many objects of the same kind can be calculated when the value of one of the objects is given.
- The value of one object of the same kind can be calculated when the value of many of the objects is given.
- The value of many object of the same kind can be calculated when the value of some of the objects is given.

Model Lesson Plan

Topic

The Unitary Method

Duration

2 periods

Specific Learning Objectives

By the end of the lesson, students will be able to apply the unitary method involving real-life problems.

Key Vocabulary

unitary method, bills

Resources

Empty boxes, price lists

Worksheet

Classroom shop; shopping lists in the following format:

Popcorn: Rs 10 per pack

Flour: Rs 52 per kg

Butter: Rs 250 per kg

Orange juice: Rs 69 per bottle

Strategy

Engagement Activity

Role play (15 mins)

Set up a small market in the classroom and assign students different roles such as shopkeeper and customer. Tell students before conducting the lesson to bring empty boxes of the above mentioned items or any other, so that they can easily set up the market.

Main Developmental Activity

Group Work (20 mins)

The class will be divided into groups. One group will be playing the role of the shop keepers, others will be buyers. Students prepare the bill based on the shopping lists for a number of problems given to them.

Example:

For a birthday party, Sana bought 20 packets of popcorn, 2.5 kg flour, 1.25 kg butter, and 5.25 litre of orange juice.

Prepare a bill for her using the cost of each item given on the worksheet.

Quantity	Description	Cost per unit	Total cost
20 packets	Popcorn	Rs 10	Rs 200
2.5 kg	Flour		
1.25 kg	Butter		
5.25 litre	Orange juice		

Feedback (10 mins)

Ask students about the total bill. How did they calculate it?

Written Assignments (30 mins)

Ex 6 Q4 (a, b, c) and word problems 1 to 4.

Wrap up (5 mins)

A short discussion should be held on the importance of the unitary method. Ask students where they use the unitary method in their daily life.

7 Geometry

Suggested Time Frame

8-10 periods

Learning Curve

Students have learnt to draw vertical and horizontal lines, they also know that angles are measured and named according to their sizes (acute, right, obtuse, straight, and reflex angles) with a protractor and according to their positions (adjacent, complementary, and supplementary). In this unit, students will identify different triangles according to their sides and angles, and the hypotenuse of a right-angled triangle. Students will also identify and name different types of quadrilaterals. They will now use compasses and rulers to construct triangles.

Real-life Application

Geometry helps:

- in the field of medicine e.g. X-ray and ultrasound.
- in the accurate calculation of physical distances.
- in the field of astronomy to map the distance between planets and stars.
- in computer aided designs, it entails lines, curves, and angles.
- in designing buildings, bridges, and furniture, patterns, and geometrical designs.

Frequently Made Mistakes

Students enjoy the topic of geometry at this level and make very few mistakes. They only sometimes are unable to identify or name angles and triangles according to their sides or angles.

Summary of Key Facts

- An acute angle is less than 90°, a right angle is equal to 90°, an obtuse angle is more than 90° but less than 180°, and a reflex angle is more than 180°.
- Adjacent angles have a common vertex.
- Two angles are complementary if their sum is 90°.
- Two angles are supplementary if their sum is 180°.
- The sides of an equilateral triangle are equal in length and each angle is of 60°.
- An isosceles triangle has two equal sides and two equal base angles.
- All three sides of a scalene triangle have different lengths, therefore, all three angles are different.
- The sum of all angles in a triangle is equal to 180°.
- In a right-angled triangle, one of the angles Is 90°.
- In an acute-angled triangle, all the angles are acute.
- In an obtuse-angled triangle, one angle is obtuse and the other two angles are acute.

Model Lesson Plan

Topic

Angles

Duration

2 periods

Specific Learning Objectives

By the end of the lesson, students will be able to define and measure reflex angles.

Key Vocabulary

acute angle, right angle, obtuse angle, reflex angle

Resources

A large size wooden geometry box

Strategy

Engagement Activity (5 mins)

Show the big wooden geometry box to the class and ask them to guess the topic. Once the students have guessed the topic then ask them to define an acute angle, right angle, and obtuse angle and side-by-side draw these angles on the board using the wooden protractor.

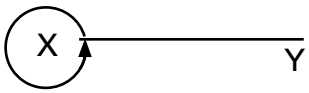
Main Developmental Activity

Demonstration (15 mins)

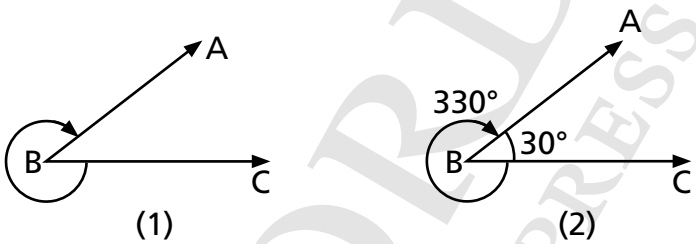
Start with a quick run through of the work done in the previous class, before moving on to measuring and constructing angles using a protractor. Working on the blackboard with a large wooden protractor is useful.

Students know that:

- when a line XY turns a full circle at point X (below) before returning to its original position, the measure of degrees at the point of turning is 360°.



- a reflex angle is greater than 180°. Reflex angles can be drawn in two ways. Look at the following figures:



Use a protractor to draw an acute angle. Let angle ABC = 30°

Subtract: 360° – 30° = 330°

The outer angle ABC = 330° which is the required reflex angle.

Group Work (15 mins)

Working in groups is fun. Divide the class into groups.

Instructions:

Ask group one to construct an acute angle on A4 size sheet (any size to be given) then calculate and measure its corresponding reflex angle. In the same manner, the rest of the groups will construct a right angle, obtuse angle and their corresponding reflex angles.

Ask each group which angle they have drawn and what is its corresponding reflex angle.

Written Assignment (40 mins)

Ex 7a Q7 (a, b, c, d), Q8 (a, b, c, d).

Wrap up (5 mins)

Hold a small discussion on the importance and application of different angles in our daily life.

8 Perimeter and Area

Suggested Time Frame

8-10 periods

Learning Curve

In the previous grades, student have calculated areas and perimeters of simple shapes. In this unit, students will move on to calculate areas of composite shapes using formulas.

Real-life Application

The calculation of area is beneficial when we want to find:

- how many tiles are needed to cover the floor, or the size of carpet required for a room.
- the covered area of a plot for construction of a building.

Frequently Made Mistakes

Students often get confused between area and perimeter, as they do not realise that area is the inside part and perimeter is the sum of the sides of the outer boundary. They also make mistakes in writing the correct units of area and perimeter.

Summary of Key Facts

- Perimeter is the sum of all the sides of the outer boundaries of a closed region.
- Area is a surface covered by a closed region.
- Composite shapes consist of two or more shapes.

Model Lesson Plan

Topic

Area and perimeter of composite shapes.

Duration

2 periods

Specific Learning Objectives

By the end of the lesson, students will be able to calculate area and perimeter of composite shapes.

Key Vocabulary

area, perimeter, simple shapes, composite shapes

Resources

Chart papers, markers, cut-outs of different composite shapes.

Strategy

Engagement Activity

Recall (5 mins)

Paste cut-outs of simple 2D shapes like square and rectangle on the board as shown in Fig. 1 ask the students if they can find the area and perimeter of these shapes. Once they say yes, join the shapes as shown Fig. 2 and ask how can the area and the perimeter of the new composite shape be found using the formula for the area and perimeter of a square and rectangle?

Square

Fig. 1

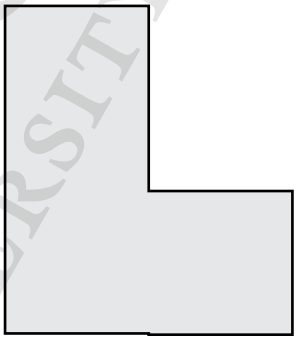


Fig. 2

Area of a square = length × length = $(\text{length})^2$

Perimeter = 4 (length)

Rectangle

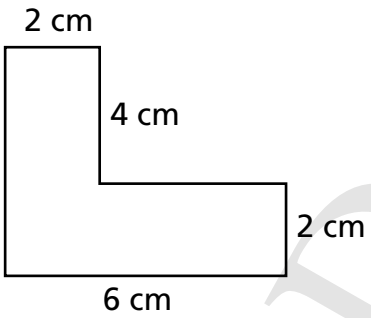
Area of a rectangle = length × breadth

Perimeter = 2 (length + breadth)

Main Developmental Activity

Group Work (20 mins)

- Divide the class into groups.
- Provide each group with the different composite shapes and ask them to calculate the area and perimeter of the given shape on a chart paper.



Feedback (15 mins)

Ask each group to represent their work and tell the other groups to give remarks on each other's work.

Written Assignments (30 mins)

Ex 8a Q 4, (a, b). Ex 8b Q5 (a to f), Q10 (a to d)

Wrap up (5 mins)

Ask students where they see composite shapes in their surroundings.

9 Data Handling

Suggested Time Frame

4-6 periods

Learning Curve

Students will work on their previous knowledge of how to read and interpret block graphs and line graphs. They will draw block graphs and column graphs in horizontal and vertical form. Furthermore, they will also learn to calculate the average of given data.

Real-life Application

- Data is useful for a census which gives the government facts and figures about the population.
- Bar graphs tells you about the preferences of different groups of people.
- Averages can be used to calculate the average rainfall in a particular region or the rate of a batsman in a cricket match (which tells us about his performance)
- Averages help people predict the annual, semi or quarterly performance of a company.

Frequently Made Mistakes

- Students often make mistakes when drawing bar graphs, where they do not leave a gap between the two bars (there should be a gap between the two bars).

Summary of Key Facts

- To find the average of a set of quantities, add them together, then divide the total by the number of quantities.
- Block graphs are used to represent data. Types of items are indicated on the horizontal axis and the number of items are presented on the vertical axis.
- A bar graph is a representation of data which helps us compare information.
- A collection of facts and statistics gathered or available for analysis and calculation about a specific topic is called data.

Model Lesson Plan

Topic

Averages

Duration

2 periods

Specific Learning Objectives

By the end of the lesson, students will be able to calculate the average of a set of quantities.

Key Vocabulary

averages, total, sum

Resources

White board, Markers

Strategy

Engagement Activity (5 mins)

Start your lesson by asking any ten students about their age and jot down on the board in the following manner.

10, 8, 9, 9, 8, 10, 9, 10, 8, 9

Just collect the data and move to the explanation.

Main Developmental Activity

Teacher's Exposition (10 mins)

To find the average of a set of quantities, add them and then divide the total by the number of quantities. You have taken the data of 10 students, now find the sum of their ages and divide by the number of students (10).

$$\frac{10 + 8 + 9 + 9 + 8 + 10 + 9 + 10 + 8 + 9}{10} = \frac{90}{10} = 9$$

This means that there may be some students around 10 years of age and some may be of 8 years of age, but the average tells us that the maximum number of students are 9 years old.

Group Work (20 mins)

Instructions:

- Divide the class into groups.
- Ask students to use white boards and markers.
- Give each group different data to calculate average.

For Example:

Group 1

If there are 20 students in the class, the number of students who the wore wrong uniform on each day of the week is as follows:

Monday 7 students, Tuesday 13 students, Wednesday, 14 students, Thursday 10 students, and Friday 6 students. Find the average number of students who wore the wrong uniform during the week.

Ask each group to share their work with the class, by showing their working on the white boards.

Written Assignments (40 mins)

Ex 9a Q1, 2, 3, 4

Wrap up (5 mins)

Discuss the importance of averages in daily life.

MATHS WISE 5

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

UNIT 1

ASSESS AND REVIEW 1

Teaching objectives

To revise concepts and skills learnt during the previous year

Teaching materials:

- additional worksheets

Learning activity

Lesson 1: **40 minutes**

At the beginning of the year it is very essential to revisit the concepts that were covered during the previous year. This not only helps the students remember the concepts, but also helps them feel relaxed and settled (there is always security in a known field). Even though the surroundings are new, children get to know their new classmates thorough group work and start to bond with the teacher.

Revision is a very useful tool for you assessing the level of each student. You can assess the progress of each student through fun activities in a friendly ambience. This will inform planning of future lessons and activities, and 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 these, as a team, as well as individual work.

The sheets need to be thought provoking rather than mathematically taxing, and conducive to lateral thinking. The students should have scope to demonstrate their thinking and their analytical skills, and simultaneously, recall the concepts learnt.

Here are some interesting buildings in different cities in the world:

A hut with a cone-shaped roof in a village

Homes with pyramid shaped roofs

A building, which looks like a LEGO house, made of different cuboids

The Cybertecture Egg in Mumbai

Take the students to a pizza shop and show them how hundreds of cardboard cut-outs of the pizza boxes are stacked, occupying very little space. The assistant picks up a cut-out and folds it to make a box. He places the pizza in it and hands it over. If it were a cylindrical box, a lot of storage space would be needed for the 100s of pizzas sold each day!

Encourage the students to make some patterns with tessellations:

Collect a number of shapes, which tessellate, as shown before. (Remember, regular pentagons do not tessellate.)

Task: Students should attempt pages 2–10.

UNIT 2

WHOLE NUMBERS AND OPERATIONS

Teaching objectives

Numbers up to one million

i. Read numbers up to 1,000,000 (one million) in numerals and words
ii. Write numbers up to 1,000,000 (one million) in numerals and words

Addition and Subtraction

i. Add numbers up to 6-digit numbers-
ii. Subtract numbers up to 6-digit numbers

Multiplication and Division

i. Multiply numbers, up to 5-digit, by 10, 100, and 1000
ii. Multiply numbers, up to 5-digit, by a number up to 3-digit numbers
iii. Divide a number up to 5-digit numbers by 10,100 and 1000
iv. Divide numbers up to 5-digit numbers by a number up to 2-digit numbers
v. Solve real life situations involving operations of addition, subtraction, multiplication, and division

Number Patterns

i. Identify and apply a pattern rule to determine missing elements for a given pattern
ii. Identify the pattern rule of a given increasing and decreasing pattern and extend the pattern for the next three terms
iii. Describe the pattern found in a given table or chart

Teaching materials:

- board and markers/chalk

Learning activity

Lesson 1: 40 minutes

Step by step, numbers up to 6 digit have been introduced in Maths Wise 4. The concept has been introduced based on the student's knowledge from previous years of place value of numbers. Comparison of place value has been done pictorially: visual and practical teaching enhances understanding and support learning.

This is not the first time the students are introduced to the concept of the international system of writing numbers. However, it is important to compare the same number in both writing styles.

Reinforce the fact that same number may be written in 2 different notations, dividing a large number into two different patterns of grouping. This does not change the value of the number. It is just two different ways of representing the same quantity.

Simple examples:

30 years is the same as 3 decades.

OR

60 apples is the same as 5 dozen apples.

OR

900 years is the same as 9 centuries.

10 000 years is the same as 10 millennia.

Answer any queries the students may have regarding the two styles. Show them how both styles of writing are used in real life. You may take newspapers of Pakistan and online international newspapers to show both styles of notation… crores and lakhs, versus, millions, and hundreds of thousands. The most important point to remember is that in the international system numbers are divided into ALL groups of 3: Units, Tens and Hundreds, as against the Pakistani system of notation.

International System of Notation:

M	HTh TTh Th	Hundreds Tens Units
Millions	Millions	Units

You may want to conduct a small activity of comparing both the styles of notation. Divide the students into pairs. One student writes an 8-9 digit number in the international system of notation on a large sheet of paper and holds it up for the other student to see. The second student reads it out aloud, and writes the same number in crores and lakhs, and holds up his/her numbers. Then repeat the activity with the students taking opposite roles.

Team games are always an excellent way to present problems involving large numbers in expanded form, ascending and descending orders, identifying numbers 'before' and 'after' a given number and skip counting. A lot of this has been handled in the previous year, with smaller numbers. So this one step ahead should not be a problem.

One half of the class collects statistical data containing large numbers, such as population of countries, height of mountain peaks, sales figures of multi-national companies, depths below the sea level at which various life forms exist, the distances between different planets, and number of seconds in a month, and writes them on the board. (It is interesting for the class to calculate how many minutes (and seconds) each child has been on this Earth; parents and teachers, as well.) The other group reads them out aloud millions, and hundreds of thousands.

Task: Students should attempt pages 13 to 15.

Lesson 2: 40 minutes

The new concept that has been introduced in Maths Wise 5 is the order of operations in an expression. It is important for students to understand why we need to fix an order in which operations have to be performed in a multi-operation simplification problem. Explain this idea with a real life problem:

Example 1:

Rehana has Rs 150 in her bag. She needs to buy a geometry box for Rs 300 and have some money left for donation to an orphanage. She looked through her savings and found Rs 250 in it. Once she buys the geometry box, how much money does she have left for the donation?

This can be written as:

150 – 300 + 250 = 400 – 300 = 100

This can also be written as:

150 + 250 – 300 = 400 – 300 = 100

Rehana has Rs100 left for the donation.

So, at this level, students need to ADD before they subtract.

Example 2:

Maher goes to a shop to buy some groceries with Rs 600. Maher buys 3 kg flour at Rs 50 per kg.

If this is worked out as:

600 – 50 × 3 = 550 × 3 = 1650 × …

This is incorrect.

Therefore, rules were made which said: Work out Multiplication, before Subtraction.

600 – 50 × 3 = 500 – 150 = 450 this is correct.

Or, use brackets:

600 – (50 × 3) = 500 – 150 = 450

Multiplication MUST BE DONE BEFORE addition or subtraction.

The above operations need to be performed in the exact order as above. Alteration in the order will not only produce a completely different result, but will not be logically correct.

With other similar examples, one can arrive at BODMAS, which gives the order of operations as follows:

Brackets, Of (Multiplication before ×), Division, Multiplication, Addition, Subtraction

Example 3:

Zain goes to a shop to buy some groceries with Rs 500. He buys 2 kg sugar at Rs 45 per kg, 3 packets of biscuits at Rs 30 a packet, and a bottle of orange juice for Rs 125. The remaining money is distributed equally among 5 needy women. How much money did each woman get?

	500 – 2 × 45 – 3 × 30 – 125	OR		500 – 2 × 45 – 3 × 30 – 125
=	500 – (2 × 45) – (3 × 30) – 125		=	500 – (2 × 45) – (3 × 30) – 125
=	500 – 90 – 90 – 125		=	500 – (90 + 90 + 125)
=	410 – 90 – 125		=	500 – 305
=	320 – 125		=	195
=	195			

The second format needs to be explained. Ali's wallet has Rs 300. Ali needs to take out from his savings box Rs 50 on the 1st day, Rs 25 the 2nd day, and Rs 60 on 3rd day:

It is correct to write: Rs 300 – (50 + 25 + 60) = Rs 300 – Rs 135 = Rs 165

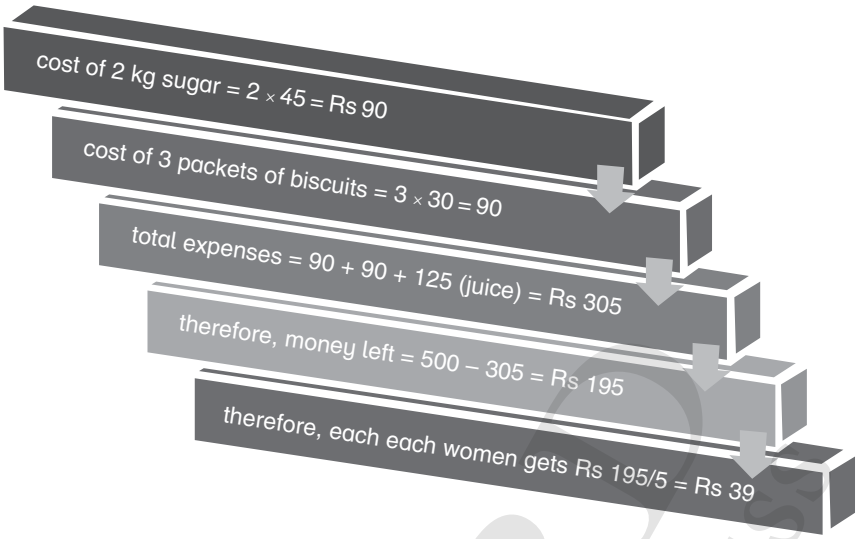
The concept of the use of brackets can only be explained by working this problem practically. Rs 300 in small notes in a wallet … take out Rs 50, Rs 25, and Rs 60 and place the money on the desk. What total amount of money has been taken out from the wallet, and given out to the shopkeeper?

300 – 50 – 25 – 60 = 300 – (50 + 25 + 60) = 300 – 135 = 165

Now getting back to example 3.

Rs 195 is to be divided amongst 5 women: $\frac{195}{5} = 39$

Each woman gets Rs 39. The operations you need to perform are as follows:



To work out the entire problem, use brackets. Explain to the students the use of a bracket … a bracket tells you 'Work the problem inside the brackets first'.

500 – (2 × 45) – (3 × 30) – 125

= 500 – 90 – 90 – 125

= 500 – 350 = 195

Work out similar problems, which involve 'millions'.

Explain to the students the need of the correct order of operations and introduce the term BODMAS:
B stands for 'Brackets'

O stands for 'Order' (exponent, square, cube)

D stands for 'Division'

M stands for 'Multiplication'

A stands for 'Addition'

S stands for 'Subtraction'

For example: 34 – (12 + 8) ÷ 5 × 2 (Follow BODMAS):

Brackets first: (12 + 8) = 20 …… 'B'

Then, division: 20 ÷ 5 = 4 …… 'D'

Then, multiplication: 4 × 2 = 8 ….. 'M'

Finally, subtraction: 34 – 8 = 26 … 'S'

WRITE THE PROBLEM DOWN LIKE THIS:

34 – (12 + 8) ÷ 5 × 2

= 34 – 20 ÷ 5 × 2

= 34 – 4 × 2

= 34 – 8

= 26

When you teach the concept of BODMAS, do several sums on the board showing the steps split-up. Then ask volunteers to guide you through working out the expression.

Make sure that the students understand exactly how to go about performing the operations. Ask them to show the indiviual steps, as shown in the example. One by one, students come up to the board and work out several problems. Give plenty of practice.

And practice is the final word for this concept!

THE FOLLOWING INFORMATION IS FOR TEACHERS.

Another word used instead of BODMAS is PEMDAS.

BODMAS is used in Asia, the UK and the US uses PEMDAS. 'Parenthesis', ' Exponents', 'Multiplication' , 'Division', 'Addition', 'Subtraction'.

A mnemonic for PEMDAS …

Please Excuse My Dear Aunt Salma

P stands for Parenthesis (brackets) and E for Exponent (which is not used at this moment, but it can replace 'Of'.)

BODMAS uses Division before Multiplication, PEMDAS works Multiplication before Division.

If you work out a few problems, you will find that this is in order.

$9 \div 3 \times 4 = 3 \times 4 = 12$ OR $9 \times \frac{4}{3} = \frac{36}{3} = 12$

Task: Students should attempt page 26.

Lesson 3 : **40 minutes**

Remind the students that a pattern is a sequence or a set of numbers placed in some order.

Write a pattern on the board, like 2, 4, 8,16, 32, __ and ask students to continue the pattern.

Explain the pattern in words (i.e. counting by twos or multiplying by twos). Point out that every number in the pattern is even and explain that in this pattern, the numbers are even because they are all multiples of two.

Tell them that they are going to look for patterns in the multiplication table.

Paste the following number sequence on the board.

6, 15, 24, 33, 42, 51

Ask the students the pattern rule applied here.

Repeat the activity with several sequences and ask them to find the pattern rule.

You can ask the missing terms in the patterns also.

Task: They will attempt pages 28 to 30.

UNIT 3

HCF AND LCM

Teaching objectives

HCF

i. Find HCF of
   - two numbers up to 2-digit numbers
   - three numbers up to 2-digit numbers using
   - prime factorisation method
   - division method

LCM

i. Find LCM of
   - two numbers up to 2-digit numbers
   - three numbers up to 2-digit numbers using
   - prime factorisation method
   - division method

ii. Solve real life situations involving HCF and LCM

Teaching materials:

- board and markers/chalk

Learning activity

Lesson1: **40 minutes**

In Maths Wise 4 students were introduced to the concept of HCF and LCM. As always, start the lesson with a revision of the basic concepts. You could conduct a quiz or have a class discussion or carry out some of the suggested activities during revision.

Why do we need to find LCM of numbers?

Addition of fractions cannot be done accurately without finding the LCM of denominators.

LCM is important in everyday life for time and speed, and time and work problems, different people running around circular race tracks, timing of bells and flashing lights, such as from a lighthouse.

HCF is important to find the largest size of tiles that may fit into rooms, while constructing a building.

Any such activity is not merely useful in its mathematical field, but increases the power of reasoning and thinking.

Introduce Prime Numbers: 2, 3, 5, 7, 11, 13, and so on. A prime number is a natural number greater than 1 that can be divided ONLY by the number itself and 1. All other numbers are composite numbers.

17 is a prime number because it has no factors other than 1 and itself.

17 ÷ 1 = 17 and 17 ÷ 17 = 1

PRIME NUMBERS: 2 3 5 7 9 11 13 15 17
COMPOSITE NUMBERS: 4 6 8 10 12 14 16 18
Prime and composite numbers can be placed in groups as shown below:

COMPOSITE NUMBERS
A composite number can be placed in rectangular formats like this:

15 = 3 × 5

14 = 2 × 7

PRIME NUMBERS
A prime number cannot be placed in rectangular formats like above.

11 = (5 × 2) + 1

7 = (2 × 3) + 1

19 = (4 × 4) + 3

Here are the prime numbers below 100, which can be shown on the 1 to 100 number chart.
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.
Prime and Composite Numbers: Discuss the meaning of prime and composite numbers and the importance of prime numbers. Then perform the Eratosthenes sieve test for prime numbers and list out the first 20 prime numbers.

Explain the positioning of the prime and composite numbers in a 1 to 100 number square. The following information is important for you:

- No two prime numbers, other than 2 and 3, are consecutive.
- No prime number, other than 2, has an even number in its unit digit.
- No prime number, other than 5, has 5 or 0 in its unit digit.
- No prime number has the sum of its digits which is divisible by 3 or multiples of 3.
- No prime number has difference between the sums of alternate digits as 11, or a multiple of 11.
- The smallest prime number is 2.
- The smallest composite number is 4.

There is no biggest prime number or composite number. Numbers go into infinity > > > >

Discuss the answers to the following questions:

- Which is an even prime number? Why is it the only even prime?
- What are the number 0 and 1 called? Why?
- What are composite numbers?
- What are the differences between prime and composite numbers?
- No prime number greater than 5 ends in 5. Why?
- Which is the greatest/smallest prime number?
- How many prime numbers are there?

Task: Prepare worksheets based of prime and composite numbers and give them to students to solve.

Lesson 2: **40 minutes**

Divisibility rules: 'Rules of divisibility' is an important concept that is very useful in factorization, and finding HCF and LCM of numbers. Discuss these rules, one at a time. Consolidate the idea through an oral activity.

Ask the class to write down five 6-digit numbers in their exercise books. Now ask one student to read out a number from his/her list. Ask a student volunteer to say whether this number is divisible by 2, 3, 4, 5, 6, 7, 9, 10. Ask the rest of the class if they agree.

Factors and multiples:

Factors:

Factors are divisors of a number which, when multiplied together, give the number itself. Every number has at least two factors, one and the number itself.

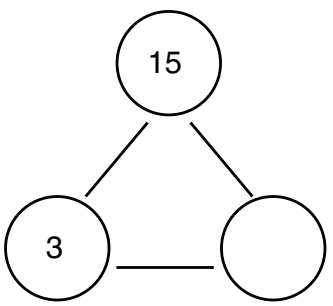
For example:

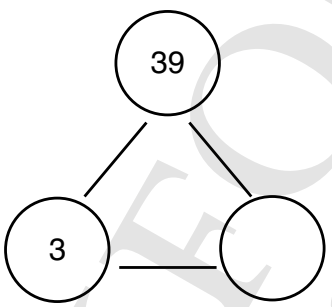
$2 \times 7 = 14$ 2 and 7 are prime divisors of number 14

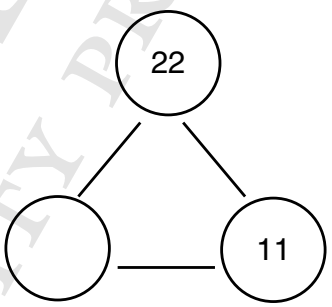
$3 \times 5 \times 11 = 165$ 3, 5, and 11 are prime divisors of number 165

15, 33, and 55 are also divisors of 165

Work out numbers in a triangle like the following:







15 is a multiple of 3 and 5; 3 and 5 are factors of 15

39 is a multiple of 3 and ____; ____, and ____ are factors of 39

22 is a multiple of 11 and ____; ____, and ____ are factors of 22.

Multiples:

A multiple of a number is the number multiplied by another integer.

Multiples of 7: 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98, 105 … to infinity

|_____|_____|_____|_____|_____|_____|_____|_____

- - - - - 7

- - - - - - - - - - 14

- - - - - - - - - - - - - - - - - 21

- 28

- 35

- 42

- 49 and so on, to infinity

Multiples of 20: 20, 40, 60, 80, 100, 120, 140, 160, 180, 200 _____ and on, and on, and on _____ to infinity

|_____|_____|_____|_____|_____|_____|_____|_____|_____

- - - - - 20

- - - - - - - - - - 40

- - - - - - - - - - - - - - - - - 60

- 80

- 100

The same number is added to itself on a number line, and the addition goes on. It goes on and on to infinity.

Count in 3's: (3) ---- ( ) ---- (9) ---- ( ) ---- ( ) ---- (18) ---- (21) ---- ( )

Count in 11's: (11) ---- (22) ---- ( ) ---- ( ) ---- ( ) ---- (66) ---- ( )

Work out more chains of numbers such as the ones shown above.

Infinity is a difficult concept for children to understand.

The grains of sand on all the beaches in the world are not infinite in number, because if some groups of people decided to count the grains, in different areas, they will be able to do so. There will be a time when all grains have been counted, and there are no more. (Of course, more grains of sand are formed all the time!)

Space is infinite; it does not end.

The number of stars may be infinite because space is infinite and the number of stars may be infinite.

Drops of water in a deep well are not infinite because sometimes the wells and rivers dry up.

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

Play the guessing games. I think of a number.

1. This 2-digit number has 2 as a factor. Ask the students to guess the possible answers: 2, 4, 6, 8, 10, 12, 14, 16, …, 98
2. What are these numbers called?
3. Ask them to guess the number conclusively. Why is this not possible? Is there a largest possible answer? NO …. Why not?
4. Give them another clue. This number is also a factor of 24. Ask the students for the possible answers: 2, 4, 6, 8, 12.
5. Can they come to a conclusion? NO.
6. Give another hint: The number lies between 10 and 15.
7. The students should now arrive an answer: 12.

Task: Students should attempt page 37.

Lesson 3: **40 minutes**

Prime Factorization, LCM and HCF:

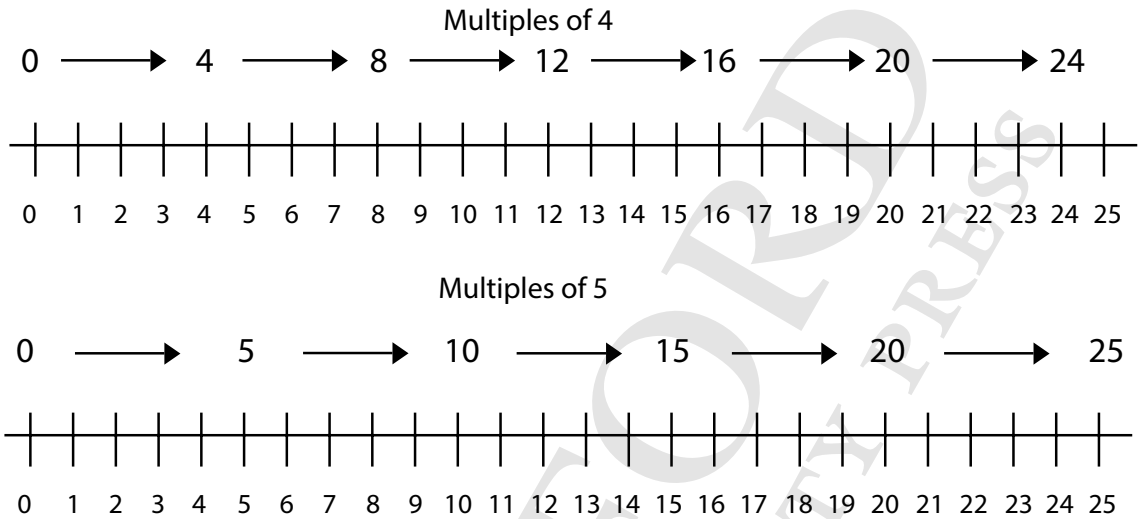
It is important to explain why students need to learn how to find the LCM of two or more numbers. Primarily, LCM of denominators makes addition of fractions possible.

For example: A tea plantation worker is paid per basket of tea leaves she plucks in a day.

If one woman plucks $\frac{3}{5}$ of a basket in the morning and $\frac{3}{4}$ of a basket after lunch, how many baskets has the she plucked during the day?

Use the LCM to create equivalent fractions to add quickly and easily: $\frac{3}{5} + \frac{3}{4}$

A. Find the LCM of 5 and 4.



Multiples of 5: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, …

Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, …

Common multiples of 5 and 4: 20, 40, 60, 80, …

Lowest common multiple is 20.

$\frac{3}{5} \times \frac{4}{4} = \frac{12}{20}$

$\frac{3}{4} \times \frac{5}{5} = \frac{15}{20}$

$\frac{12}{20} + \frac{5}{20} = \frac{27}{20} = 1\frac{7}{20}$

The payment to the tea picker can now be calculated.

The second reason is to solve real-life problems. If two or more events are happening at different time intervals and we may need to know when they will both happen at the same time. For example: Seema has 30-minute lessons and Rumi has 45-minute lessons. If they start the first lesson at the same time, when will they next start a lesson together again?

It would be useful to use story problems to find the LCM; real-life story problems help students with the question of 'Why do I need to know this?'

Follow the steps below to explain exactly what students need to do.

Step 1: Students need to define, in their own words, each word in this mathematical term: LOWEST COMMON MULTIPLE.

What does 'lowest' mean? Students may define it as smallest or minimum. Record the students' ideas on the board.

What does 'common' mean? Students may come up with words such as common, typical, and average. Write their answers on the board.

What does 'multiple' mean? The answers that are formed as a result of skip counting on a number line. Ask students to provide examples: Multiples of 3 are 3, 6, 9, 12, 15, ...

Step 2: Give students a real-life example to solve.

Jassal has a soccer game every 4th day and Karate classes every 6th day. If he starts with both classes on the 1st, then when will he have a class on the same day again? Ask students to share their thinking.

If students do not have an organized way of expressing their thoughts, introduce an open number line. Use the open number line to skip count to find the lowest common multiple.

For students who need more structure than an open number line, use a 100 square grid to find LCM. Mark multiples of the two numbers in different colours; the LCM will be the smallest number with marks of both colours of pencils.

Step 3: Give students more real-life problems to solve. Be certain to have students share out their thinking. Encourage them to create their own 'word problems'.

B. FIND THE HCF of 12 and 16

Use a similar strategy for HCF.

Factors of 16: (1) (2) (4) (8) (16)

Factors of 28: (1) (2) (3) (4) (6) (8) (12) (24)

Once you have revised the concept and the method for calculating the for LCM and HCF using Venn diagrams and listing methods, discuss the drawbacks of these methods.

If there are 4 or 5 numbers whose LCM needs to be determined, the listing method will pose a huge problem. The number of multiples will be too large to compare and find out the lowest common multiple. In fact, you may have to list out too many multiples for each number to find the common number to all the given numbers. This can be very time consuming! Again, to determine the HCF of large numbers, the list of factors will be too large to compare. Also, to find out all the factors of all the numbers the time spent will be too great. Hence, the method is inefficient.

Once you have discussed the disadvantages in the listing method, your class will be ready to be introduced to the alternate method. It is a common observation that the students find calculating the LCM relatively easier than calculating the HCF. So, introduce LCM by short division first.

A. Find the LCM and HCF of 30 and 45.

$45 = 3 \times 3 \times 5$

$60 = 2 \times 2 \times 3 \times 5$

LCM (every number that appears in either 45 or 60 the maximum number of times): $2 \times 2 \times 3 \times 3 \times 5 = 180$

HCF (every number that is common to 45 and 60) = $3 \times 5 = 15$

B. Find the HCF and LCM of, 60, 40, 144, 240.

$40 = 2 \times 2 \times 2 \times 5$

$60 = 2 \times 2 \times 3 \times 5$

$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

HCF of 40, 60, 144 = $2 \times 2 = 4$

LCM of 40, 60, 240 = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 720$

A multiple of these numbers, 40, 60 and 144, will have each factor appearing maximum number of times in any of these numbers.

It is also interesting to give the HCF and LCM of two (unknown) numbers and ask the class to find out what the numbers are.

HCF = 3, LCM = 36 ($2 \times 2 \times 3 \times 3$)

Numbers: 12 and 9

A great deal of practice is necessary.

To begin with, the long division method for HCF might be a little overwhelming. Explain each step of the method slowly and work out several sums on the board. Ask student volunteers to solve a few problems on the board.

Task: Students should attempt pages 33, 34, 38, 39 and 41.

UNIT 4

FRACTIONS

Teaching objectives

Addition and Subtraction of Fractions

i. Add and subtract two or three fractions with different denominators

Multiplication of Fractions

i. Multiply a fraction by a 1-digit number and demonstrate with the help of diagram
ii. Multiply two or three fractions involving proper, improper fractions, and mixed numbers
iii. Solve real life situations involving multiplication of fractions

Division of Fractions

i. Divide a fraction by another fraction involving proper, improper fraction, and mixed numbers
ii. Solve real life situations involving division of fractions

Teaching materials:

- Rangometry pieces
- sand and similar containers
- board and markers/chalk

Learning activity

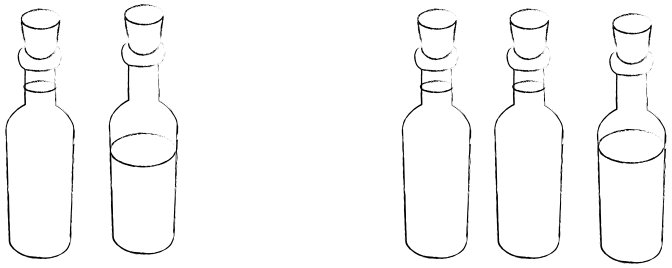
Lesson 1: 40 minutes

Fractions were dealt with in Maths Wise 4. Revise the concepts and problems related to fractions taught previously.

In this book the concepts have been elaborated upon and the students are introduced to a wider variety of fractions operations. The basic stress is on different types of operations related to fractions in real life applications. It is very important at this stage, as it is at every step, that students understand the concepts clearly and can work with them in real-life application. Hands-on activity is always useful to facilitate their understanding, and helps them recall the required skills.

Proper and Improper fractions:

Talk about 'parts of a whole' and 'more than one whole'. Bring in real-life examples. Give the students some sand and couple of containers of the same shape and size. Then, call out some proper and improper fractions, and ask the students to fill up the containers with sand to represent the given fractions. Use Rangometry blocks, as was done in Maths Wise 4.



Addition and Subtraction of Fractions:

The students work in groups with Rangometry sets and make equivalent fractions of $\frac{1}{2}, \frac{2}{3}, \frac{1}{4}, \frac{3}{5}, \frac{5}{6}$ and any other convenient ones and share the formations with other groups, to revise addition and subtraction of fractions.

Explain that $\frac{2}{3} - \frac{1}{2}$ cannot be worked out until a 'common denominator' is found for both fractions (as was done in Maths Wise 4).

The number used as the 'common denominator' must be the lowest common multiple of 3 and 2 (i.e. 6).

Some examples:

$\frac{1}{4} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$

$\frac{7}{10} - \frac{4}{15} = \frac{21}{30} - \frac{8}{30} = \frac{13}{30}$

$\frac{1}{12} + \frac{2}{3} - \frac{3}{4} = \frac{1}{12} + \frac{8}{12} - \frac{9}{12} = 0$

Ask the students to come up to the board, one by one, and work out a number of similar problems, orally, as well as in writing. Give assignments to be done in their exercise books till they are extremely confident with the process.

In the case of operations with mixed fractions, ask the students learn to convert the mixed fractions to improper fractions and repeat the above method.

For example:

$2\frac{4}{5} + 1\frac{3}{4}$

$= \frac{14}{5} + \frac{7}{4}$

$= \frac{56}{20} + \frac{35}{20}$

$= \frac{91}{20} = 4\frac{11}{20}$

Repeat these exercises several times till the students are confident with addition and subtraction of unlike fractions.

Task: Students should attempt pages 52 and 53.

Lesson 2: **40 minutes**

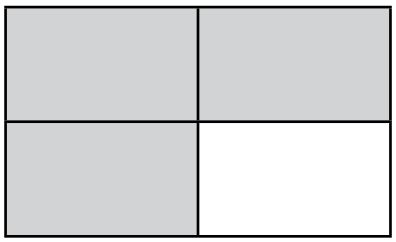
Multiplication of fractions:

Many students encounter a problem with multiplication and division of fractions when there are mixed fractions involved. A great deal of confusion can be overcome by paying close attention to the language in which the concepts are introduced, specially with division when the fraction needs to be 'inverted'.

5 apples shared by 2 children

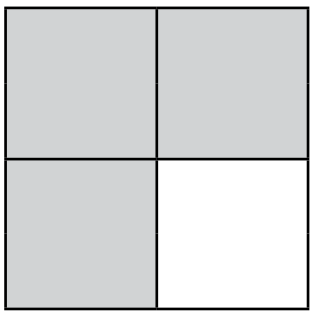
OR

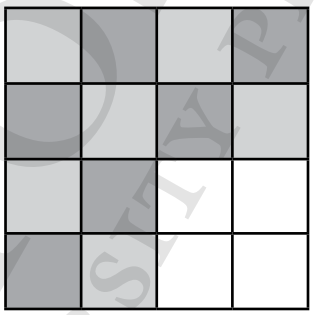
5 divided by 2 OR $5 \times \frac{1}{2}$ (How many $\frac{1}{2}$ s do you get out of 5?). For example $\frac{1}{2}$ of $\frac{3}{4}$ can be interpreted diagrammatically as follows:



$\frac{3}{4}$ of the square is shaded. Now we have to shade half of the shaded region.

The shaded portion represents 3 out of 4 boxes.





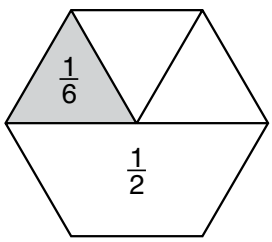
Each shaded box is divided into 4.

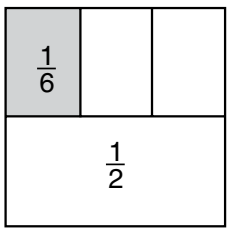
From the portion in light grey, half of them have been shaded in dark grey. The grey represent 6 out of 16 smaller boxes.

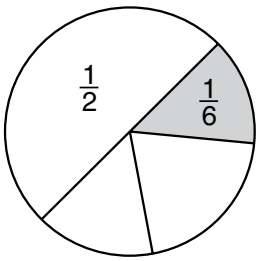
Hence, $\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8} = \frac{6}{16}$

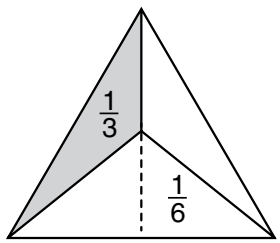
Do several examples on the above lines to explain the concept of multiplication. Then introduce the rules of multiplication.

(Show $\frac{1}{2}$ of each shaded, and then $\frac{1}{3}$ of $\frac{1}{2}$ as in the circle, square, and hexagon.)









The triangle above is cut into 3 equal parts. One 'third' part has been cut into halves.

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

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

After a few practical examples of multiplication, students should solve the problems in their books.

Rules are to be looked at after they understand the concept clearly.

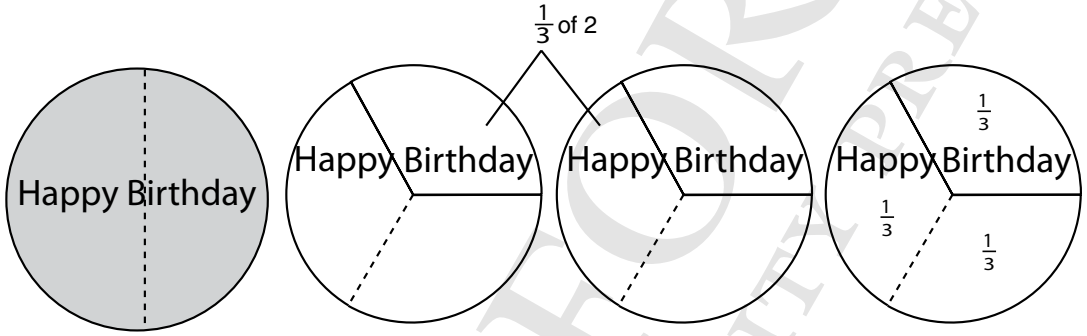
IMPORTANT: They should understand that 'of' and '×' represent to the same operation, except that, in simplication, 'Of' gets preference over '×'

Task: Students should attempt pages 57 and 58.

Lesson 3 — 40 minutes

When the students start division, it is essential that they understand the process correctly. Wooden boards or cardboard cut-outs are very useful.

Take the students back to division of whole numbers.



1 cake divided between 2 children:

$1 \div 2 = \frac{1}{2}$. Each child gets $\frac{1}{2}$ cake.

THIS IS THE SAME AS

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

OR $\frac{1}{2}$ of $1 = \frac{1}{2} \times 1 = \frac{1}{2}$.

2 cakes divided between 3 students

$2 \div 3 = \frac{2}{3}$. Each child gets $\frac{2}{3}$.

THIS IS THE SAME AS $2 \times \frac{1}{3} = \frac{2}{3}$

OR $\frac{1}{3}$ of $2 = \frac{2}{3}$.

$\frac{2}{3}$ of a cake to shared by 2 children:

$\frac{2}{3} \div 2 = \frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$ each child get $\frac{1}{3}$ each

OR $\frac{1}{2}$ of $\frac{2}{3} = \frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$

$\frac{1}{5} = \frac{2}{5} \times \frac{1}{2}$ (2 divided by 2 = 1)

$\frac{1}{5} = \frac{3}{5} \times \frac{1}{3}$ (3 divided by 3 = 1)

$\frac{1}{5} = \frac{4}{5} \times \frac{1}{4}$ (4 divided by 4 = 1)

Students should remember from earlier years that 'division by 2' means 'division by $\frac{2}{1}$' 'multiplication by $\frac{1}{2}$'. Make this abundantly clear by working out several examples:

$10 \div 2 = 10 \div \frac{2}{1} = 10 \times \frac{1}{2} = \frac{1}{2}$ of $10 = 5$

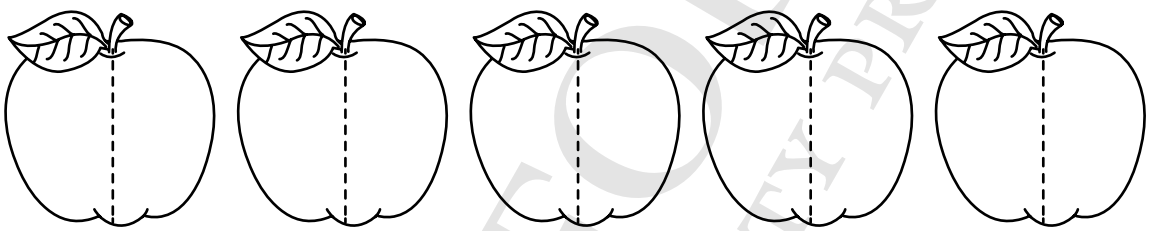
$15 \div 5 = 10 \div \frac{5}{1} = 15 \times \frac{1}{5} = \frac{1}{5}$ of $15 = 3$

$12 \times \frac{1}{2} = 12 \div \frac{2}{1} = 12 \div 2 = \frac{1}{2}$ of $12 = 6$

$21 \times \frac{1}{3} = 21 \div \frac{3}{1} = 21 \div 3 = \frac{1}{3}$ of $21 = 7$

$\frac{1}{3}$ of $9 = 9 \times \frac{1}{3} = 9 \div 3 = 9 \div \frac{1}{3} = 3$

This may sound like unnecessary repetition, but it is very important that the students understand each of these concepts.



5 apples 'divided' into $\frac{1}{2}$ s (halves)

How many $\frac{1}{2}$ s (halves) do you get from 5 apples?

$5 \div \frac{1}{2} = 5 \times \frac{2}{1} = 10$ halves

5 apples give 10 half apples

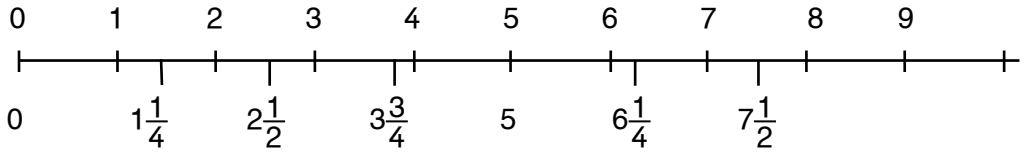
3 cakes divided into $\frac{1}{4}$ s (quarters)

How many $\frac{1}{4}$ s (quarters) will you get from 3 cakes?

$3 \div \frac{1}{4} = 3 \times \frac{4}{1} = 12$ quarter cakes

3 cakes give 12 quarter cakes

You need to decorate one window in the class. You have $7\frac{1}{2}$ m of ribbon. How many $1\ \frac{1}{4}$ metre pieces of ribbon can you get from this piece?



Try this practically. The students will be able to cut 6 pieces of $1\frac{1}{4}$ m ribbon strips from a $7\frac{1}{2}$ m piece. How can this be worked out?

$7\frac{1}{2} \div 1\ \frac{1}{4} = \frac{15}{2} \div \frac{5}{4} = \frac{15}{2} \times \frac{4}{5} = \frac{60}{10} = 6$

(Divide the numerator and denominator by 10.)

OR $1\frac{1}{4} \times 6 = \frac{5}{4} \times 6 = \frac{5}{2} \times 3 = \frac{15}{2} = 7\frac{1}{2}$

Division of fraction may be an area of concern for some students. In Book 4, simple division was introduced. Consolidate the concept with a lot of practice. Unless the students are absolutely sure of each step for working out the problem, they will face a great deal of trouble when applying division in BODMAS operations.

Example: $\frac{4}{5} \div 12$ (division of a fraction by a whole number). Ask the students to rewrite the problem as a multiplication with the divisor reciprocated, i.e. $\frac{4}{5} \times \frac{1}{12}$. Now ask them to use rules of divisibility to check whether the number in the numerator and those in the denominator have any common factor. If yes, divide both numerator and denominator by the common factor. In the example, both 4 and 12 have the common factor 4. Hence we divide both numerator and denominator by 4. Hence the reduced fraction is $\frac{1}{5} \times \frac{1}{3}$. Now multiply the numbers in the numerator together and those in the denominator together. The required answer is $\frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$.

RULES TO REMEMBER FOR DIVISION OF FRACTIONS:

1. To divide one fraction by a second fraction, convert the '÷' division problem to '×', by putting '×' between two fractions and invert the fraction to the right of '×'. Solve it as for multiplication.
2. Convert mixed fractions into improper fractions, when necessary. Then solve as required.
3. Reduce the numerators and denominators by dividing (cancelling) with numbers common to both.
4. Multiply the numerators and write down the product above the bar.
5. Multiply the denominators and write down the product below the bar.
6. Convert this into a mixed number. This is your answer.

EXAMPLE:

$$9\ \frac{1}{3} \div 1\frac{1}{6}$$
$$= \frac{28}{3} \div \frac{7}{6}$$
$$= \frac{28}{3} \times \frac{6}{7}$$
$$= \frac{4}{1} \times \frac{2}{1}$$
$$= \frac{8}{1} = 8$$

Follow it up with a lot of examples so that the students are confident of the basic steps before you move on. It would also be a good idea to have a small class assessment at this point

Task: Students should attempt page 61.

Lesson 4: **40 minutes**

Simplification:

The new concept that has been introduced in Book 5 is the order of operations. It is important for students to understand the reason for a fixed order in which operations have to be performed in a multi operation simplification problem. Do insist that the simplification must go from LEFT TO RIGHT of an expression.

BODMAS stands for this order…

B … Brackets

O … Of (multiplication)

D … Division

M … Multiplication

A … Addition

S … Subtraction

Operations need to be performed in this fixed order. Altering the order will result in incorrect results. It is worthwhile to mention that this concept, once again, requires a great deal of practice to perfect it. Spend sufficient time on it so that the students clearly understand the concept.

ALWAYS WORK FROM LEFT TO RIGHT.

A. Brackets must always be worked first.

$9 \times (2 + 3) = 9 \times 5 = 45$ ✓

$9 \times (2 + 3) = (9 \times 2 + 9 \times 3) = (18 + 27) = 45$ ✓

$9 \times (2 + 3) = 18 + 3 = 21$ (wrong)

B. Work from the left to the right (division first)

$\underline{30 \div 5} \times 3 = 6 \times 3 = 18$ ✓

$30 \div 5 \times 3 = 30 \div 15 = 2$ X

C. Addition or subtraction first?

$\underline{4 + 8} - 5 = 12 - 5 = 7$ ✓

$4 + \underline{8 - 5} = 4 + 3 = 7$ ✓

$\underline{4 + 8} - 5 = -1 + 8 = 7$ ✓

$\underline{4 - 8} + 5 = -4 + 5 = 1$ ✓

$4 \underline{- 8 + 5} = 4 - 3 = 1$ ✓

D. In complex problems, BODMAS must be maintained.

$12 + \underline{30 \div 5} \times 3 = 12 + 6 \times 3 = 12 + 18 = 30$ ✓

$12 + 30 \div 5 \times 3 = 12 + 30 \div 15 = 12 + 2 = 14$ X

$21 + 25 \times 6 \div 3 - 14 = 21 + 150 \div 3 - 14 = 21 + 50 - 14$ X

$21 + 25 \times \underline{6 \div 3} - 14 = 21 + 25 \times 2 - 14 = 21 + 50 - 14 = 57$ ✓

$3 \times 5 + 4 \times \underline{9 \div 3} = 3 \times 5 + 4 \times 3 = 15 + 4 \times 3 = 27$ ✓

If you work from left to right:

- the order of addition or subtraction can be altered. (Students must understand negative numbers.)
- the order of multiplications can be altered.
- the order of division and multiplication, when they appear adjacent to each other, cannot be altered.

This concept, like many others in mathematics, requires a lot of practice to perfect it. Give the students enough examples to work on.

Task: Students should attempt page 64.

UNIT 5

DECIMAL FRACTIONS AND PERCENTAGES

Teaching objectives

Decimal numbers

i. Compare numbers up to 3-digits with 2 decimal places using signs <,> or =
ii. Arrange numbers up to 3-digit numbers with 2 decimal places in ascending and descending order
iii. Add and subtract 4-digit numbers up to 3-decimal places
iv. Multiply a 3-digit number up to 2 decimal places by 10, 100, and 1000
v. Multiply a 3-digit number up to 2 decimal places by a whole number up to 2-digit
vi. Multiply a 3-digit number up to 2 decimal places by a 3-digit number up to 2 decimal places
vii. Divide a 3-digit number up to 2 decimal places by 10, 100, and 1000
viii. Divide a 3-digit numbers up to 2 decimal places by a whole number up to 2-digit
ix. Divide a 3-digit number up to 2 decimal places by a 2-digit number up to 1 decimal place
x. Convert fractions to decimals using division
xi. Solve real life situations involving division of 3-digit numbers up to 2 decimal places

Estimation

i. Round off a 4-digit number up to 3-decimal places to the nearest tenth or hundredth
ii. Estimate sum or difference of the numbers (up to 4 digits)

Percentages

i. Recognise percentage as a special kind of fraction
ii. Convert percentage to fraction and to decimal number and vice versa (only for numbers without decimal part i.e. 35%, 75% etc.)
iii. Solve real life situations involving percentages

Teaching materials:

- square grid paper (10 × 10)
- cubes sliced into 10 by 10 by 10 smaller cubes

Learning activity

Lesson 1: 40 minutes

The teaching focus, during this year, is decimal fractions or 'decimals'. By the end of Year 5, the students should be able to identify decimals, perform the basic mathematical operations with decimals, apply BODMAS and apply decimals in real-life situations. It must be clear to the students that decimal fractions are merely another form of writing vulgar fractions with the denominators 10, 100, 1000, and so on. The decimal point is an extension point beyond which the order of 'tenths' remains from left to right:

hundreds tens units . tenths hundredths thousandths

A decimal point used on the right of the unit (or Ones) digit differentiates whole numbers and decimal fractions of the number.

IMPORTANT POINT TO REMEMBER: A decimal fraction is different form of a vulgar fraction, written as an extension of counting numbers.

The best way to introduce decimals is through the modern currency of any country: the US $, the Euros of Europe, Great Britain's pounds, or the currency of Pakistan. The class must understand the following conversions:

Rs 100	Ten Rs 10 notes (or coins)
Rs 10	Ten Re 1 coins

The students are familiar with U, T, H, and so on, in numbers. They have applied these to money, and used the four operations of +, –, ×, and ÷. It is easy to reinforce this with paper money in the classroom, emphasizing the fact that Re1 is the unit of the system.

Today, units of measurement for money, length, weight, capacity, and temperature (except time) are all metric: Rupees, metres, grams, litres and degrees. The most common use of the decimal point is money, which the students have handled since they were little, buying books, pencils, or ice creams. Two places of decimal points are most easily introduced through paper money and cardboard coins.

In the following notation, the decimal point is the place where the whole numbers ends and fractions begin, at the same rate, i.e. tenths.

	Hundred	Tens	Ones	.	$\frac{1}{10}$	$\frac{1}{100}$
	H	T	U	.	tenth	hundredth
	Rs 100	Rs 10	Re 1	.	10p	1p
A.	5	3	6	.	7	5
B.	2	4	9	.	8	0

Reads:

A. Rs 500 + Rs 30 + Rs 6 + 70 p + 5p = Rs 536.75
   Rupees five hundred and thirty-six, and paise 75
   OR Rs five hundred and thirty six point seven five
B. Rs 200 + Rs 40 + Rs 9 + 80 p + 0 p = Rs 249.80
   Rupees two hundred and forty-nine, and paise 80
   OR Rs two hundred and forty-nine point eight

The students are familiar with this, but it is useful to put it down in writing:

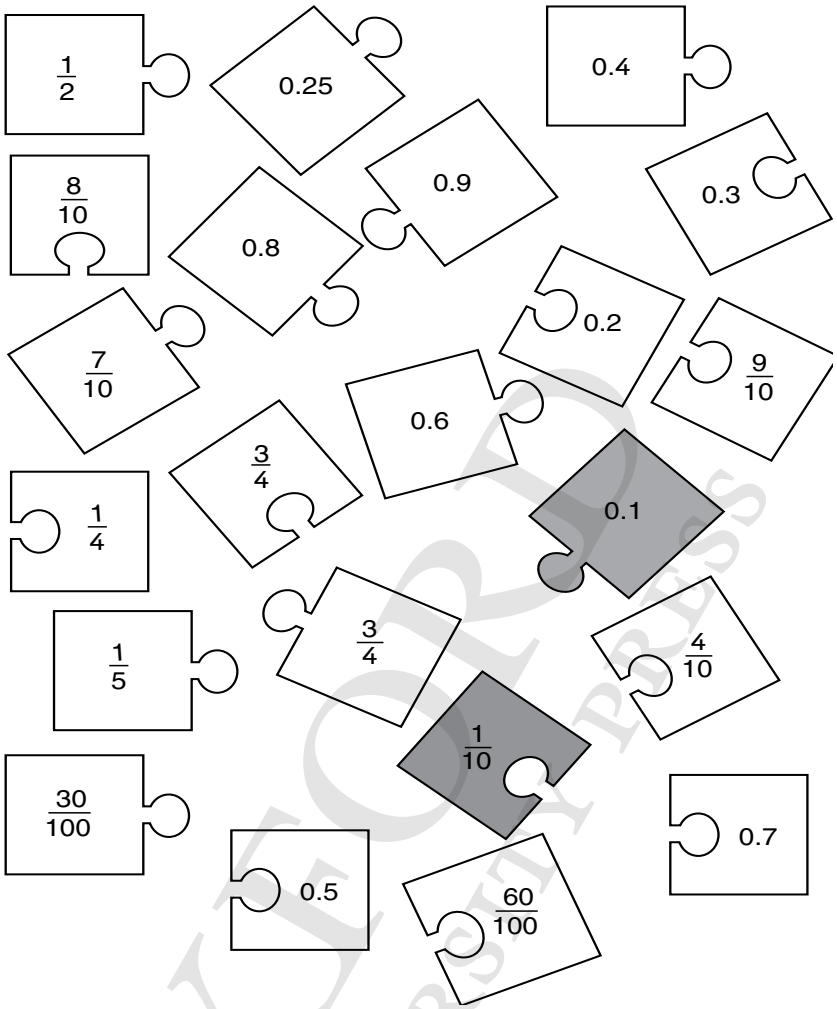
Ten Re 1 coins = one Rs10 note = Rs10

Ten Rs 10 notes = one Rs100 note = Rs100

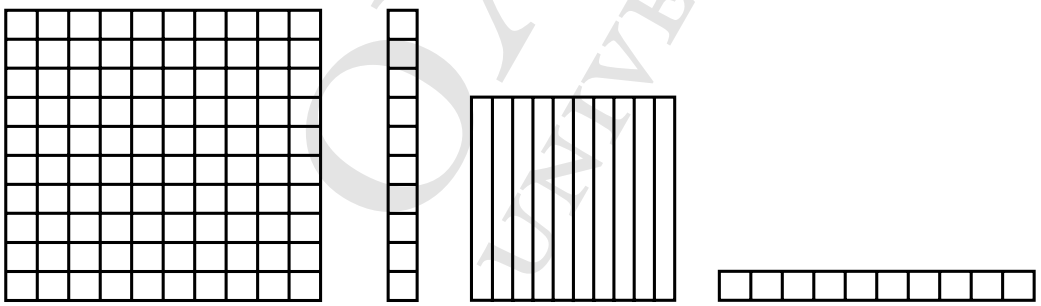
Ten Rs100 notes = one Rs1000 note = Rs1,000

Set up shops in the classroom with toy cars, paper flowers, pencils, and similar objects. Have students learn the use of decimal point, addition, subtraction, multiplication, and division of numbers with decimal point in no time, when bills are made out, and everything is worked practically.

Match the fractions with the decimals.



To generalize decimals, draw a chart like this:



TENS	ONES	.	tenths	hundredths	
4	1	.	7	5	= 41.75
2	5	.	6	2	= 25.62
1	2	.	8	2	= 12.82
1	0	.	0	0	= 10.00
3	6	.	5	0	= 36.50

Explain to the students that the places on both sides of the decimal point can be extended as shown below:

REMEMBER:

'Thousand' is $\frac{1}{10}$ of 'Ten thousand'

'Hundred' is $\frac{1}{10}$ of 'Thousand'

'Ten' is $\frac{1}{10}$ of 'Hundred'

'One' is $\frac{1}{10}$ of 'Ten'

'Tenth' is $\frac{1}{10}$ of 'Unit' or 'One'

'Hundredth' is $\frac{1}{10}$ of 'tenth'

'Thousandth' is $\frac{1}{10}$ of 'hundredth', …

PLACE VALUE AND DECIMALS

millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones	and	tenths	hundredths	thousandths	ten-thousandths	hundred-thousandths	millions
					3	1	.	7	5				

The students must understand that these figures can represent most physical measurements, such as

money: cost of a bar of a flower bouquet: Rs 41.75
weight of a child: 25.62 kg
height of a tree: 12.82 m
litres of juice: 2.00-litre bottle of juice
temperature: 36.5° C on a hot day

EXCEPT TIME … nature did not create the metric system!

To be able to use decimal fractions confidently, the students must first understand the decimal notation and the equivalence of decimals to vulgar fractions (and, later, to percentages).

Cost of a flower bouquet is $\text{Rs } 40 + 1 + \frac{7}{10} + \frac{5}{100}$

$\text{Rs } 41 + \frac{70}{100} + \frac{5}{100}$

$\text{Rs } 41 + \frac{75}{100} = \text{Rs } 41.75$

Weight of a child is $20 \text{ kg} + 5 \text{ kg} + \frac{6}{10} + \frac{2}{100}$

$= 25 \text{ kg} + \frac{60}{100} + \frac{2}{100}$

$= 25.62 \text{ kg}$

More of these examples should be worked on the board.

The students will now have a good understanding of the concepts of decimals as fractions and be familiar with the decimal representation of numbers. Revise the concept before you move on to operations with decimals.

Task: Students should attempt pages 62 and 63.

Lesson 2: **40 minutes**

Talk about the meaning and significance of the decimal point. If you feel the need, give each student a 10 × 10 grid and ask them to colour squares to represent the given decimal fractions. Ask the students to make tables as shown below. Call out several decimal numbers and ask the students to write them in the correct positions. The left portion of the tables represents the whole number and the right portion represents the fractional parts. The dot separates the fractional parts from the whole numbers.

THOUSANDS	HUNDREDS	TENS	UNIT	•	TENTHS	HUNDREDTHS	THOUSANDTHS
			4	•	2		
			0	•	2	3	
		9	1	•	5	6	4
2	0	0	3	•	1	2	9

REPEAT: a decimal fraction is a vulgar fraction (with the denominator of 10, 100, 1000, …. 'Multiples of 10') written in a different manner.

Expanded form of the numbers in the above table:

$4 \times 1 + \frac{2}{10} = 4.2$

$0 \times 1 + \frac{2}{10} + \frac{3}{100} = 0.23$

$9 \times 100 + 1 \times 1 + \frac{5}{10} + \frac{6}{100} + \frac{4}{1000} = 901.564$

$2 \times 1000 + 0 + 3 \times 1 + \frac{1}{10} + \frac{2}{100} + \frac{9}{1000} = 2003.129$

Once the students understand the decimal notation as an extension of place value, teaching the number operations will be easy. The numbers on the right side of the decimal point are merely an extension of a series of numbers which go up 10 times, from right to left, and go down 10 times, from left to right, exactly as whole numbers do.

Lesson 3: **40 minutes**

Addition and Subtraction:

Add 2.3 and 4.5. Ask the students to think of the problem as 23 + 45. How would they have attempted it?

TENS	UNITS
2	3
4	5
6	8

Encourage the students to think of the decimal problem in a manner similar to whole numbers, except there is a decimal pointer separator between the 2 digits: units and tenths. Let them write down the problem as shown below and perform addition as shown above.

UNITS	•	TENTHS
2	•	3
4	•	5
6	•	8

Similarly, to attempt a problem with unequal number of places on the left side and the right side of the decimal point, fix the position of the decimal point and the arrange the digits according to their place values. Then, perform the operations as usual.

For example: 20.45 – 3.451

TENS	UNITS	•	TENTHS	HUNDREDTHS	THOUSANDTHS
2	0	•	4	5	0
	3	•	4	5	1
1	6	•	9	9	9

It is extremely important that the students understand that adding 0's to the left of any whole numbers has no value, and adding 0's to the right of the decimal places has no value.

hundreds	tens	units	•	tenths	hundredths	thousandths
	4		•	9		
0	4		•	9	0	
0	0	4	•	9	0	0

IMPORTANT: 4.9 = 04.90 = 004.900

TO THE RIGHT OF A DECIMAL POINT: adding 0 to the right of the number does not change the number.

0.030 = 0.300 = 0.3000

TO THE LEFT OF A DECIMAL POINT: adding 0 to the left of the number does not change the number.

35 = 035 = 0035 = 00035

Task: Students should attempt page 70.

Lesson 4: **40 minutes**

Multiplication:

Multiplication of decimals can be carried out exactly the same way as multiplication of whole numbers. However, it is essential to align the decimal points correctly.

A. For example: 4 × 35.9 (Decimal fraction multiplied by a whole number)

Practically the problem may be thought of as 4 strips, each of length 35.9 units placed end to end. Add the lengths repeatedly to obtain the total length.

35.9 + 35.9 + 35.9 + 35.9

Total = 143.6

To represent it as a multiplication problem, use the tabular form below:

HUNDREDS	TENS	UNITS	•	TENTHS
	3	5	•	9
				4
1	4	3	•	6

First step: $0.9 \times 4 = \frac{9}{10} \times 4 = 36$ tenths $= 3.6$

Second step: The 'carry over' of 3 is done just like the 'carry over' in whole numbers. The rest is normal multiplication

B. Example: .02 × 1.5 (Decimal fraction multiplied by a decimal fraction)

Convert decimal fraction to vulgar fractions.

$.02 \times 1.5 = \frac{2}{100} \times \frac{15}{10} = (2 \times 15)/(100 \times 10) = \frac{30}{1000} = 0.030$ $\frac{30}{1000} = 0.030$

Explain the same example using the decimal representation:

0	•	0	2	
1	•	5		
0	•	0	3	0

There are a total number of 3 decimal places in 0.02 and 1.5; the total number of decimal places in the product must be 3, as well.

RECAP

2 × 15 = 30

2 × 1.5 = 3.0

0.2 × 0.15 = 0.030

0.02 × 1.5 = 0.030

The students will have to count the total number of decimal places occupied by the multiplier and the multiplicand and adjust the number of decimal places in the product, accordingly. If the multiplier has 2 places of decimal and the multiplicand has 1 place, the product MUST HAVE 2 + 1 = 3 places of decimal.

It is simpler to work out multiplications in this manner:

A. EXAMPLE: 2.3 × 0.17

2.3 × 0.17

Multiply without decimals: 23 × 17 = 391

2.3 has **1 decimal place**

0.17 has **2 decimal places**

Product has **3 decimal places** 0.391

B. EXAMPLE: 5.9 × 1.02 × 0.7

Multiply without decimals 59 × 102 × 7 = 42126

5.9 has **1 decimal place**

1.02 has **2 decimal places**

0.7 has **1 decimal place**

Product has **4 decimal places** 4.2126

Several multiplications need to be worked out like this, because in everyday life the students will find an assortment of situations where these occur.

Cost of 5.5 l at Rs 105.75 per litre

Travelling by bus, tickets costs Rs 12.50 per person; half price for a child. The family needs 4 adult tickets and one child's ticket.

2.5 kg tomatoes at Rs 50.80 per kg

2.5 m of fabric for a dupatta at Rs 650.75 per metre

RULE: When multiplying decimal fractions, IGNORE the decimal points. Find the product. The answer will have as many decimal places as those in the original numbers. Mark the decimal point accordingly.

Task: Students should attempt page 73.

Lesson 5: **40 minutes**

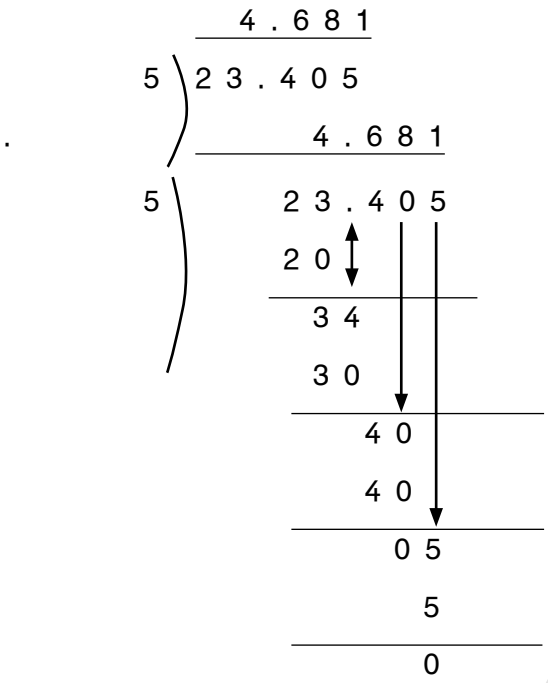
Division:

Division of numbers with decimals can be performed in the same way as division of whole numbers, keeping the position of the decimal place fixed in the dividend and the quotient.

Ignore the decimal point; work out the division and insert the decimal point again just above its position in dividend.

For example: 23.405 ÷ 5

The position of the decimal remains unaltered when the divisor has no decimal places.



When you need to divide a decimal fraction by another decimal fraction, remove the decimal places for the divisor and shift the decimal point correspondingly for the dividend, as shown above:

For example : 43.028 ÷ 0.4

Here, the divisor has only one place after the decimal. To remove the decimal from it we have to multiply both the divisor and the dividend by 10.

$\frac{43.028}{0.4} = (43.028 \times 10)/(0.4 \times 10) = \frac{43.028}{4}$

Division is carried out as above: 430.28 ÷ 4

So, 43.028 ÷ 0.4 = 107.57

Once the students are confident with the methods for the four basic operations, it will be simple to carry out multi□operational numerical problems. Revise the BODMAS rule again. Then go on to simplification.

Task: Students should attempt pages 75, 76, and 77.

Lesson 6: 40 minutes

Rounding off

Tell them that to estimate a sum or a difference of decimals you round the decimal to the nearest whole number. Guide them using an example.

For example 376.12 +160.78

Round each number to the nearest whole number to find a reasonable estimate.

376.12 becomes 376

160.78 becomes 161

376 + 161 = 537

The answer is that 376.12 + 160.78 is approximately 537.

Now shown them estimations with subtraction.

Tell them that they can work on these problems in the same way, by rounding.

Estimate 95.78 - 43.10 = _____

95.78 rounds to 96

43.10 rounds to 43

96 - 43 = 53

The answer is that 95.78 - 43.10 is approximately 53.

Now divide the class in 4 groups.

Give each group a card, written two grocery items on it with price in decimals.

For example, Tea for Rs 987.45 and Sugar for Rs 225.55

Ask them to estimate the sum and difference of the prices.

Task: Students should attempt pages 79 and 80.

Lesson 7: **40 minutes**

Having explained the concept and the methods of working with decimals, introduce percentages as a special format of decimal fractions. Give each students 10 × 10 grid papers (100 squares).

Ask them to colour some squares. Ask them to call out the number of squares they have coloured as a fraction and as a decimal number.

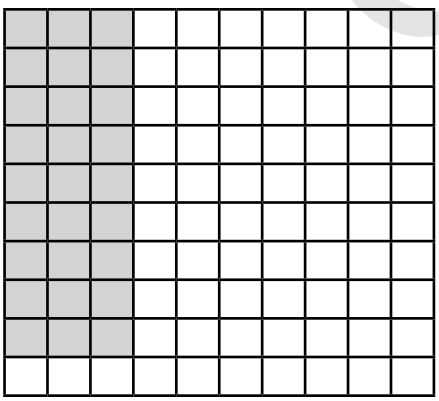
Shahana colours 25 squares; she has covered 25% of the page.

Riaz colours 49 squares; he has covered 49% of the page.

This will be an easy way of introducing the new way of representing the vulgar fraction as a decimal fraction. Introduce the symbol for percentage %.

It is interesting to note the history of the % sign. It evolved from the Italian term per cento. Originally, it was written as pcento. Eventually, the 'p' disappeared and the two 0s for 100 were separated by a horizontal line, $\frac{0}{0}$.

This eventually took the form of %.



Fraction coloured = 27 out of 100

$\frac{27}{100}$ as a vulgar fraction

0.27 as a decimal fraction

27% as a percentage

Take the students to the library to research on the various types of data that are written as percentages: percentage of the population living with low incomes, women and children in Pakistan as percentages of the total population, percentage of air crashes, percentage increase in prices the world over, etc.

Discuss in class the uses, advantages, and disadvantages of fractions, decimal fractions, and percentages. Also ask the students to deliberate on the need for the concept of percentages given the fact that we already have the concepts of fractions and decimals in place.

Operations with percentage can be dealt with easily once the students are aware of the significance of the conversion of a percentage to a fraction or a decimal.

Task: Students should attempt pages 84 to 88.

UNIT 6

DISTANC AND TIME

Teaching objectives

Distance

i. Convert measures given in
   - kilometres to metres and vice versa
   - metres to centimetres and vice versa
   - Centimetres to millimetres and vice versa

ii. Solve real life situations involving conversion, addition and subtraction of measures of distance

Time

i. Convert
   - hours to minutes and vice versa
   - minutes to seconds and vice versa

ii. Convert years to months and vice versa, months to days and vice versa, weeks to days and vice versa

iii. Add and subtract intervals of time in hours and minutes with carrying and borrowing

iv. Solve real life situations involving conversion, addition and subtraction of intervals of time

Teaching materials:

- board and markers/chalk
- conversion table

Learning activity

Lesson 1: 40 minutes

The concepts of length and time have already been introduced in the earlier books. In this book the ideas are revisited and the students are introduced to the units of temperature. Choosing the right unit of measuring a particular object has already been dealt with in the earlier books and by now the students are ready to convert a given measurement to a suitable unit.

Begin the lesson by revising the various units of length as an oral activity. Recall the prefixes for the various units of the length commonly used, and what they represent.

The commonly used measurements of length (weight and mass) are:

millimetres	milligrams	millilitres
centimetres	grams	litres
metres	kilograms	kilolitres
kilometres		

A millimetre (mm) is used for measurement of small lengths, such as thickness of the soft cover of a book. It is a tiny measurement.

---

1 centimetre = 10 millimetre

A centimetre (cm) is used for measurements of thickness 10 times that of 1 mm, e.g. the thickness of an eraser or the width of a nail on your hand.

Centimetres are used to measure the width of a table or the thickness of a door.

1 cm = 10 mm

---

1 metre = 100 centimetres

A metre used to measure lengths 100 times that of 1, e.g. the height of the roof, the width of a floor

1 m = 100 cm = 1000 mm

---

1 kilometre = 1000 metres

A kilometre (kilo) means 'thousand' and is used to measure lengths 1000 times that of 1 km, e.g. the distance between 2 cities, the distance that a car travels in an hour.

1 km = 1000 m = 1, 00, 000 cm = 10, 00,000 mm

Put up in class the chart of the prefixes given below and the mnemonic to remember these by.

Unit of measurement of length: Metre(m)

PREFIX	MEANING	UNITS OF MEASUREMENT
kilo	thousand times (× 1000)	(Km) (Kg) (Kl)
hecto	hundred times (× 100)	(Hm) (Hg) (Hl)
deca	ten times (× 10)	(Dm) (Dg) (Hl)
Unit of measure		Metre, Gram, Litre
deci	one tenth (1 ÷ 10)	(dm) (dg) (dl)
centi	one hundredth (1 ÷ 100)	(cm) (cg) (cl)
mille	one thousandth (1 ÷ 1000)	(mm) (mg) (cl)

A common mnemonic for memorizing the order of the above units is given below. You can ask the students to create their own.

- **Khan Habib Drives motorcars during cold months**
- **Km Hm Dm m dm cm mm**

Do plenty of oral work in class as revision. Keep the figures simple so that the students can focus on the conversion.

Ask questions like:

- How many Hm are there in 10 km?
- Convert 13 mm into cm?
- How many m in 45 Hm?
- How many cm in 4 m?
- How many m in 0.2 km?

Since the measurement of length uses the metric (or decimal) system, all calculations should be easy for the students. Ask them to calculate the conversions mentally and differentiate the problems that require multiplication from those that require division.

Once the students are confident with conversions, move on to the number operations with measurements in different units of length.

PROBLEM

1 km 50 m + 2 km 67 m

There are two ways to handle a problem like this.

Method 1:

Convert the above terms into smaller units (m).

1 km 50 m = 1050 m and 2 km 67 m = 2067 m

1050 m + 2067 m = 3117 m

3117 m = 3 km 117 m

Method 2:

Recap the additions of decimal fractions (1 km = 1,000 m). Place the decimal points one below another and add, as is done for natural numbers.

1 km 50 m = 1.050 km and 2 km 697 m = 2.987 km

$$\begin{array}{rcccc} & 1 & . & {}^{1}0 & 5 & 0 \\ + & 2 & . & 9 & 8 & 7 \\ \hline & 4 & . & 0 & 3 & 7 \end{array}$$

This is a simpler and more straightforward method.

Either of these two methods works well, as long as the students understand them.

Subtraction of different units of length can be taught along the same lines, where the numbers are placed one below another, with the decimal point aligned properly.

12 kg 350 g – 9 kg 569 g

$$\begin{array}{rcccccc} & 1 & {}^{1}2 & . & 3 & 5 & 0 \\ – & & 9 & . & 5 & 6 & 9 \\ \hline & & 2 & . & 7 & 8 & 1 \end{array}$$

Check:

$$\begin{array}{rcccccc} & {}^{1}2 & . & 7 & 8 & 1 \\ + & 9 & . & 5 & 6 & 9 \\ \hline 1 & 2 & . & 3 & 5 & 0 \end{array}$$

The same metric system applies to grams and litres:

Equivalents in metric systems

1 km (kilometre) = 1000 m (metre)

1 m (metre) = 1000 mm (millimetre)

1 kg (kilogram) = 1000 g (gram)

1 g (gram) = 1000 mg (milligram)

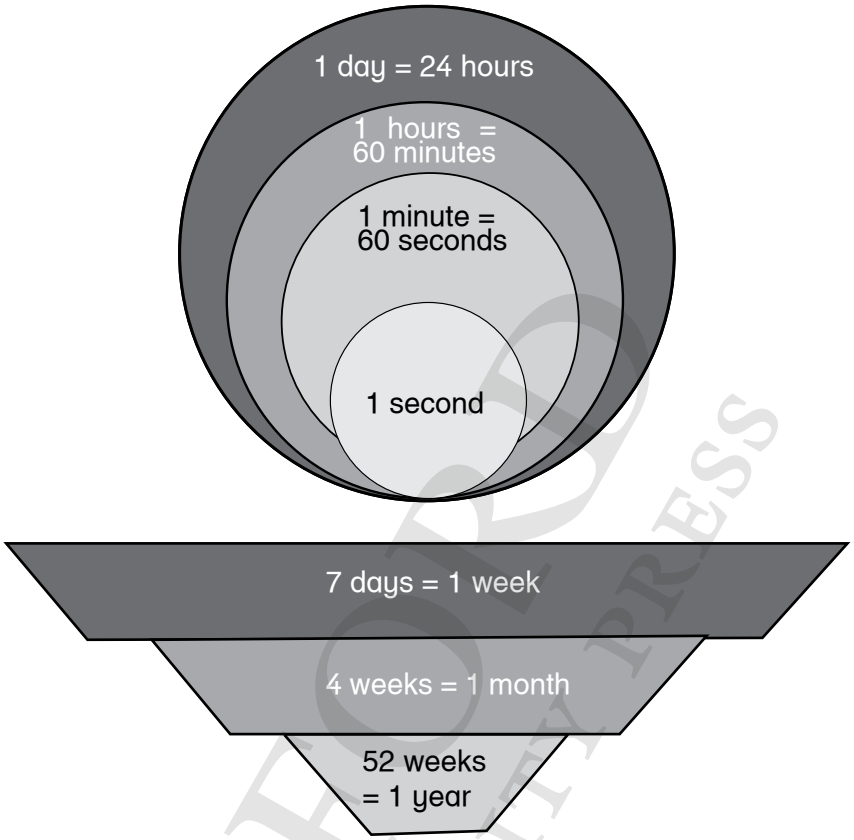
1 kl (kilolitre) = 1000 l (litre)

1 l (litre) = 1000 ml (millilitre)

Task: Students should attempt pages 90 to 94.

Lesson 2: **40 minutes**

Units of time have already been introduced in Maths Wise 4. This book introduces the number operations with time expressed in different units. Before going into number operations, revise the different units of time and the inter□conversion between them.



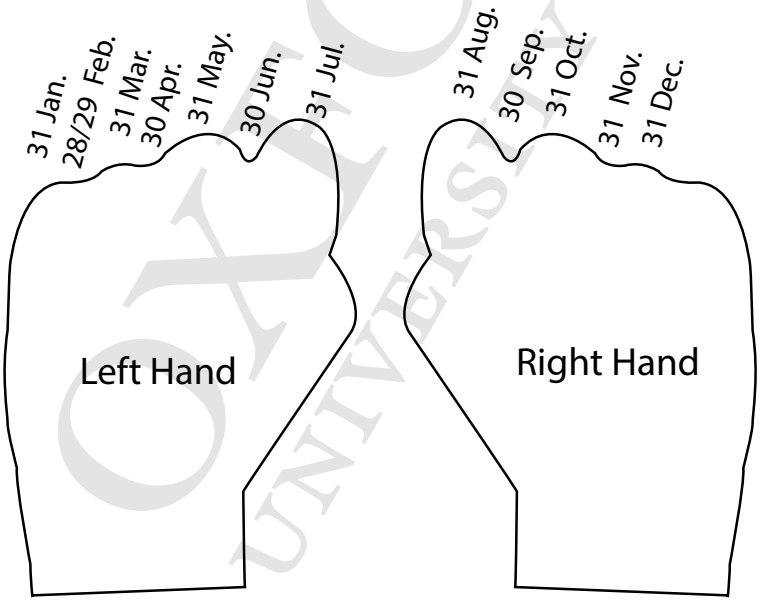
Divide the students into groups and assign a project to each group. Each group should make a colourful chart showing the different conversion of the units. Present it to the rest of the class. Display the charts in the classroom and refer to them when you do addition and subtraction of different units of time.

Name of Unit	**Symbol**	**Definition**
millennium		1000 years
century	(c)	100 years
decade	(dec)	10 years
year	(yr)	365 (a fraction) days, 52 (+a fraction) week (the time it takes for the Earth to rotate around the Sun)
leap year		366 days (appears every 4th year)

month	(mo)	i) 28 days in February 30 days in April, June, September, November 31 days in Jan, Mar, May, Jul, Aug, Oct, Dec ii) 4 weeks (+ a fraction)
fortnight	(fn)	14 days or 2 weeks
week	(wk)	7 days
day		24 hours
hour	h	60 minutes
minute	min	60 seconds
second	sec	the time it takes for light to travel nearly 300 million metres.

The above chart is for the general understanding of time. The basic unit is a second; and a year is the time it takes the Earth to go round the Sun. Everything is derived from nature.

Divisions of time are man-made. And man has not been able to convert the calculation of time into metric system. The Earth revolves around the Sun taking 365¼ days, i.e. one revolution of the Earth around the Sun. This cannot be converted into a metric system. The students easily learn the 'number of days in a month' on the knuckles of both their hands.



For addition, subtraction, multiplication, and division, the carrying-over and borrowing will not be in groups of 10 as in the metric system. The conversion units are different units. Hence, the students have to be very careful when carrying over or borrowing. You may choose any one of the following methods to discuss in class and let the students follow. Let us take the example:

PROBLEM 1: 14 h 45 min + 20 h 34 min

Method 1:

This method is not recommended as a regular method for addition and subtraction of hours and minutes; but is a good way for the students to practice number operations.

Convert the larger unit (hour) to the smaller unit (minutes) and perform addition as usual. The sum obtained can be converted back to the original units.

14 hr 45 min = 14 × 60 + 45 min = 840 min + 45 min = 885 min

Similarly, 20 hrs = 20 × 60 + 34 min = 1200 min + 34 min = 1234 min

$$\begin{array}{rr} & 885 \text{ min} \\ + & 1234 \text{ min} \\ \hline & 2119 \text{ min} \end{array}$$

To convert 2119 into hours and minutes:

$\frac{2119}{60}$ = 35 h 19 min = 1 day 11 h 19 min

$$\begin{array}{rr} & 14 \text{ h } 45 \text{ min} \\ + & 20 \text{ h } 34 \text{ min} \\ \hline \multicolumn{2}{l}{1 \text{ day } 11 \text{ h } 19 \text{ min}} \end{array}$$

Method 2:

Retain the figures in their original units.The conversion factor is used only when carrying over.

	Hours		minutes
	1 hr carried over		
1	4	4	5
2	0	3	4
3	5	1	9

Here 45 + 34 =79 min = 1 hr 19 min

Choose one of the above methods to practise various additions and subtractions of time units in the class. It is always better to use the same methods in addition and subtraction of length, time, and other units of measurement, whenever possible.

Task: Students should attempt pages 95, 96, 97, 99, 100, 101, and 103.

UNIT 7

UNITARY METHOD

Teaching objectives

Unitary Method

i. Calculate the value of many objects of the same kind when the value of one of these objects is given
ii. Calculate the value of one object of the same kind when value of many of these objects are given
iii. Calculate the value of many objects of the same kind when the value of some of these is given

Teaching materials:

- board and markers/chalk
- coloured paint
- clear plastic cups
- large bowl

Learning activity

Lesson 1: 40 minutes

As always, unitary method should be taught starting with examples from real-life. Tell the students that this method is very useful and commonly used in daily life situations and can be applied under various conditions.

Start with a couple of the following examples with different scenario.

In first case the value of one object is known, Thus, we can calculate the value of many objects of the same kind. Few examples are given below:

- Mrs Ahmed earns Rs 5000 per month.
- Earnings = 5000 Đ months worked
- At a party, 2 cup cakes per person are needed.

Total cup cakes required = 2 Đ the number of guests

- A hired taxi charges Rs 300 per hour.

  Total amount to be paid = 300 Đ the number of hours

Here we notice that if one quantity increases, the other quantity also increases at the same rate.

Similarly, if the value one quantity decreases, the value of the other also decreases at the same rate.

Ask the students to suggest examples of their own and write them on the board.

In another case, we can calculate the value of one object of the same kind when the value of many of these is known. Few examples are given below:

- Cost of 5 m of cloth is Rs 500.
  Cost of 1 metre of cloth = 500 ÷ 5
- Mr Hassan's annual earning is Rs 720 000.
  Earnings per month = 720 000 ÷ 12
- A car covers 180 km in 4 hours.
  Distance covered in 1 hour = 180 ÷ 4

Here we notice that the value of many objects is always more than the value of one of these objects.

Ask the students to suggest examples of their own and write them on the board.

Sometimes, when the value of some of the objects is known, we can easily calculate the value of many objects of the same kind, by first finding the value of one of these objects.

Few examples are given below:

- In a Supper market 6 dozen oranges are sold for Rs 600. What will be the cost of 8 dozen oranges?
  Cost of 6 dozen oranges = Rs 600
  Cost of 1 dozen oranges = 600 ÷ 6
  Cost of 8 dozen oranges = (600 ÷ 6) x 8
- A train takes 9 hours to cover 1800 km. If it maintains its average speed, then how long will it take to cover 500 km?
- If 10 tables cost Rs 15000, what will be the cost of 3 tables?

Ask the students to suggest examples of their own and write them on the board.

An alternate method can also be explained by comparing quantities. Now, look at the examples given below.

- A driver is paid Rs 15000 per month.
  Earnings in a year = 15000 Đ 12 months
- At a school party, 2 cartons of juice per person are needed.
  Total cartons of juice required = 2 Đ the number of students
- A hired car charges Rs 250 per hour.
  Total amount to be paid = 250 Đ the number of hours

We notice that the pairs of items in these examples are 'directly proportional' to each other.

Here when one quantity increases, the other quantity also increases at the same rate.

Let us consider few more examples.

- The amount of light on a planet increases as the distance of the Sun from a planet decreases.
- The number of cockroaches in the house will reduce as the frequency of the visits of the pest controller increases.
- The number of days it takes to paint a room will decrease as the number of painters on the job increase.

We notice that the pairs of items in these examples are 'inversely proportional' to each other. Here when one value increases, the other value decreases at the same rate.

Ask the students to suggest examples of their own and write them on the board. Oral numerical problems are fun.

EXAMPLES:

- A 10 km journey costs Mahmud Rs 300. How much will a 15 km journey cost?
- A picnic meal for 15 boys from a welfare home costs Rs 800. How much will a similar meal cost for 21 boys?

Ask for suggestions to solve the problem. Some students will answer intuitively. They will halve the price of the 10 km journey, and add that amount to the cost of a 10 km journey. Take your lead from that and ask how they would find the required amount if the figures were such that they could not be halved.

On the board, work out the cost of a 1 km journey and then multiply by the required number (in this case 15) to find the correct answer.

Establish 'Reduce it to 1 first' as a standard strategy/ method.

Solve several word problems so that the students are comfortable with this unitary method. Also emphasise the fact that proper statements MUST be written, and steps of working MUST be shown correctly. Here is an example:

Cost for a 20 km journey = Rs 540

Cost of 1 km journey = Rs 540 ÷ 20 = Rs 27

Cost of 15 km journey = Rs 27 Đ 15 = Rs 405

Cost of 15 meals = Rs 810

Cost of 1 meal = Rs 810 ÷ 15 = Rs 54

Cost of 21 meals = Rs 54 Đ 21 = Rs 1134

Task: Students should attempt pages 109 and 110.

UNIT 8

GEOMETRY

Teaching objectives

Angles

i. Recognise straight and reflex angle
ii. Recognise the standard units for measuring angles is 1˚, which is defined as 1/360 of a complete revolution
iii. Identify, describe and estimate the size of angles and classify them as acute, right or obtuse
iv. Compare angles with right angles and recognise that a straight line is equivalent to two right angles
v. Use protractor and ruler to construct
   - A right angle
   - A straight angle
   - Reflex angles of different measures
vi. Describe adjacent, complementary and supplementary angles

Triangles

i. Identify and describe triangles with respect to their sides. (isosceles, equilateral, and scalene)
ii. Identify and describe triangles with respect to their angles. (Acute angled triangle, Obtuse angled triangle and right-angled triangles)
iii. Use protractor and ruler to construct a triangle when
   - two angles and their included side is given
   - two sides and included angle is given
iv. Measure the lengths of the remaining two sides and one angle of the triangle

Quadrilaterals

i. Recognise the kinds of quadrilateral (square, rectangle, parallelogram, rhombus, trapezium, and kite)
ii. Identify and describe properties of quadrilaterals including square, rectangle, parallelogram, rhombus, trapezium, and kite, and classify those using parallel sides, equal sides and equal angles
iii. Use protractor and ruler to construct square and rectangle when lengths of sides are given

Symmetry

i. Recognise different types of symmetry (Reflective and Rotational) in 2D figures
ii. Identify lines of symmetry for given 2D figures
iii. Find point of rotation and order of rotational symmetry of given 2D figures

Three dimensional (3D) Objects

i. Identify cubes, cuboids and pyramids from their nets
ii. Describe and make 3D objects (cubes, cuboids, cylinder, cone, sphere, pyramids)

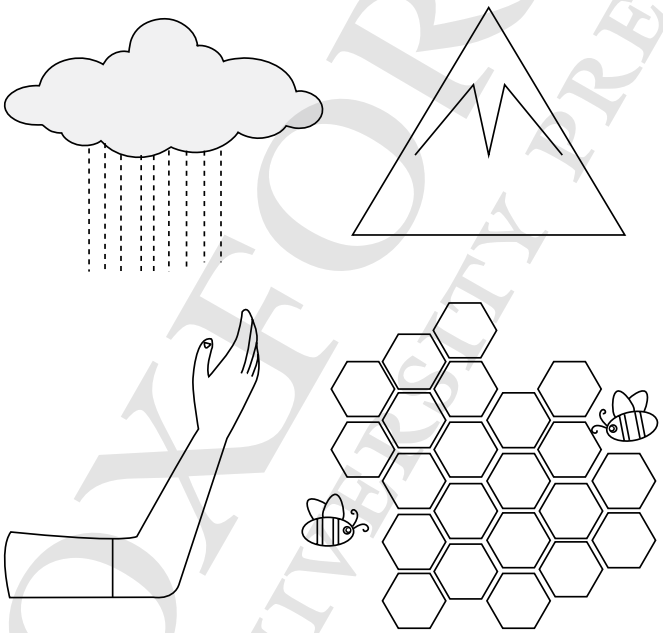
Teaching materials:

- geometry box
- ruler
- set-squares
- clock with moveable hands
- board and markers/chalk

Learning activity

Lesson 1: 40 minutes

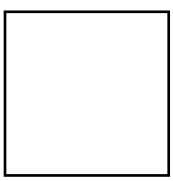
Many examples of geometry are to be found in nature. The shape of the Earth (spherical), the shape of the Sun seen from the Earth (circle), the elliptical path of the Earth around the Sun, rays of the Sun and the raindrops falling from the skies (straight line), the various shapes of leaves and flowers, the hexagons in beehives, the banks of a river and the lines on the back of a squirrel (parallel lines), the peak of the mountain (angle and a cone), the rotation of the Earth, the revolution (elliptical), angles between the branches of trees, at our knees and our elbows, and between our fingers, and the angle which the foot makes with the leg; all these, and more, are basic geometry.

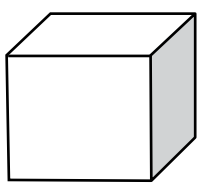


Students become familiar with geometrical concepts as soon as they are born, for example, in the shape of mother's eyes and the retina, the ball in their pram, etc.

This lesson deals with plane geometry, i.e. flat shapes, which can be drawn on a paper. A point, a straight line, a triangle, a quadrilateral, a circle, and so on.

Figures in plane geometry have 2 dimensions. Look at these diagrams:





1. (Length) 2. (L and B) 3. (L, B, and H)

Dimensions:

Discuss the significance of dimensions.

A point has no dimensions; no length and no breadth.

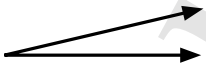
A straight line has one dimension: ONLY length.

All flat (2D) shapes on paper have two dimensions: length and breadth (or width).

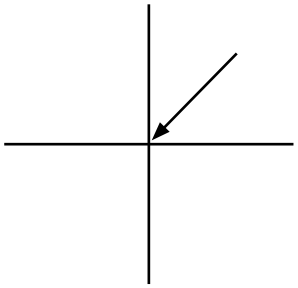
All solid (3D) objects have 3 dimensions (these shapes cannot be drawn on paper): length, breadth, and height.

It is interesting to note that even though a child touches and feels 3D objects at the beginning of his or her life, geometrical studies begin with 2D objects.

This lesson starts with revision of some of the basic definitions of geometric terms: a point, a straight line, a ray, a line segment, an angle, a triangle, a quadrilateral. You may want to make this more interesting by using a fun worksheet. Test the students with a 3-way matching worksheet as suggested below. Students have to match one item in the first column to its corresponding item in column 2, and its corresponding item in column 3.

COLUMN 1	COLUMN 2	COLUMN 3
POINT		shortest distance between 2 points
RAY		has no dimension only existence
STRAIGHT LINE		part of a straight line
LINE SEGMENT		formed when 2 straight lines intersect at a point
ANGLE		starts from a point and extends indefinitely on one side

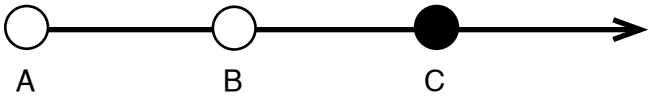
1. Point



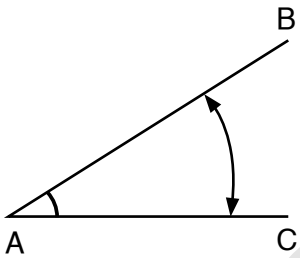
2. Straight line

3. Line segment AB

4. Ray



5. Angle



Once you have revised the basic definitions and the students have recalled the names and shapes of the above, move on to angles. Angles have already been dealt with in detail in Year 4, so just revise the basic facts. Ask questions and as students come up with the facts, list them on the board. Make sure you revise the following points, with the help of moving hands of a clock.

- What is an angle?
- How is it formed?
- What is a vertex?
- Which are the arms of an angle?
- How do you label an angle?
- What are the different types of angles?
- Form the following angles with your arms:
  - An acute angle
  - A right angle
  - An obtuse angle
  - A straight angle
  - A reflex angle
- A complete angle (possible when the child holds his or her hands horizontally straight, and takes a full turn around, on the ground)

What are clockwise and anticlockwise rotations? It is interesting to talk about why clockwise runs from left to right? It all started in the northern hemisphere, where the shadow of the Sun went around from left to right.

Ask one or two students to stand up with their arms stretched out at straight angles, and show clockwise and anticlockwise movements to form various angles. This can also be done with the hands of a clock.

It will be interesting to discuss why the hands of a clock move from left to right, and that is known as clockwise direction. Why?

Look at the Sun rising in the sky. It moves from the left, goes almost over your head, to the right (we are in the northern hemisphere of the Earth). The inventors of the clock were in the northern hemisphere, and the shadow of the sundial moves from left to right. The hands are actually modeled after the shadow on a sundial, and it began to be known as clockwise direction.

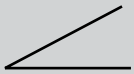
It useful to talk about clockwise and anticlockwise movements of hot and cold taps, the regulators of old fans, or the switches attached to gas and electric burners. Ask the students to observe these at home. They should note their observations and discuss these the next day.

Make a colourful chart of the different types of angles and display it in class. The following template will be useful:

ANGLES

When 2 straight lines intersect at a point, an angle is formed. There are different types of angles.

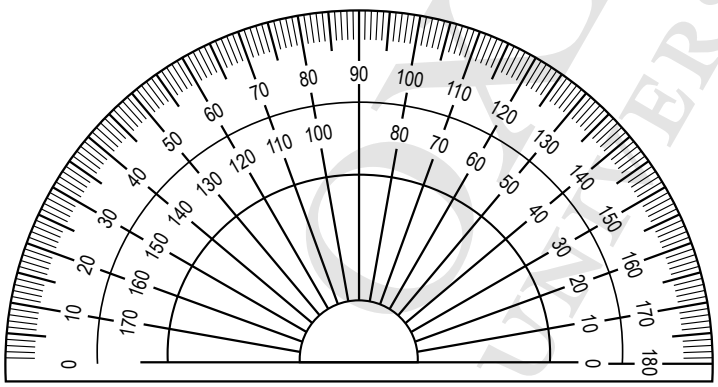
Acute angle: less than a right angle.

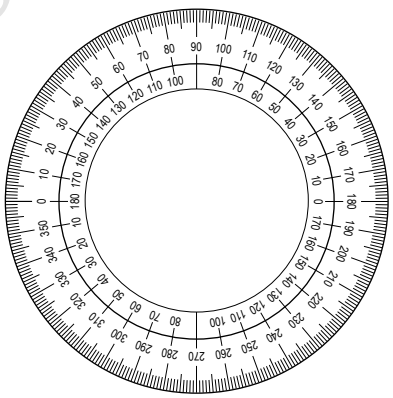


Right angle: when the 2 arms of an angle are perpendicular to each other, the angle formed is called a right angle.

Obtuse angle: Straight angle: Reflex angle: Complete angle:

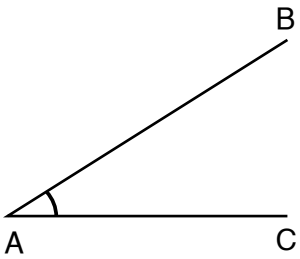
Once the students are aware of what the different angles look like, they must learn how to construct them accurately. For this, introduce the protractor and explain the different parts of the protractor. Initially, they may be a bit confused about the two scales on the protractor. Explain that different scales are used depending on the side of the base line you want to draw the angle from. Teach them various steps for using a protractor:





1. Mark the vertex with a point.
2. Draw a straight line through the vertex to represent the base arm of the angle.
3. Now place your protractor (180°) so that the centre of the protractor lies on the vertex and the 0° line coincides with the base line.
4. Now measure the required degree along the correct scale and mark the point with a dot.
5. Remove the protractor and join the dot to the vertex using a ruler.

6. Label the angle using the labeling convention and write the measurement on the angle.

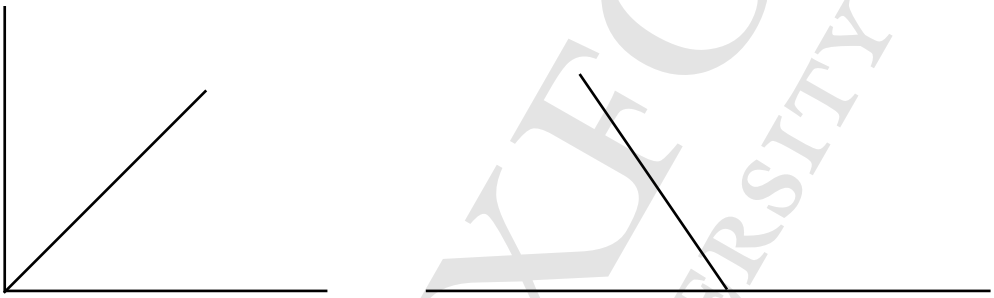


Give the students plenty of practice in construction of triangles. Ask them to draw angles of different sizes so that they spend enough time drawing acute/right/obtuse/reflex angles. Make sure the students are confident about drawing the different types of angles.

Explain:

- A pair of angles which add up to a 90° are called complementary pairs.
  Work with cut-outs of complementary pairs of angles.
  Example: 30° and 60° angles. Place them side-by-side and show that they make a right angle. You might want to introduce 'perpendicular lines' at this stage.
- A pair of angles that add up to 180° are called supplementary angles.
  Example: 50° and 130°

Ask the students to write down some pairs of complementary and supplementary angles.

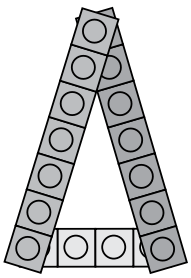


Task: Students should attempt pages 112, 113, 116 to 119.

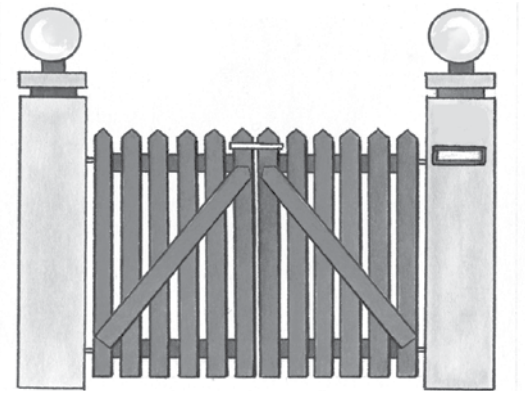
Lesson 2: **40 minutes**

Triangles: A triangle has 3 sides and 3 angles.

Triangles are also found in nature; you see one every day when you look at the mirror! The outline your nose makes with your face is a triangle. Cut an orange across the wedges; you will see that each wedge of an orange has a triangular shape. In a spider's web, there are many triangles.



It is interesting to note that a triangle is the strongest shape in geometry. If you press down a triangle made from Lego pieces, it will not bend; the pressure on the tip of the triangle is absorbed by the base of the triangle. Therefore, high telephone towers are made with triangular sides.



Sides of pyramids are triangular. That is the reason why the Egyptians made pyramids and not cuboid buildings. The sides of the Eiffel Tower are also triangular in shape.

Look at this garden gate. The outside shape is a rectangle, make from planks of wood. The carpenter usually joins one set of opposite corners to make the gate stronger (by creating two triangles). The same thing is often done with fences.

Point out some triangular shapes in the classroom, such as patterns on a grill of the window. A ribbon put across the board divides it into 2 triangles. There are some wooden triangular boards in the box of shapes which young students play with. Mithai often comes in triangles. Samosas are triangular. 'Tri' refers to 3, e.g. tripods and trilingual (someone who speaks 3 languages). How many students in the class are trilingual?

Introduce a triangle as a 2-dimensional closed shape with 3 sides and 3 angles. Divide the students into groups of 4 or 5 and give them each a geo-board and a few rubber bands. Ask them to make 3 different types of triangle using the apparatus given.

Once they are ready with their sets of triangles, call each group to come and present their triangles to the class and explain why the triangles are different from each other, with reference to the sizes of angles and sides.

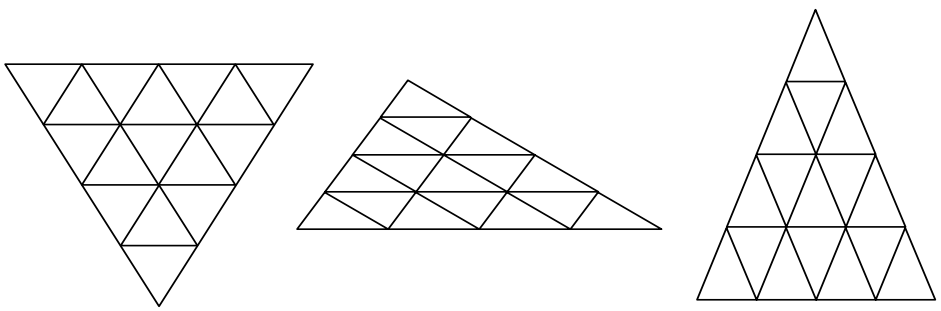
As the students present their work. List the properties they use to distinguish between different triangles. Once all the groups have made their presentations, summarize the criteria that they have used to differentiate the triangles, and formalize the concept.

Triangles are classified according to the lengths of their sides and sizes of their angles. You could use a branch diagram to illustrate the different types of triangles.

The students note down the properties of triangles:

- Right-angled triangle: has one 90°angle (the size of the sides is not important)
- Equilateral triangle: has 3 equal sides and 3 equal angles
- Isosceles triangle: has any two equal sides and two equal angles (the angles are opposite the equal sides)
- Scalene triangle: has no equal sides, no equal angles
- Acute angled triangle: all angles are acute.

Work with different types of triangles, with 10-12 identical pieces of the same shape and size. You will find that each kind of triangle can be tessellated.



Once you have discussed the different types of triangles, give the students some coloured paper and templates or stencils of the different types of triangles. Ask them to trace the triangles onto the coloured paper, cut them out, and glue these in their exercise books. Then they should write the names and the properties of each of the triangles.

This is the first time that students will construct geometric figures. Before you start with actual constructions, explain the significance of constructions, the differences between the instructions 'draw' and 'construct' the basic rules of construction.

Accurate construction of geometric shapes is required to make blueprints for cars, 22-wheeled trucks, airplanes, buildings, bridges, malls, and the city plans (even cake boxes and pizza boxes).

When you teach the method of constructing triangles, explain the parameters that should be provided. Tell them that for a 3-sided figure, the values of at least 3 parameters should be provided.

In Year 5 students will learn to construct triangles with 3 sides given, so recall once again how to measure the length of a straight line and how to draw a straight line of a given length.

The book handles the construction of triangles with the following parameters given:

- three sides
- two angles and the length of the side between
- two sides and an angle between the two sides

The students enjoy working with a compass and drawing various figures. Triangles will be quite easy to follow.

Task: Students should attempt pages 121, 122, 123, 125, 126, and 127

Lesson 3: 40 minutes

A lot of practice is necessary to attain the level of accuracy and perfection desirable. So spend enough time on construction of triangles before moving ahead. It is essential that the students measure all the 3 angles of a triangle to make sure that they add up to 360 degrees. Remind the students that all these are 2D shapes.

Ask the students to work with matchsticks to form various shapes. They will find that the shapes they can construct are all equilateral:

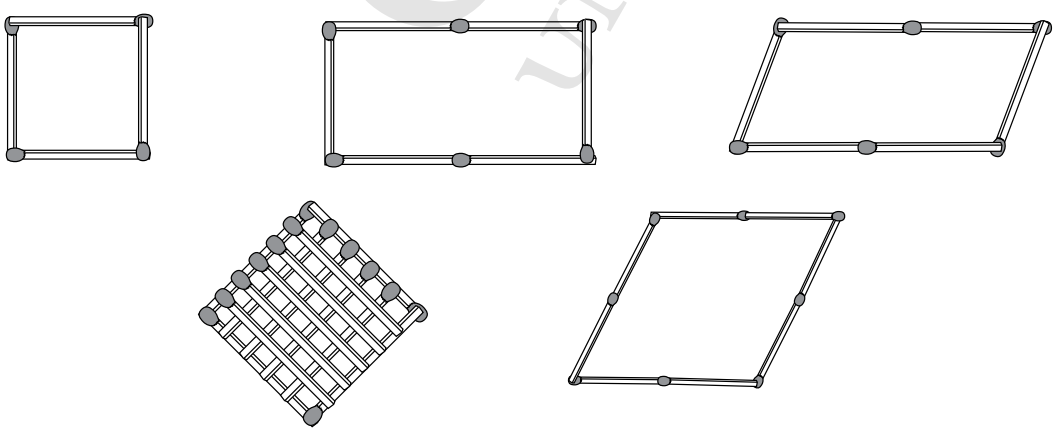
An equilateral triangle

A square

A rhombus (or a diamond)

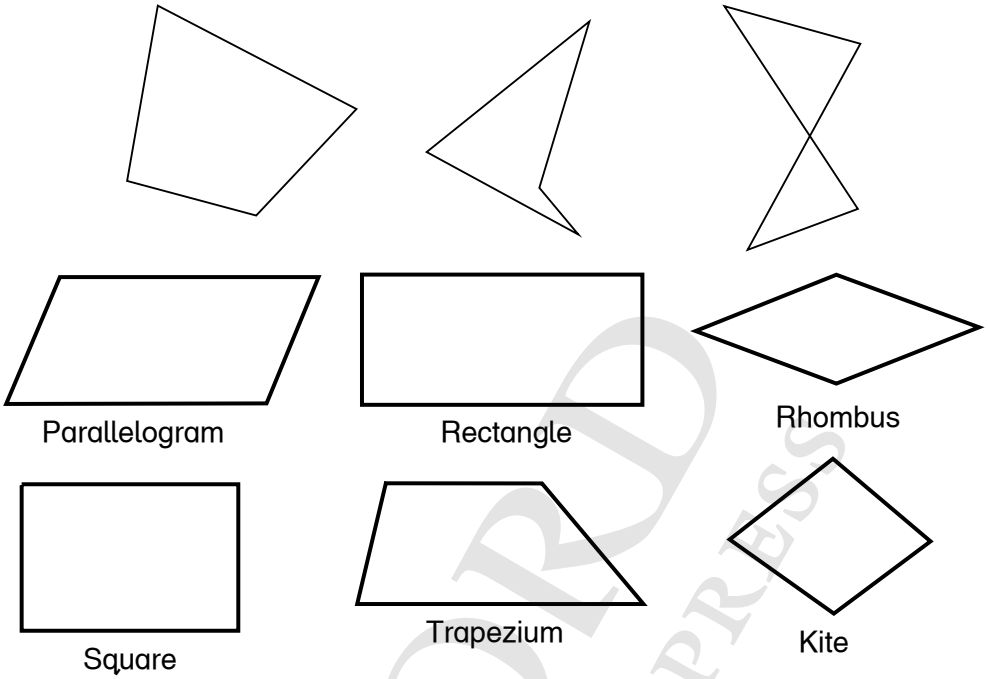
A parallelogram

(Regular pentagon and hexagons and others are also possible.)



It is helpful to display charts with different types of quadrilaterals (as shown in the book) as a reminder to students. It is interesting for them to see how different irregular quadrilaterals can look.

The following quadrilaterals cannot be made from matchsticks (sides are unequal).



Different sizes and shapes of quadrilaterals help the students to see what shapes parallelograms, kites, rhombuses, trapeziums, and arrowheads can take.

It is worth mentioning that some students may experience difficulty in carrying out the process effectively. Some students cannot focus to read the measurements from the ruler correctly due to eyesight problems; some are unable to hold the compass firmly due to neuro-motor problems. Also, dyslexic and left-handed students may have trouble with constructions. Be very patient with them and organize a special one-to-one session with them or ask a teaching assistant to help you, without becoming impatient and without using negative language. You may also pair students of different abilities and encourage peer tutoring. As a word of compassion, do not push these students too much. They may not be able achieve the level you are expecting from them, but that is not because they are not trying, it is because they are unable to!

Explain the meaning of 'quadra': many animals are quadrupeds; a 'quadragenarian' is a person between the ages of 40 and 49; a quadrilateral is a 4-sided geometric figure, which is also known as a quadrangle; a quadraplex is a building divided into four residences.

Task: Students should attempt pages 129 and 130.

Lesson 4: 40 minutes

Divide the class in pairs.

Give 2 cards with letter N to each pair of students. One letter N will be cut out by one student. Ask students to work together to place the N they cut out on the N which is not cut. Ask them to use their pencil as the centre of rotation to determine if the letter N has rotational symmetry, and for which degree turns.

Ask them to share the results of their rotation with the class.

Label their results with the vocabulary term order of rotation.

Guide them repeat the process with the letter B.

Students will share aloud what they discovered about the letters N and B.

Ask them, did both of them show rotational symmetry ?

The teacher will provide several examples for students to consider whether they have rotational symmetry. Students will explain whether each shape has rotational symmetry and if it does they will share the order of rotation.

Give them several independent practice examples to check for understanding of rotational symmetry.

Task: Students should attempt page 134.

Lesson 5: **40 minutes**

Ask each student to bring a small cardboard box.

Guide them to open the sides of the box along the folding crease.

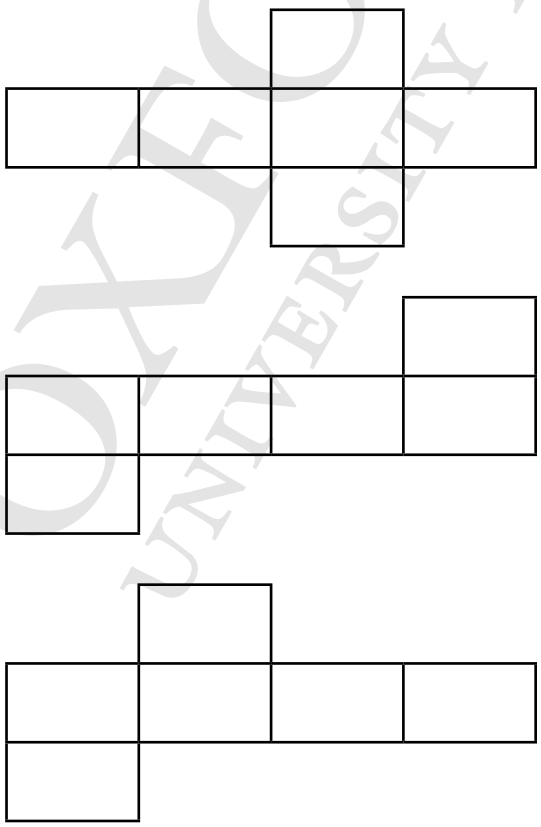
The box will open in different ways.

Tell them that the net of a 3D figure looks like a 2D shape if it is opened out flat and there may be several possible nets for one 3D shape.

Tell them that a net can be folded up to make a 3D shape. You can draw a net on paper, then fold it into the shape.

A net is a pattern that you can cut and fold to make a model of a solid shape.

Draw the following nets of a cube on the board and ask them to draw these patterns on a piece of paper and cut them along the outline. Guide them to fold along the lines and turn the folds to make a cube.



Task: Students should attempt pages 137 and 138.

UNIT 9

PERIMETER AND AREA

Teaching objectives

Perimeter and area

i. Differentiate between perimeter and area of a square and rectangular region
ii. Identify the units for measurement of perimeter and area
iii. Find and apply formulas to find perimeter and area of a square and rectangular region
iv. Solve real life situations involving perimeter and area of square and rectangular regions

Teaching materials:

- board and markers/chalk
- 1 cm × 1 cm square grid paper

Learning activity

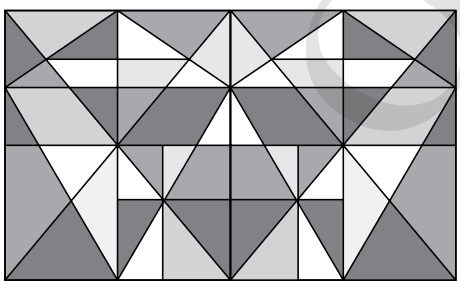
Lesson 1: 40 minutes

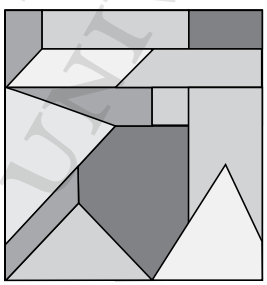
The concepts of area and perimeter have already been introduced in previous years. In Year 5, the concept is refined and formalized with the introduction of the mathematical formulae for finding the areas and perimeters of 2D shapes, such as a square and a rectangle.

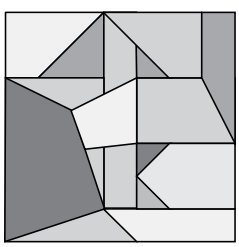
Revise the concepts with some hands-on activity.

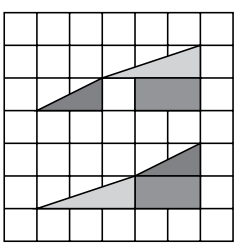
A concept that should be explained is that flat shapes have 2 dimensions: length and breadth (also referred to as width). Measurements of desktops, pieces of chart paper and broad ribbons clarify the 2D concept. All 2D surfaces can be laid flat on the desk or the floor.

Extra activity: It is interesting to work with different 2D shapes and see how they tessellate.









In this unit, the students learn about the concepts of area and perimeter of 2D shapes.

Perimeter:

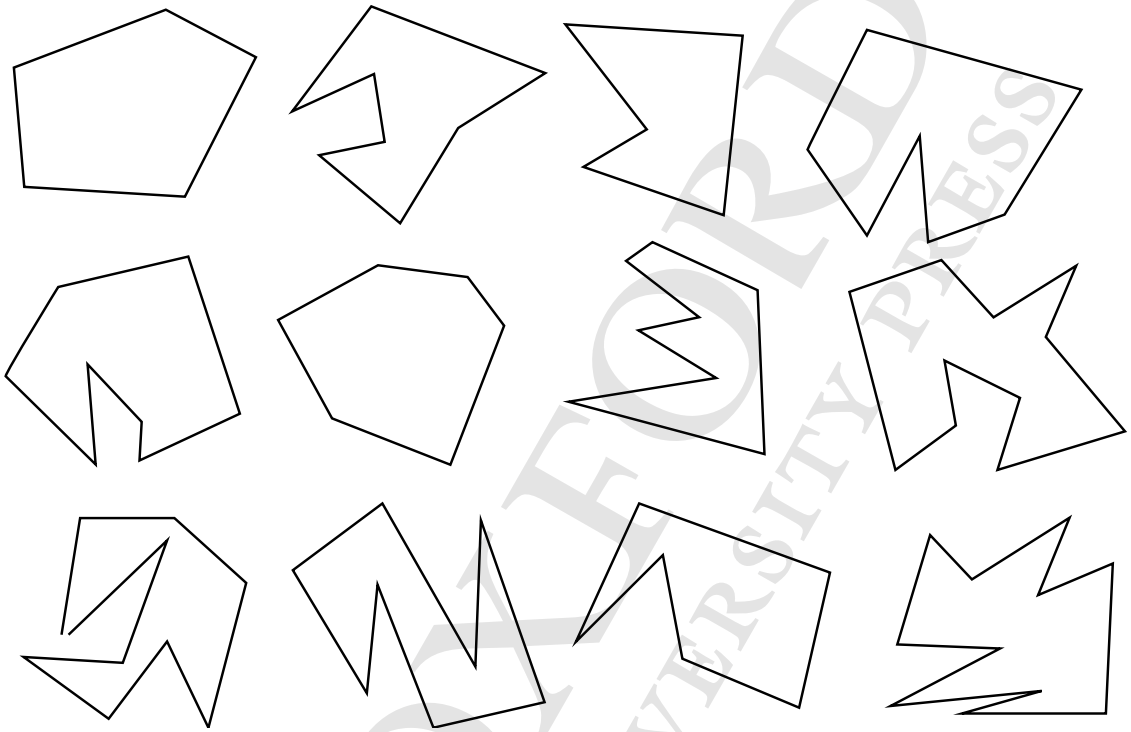
In the construction activity with matchsticks, the matchsticks formed the perimeter of each figure.

Let students explore the concept of perimeter by walking around a garden or around the classroom: they can talk about perimeter in terms of 'footsteps'. Then they can tie ribbons or strong thread around a desk or around the board. The perimeter, in these cases, will be measured in terms of metres or centimetres.

Divide the students into groups of 3 or 4 and give each group straws cut into lengths of 5 cm, 10 cm, and 15 cm with which to make different-sized polygons.

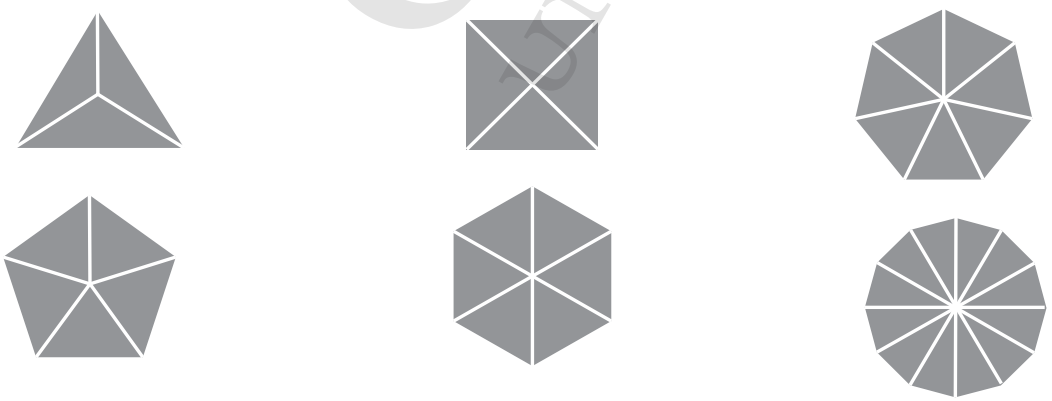
Polygons:

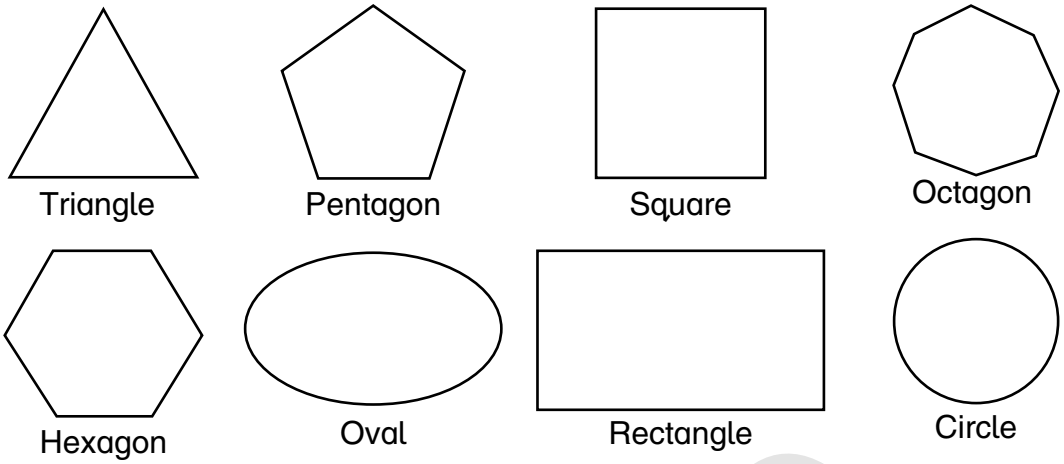
A polygon is a closed figure with any number of sides (not necessarily equal sides).



REGULAR POLYGONS:

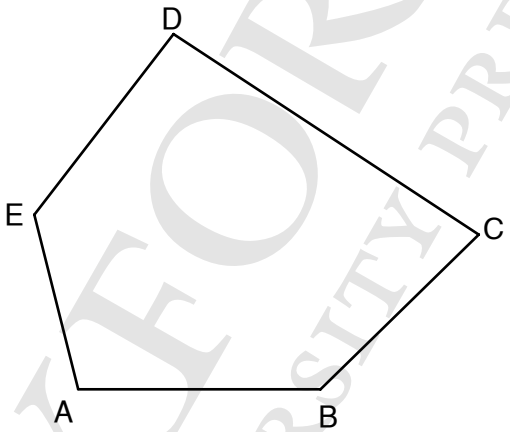
A regular polygon is also a closed figure, BUT all sides and angles must be equal.





It helps to have random polygons with 3 sides, 4 sides, 5 sides 6 sides, etc. drawn on the board or on the floor.

Students measure the sides and add the lengths.



Pentagon ABCDE

AB = 20 cm

BC = 17 cm

CD = 30 cm

DE = 18 cm

EA = 14 cm

Perimeter of ABCDE = AB + BC + CD + DE + EA = 99 cm

Ask students to draw random polygons in their exercise books. Each student measures the sides, writes down the lengths, and finds the perimeter of each figure, as shown above.

Tell a story. Make it interesting and funny so that the students are drawn in and take an interest in the story and hence the lesson.

Mr and Mrs Rahim invited 32 people to a get-together. To accommodate their guests they set up eight tables, with tops of different-sized squares or rectangles.

The guests need to bring chairs from the side of the hall to the individual tables. They rearrange the seating arrangements so different families can sit together in groups of 3, 4, or 5. Mr Rahim protests, knowing the arrangements won't work, but no one listens. After a great deal of confusion the guests realize Mr Rahim was right.

Narrate just the first part of the story, until the guests begin to move the tables. Then tell the students that they are going to help Mr Rahim arrange the tables so that no tables are crowded.

Place squares and rectangles on your table, so that the students can work out a seating pattern.

They may be confused initially, but exasperation always gives way to delight when they realize that the only way to get 32 places at the table is with Mr Rahim's original plan!

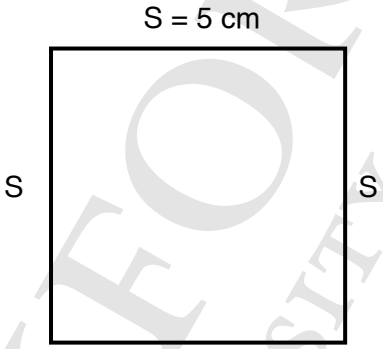
Soon, the class will work out that, if each table had 4 people, one on each side, the seating will be correct.

This exercise may not teach the students how to calculate area or perimeter, but it helps them differentiate between the perimeter of a shape and its area.

Then, introduce the formula for calculating the perimeter of a square and a rectangle.

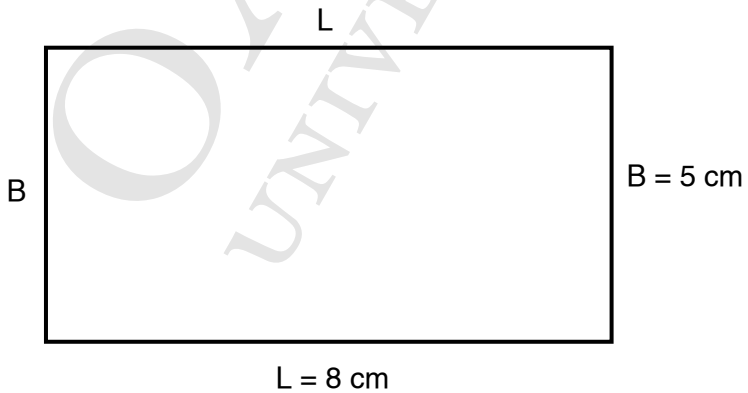
A square has 4 equal sides, each side with the length of 5 units.

So, the perimeter of a square is 4 × length of each side = 4 × 5 = 20 units.



A rectangle has two pairs of equal sides, L being the length, B being the breadth.

The perimeter = 2 × length + 2 × breadth = 2(L + B) = 2 (8 + 5) = 2 × 40 = 80 cm



In real-life situations, to find the perimeter of a square or a rectangular room, students may prefer to add all the 4 sides, rather than apply the formulae. Allow them to do that, until they realize that the use of the formulae makes the problem easier.

Task: Students should attempt pages 141 to 143.

Lesson 2: **40 minutes**

Before moving on to area use the activity below to reinforce the distinction between the area and the perimeter of a shape.

REMEMBER: Perimeter is 1-dimension, and area is 2-dimension.

Area:

The length (L) of a square is 1 cm, and the breadth (B) is 1 cm. (In a square, L = B)

Area = 1 cm^2

Perimeter = 4 cm

This means that the square covers space with area of 1 $cm^{2.}$

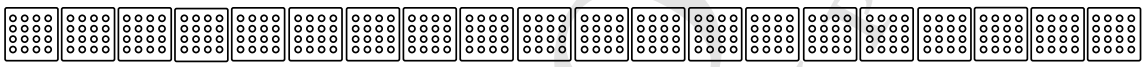
If an ant walks around the 4 sides, it will cover a distance of 4 cm. This is the perimeter of the square.

Students always seem to focus closely on lessons that involve edible objects, because they know that when the work is done, they can eat it all up!

IMPORTANT: Make sure that the snacks do not get soiled! Also, remember that certain children may have allergies.

Set up a few workstations. Give each student a packet of 20 Cheeselets or small cumin biscuits or other square biscuits (with each side 1 cm). Use these to compare and contrast the area and perimeter of different rectangles given below.

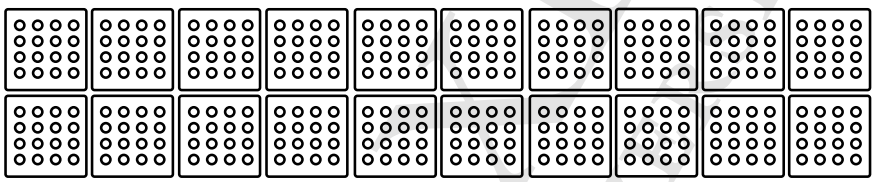
Students place 20 biscuits (each 1cm square) in the following patterns:



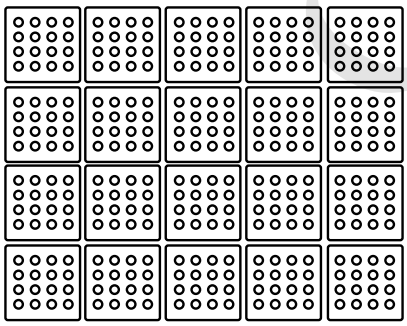
L = 20 cm B = 1 cm

Area: 20 biscuits = 20 cm^2

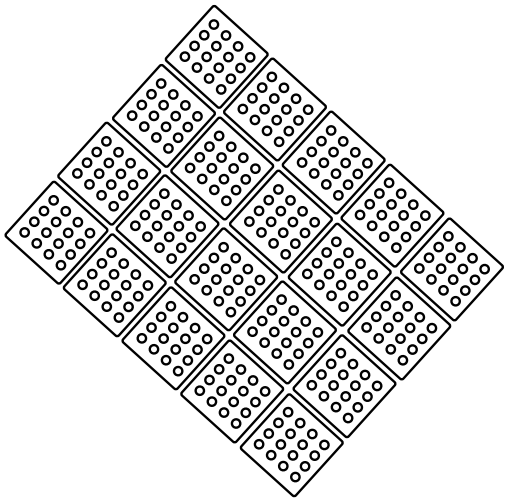
Perimeter: 20 + 20 + 1 + 1 = 42 cm.



Area: 20 biscuits = 20 cm^2
Perimeter: 10 + 10 + 2 + 2 = 24 cm



Area: 20 biscuits = 20 cm^2
Perimeter: 5 + 5 + 4 + 4 = 18 cm



Area: 20 biscuits = 20 cm^2

Perimeter: 5 + 5 + 4 + 4 = 80 cm.

The area of each pattern is 20 cm^2, but the perimeters vary.

Working in reverse, if a ribbon loop of 30 cm is the perimeter, one can have rectangles with these areas:

Area = 8 cm × 7 cm = 56 cm^2

Area = 9 cm × 6 cm = 54 cm^2

Area = 10 cm × 5 cm = 50 cm^2

Area = 11 cm × 4 cm = 44 cm^2

Area = 12 cm × 3 cm = 36 cm^2

Area = 13 cm × 2 cm = 26 cm^2

Area = 14 cm × 1 cm = 14 cm^2

It is interesting to note that with perimeter constant, as one side becomes longer, the area reduces! The slimmer the rectangle, the larger the area.

Once the students have enjoyed themselves with this activity, introduce the mathematical formula for the area of a square and a rectangle.

Take an example of a square, with L = 5 cm, B = 5 cm.

The area of the square = 5 × 5 cm = 5 cm^2 = 25 cm

The perimeter = 4 × 4 cm = 16 cm

Area of a square = side × side = L^2 cm^2

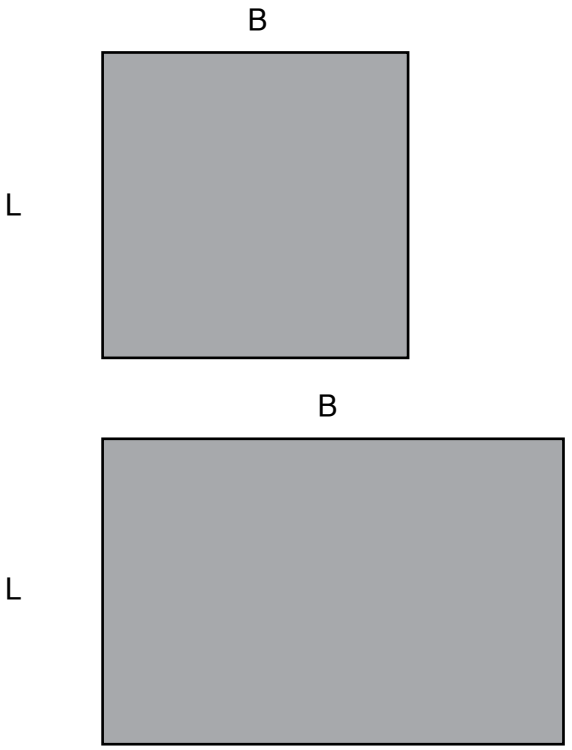
Using the formula, $A = L^2$

Area of a square biscuit: 1 cm × 1 cm = (1 × 1) cm^2 = 1 cm^2

Area of a square table top: 1 m × 1 m = (1 × 1) m^2 = 1 m^2

Area of a square tile: 10 cm × 10 cm = (10 cm × 10 cm) = 100 cm^2

Area of an open space on the highway 1 km × 1 km = (1 × 1) km^2 = 1 km^2



A rectangle has two pairs of equal sides 2 L and 2 B.
(Use rectangles formed by the square biscuits, as examples.)

Therefore, area = (L × B) cm^2

A rectangle with length 3 cm, breadth 2 cm
Area = 2 cm × 3 cm = (2 × 3) cm^2 = 6 cm^2

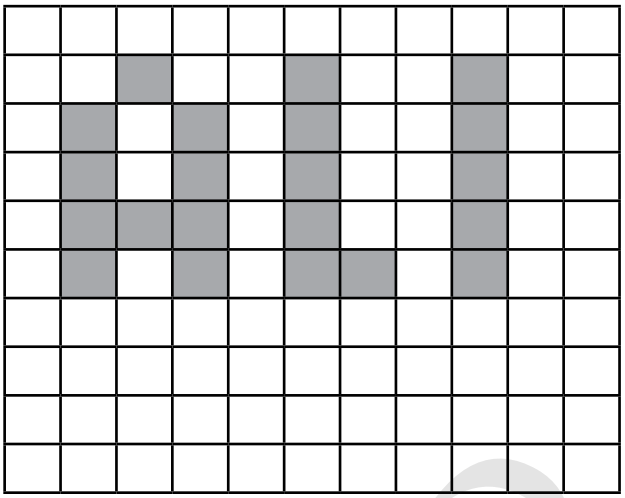
A table top: length = 50 cm; breadth = 20 cm
Area = 50 cm × 20 cm = (50 × 20) cm^2 = 100 cm^2

A square tile with one side 10 cm
Area = 10 cm × 10 cm = (10 × 10) cm^2 = 100 cm^2

Follow this up with a lot of oral activity and application to real-life situations. It is essential to show the concept of area with square biscuits, tiles on the floor, or a paper grid. In everyday life, the students have seen the tiles being laid in new homes, or a carpet for the sitting room floor. The perimeter comes in when the carpet needs to be finished by the layer, or the floor has a border all around, different from the tiles.

End this topic with drawings on a square grid. This activity is always a huge favourite with the students. Give each student a cm grid paper. First they use the square cm graph paper to write out their names. Next, they find the area and perimeter of each letter and add those together to find the area and perimeter of their entire name. Allow the students to compare the perimeters and areas of their names.

Encourage peer tutoring/help because when one student is having trouble visualizing how letters A or M can be made out of squares, a group member is always there to help.



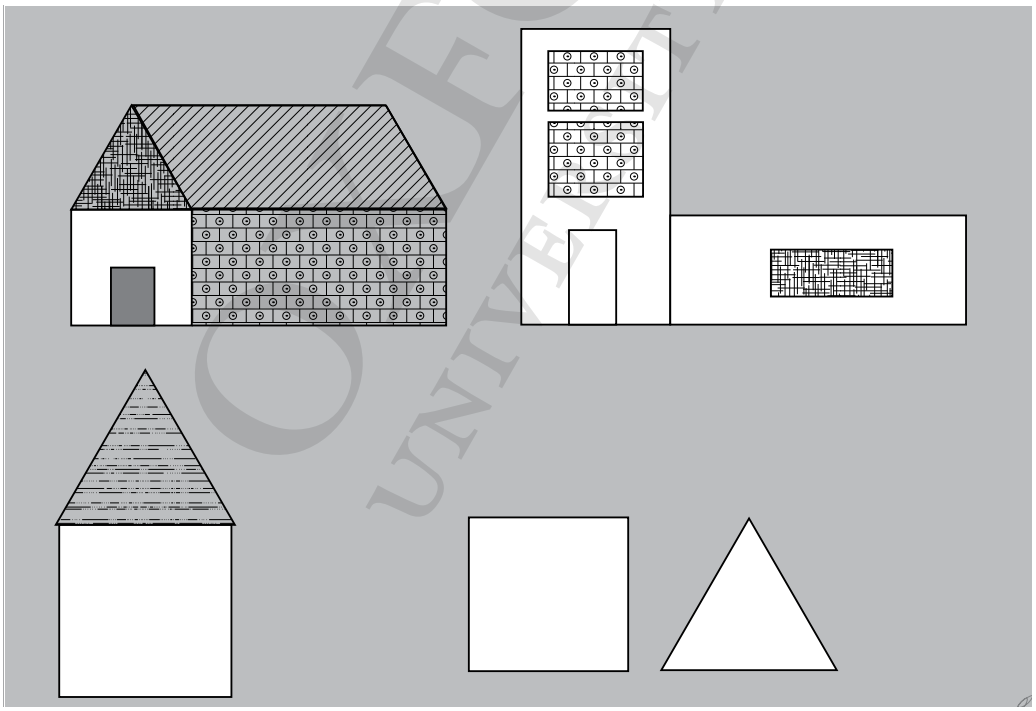
Ali finds the area occupied by his name, and the perimeter of each letter.

Area: A = 10 cm^2, L = 6 cm^2, I = 5 cm^2 Total area = 21 cm^2

Perimeter: A = 25 cm, L = 14 cm, I = 12 cm, Total perimeter = 51 cm

A chart with all the letters of the alphabet written in this names is useful.

This interesting activity enables students to create an area and perimeter neighbourhood. Print or photocopy cm grids onto coloured paper. Let the students select four different colours to create a house, roof, door, and windows. Drawing the polygons and cutting and fitting them together into different shapes requires substantial use of problem-solving skills. Once the project is ready, let them calculate the area and perimeter of each element. Completed houses can be displayed on a bulletin board along with details of the area and perimeter of the shape.



Far more complex compositions are often visualized by 9 to10 year olds.

Task: Students should attempt pages 145 **-** 147, 149, 150, 151

UNIT 10

DATA HANDLING

Teaching objective:

Average

i. Find and describe average of given quantities in the data
ii. Solve real life situations involving average

Bar Graphs

i. Organise the given data using bar graph
ii. Read and interpret a bar graph given in horizontal and vertical form
iii. Draw horizontal and vertical bar graphs for given data
iv. Solve real life situations using data presented in bar graphs

Teaching materials:

- sample graphs from newspapers, the Internet, or magazines
- charts
- Excel sheets

Learning activity

Lesson 1: **40 minutes**

Introduce the concept of average as 'normal' or 'something that is in the middle of a range'. It involves flattening out a range of numbers.

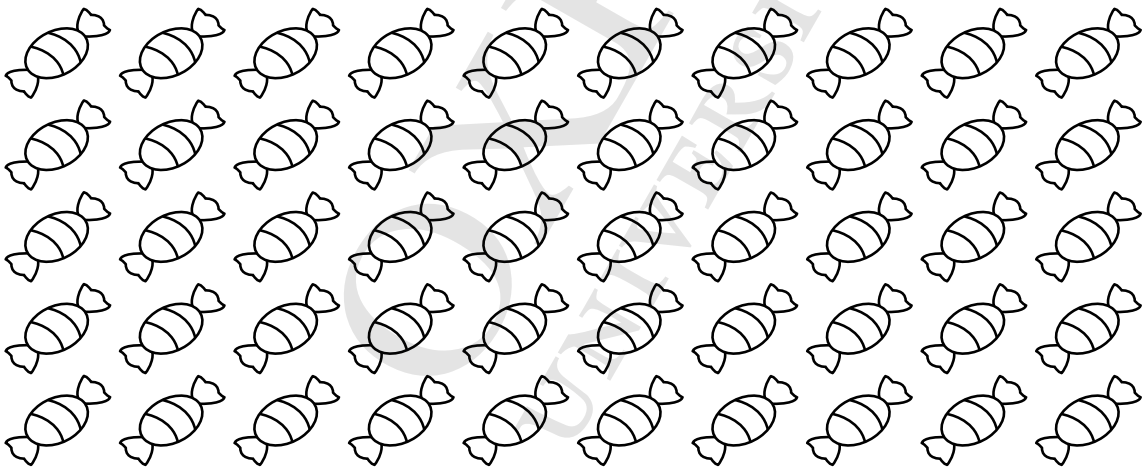
Tahira's mother bought 100 sweets for her birthday party. Fifty were given to the children of the domestic staff. She packed the remaining 50 into 10 gift packets for Tahira's friends. But, the packets did not all contain the same number of sweets. She put 6 or 7 in each packet and realized that she was running out of sweets, so she started putting 3, 4, or 5 in the remaining packets.

Tahira picked the largest one containing 8 sweets; Rahman's packet held 6, Mehru's 6, Syeeda's 6, Kishwer's 5, Alia's 5, Charu's 4, Lara's 4, Hameed's 3, and Neera's 3.

ACTUAL NUMBER OF SWEETS RECEIVED BY 10 CHILDREN

T R M S K A C L H N

AVERAGE NUMBER OF SWEETS RECEIVED BY A CHILD



T R M S K A C L H N

What was the average number of sweets each child received? The average is calculated by dividing the total number of sweets by the number of children at the party.

$\frac{50}{10} = 5$

B. Flavours of ice creams

10 different varieties of ice creams available at 'KREEMY CORNER'. One cone of each of the 10 flavours costs:

Fudge and brownie ice cream: Rs 50

Chocolate and nuts: Rs 45

Chocolate: Rs 40

Chocolate ribbon: Rs 38

Cherry: Rs 35

Strawberry: Rs 32

Blueberry: Rs 30

Vanilla with chocolate sauce: Rs 75

Vanilla and nuts: Rs 25

Vanilla: Rs 20

What is the average price of an ice cream cone?

C. Speed of a car over a long distance is often described in terms of 'average speed'.

The Ali family went for a picnic to Kalri Lake which is 130 km from Karachi. The family left home at 7 a.m. and reached at 10 a.m. What was the average speed of the car?

This means that the car may have gone very fast on a highway, at a speed of 80 km per hour or at a much lower speed of 30 km per hour, during traffic.

D. Cherrapunji (in India) is the wettest place in the world. The total rainfall during June, 2013, was 1525 mm. This means the daily rainfall would be in the region of $\frac{1525}{30}$ mm, which is approximately 50 mm every day.

NOTE FOR THE TEACHER: It is important to qualify the data being represented by the average. Is the average rainfall for a day in Cherrapunji the average over a month? Or a whole year? Or has the average been calculated over a few days? Or a few years?

The average of a set of data may or may not coincide with a particular item of data in the group; it is representative of the group as a whole. Explain the method of calculating the average: add up all the data in the survey and divide the total by the number of data items.

Give the students plenty of practice with the concept so that they are confident in finding averages.

Task: Students should attempt pages 157 to 159

Lesson 2: 40 minutes

Graphs were dealt with in detail in Book 4. Basically, a graph (at this level) is a pictorial depiction of the relationship between two variables.

In Unit 10, the emphasis is on the interpretation of graphs and calculation of averages from graphs.

Start by revising the basic concepts of a graph. You may want to base the revision on a question/ answer pattern.

1. What is a graph?

   It is a pictorial representation of two sets of information.

2. Why is it useful?

   It gives you quick and easy access to the information.

3. What are the different types of graphs that you have learnt about?

   Bar graph, column graph, pie graph, and line graph.

4. What are the essentials in a graph?

   A set of axis, a scale, a key, 2 sets of information to be represented.

A. Bar graph

Give the students a topic about which they can conduct a survey and collect data. For example, let the topic be 'The number of cartoon shows each student is allowed to watch'. Let them ask their friends in class as well as their friends in the neighbourhood (a minimum of 25). Help them tabulate the data. Ask them to count the number of children that are allowed to watch only one cartoon show, how many are allowed 2, how many are allowed 3, and so on. Sample tabulation is given below:

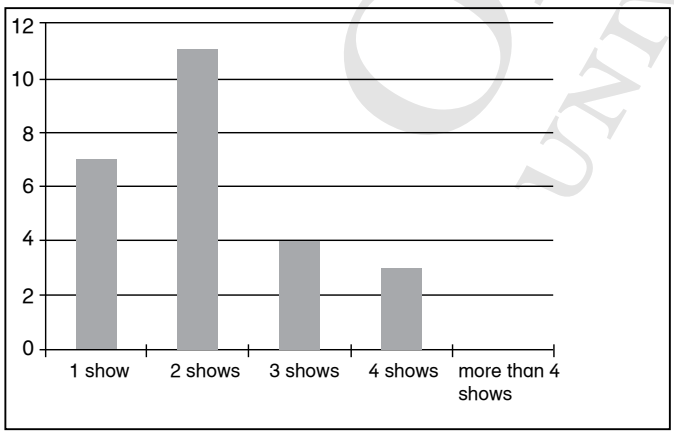
Number of shows	Number of children
1 show	7
2 shows	11
3 shows	4
4 shows	3
More than 4 shows	0
TOTAL	25

Now ask them to represent the information on a bar graph. As they do so, recall the different parts of a graph. You may conduct a small oral quiz to revise the concept. Show them the graph below and ask them to name the different components.

TITLE: Number of cartoon shows you are allowed to watch in a day

Revisit the steps for a bar graph:

- Draw a pair of axes.
- Choose a suitable scale; generally 1 cm = 1 unit.
- Find the heights of each bar according to the data given for example, the height of the bar representing 1 show is 7 cm, the height of the bar representing 2 shows a day will be 2 cm and so on (remember to keep to the scale).
- Use a ruler or graph paper to plot the points.
- Use a ruler to join them to form rectangles.
- Write the scale and make a legend.



Scale: 1 cm = 1 unit

Once the basic steps have been revised, go over the steps for drawing a bar graph and a pie chart from the set of data given above.

B. Steps for a pie chart:

To construct a pie chart, let the children collect data on their favorite sport. A sample collection is given below.

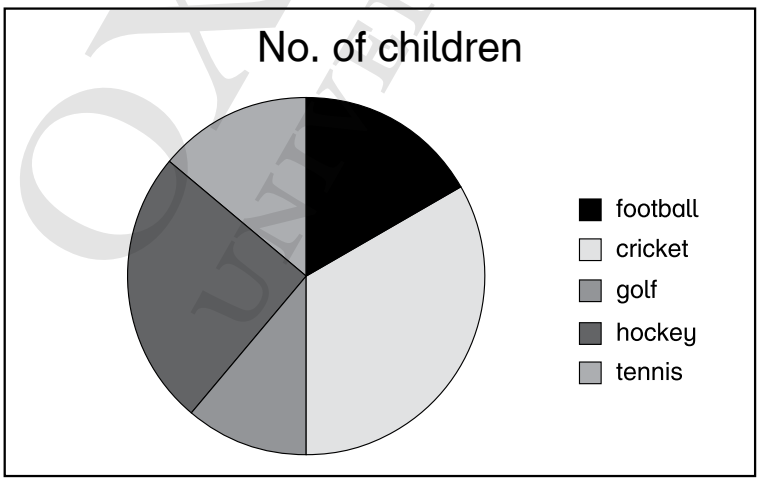
Sport	No. of children
Football	12
Cricket	23
Golf	7
Hockey	18
Tennis	10

Revisit the steps to construct a pie chart:

- Convert each frequency to it proportional part of the whole.
- For example, data A is 12 parts out of a total of (12 + 23 + 7 + 18 + 10 = 60)
- Data = $\frac{12}{60} = \frac{1}{5}$
- Calculate the proportional part out of 360°.

  $\frac{12}{60} \times 360°$

  $= \frac{1}{5}$ of $360° = 72°$
- Draw a circle of a suitable radius
- In the circle, mark sectors with the angles calculated proportionate to the data
- Label the corresponding sectors correctly
- The pie chart is ready, make a legend for the pie chart.



Once the students have revised the basics, ask them to conduct surveys on various topics.

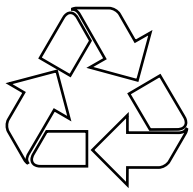
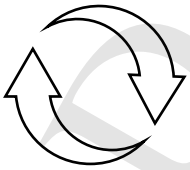
Given below is a template for an interesting survey, which you might want the students to conduct and represent the information on a bar/pie chart. This activity may be given to the students as a mathematics project.

What is the most important thing young people can do to protect the environment?

- Recycle.
- Plant trees.
- Buy only eco-friendly products.
- Raise money to save environment.
- Raise awareness about the environmental issues.

You could include other topics of concern or ask the students for their choice of topics for a survey. It is preferable that the students choose topics which relate to their daily life and are thought-provoking.

Do include other topics of everyday concern (such as use of plastics, wastage of paper) or ask the students for their choice of topics for a survey.

Once their survey is complete, help the students to tabulate the data and represent it on a bar or a pie chart. Ask each student to present his/her survey results and draw conclusions from them. Discuss these topics in class and encourage them to think about the local social issues, and give their individual opinions on the matters.

Introduce the concept of average as a representative of a group. An average of a set of data may or may not coincide with a particular data in the group. It is a representative of the group as a whole. Teach the method of calculating averages: add up all the data in the survey and divide it by the number of observations. Give the students enough practice in the concept till they are confident.

Task: Students should attempt pages 162 to 165.

UNIT 11

ASSESS AND REVIEW 2

Teaching objectives

- to revise the concepts learnt throughout the year

Teaching materials:

- additional worksheets

Learning activity

Lesson 1: 40 minutes

For a little number fun

During a spare period, begin by writing 3 or 4 lines of these pyramids on the board and ask the students to complete these in their exercise books, WITHOUT THE USE OF A CALCULATOR. It will be interesting to find out how many of the class are able to follow the pattern and complete the pyramid, without having to multiply the numbers.

$1 \times 8 + 1 = 9$

$12 \times 8 + 2 = 98$

$123 \times 8 + 3 = 987$

$1234 \times 8 + 4 = 9876$

$12345 \times 8 + 5 = 98765$

$123456 \times 8 + 6 = 987654$

$1234567 \times 8 + 7 = 9876543$

$12345678 \times 8 + 8 = 98765432$

$123456789 \times 8 + 9 = 987654321$

$1 \times 9 + 2 = 11$

$12 \times 9 + 3 = 111$

$123 \times 9 + 4 = 1111$

$1234 \times 9 + 5 = 11111$

$12345 \times 9 + 6 = 111111$

$123456 \times 9 + 7 = 1111111$

$1234567 \times 9 + 8 = 11111111$

$12345678 \times 9 + 9 = 111111111$

$123456789 \times 9 + 10 = 1111111111$

$$9 \times 9 + 7 = 88$$

$$98 \times 9 + 6 = 888$$

$$987 \times 9 + 5 = 8888$$

$$9876 \times 9 + 4 = 88888$$

$$98765 \times 9 + 3 = 888888$$

$$987654 \times 9 + 2 = 8888888$$

$$9876543 \times 9 + 1 = 88888888$$

$$98765432 \times 9 + 0 = 888888888$$

$$1 \times 1 = 1$$

$$11 \times 11 = 121$$

$$111 \times 111 = 12321$$

$$1111 \times 1111 = 1234321$$

$$11111 \times 11111 = 123454321$$

$$111111 \times 111111 = 12345654321$$

$$1111111 \times 1111111 = 1234567654321$$

$$11111111 \times 11111111 = 123456787654321$$

$$111111111 \times 111111111 = 12345678987654321$$

At the end of the work out of each pyramid, it is worthwhile to check the answer on a calculator for the class to see.

Task: Students should attempt pages 168 to 173.

Answers to Book 5

Unit 1: Assess and Review 1

Exercise 1

1. 104,260,000
2. 123,069,000
3. 260,599
4. 103,944,000
5. 8 million

Exercise 2

1. 404,040
2. 200,048,503
3. 6,337,027
4. 45,097,012

Exercise 3

1. 429,576 inches
2. 1,073,940
3. 10.91

Exercise 4

90,001

Exercise 5

0.001, 0.02, 0.112, 0.121

Exercise 6

1. 16:25
2. 00:10
3. 12:30
4. 21:18

Exercise 7

1. 1278
2. 12
3. 1419

Exercise 8

16,002 railway compartments

Exercise 9

8548 m

Exercise 10

468,505,600 sq.km

Exercise 11

1. 11:00 p.m.
2. 12:54 a.m.
3. 12:45 p.m.

Exercise 12

1324

Exercise 13

18

Exercise 14

535150

Exercise 15

Rs 423.20

Exercise 16

1. < 2. > 3. = 4. < 5. > 6. > 7. <

Exercise 17

10.22 carats

Exercise 18

Sohail by 0.75 m

Exercise 19

orange

Exercise 20

630 kernels

Exercise 21

Siddiq by $\frac{1}{10}$ km

Exercise 22

1. 3 & $\frac{8}{9}$ 2. 9 & $\frac{2}{11}$ 3. 10 & $\frac{3}{6}$ 4. 11 & $\frac{9}{8}$

Exercise 23

1. $\frac{14}{3}$ 2. $\frac{67}{10}$ 3. $\frac{100}{3}$ 4. $\frac{100}{9}$

Exercise 24

Anwaar plays more.

Exercise 25

Check the angles the students draw.

Exercise 26

1. 12 2. 81 3. 1 4. 12

Exercise 27

obtuse angle, acute angle, right angle, acute angle

Exercise 28

1. 168 2. 48 3. 360 4. 1092

Exercise 29

96

Exercise 30

42, 84

Exercise 31

30

Exercise 32

19, 50

Exercise 33

26 kg 700 g

Exercise 34

1. $\frac{3}{4}$ 2. $\frac{6}{7}$ 3. $\frac{15}{27}$ 4. $\frac{1}{4}$

Exercise 35

1 and 4 are groups of like fractions.

Exercise 36

Tazeen got the biggest share and Maham the smallest.

Exercise 37

1. 24 2. $\frac{5}{7}$ 3. 0 4. $\frac{3}{8}$ 5. $\frac{1}{12}$ 6. $\frac{5}{8}$

Exercise 38

13.95 kg

Exercise 39

1. 5700 minutes 2. 310 minutes 3. 4 minutes

Exercise 40

1. 5 hrs 59 mins 2. 7 hrs 30 mins 3. 8 hrs 59 mins

Exercise 41

40 mins 40 secs

Exercise 42

4320 flowers

Exercise 43

Check the lines the students draw.

Exercise 44

670, 532

Exercise 45

Check the lines the students draw.

Exercise 46

1. square
2. parellogram
3. rectangle
4. trapezium

Exercise 47

1. circumference
2. diameter
3. centre
4. equal

Unit 2: Whole Numbers and Operations

Exercise 1

1. Only the number: 4,085,000
2. 1,000,000 + 500,000 + 60,000 + 1000 + 90 + 7
3. One million, four hundred and fifty□six thousand and eight hundred and seven
4. 2 is in 10 thousand place
5. 1,682,510

Exercise 2

1. 1,453,298
2. 1,046,710
3. 1,097,012
4. 45,337,027
5. 25,040,015

Exercise 3

1. Nine hundred and sixty□six thousand, eight hundred and fifty
2. Nine hundred and seventy□six thousand, two hundred and twenty□five
3. One million, eight hundred and seventy□three thousand, three hundred
4. One hundred and twenty-three million, eight thousand, four hundred and fifty
5. Eight million, forty thousand and five

Exercise 4

1. 788,004
2. 1,543,098
3. 1,763,005
4. 83,930,400
5. 2,639,254

Exercise 5

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

Exercise 6

1. 14,300; 20,200; 30,450
2. 2481; 3694; 6019
3. 208,751; 240,715; 248,517;
4. 305,812; 350,216; 503,612

Exercise 7

1. 1,065,679
2. 1,093,421
3. 1,246,956
4. 1,219,011
5. 886,961
6. 423,716
7. 2,201,844
8. 2,470,717
9. 1,425,727

Exercise 8

1. 57,611
2. 136,787
3. 229,209
4. 655,852
5. 89,134
6. 119,708
7. 141,609
8. 5,469,060
9. 3,111,257

Exercise 9

1. 1,439,794
2. 498,702
3. 335,805
4. 927,943.
5. 3764
6. 978,896,452
7. 11,126,401

Exercise 10

1. Karachi
2. 16,791,379
3. 8,917,521
4. 18,201,147

Exercise 11

1. 14,058,198
2. 32,476,665
3. 52,966,074
4. 35,075,600
5. 23,607,120

Exercise 12

1. 2325
2. 65 R236
3. 95
4. 103 R90

Exercise 13

1. Rs 21292500
2. Rs 27,357,950
3. 111
4. 1,027,601
5. 1500 mins
6. 5669 min
7. 604,800 secs
8. Rs 1,338,525,000

Exercise 14

1. 1119
2. 2530
3. 484
4. 0
5. 0
6. 226

Activity

3	4	12	9	3	3
7	5	6	2	8	16
21	20	2	18	24	17
7	4	10	40	8	48
22	48	26	2	16	10
15	12	36	3	8	24
6	45	5	9	2	14
9	15	3	12	4	6

Exercise 15

1. Subtract 11; 154, 143, 132
2. Subtract 15; 60, 45, 30
3. Multiply by 2; 1760, 3520, 7040
4. Divide by 2, 28, 14, 7

Exercise 16

1. 37, 41, 45, 49, 53, 51
2. 4, 8, 16, 32, 64, 128
3. 35, 30, 25, 20, 15, 10 [Students can give patterns in increasing or decreasing order]

Exercise 17

1. 31, 42, 53, 64, 75, 86, 97; Add 11
2. 66, 57, 48; subtract 9
3. 60, 49, 38, 27, 16, 5; subtract 11
4. Students answers may vary.

Exercise 18

1. 16, 32, 64, 128, 256, 512
   Multiply by 2

Exercise 19

1. 6561, 729, 81, 9, 1

Unit 3: Highest Common Factor (HCF) and Least Common Multiple (LCM)

Exercise 1

1. 2	2. remainder	3. 18	4. 7	5. 8
6. multiples	7. 0	8. 99	9. 2	10. 1

Exercise 2

2. 24	3. 30	4. 84

Exercise 3

2. 7	3. 11	4. 6

Exercise 4

2. 6	3. 7	4. 8.

Exercise 5

1. by 3 6543; 20,058; 67,800; 12,609; 456,984
2. by 4 29,612; 48,232; 67,800; 456,984
3. by 6 20,058; 67,800; 456,984
4. by 9 6543; 12,609; 456,984
5. by 11 1870; 15,686; 70,202; 29,612; 456,984

Exercise 6

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

Exercise 7

1. 900	2. 180	3. 96	4. 132	5. 84

Exercise 8

1. LCM: 36; HCF 3 product of 12 and 9: 108; product of LCM and HCF: 108
2. LCM: 90; HCF: 15; product of HCF and LCM: 1350; product of 30 and 45: 1350
3. LCM: 48; HCF: 8; product of HFC and LCM: 384; product of 16 and 24: 384
4. LCM: 300; HFC: 15; product of HCF and LCM: 4500; product of 60 and 75: 4500

Exercise 9

1. 3 2. 60 3. 20

Exercise 10

1. 11:30 a.m. 2. 185 3. 36
4. 20 children, 4 books, 5 toys
5 a. 20 ml b. 9, 10 times
6. after 30 secs, 2nd time after 60 secs
7. 16 8. after 6 days

Activity

1. D	I	V	I	4. S	I	B	L	E
				I				V
2. F		3. P		X		6. O	N	E
O		R			7. T			N
U		I			E		8. Z	
9. R	E	M	A	I	N	D	E	R
		E					R	
			10. F	A	C	T	O	R
11. T	W	O						

Unit 4: Fractions

Exercise 1

proper $\frac{5}{15}, \frac{2}{5}, \frac{1}{3}, \frac{1}{9}$

improper $\frac{16}{7},$

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

unit $\frac{1}{3}, \frac{1}{9}, \frac{10}{10}$

Exercise 2

1. $7\frac{1}{2}$ 2. $3\frac{2}{7}$ 3. $12\frac{2}{9}$ 4. $3\frac{3}{16}$

Exercise 3

1. $\frac{13}{3}$ 2. $\frac{100}{9}$ 3. $\frac{77}{9}$ 4. $\frac{45}{2}$

Exercise 4

1. 20 2. 63 3. 104 4. 5

Exercise 5

1. $\frac{4}{5}$ 2. $\frac{11}{12}$ 3. $\frac{1}{2}$ 4. $\frac{2}{5}$

Exercise 6

1. $\frac{1}{2}, \frac{3}{2}, \frac{13}{2}$ 2. $\frac{1}{4}, 1\frac{1}{4}, \frac{23}{4}$

Exercise 7

1. < 2. > 3. =

Exercise 8

1. $\frac{7}{11}$ 2. $\frac{2}{28} = \frac{1}{14}$ 3. 1 4. 1

Exercise 9

2. $\frac{7}{9}$ 3. $\frac{3}{4}$ 4. $\frac{14}{31}$

Exercise 10

1. $\frac{3}{4}$ 2. $\frac{41}{24}$ 3. $1\frac{2}{9}$ 4. $1\frac{1}{4}$ 5. $\frac{3}{5}$

6. $5\frac{17}{35}$ 7. $10\frac{1}{12}$ 8. $2\frac{1}{6}$ 9. $5\frac{19}{24}$ 10. $3\frac{7}{34}$

11. $14\frac{29}{42}$ 12. $\frac{7}{20}$ 13. $1\frac{1}{60}$ 14. $2\frac{3}{20}$ 15. $\frac{7}{15}$

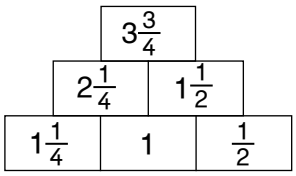
Exercise 11

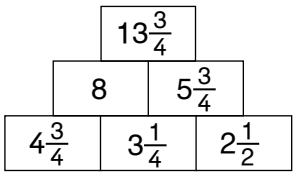
1. a. $\frac{5}{6}$ b. $\frac{1}{6}$ 2. $2\frac{3}{4}$

3. Rs $51\frac{1}{2}$ 4. 8 cm 5. Arman, $\frac{5}{8}$ more

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

Activity





Exercise 12

1. $\frac{8}{15}$ 2. $\frac{3}{14}$ 3. $\frac{1}{6}$ 4. $3\frac{1}{4}$
5. $\frac{5}{6}$ 6. $\frac{3}{22}$ 7. $84\frac{3}{20}$ 8. $4\frac{2}{3}$

Exercise 13

1. 16 hours 2. 25 seconds 3. 3 days 4. 6
5. 80 paisa 6. 75 cm 7. 500 ml 8. 6 days

Exercise 14

1. 20 m 2. $\frac{1}{5}$ 3. $\frac{2}{21}$ 4. $\frac{5}{24}$ 5. 3 eggs

Exercise 15

1. $\frac{4}{5}$ 2. $\frac{8}{15}$ 3. $\frac{4}{15}$ 4. $2\frac{4}{7}$ 5. $\frac{25}{26}$

Exercise 16

1. $4\frac{1}{2}$ 2. $22\frac{1}{2}$ 3. 6 pieces 4. 25 pieces

Challenge

15 boards

Activity

THEY ALREADY HAVE BILLS.

Exercise 17

1. $2\frac{1}{12}$ 2. $\frac{5}{9}$ 3. $4\frac{3}{28}$ 4. $1\frac{1}{4}$ 5. $\frac{1}{2}$ 6. 4

Unit 5: Decimal Numbers and Percentages

Exercise 1

1. $\frac{2}{10} = 0.2$ 2. $\frac{75}{100} = 0.75$

Exercise 2

1. 1.9 2. 0.45 3. 57.3 4. 10.9

Exercise 3

2. 0.55 m 3. 0.575 m 4. 0.05 m

Exercise 4

2. $\frac{3}{4}$ 3. $\frac{2}{25}$ 4. $3\frac{1}{2}$ 5. $10\frac{3}{4}$

Exercise 5

1. 2831.47 2. 303.2 3. 1004.308 4. 4.05

Exercise 6

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

Exercise 7

1. 8.854 2. 461.18 3. 67.425 4. 111.968 5. 104.895

Exercise 8

1. 12.74 2. 19.09 3. 3.378 4. 54.001 5. 361.125

Exercise 9

1. 11.8 2. 6.02 3. 10.293

Exercise 10

1. 12.4 2. 17.269 3. 5.0784 4. 0 5. 1.125

Exercise 11

1. 100 2. 1000 3. 10 4. 100 5. 100

Exercise 12

1. 68.25 m 2. Rs 217.00

Exercise 13

1. 450 cm 2. 15,250 g 3. 510 cm 4. 1500 ml 5. 55 mm

Exercise 14

1. 3.467 2. 0.90678 3. 0.48623 4. 0.0034 5. 0.001009 6. 3.24
7. 12.5 8. 46.5 9. 110 10. 1

Exercise 15

2. 100 3. 1000 4. 100 5. 0

Exercise 16

2. 0.0175 3. 0.0175 4. 17.5 5. 0.175

Exercise 17

1. 4.5 2. 0.90 3. 34.52 4. 6.500
5. 9.500 6. 2.360 7. 20.50

Exercise 18

1. 198.583 2. 3.3 3. 0 4. 0.46 5. 2.25

Exercise 19

1. a. 3.8 b. 60.0 c. 196.9
2 a. 8.97 b. 37.90 c. 500.00
3. b. 4.98 c. 116.67 d. 73.89 d. 49.02

Exercise 20

1. Rs 15.10 2. 18 m 3. 300.2 kg 4. 10.23 cm 5. 75.3 km 6. 45.3 7. Hafiz by 0.3 sec 8. Rs 75 9. 6 cups 10. 176.85 kg

Challenge 1

$7 \div 0.7 \times 7 \div 0.7 = 100$

Challenge 2

9.95, 11.08, 12.21 (+1.13)
3.4, 2.9, 3.3 (+ 0.4, – 0.5)
0.47, 0.60, 0.57 (+ 0.13, – 0.03)
0.8, 8, 80 (× 10)

Exercise 21

1. 10,000 2. 14,000 3. 5000 4. 9000 5. 10,000 6. 15,000

Exercise 22

1. Yes she has enough money to purchase both the dresses.

Exercise 23

2. 32% 3. 45% 4. 80% 5. 60% 6. 150%

Exercise 24

Per cent	Fraction	Decimal Fraction
35%	$\frac{35}{100}$	0.35
50%	$\frac{50}{100}$	0.50
45%	$\frac{45}{100}$	0.45
75%	$\frac{75}{100}$	0.75
5%	$\frac{5}{100}$	0.05
1%	$\frac{1}{100}$	0.01
129%	$\frac{129}{100}$	1.29
245%	$\frac{245}{100}$	2.45
525%	$\frac{525}{100}$	5.25

Exercise 25

1. $\frac{65}{100}$, 65%, 35% 2. $\frac{43}{100}$, 43%, 57%

Exercise 26

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

Exercise 27

2. 0.07 3. 0.02 4. 0.15 5. 0.90 6. 1.25

Exercise 28

2. 87% 3. 1% 4. 56% 5. 23% 6. 225%

Exercise 29

Only part 4 is incorrect the correct answer is 0.015.

Exercise 30

1. 6% 2. 175% 3. 36% 4. 75%
5. 40% 6. 6% 7. 180% 8. 412.5%

Exercise 31

1. 60% 2. 170% 3. 50% 4. $\frac{4}{25}$

Exercise 32

1. 30% 2. maths 90% 3. $\frac{2}{5}, \frac{1}{5}, \frac{1}{10}, \frac{3}{10}$
4. a. 20% b. 80%
5. a. 60% b. 312 c. 208
6. a. 53% b. 47%

Activity

cricket (40%), football (20%), basketball (30%), badminton (10%)
1. cricket 2. badminton 3. 160

Unit 6: Measurements: Distance and Time

Exercise 1

3. 0.8932 4. 9300 5. 0.326 6. 6084
7. 8.11 8. 34500 9. 4.050 10. 9530
11. 47.8 12. 45,000

Exercise 2

2. 1265 3. 1 km 567 m 4. 3 cm 9 mm 5. 3020 6. 12

Exercise 3

1. 15 m 79 cm
2. 20 m 10 cm
3. 56 km 475 m
4. 5 cm 2 mm
5. 56 m 5 cm

Exercise 4

1. 528.92 km
2. 42.05 m
3. 4.25 km
4. 2.05 m
5. 1.015 km

Exercise 5

1. 141 km 34 m
2. 111 m 82 cm
3. 22 cm 2 mm
4. 10 km 910 m
5. 9 km 91 m
6. 5 m 77 cm

Exercise 6

1. 784.241 km
2. 1.875 km
3. 6400.1 km
4. 37,552 km
5. 2.5 km
6. 251.78 km

Exercise 7

1. 240 secs
2. 180 mins
3. 96 hrs
4. 250 mins
5. 460 secs

Exercise 8

1. 5 mins 52 secs
2. 7 hrs 30 mins
3. 10 days 20 hrs
4. 4 hrs 50 mins
5. 8 years 11 months

Exercise 9

1. 2 hrs 5 mins
2. 11 mins 22 secs
3. 5 weeks 1 day
4. 4 years 3 months

Exercise 10

1. 09.00 a.m.
2. 1 hour
3. 3 hours 15 minutes
4. 1 hour 45 mins
5. 0900 hrs, 1000 hrs, 1600 hrs

Exercise 11

7 hrs 50 min

Exercise 12

1 min 46 secs

Exercise 13

2. 69 hrs 2 mins
3. 41 hrs 20 mins
4. 59 mins 47 secs
5. 49 mins 12 secs
6. 81 mins 24 secs

Exercise 14

2. 3 hrs 34 mins
3. 10 hrs 34 mins
4. 5 mins 19 secs
5. 4 mins 16 secs
6. 23 mins 48 secs

Exercise 15

1. 49 days
2. 40 weeks
3. 432 weeks
4. 8 weeks
5. 96 months
6. 144 months
7. 1095 days
8. 5 months
9. 120 days
10. 12 weeks

Exercise 16

1. 7:45 a.m.
2. 22:45 hours
3. 8 hrs. 45 min
4. 4 hrs. 49 min
5. 4 hrs 35 min

Challenge

7 June
31/12/06, 11:52 p.m.

Unit 7: Unitary Method

Exercise 1

1. 1950 kg
2. 200 km
3. 25 kg
4. 16 days
5. 500 men
6. 960 kg
7. 3 days
8. 150 pages
9. 16 days
10. 16 nights

Exercise 2

1. proportion
2. ratio
3. directly
4. decrease

Unit 8: Geometry

Exercise 1

arms; vertex; acute, 90°; obtuse, straight; right; 360°

Exercise 2

1. ∠DCB = 26°, acute
2. ∠EFG = 125° obtuse
3. ∠MNO = 55°, acute
4. ∠PQR 98°, obtuse

Exercise 3

Check the students' work.

Exercise 4

2. any corner of the classroom
3. any corner of your book
4. any corner of the teacher's desk

Exercise 5

300°, 340°, 250°, 310°

Exercise 6

Check the students' work.

Exercise 7

∠POR and ∠ROS ; ∠ROS and ∠SOQ
∠DOA and ∠AOC ; ∠AOC and ∠COB; ∠COB and ∠BOD; ∠BOD and ∠DOA

Exercise 8

1. complementary
2. supplementary
3. supplementary
4. complementary
5. complementary

Exercise 9

1. 57° 2. 124° 3. 102° 4. 68° 5. 174°
6. 177° 7. 14° 8. 25° 9. 72° 10. 12°

Exercise 10

3. 90° 4. 60° (30 × 2 = 60)

Exercise 11

1. Less than 90° 2. greater than 90°
3. less than 90° 4. less than 90°
5. greater than 90° 6. less than 90°

Exercise 12

equilateral, scalene, scalene
isosceles, scalene, equilateral

Exercise 13

right-angled triangle, right-angled triangle, acute-angled triangle
obtuse-angled triangle, obtuse-angled triangle, acute-angled triangle

Exercise 14

Triangle	Angle 1	Angle 2	Angle 3	Sum
ABC	90°	30°	60°	180°
PQR	90°	45°	45°	180°
XYZ	100°	50°	30°	180°

Exercise 15

The triangles PQR and DEC cannot be drawn as the sum of two of the sides in each triangle is less than the third side.

Exercise 16

Check the students' work; triangle XYZ cannot be drawn with the given measurements.

Exercise 17

Check the students' work.

Exercise 18

1. square 2. rhombus 3. parellelogram
4. rectangle 5. trapezium

Exercise 19

Check the students' work.

Exercise 20

Check the students' work.

Activity

1. rhombus 2. parallelogram 3. trapezium
4. rhombus 5. kite 6. an irregular quadrilateral

Exercise 21

1. 1 2. 1 3. 2 4. 0 5. 1 6. 4

Exercise 22

1. 2 2. 4 3. 4 4. 0 5. 0

Exercise 23

6, 6, 5

Exercise 24

Check students work

Unit 9: Perimeter and Area

Exercise 1

2. m 3. km 4. cm

Exercise 2

1. 22 cm 2. 24 cm 3. 24 cm 4. 19 cm

Exercise 3

1. 16 m
2. a. 50 m b. Rs 3750
3. 1 km 4. 10 m 5. 16 m

Exercise 4

1. 8 cm^2 2. 16 cm^2 3. 12 cm^2

Exercise 5

1. a. 4 cm^2 b. 70 cm^2 c. 15 cm^2
2. L = 8 cm, B = 2 cm, P = 20 cm, A= 16 cm^2
3. 64 m^2
4.

Length (cm)	Breadth (cm)	Perimeter (cm) 2 (l + b)	Area (cm^2) l × b
14	10	48	140
20	15	70	300
12.5	8.5	42	106.25
15	6	42	90
25	20	90	500

Exercise 6

1. Rs 6000 2. Rs 192,000 3. Rs 1.8 million

Exercise 7

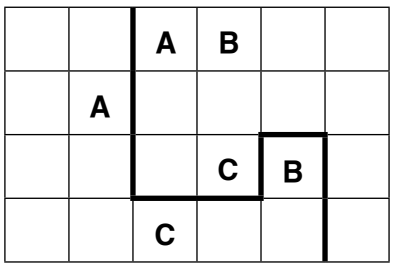
1. P = 90 cm, A = 506.25 m^2
2. P = 112 m, A = 768 m^2
3. P = 150 cm, A = 1250 cm^2

4. a. B = 10 m b. A = 300 m² c. Rs 4500 d. P = 80 m
   e. Rs 2000
5. 210 m
6. Sonia runs 1200 m (150 + 150 + 150 + 150) × 2
   Nina runs 1080 m (100 + 80 + 100 + 80) × 3
   Sonia runs 120 m
7. 12 m
8. a. Hexagons and equilateral triangles as their area is the easiest to calculate.
   b. because they leave gaps in between (the shape does not tessellate)

Challenge

The first challenge shows two diagrams. Help the students calculate taking the hint.

The second challenge is solved as shown below:



Unit 10: Data Handling

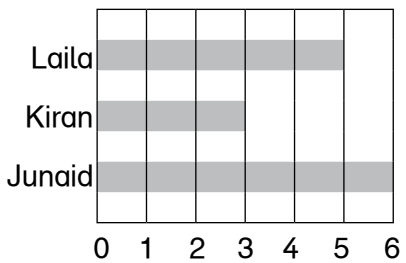
Exercise 1

2. 45 3. 55 4. 3 5. 758 m 6. 5

Exercise 2

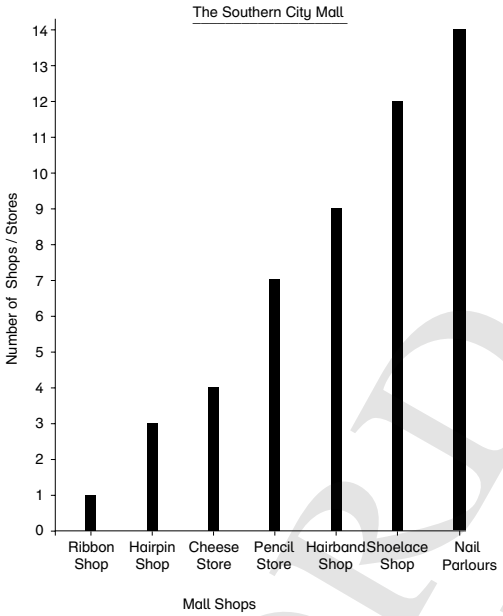
1. Rs 280
2. a. Younis: 113.6, Yousuf: 92.8, Imran: 74.8, Kamran: 83.6, Syed: 78.4, Iqbal: 69.6
   b. 69.6, 74.8, 78.4, 83.6, 92.8, 113.6
   c. three players
3. 66.8 grams 4. 40 km 5. 340 kg
6. b. 2 + 4 = 6÷2 = 3 (odd); 24 + 26 + 50 ÷ 2 = 25 (odd)
   a. 3 + 5 = 12 ÷2 = 6 (even); 15 = 17 = 32 ÷ 2 = 16 (even)
7. town A: 8.3°C, town B: 8.8°C—town A is colder.

Exercise 3



Exercise 4

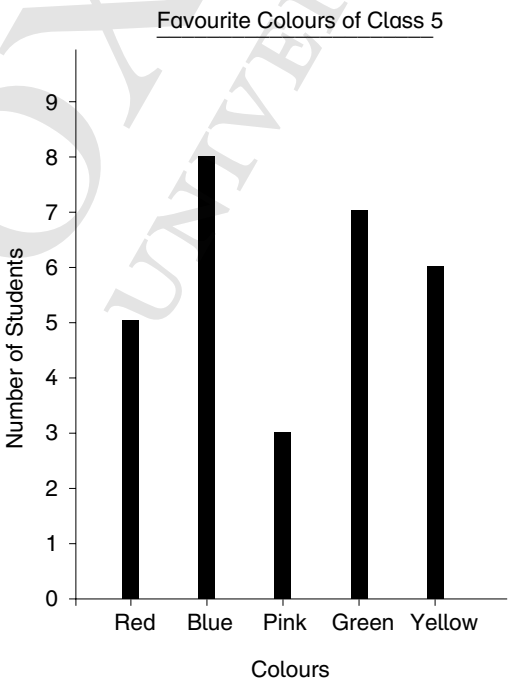
The graph will look like the one given below. It can be either a horizontal bar graph or a vertical bar graph as shown.



Exercise 5

1. four bars
2. labels
3. the bar for the blue whale since it has the maximum length
4. the bar for the humpback whale
5. Check the graphs the students draw.

Exercise 6



Exercise 7

1. The graph shows information about the sports played by students of Class 5.
2. There are 5 bars, since 5 sports are listed.
3. cricket
4. Hockey and volley ball
5. 50 students
6. 5:2

Exercise 8

The answers will vary.

Exercise 9

1. Rs 675 2. Rs 1350

Unit 11: Assess and Review 2

Exercise 1

i. 20,480,503 2. 162,337,027 3. 45, 097,012

Exercise 2

1. 7080 kg 2. 5 3. 8 m 4. 60
5. 100, 111, 102 6. 36 7. 5-2/5 8. 500 secs
9. Check the angles drawn by the students.
10. 10,050 m
11. a. Rs 5.07 b. Rs 14. 58 c. Rs 0. 54 d. 5.67 m
    e. 333.450 km f. 56.560 kg g. 2.5 l h. 0.150 g
12. 4 children
13. 1.45 m
14. Yes
15. a. 23 days b. 72 days c. 9 days
16. cabbage
17. Skardu
18. 10.87 m
19. 15 hours
20. 1. 57° 2. 86° 3. 130° 4. 240°
    5. 320° 6. 160°
21. a. windows b. 180° c. door
22. 678, 411, 693
23. a. 7 b. 9 c. 13
24. a. 96 b. 3420 c. 390 d. 360
25. Rs 160,000
26. Rs 7200
27. 857,750 bulbs, 17,155 cartons
28. a. 28% b. 60% c. 100%
29. a, d, f, and g, are complimentary
    b, and h, are supplementary
    c, e, i, and j, are neither

30. 64 l

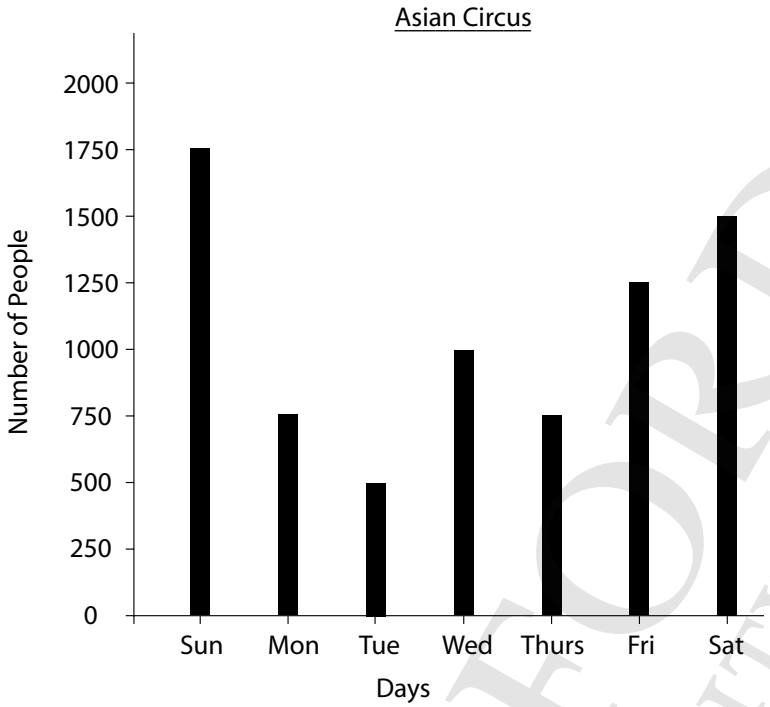
31. 130°

32. a. 0.42 b. 0.77 c. 1.83 d. 0.88

33. 1. 12.6 2. 29.1 3. 2.5 4. 3.4
5. 5.2 6. 89.4

34. a. 16.12 b. 100.43916 c. 36.694 d. 15.007
e. 6.145 f. 4 g. 48 h. 31.65

35.

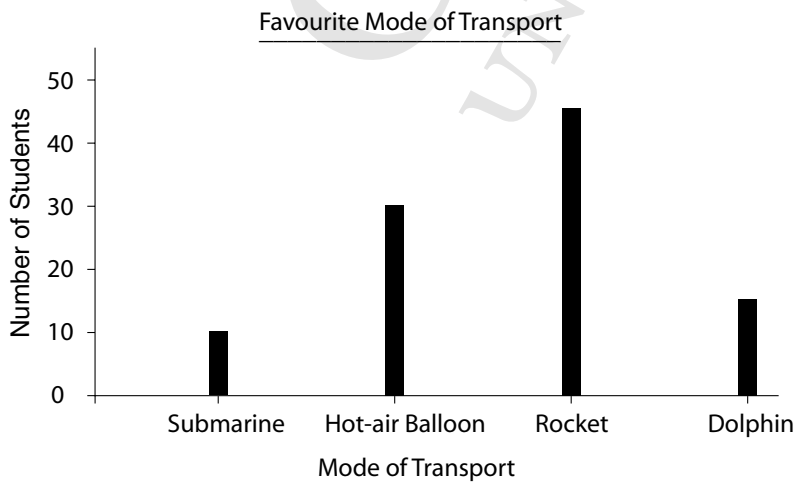


36. a. 30° b. 72° c. 180° d. 15°

37. a. right angle b. obtuse angle c. acute angle
d. reflex angle

38. 1. 23.99 2. 3.71 3. 4.45 4. 44.04
5. 999.47 6. 7.44

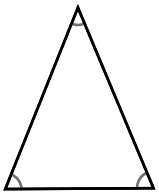
39.



Glossary

A

acute-angled triangle

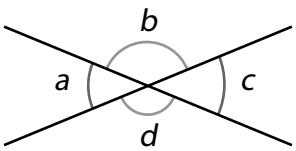


a triangle with three acute angles (angles that are less than 90°)

angles at a point

angles that converge at a point, where the sum of angles is equal to 360°

Example



$\angle a + \angle b + \angle c + \angle d = 360°$

area

the amount of surface taken up by a figure

Example

Area of triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

C

cubic unit

Unit of measure of volume

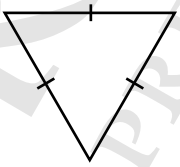
D

decimal

"Decimal number" is often used to mean a number that uses a decimal point followed by digits that show a value smaller than one.

E

equilateral triangle



a triangle with three sides of equal length and three equal angles, where each angle is 60°

estimation

estimation means having a rough calculation of the value, number, or quantity.

H

HCF

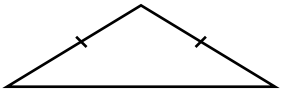
a common number that completely divides two or more numbers.

I

improper fraction

when the numerator of a fraction is larger than it denominator

isosceles triangle



a triangle with two sides of equal length and two equal angles

L

LCM

a number that is the first common multiple of two or more numbers

litre (ℓ)

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

M

million

7th place value from the left, where
1 million = 1 000 000

millilitre (mℓ)

a smaller unit of measure of volume (see litre)

mixed numbers

a fraction that consists of a whole number and a fraction

O

obtuse-angled triangle

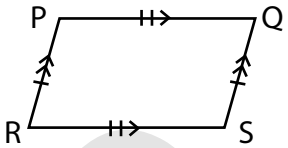
a triangle with one obtuse angle (an angle that is more than 90° and less than 180°)

order of symmetry

the number of times a shape fits into itself in one complete rotation is called the order of rotational symmetry

P

parallelogram



a quadrilateral with opposite sides that are parallel and equal in length and opposite angles that are equal.

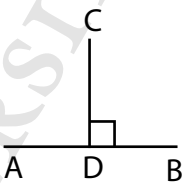
percentage

a number expressed as a fraction of 100

perpendicular lines

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

Example



We write CD ⊥ AB or AB ⊥ CD.

R

rate

the ratio between two related quantities

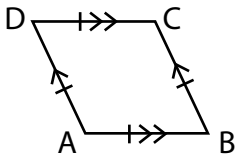
ratio

the relationship between similar quantities displaying the number of times is one of the other

reflective symmetry

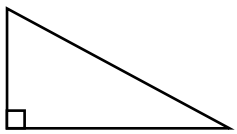
when a shape or pattern is reflected in a mirror line or a line of symmetry. The shape that is reflected will be the same as the original, will also be of the same size and it will be the same distance away from the mirror.

rhombus



a quadrilateral with opposite sides that are parallel, all sides equal in length and opposite angles that are equal.

right-angled triangle



a triangle with a right angle (a 90° angle)

rotational symmetry

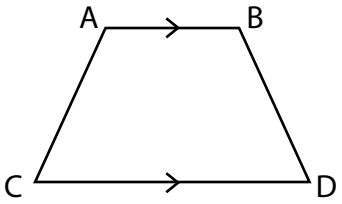
A shape has rotational symmetry when it looks the same after some rotation

rounding off

rounding off means the number is made simpler by keeping its value intact but closer to the next number. Rounding off is done for whole numbers, and for decimals at various places of hundreds, tens, tenths, etc.

T

trapezium



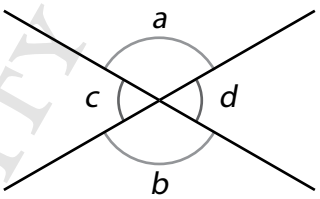
a quadrilateral with only one pair of parallel sides

V

vertically opposite angles

angles that are formed when two lines intersect, where the angles are equal to each other

Example



$\angle a$ and $\angle b$ are vertically opposite angles, where $\angle a = \angle b$.

$\angle c$ and $\angle d$ are vertically opposite angles, where $\angle c = \angle d$.