TEACHER'S MANUAL
Mastery in Mathematics through the Concrete Pictorial Abstract (CPA) Approach

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Our Core Philosophy

This Teacher’s Manual has been designed to promote good teaching practices for teachers to implement the Single National Curriculum. 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 to relevant and real-life situations. Teaching mathematical concepts with real-life context and providing hands-on experience facilitates the teaching process, so long as the context is comprehensible to the class. Pupils should be able to apply what they learn in class to real-life situations to find solutions. This series engages pupils by providing hands-on and interactive activities, as well as individual exercises. Each unit is book ended by class discussions, inviting pupils to share their perspective, and all concepts are supported by real-life tie ins. This approach begins every unit by inviting each pupil individually to have 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 learned. The heavy focus on inquiry-based learning, demonstration approach, and cooperative learning allows the teacher to expose the class to different teaching styles, which will 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 supplemented 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 to teachers regardless of what series they use.

The Teacher’s Manual supports a meaningful and holistic approach to teaching the strands of Mathematics. The buildup of concepts throughout this series is progressive and comprehensive. 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 are implemented through activities in the form of games, standard and non-standard materials and resources. The Teacher’s Manual facilitates teachers to implement this aspect of the series proficiently. The Teacher’s Manual 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:

- **SNC Aligned** – SLOs listed at the start of each unit, as well as next to each activity in the margins.
- **Unit Guides** – Detailed lesson plans for the lessons 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 and hands-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 tie ins are necessary for pupils to really appreciate the math that they are learning. This will help you start a conversation at each unit’s 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 tie in, 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 also 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’s “Role of a Teacher”.

A user-friendly guide to the SNC 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 also, 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’s 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.
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

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<th>Key Learning Strands</th>
<th>Standards</th>
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<tr>
<td>1. Numbers and Operations</td>
<td>• 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</td>
</tr>
<tr>
<td>2. Algebra</td>
<td>• 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</td>
</tr>
<tr>
<td>3. Geometry and Measurement</td>
<td>• 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</td>
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<tr>
<td>4. Data Handling</td>
<td>• 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</td>
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The Mathematics Curriculum Standards and Benchmarks – SNC 2020

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

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<th>Standards</th>
<th>Benchmarks Grade I – III</th>
<th>Benchmarks Grade IV – V</th>
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<tr>
<td>Numbers and Operations</td>
<td>The students will be able to:</td>
<td>The students will be able to:</td>
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<tr>
<td></td>
<td>• identify, read and write whole numbers up to 10,000</td>
<td>• read and write whole numbers up to 1,000,000 (1 million) in numerals and words</td>
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<tr>
<td></td>
<td>• read and write Roman numbers up to 20</td>
<td>• add and subtract numbers of different complexity and of arbitrary size</td>
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<td></td>
<td>• identify and differentiate even and odd numbers up to 99</td>
<td>• multiply and divide numbers, up to 6 digits, by 2 or 3-digit numbers and by 10,100 and 1000</td>
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<td>• arrange, compare numbers up to 3 digits using symbols (&lt;, &gt; or, =)</td>
<td>• solve real-life situations involving operations of addition, subtraction, multiplication, and division</td>
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<tr>
<td></td>
<td>• identify and recognise place values up to 5-digit numbers</td>
<td>• recognise and differentiate between factors and multiples of two or three 2-digit numbers</td>
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<td></td>
<td>• represent and identify the given number on number line</td>
<td>• find highest common factor (HCF) and least common multiple (LCM) of two, three, or four numbers, up to 2-digits</td>
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<td>• round off a number to the nearest 10 and 100</td>
<td>• solve real-life situations involving HCF and LCM</td>
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<td>• add, subtract numbers up to 4 digits</td>
<td>• recognise and compare like and unlike fractions</td>
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<td></td>
<td>• develop multiplication tables up to 10</td>
<td>• arrange, convert and simplify fractions</td>
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<td>• multiply number up to 2 digits with 1-digit numbers</td>
<td>• add, subtract, multiply and divide fractions</td>
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<td></td>
<td>• recognise and use of division symbol, divide up to 2-digit numbers by 1-digit number</td>
<td>• solve real-life situations involving addition, subtraction, multiplication and division</td>
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<td></td>
<td>• solve real-life situations involving addition, subtraction, multiplication, and division</td>
<td>• recognise fractions and different forms of fractions with the help of objects and figures</td>
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<td></td>
<td>• recognise fractions and different forms of fractions with the help of objects and figures</td>
<td></td>
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<tr>
<td>Standards</td>
<td>Benchmarks Grade I – III</td>
<td>Benchmarks Grade IV – V</td>
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| • 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 |
<table>
<thead>
<tr>
<th>Standards</th>
<th>Benchmarks Grade I – III</th>
<th>Benchmarks Grade IV – V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Geometry and Measurement</strong></td>
<td><em>identify measurable attributes of objects, construct angles and two-dimensional figures</em></td>
<td><em>convert standard units of length, mass, capacity, and time</em></td>
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<td></td>
<td><em>analyse characteristics and properties of geometric shapes and develop arguments about their geometric relationships</em></td>
<td><em>solve the real-life situations involving addition and subtraction of units of distance/length, mass, capacity, and time</em></td>
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<td><em>examine real-life situations by identifying, mathematically valid arguments and drawing conclusion to enhance mathematical thinking</em></td>
<td><em>distinguish parallel and non-parallel lines</em></td>
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<td><em>identify, classify and construct different types of angles</em></td>
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<td></td>
<td><em>describe and classify 2-D figures and 3-D geometrical objects</em></td>
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<td><em>determine perimeter and area of square and rectangle</em></td>
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<td></td>
<td><em>describe and complete symmetric figures with respect to given line of symmetry and point of rotation</em></td>
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<tr>
<td><strong>Data Handling</strong></td>
<td><em>read, interpret and represent data using Carroll diagrams, picture graphs and tally charts</em></td>
<td><em>read and interpret bar graphs, line graphs and pie charts</em></td>
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<td><em>represent real-life situations using pie chart</em></td>
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<td><em>find an average of given quantities in the data</em></td>
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<td><em>draw and read simple bar graphs both in horizontal and vertical form</em></td>
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<td></td>
<td><em>solve real-life situations using simple bar graphs</em></td>
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**Note:** Lifted from SNC document. To learn more about the SNC go to mofept.gov.pk, choose curriculum, then SNC, the Single 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:

Numbers up to One Million 5 lessons
Addition and Subtraction 5 lessons
Multiplication and Division 5 lessons
Number Patterns 5 lessons

The approximate duration of this unit should be 20 lessons.

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, 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. Students can make mistake when they deal with subtraction/ addition questions given in words, they need to be careful while placing one number under the other (correct place 1 19v value) in case of subtraction if given in words, the word FROM causes a confusion, and students generally write the number first which is written before the word FROM.

**This Pairs with:**
Math Lab 5, page 2 to 18

**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 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**
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 chapter. Ask the class if anyone has ever had to use very large digit 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?
Assign classwork from the textbook.

**Activity 1**
15 minutes

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 with up to six 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.

**Activity 2**
15 minutes

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.

Assign classwork from the textbook.

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**Confusion level**

<table>
<thead>
<tr>
<th>Number of Pupils</th>
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<td>5</td>
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</table>

If pupil is below 3 use Math Lab

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**Activity 3**
10 minutes

Write a five-digit number on the board. For example, 29261. Ask pupils what will happen when you multiply this number by ten. Ask a volunteer to come to the board and solve this using long multiplication. When they have the answer, which should be 292610, ask them if they notice how a number is affected when multiplied by ten. 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 add a zero to get to the right answer, and when a number is multiplied by 100, then 2 zeros must be added. 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) 252 × 2614
2) 911 × 25132
3) 98292 × 261
4) 825 × 72528
5) 308 × 70067
6) 109 × 25276
1.3 iii iv Activity 4 10 minutes

Write a five-digit number on the board. For example, 90000. Ask pupils what will happen when you divide this number by ten. 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. Then 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 is divided by 10, one simply needs to remove a zero to get to the right answer, and when a number is divided by 100, then 2 zeros must be removed. Ask the class if they can guess what the answer to 29261 multiplied by 100 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 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) \( 825 \div 2528 \)
5) \( 70067 \div 30 \)
6) \( 25276 \div 19 \)

1.3 v Activity 4 20 minutes

Assign classwork from the textbook.

Ask pupils, in pairs to come up with a number story for any of the four number operations. Ask them to look to their own lives to try and make it realistic. Give the class five minutes in pairs, 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 it 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.

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 five 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.

<table>
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<th>Item</th>
<th>Cost</th>
<th>Quantity</th>
<th>Total</th>
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<tr>
<td>Space rental per hour</td>
<td>4500</td>
<td>5</td>
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<td>Paper Plates</td>
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<td>20</td>
<td>900</td>
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<td>Fizzy Drink</td>
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<td>40</td>
<td>4800</td>
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<td>Plastic cups</td>
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<td>Pack of Balloons</td>
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<td>15</td>
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<tr>
<td>Pizza sauce</td>
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<td>17250</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>455</td>
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<tr>
<td>Chicken</td>
<td>1500</td>
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<td>22500</td>
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<tr>
<td>Pizza Crusts</td>
<td>670</td>
<td>50</td>
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<tr>
<td>Block of cheese</td>
<td>800</td>
<td>14</td>
<td>11200</td>
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<tr>
<td>Fresh Herbs</td>
<td>400</td>
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## Self Assessment

1.1. Numbers up to one million
1.2. Addition and Subtraction
1.3. Multiplication and Division

### 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) Solve $3820 \times 105$
   - a) $382000$
   - b) $401100$
   - c) $150100$
   - d) $328005$

2) Solve $50983 \div 17$
   - a) $2999$
   - b) $2399$
   - c) $5098$
   - d) $3209$

3) If Rida needs to buy 3 books per person, for 19 people, and each book costs Rs 530, how much will she need to spend on books?
   - a) $30210$
   - b) $19133$
   - c) $32012$
   - d) None of the above

<table>
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<tr>
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Take a learning break and assign some questions from the textbook related to the above concepts.
Unit 2

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

2.1. HCF
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. LCM
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:
HCF 6 lessons
LCM 6 lessons

The approximate duration of this unit should be 12 lessons.

Before You Start:
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 and Venn diagram. 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.

Watch Out For:
Students often get confused in recognising events which are related to HCF and LCM in real-life story sum.

This Pairs with:
Math Lab 4, page.
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 a 4 or above, move on to the next activity.

Let’s Begin
HCF and LCM are two methods that make number operations easier. 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 and Venn diagram. 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.

SLOs

Activity 1
10 minutes
Quiz cards

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.
\[2 \quad 4 \quad 5 \quad 6 \quad 8 \quad 10\]
4. List all the prime numbers between 20 and 40.
5. Which number can evenly divide 81?

Assign classwork form the textbook.
Using 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. For example, let us try to find the HCF of two numbers, 6 and 20.

### Activity 2
20 minutes
Two coloured counters

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Fig. 1

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Fig. 2

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Fig. 3

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.

Assign classwork from the textbook.
2.2 Activity 3 10 minutes
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.

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2.1 Activity 4 Dice A4 paper
Divide the class into pairs. Give each pair two dice. Instruct each pupil to roll the pair of dice and form a 2-digit number using the numbers on the dice. 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. Repeat the same activity for LCM as well.

Let’s try it
Present pupils with questions to be solved individually. These questions should be real-life situations that require them to find the LCM and, or, the HCF. Try to keep numbers two-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 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? At the end of this discussion allow five minutes so that pupils may write a reflective paragraph about the chapter.

Let’s get practical
Ask pupils to use HCF and or LCM to figure out how many times in twenty 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.
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) Find the LMC of the following: 80 and 50.
   a) 40
   b) 400
   c) 80
   d) 50

2) Find the HFC of the following: 48, 96, and 72
   a) 72
   b) 48
   c) 24
   d) 96

3) If there are 21 students from Grade 4 and 28 students in Grade 5 and the teacher wants to arrange students in minimum rows, will they calculate the HCF or LSM to calculate how many rows to make of each?
   a) LCM
   b) HCF
   c) Either
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.

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:
Addition and Subtraction of Fractions 6 lessons
Multiplication of Fractions 5 lessons
Division of Fractions 5 lessons
Decimal Numbers 5 lessons
The approximate duration of this unit should be 21 lessons.

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:
Students make the following mistakes. While simplifying fractions they 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 4, page.

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

Let’s Begin
Pupils are aware of fractions in their own lines. Now that they have also been introduced to the concept of decimals and percentages, ask them to discuss how they actually use fractions, and if they are interchangeable.

SLOs

Activity 1
10 minutes – Quiz cards
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 no more than two 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. 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 make the denominator common again 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. Once this is done, ask each pair to do the exact same with their three fractions. Emphasise the importance of always making sure a fraction is simplified.

Activity 2
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. 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.

Assign 15 minutes of classwork from the textbook.
On the board, work through the following questions with pupils.

\[
\frac{2}{5} \times 10 \quad \frac{6}{15} \times 50 \quad \frac{4}{7} \times 78
\]

Instead of focusing on the math, draw fraction discs to show the fractions. Explain to the class that when you multiply a fraction that has a smaller numerator than a denominator with a whole number, that number will get smaller. This is because when you multiply \(\frac{2}{5}\) with 10, you are really finding out what \(\frac{2}{5}\) of ten is. 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.

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.
Activity 4

Make three bowls of chits. One of proper fractions, one of improper fractions, and mixed numbers. Place these at the front of the class and pick one chit out of each bowl. Write them on the board like so

\[
\frac{15}{4} \times \frac{8}{10} \quad \frac{16}{3} \times \frac{8}{10}
\]

Ask pupils if they have any idea how to carry out this multiplication. They are familiar with the idea of changing fractions to add and subtract them but may not be sure about approaching the mixed number. Explain that a mixed number is simply another form of a mixed fraction. An improper fraction has a larger 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 convert the mixed number into an improper fraction. Allow them to attempt it, but if they can’t figure it out, explain, using \(\frac{5}{7}\) 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 in 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:

\[
\frac{15}{7} \times \frac{8}{10} \times \frac{16}{3}
\]

We now know that this is:

\[
\frac{12}{7} \times \frac{8}{10} \times \frac{16}{3}
\]

Ask pupils to help you multiply this on the board. Then, ask them each to pick a chit out of each bowl and ask 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: \(1 ÷ \frac{1}{4}\). If you ask, ‘how many quarters make a whole?’, the answer will come back loud and clear!
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 like so:

\[
\frac{15}{7} \div \frac{8}{10} \div \frac{16}{3}
\]

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

\[
\frac{15}{7} \div \frac{16}{3} \\
\frac{12}{7} \div \frac{16}{3} \\
\frac{12}{7} \div \frac{3}{16} \\
\frac{36}{112} = \frac{18}{56} = \frac{9}{28}
\]

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?

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</table>

Assign 25 minutes of classwork from the textbook.

Ask pupils if they have ever used or seen anyone use fractions in their lives. If most of them answer no, it’s probably because they don’t 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 an equation 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 five minutes to write a reflective essay about what they learnt and understood while studying this chapter.

Let’s get practical

Present pupils with this ingredient list for 55 cupcakes. Ask them to make a list of all the people in their immediate family and count them. Once they have a number, they should calculate how much of each ingredient would be needed to make that many cupcakes.

\[
\begin{align*}
\frac{3}{5} \text{ kg flour} & \quad 9 \text{ eggs} & \quad 1 \text{ gram of baking soda} \\
\frac{3}{5} \text{ kg butter} & \quad \frac{1}{2} \text{ cup milk} & \quad 4 \text{ ml vanilla essence} \\
\frac{4}{7} \text{ kg caster sugar} & \quad 1 \text{ gram of salt} & \quad \frac{1}{4} \text{ kg coco powder}
\end{align*}
\]

Work out which number operations will be necessary and rewrite the ingredient list with the correct measurements. Remind pupils not to try and compare answers as they will likely have different ones.
**Self Assessment**

3.1. Addition and Subtraction of Fractions
3.2. Multiplication of Fractions
3.3. Division of Fractions

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**Multiple Choice Questions**

Read the questions out, or write them on the board if necessary, and have all pupils silently make note of the right answer, and then have the entire classroom close their eyes. Then call out, question 1, a... b... c... d and make note of who is making mistakes and ask them to raise their hands when the right answer is called. Do the same for 2 and 3.

1) \( \frac{5}{6} - \frac{11}{27} \)
   a) \( \frac{23}{54} \)
   b) \( \frac{12}{27} \)
   c) \( \frac{30}{54} \)
   d) \( \frac{16}{27} \)

2) \( \frac{6}{7} \times \frac{5}{4} \)
   a) \( \frac{30}{28} \)
   b) \( \frac{3}{2} \)
   c) \( \frac{15}{14} \)
   d) \( \frac{5}{7} \)

3) \( \frac{9}{100} ÷ \frac{3}{20} \)
   a) \( \frac{3}{5} \)
   b) \( \frac{9}{15} \)
   c) \( \frac{180}{100} \)
   d) All of the above
Unit 4

Measurement: Length, Mass, and Capacity

<table>
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<th>4.1. Length</th>
<th>4.2. Mass</th>
<th>4.3. Capacity</th>
</tr>
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<tbody>
<tr>
<td>i. Compare the lengths of different objects.</td>
<td>i. Compare the mass of different objects.</td>
<td>i. Compare capacity of different objects using nonstandard units (jug, glass, cup, etc.)</td>
</tr>
<tr>
<td>ii. Recognize the units of length (meter and centimetre)</td>
<td>ii. Recognize the units of mass, i.e. kilogram, gram</td>
<td>ii. Recognize and use the standard metric units of capacity, i.e. litre and millilitre</td>
</tr>
<tr>
<td>iii. Use standard metric units of length (meter and centimetre) and their abbreviation to measure and record lengths of variety of objects.</td>
<td>iii. Use standard metric units of mass (kilograms and grams) and their abbreviation to measure and record mass of variety of objects.</td>
<td>iii. Use addition and subtraction within 100 to solve real-life situations involving capacity in same units.</td>
</tr>
<tr>
<td>iv. Use addition and subtraction within 100 to solve real-life situations involving lengths in same units.</td>
<td>iv. Use addition and subtraction within 100 to solve real-life situations involving mass in same units.</td>
<td></td>
</tr>
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Plan Ahead:
Decimal Numbers 6 lessons
Estimation 6 lessons
Percentage 6 lessons

The approximate duration of this unit should be 18 lessons.

Before You Start:
Pupils would have learned about the concepts of length and mass before, but always with non standard units. This chapter will be their first interaction with these units in the classroom. However, they may still know a little bit about them from home.

Watch Out For:
Avoid any confusion between the units to measure mass, length, and capacity. Also, be sure to explain the fact that it is almost always alright to use the abbreviations instead of the words, but they do have to make sure they learn the correct spelling.
This Pairs with:
Math Lab 5, page 63 to 66.

Make Sure You Have:
Chart paper  A4 sheet  Ruler  Balance scales
Oranges  Water  Pupils' toys and books  Measuring cups
Digital scales  Metre ruler  Water containers  Measuring cups

If They’re Struggling:
Try to connect the non-standard units previously learned to what they are learning now. Explain that these units are agreed upon universally, which is why it is important that everyone learn to use them, but they are still just measurements. The phrase “100 ml of water” is the same as half a cup of water. When using addition and subtraction with these units, make sure they know to treat the numbers just as numbers, because the unit will not affect the math. Also, be sure to assign plenty of classwork from your textbook and workbook so that they are not entirely dependant on the activities, because this chapter will require plenty of practice.

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
Ask pupils how they know if an object is heavy or light. They will most likely answer that they can tell by lifting it. Ask them, is that really a good way to check? Let them discuss what could go wrong. If they don’t realise themselves, point out that just because one person thinks that something is heavy, it doesn’t necessarily mean that everyone else will, or that it is in fact, heavy. Then, bring up length, and ask if they can connect that idea to length as well. Lead the pupils to the idea that if you decide whether something is heavy by lifting it, and if it is long by looking at it, you are really deciding if something is heavy for you or looks long to you. While the se are valid observations, they are not so good for sharing ideas. A friend may tell you that something is heavy, but you may find it light. A standardized way to communicate the mass of an object, or the length or capacity is necessary. Ask pupils if they know of any.

SLOs

4.1  
Activity 1  
5 minutes

Ask the class what they think the longest object in the classroom is. Challenge their answers and offer more ideas if they are stuck. Then ask what the shortest object is. Make a list on the board of the longest 5, and the shortest 5. If they are within reach, help the pupils measure them using non-standard units, like hands to make sure that they are right about which one is longest/shortest.
Let’s Pause

Pupils might need a reminder to write the units next to their answer. Remind them that without the unit, they’re not really answering the question.

Show the class a meter ruler and ask them to vote whether they think it’s long or short. Ask for examples of what they think they could measure with a ruler that big. After they come up with a few, ask the class what they understand by the word measure. Let them do their best to answer, and then ask how they have measured things previously. If they are confused, explain that you are asking about units. Most of them will probably mention using body parts like hands or arms. Ask at this point if they can see any flaws with using body parts to measure. Let them volunteer ideas, and they will hopefully conclude that using a non-standard unit of measurement, especially a body part is too inconsistent. If they do not, discuss how we use measurements in real-life. Use the examples of giving measurements to a carpenter. If one said, “build me a wardrobe three hands wide”, the carpenter would not be able to get the same measurements using his or her own hands. Liken this to days of the week. Explain that we have standard units of measurement that can be used globally because they are necessary. Tell them about meters and centimetres while passing around the meter ruler so that pupils can get familiar with them. Ask questions like, “can you guess how many centimetres can fit in a metre?”.

Let’s try it

As homework, ask pupils to trace the outline of one of each of their family’s hands in their notebook. Tell them to be sure to also trace their own hands, and to label them. In class, ask each pupil to measure each hand in centimetres, using a ruler. Draw a hand on the board and measure it so they know how to do it. Measure from top to bottom, and from side.

Remind them to make markings of their measurement points so that they can find them again if they need to. Once they know what they’re doing, ask them to measure all the outlines they got from their families, and compare them. Ask the class if the size of each person’s hand was quite different, or not. Point out that therefore we do not use non-standard units. Measurements must always be precise. Ask the pupils to come up with examples of what could go wrong if people used the wrong measurements.

Let’s Pause

If pupils want to measure something that is longer than the measuring tool you have available, show them how to do it. For example, if you have a meter ruler, but an object is longer than a metre, they should measure the metre, put down a mark, or some tape, and then measure from the mark.

Ask pupils, in pairs, to measure five to ten objects around the classroom or outdoors and make note of the measurements.
**Activity 3**
10 minutes

Using the measurements of the hands from the previous Let's Try It, ask the pupils to find differences between the measurements. Have a volunteer share their measurements on the board. Have the class help you to; arrange them from smallest to biggest, calculate the difference between the width and length of each hand and the one bigger than it, also find the difference between the biggest and the smallest. So, if the hands from smallest to biggest are, in order, A, B, C, D, find the difference between A and B, B and C, C and D, and A and D.

**Let’s try it**

Assign up to five measurement-based addition and subtraction questions, within 100 using only one unit in each. Here are some examples you can use:

1) Samana has grown 3 centimetres. She is 98 centimetres tall. How tall was she before?
2) If a teacup is 8 centimetres tall, but you have to leave the top 2 centimetres empty to avoid spilling, how many centimetres high will the tea be from the bottom of the teacup?
3) In a relay race, I run 50 metres and my friend runs 35. How many did we run in total?
4) A teacher has a roll of tape that is 50 centimetres long. She uses an 18-centimetre-long piece of tape to secure a wire to a wall. How much tape is left in the roll?
5) Mahnoor’s hair is 25 centimetres long when she decides to cut off 7 centimetres. What will her hair length be after her haircut?

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**Activity 4**
25 minutes
balance scales
pupils’ toys and books

Ask every pupil, the day before to bring in their favourite toy and their favourite book from home. Remind them not to bring anything delicate or valuable. Once they all have a book and a toy, make groups of 4 to 6. Let's say you have group A, B, C, D, and E. Ask each group to compare weights, just by feel and list their books and toys from heaviest to lightest in each group, keeping the book list separate from the toy list. After they have made their lists, combine groups in sets of twos so that there are half as many groups left. If there are an odd number of groups, let one of the groups be of three, so hypothetically you then have A and B in one group, C, D, and E in one group. Ask pupils to work collaboratively with their new group members and create new lists together, once again, listing the entire group’s toys and books in order of heaviest to lightest, and once again, keeping the book list separate from the toy list. Remind them that they are going only by feel. Also make sure they don’t spend more than 7 minutes making each list. Once the new lists are made, collect them, and introduce the class to balance scales. Give them a quick explanation of how they work, in case they have forgotten, and then explain that you will be using them to create a list for the whole class, on the board, using the balance scales to get a more accurate idea of which book or toy is heavier than the other. At this point you need not use any units; only adjectives like heavy and light. Make pupils help you identify which side of the balance scales is lower.
Collect copies of textbooks and or workbooks from all the pupils’ classes. If there are less than five books, borrow some from the school library, but make sure there are no more than five. Try to have as much variation in weight as possible. For this class, try to have as many weights as possible. At minimum a one-kilogram weight, a five-hundred-gram weight, and a one-gram weight are necessary. Introduce these to the class and ask them to pass them around as you explain the activity. Write the words kilogram and gram on the board and explain them in relation to the weights. Ask pupils if they can guess what one would need weights for. How could one make use of an object that they knew the exact weight of? If they don’t come to an answer, ask them if the weights could be used with the balance scales. Lead them to the conclusion that using weights can help one determine the approximate weight of an object, or at least whether it is more or less than a fixed number. Previously, we used the balance scales to determine whether objects were heavier or lighter than each other, whereas now we can determine whether an object is heavier or lighter than a certain weight. The class should already understand the benefits and uses of standardized units of measurement. Once the class is through with all the weights, use the balance scales to weigh the books. Have the class assist you. Try to get an exact measurement for each book. During this weighing process, it should become quite clear that using balance scales to determine the weight of an object is actually quite difficult, especially when one has limited access to weights. At this point, introduce them to a more modern weighing scale that gives an exact weight, making sure that it is to the gram. Allow pupils to gather round as you weigh all 5 books. Write the weights on the board so that they can then arrange them in ascending order. Take this opportunity to show them how these units and their abbreviations are written. Be careful to have measurements only in KGs or in grams.

Make groups of five to seven pupils and ask each group to incorporate “props” found around the classroom to prepare a skit of what would happen in real-life if one did not understand weight. To make sure they understand, ask them where weight is used in real-life. If they are having trouble brainstorming, give them the examples of luggage checks at the airport, buying fruits and vegetable by the KG, and even on pre-packaged foods at the grocery store. Allow a few minutes of class discussion to share ideas, and then let each group have 12 minutes to prepare their acts, telling them that they should seek to highlight the importance of understanding weight while also creating a sort of number story, so that each skit provides an addition or subtraction sentence. Ask them to keep numbers under 100, and skits between one and two minutes. After all of the skits, ask the pupils what number stories they were able to identify. Solve them on the board.
Let's try it

Assign up to ten addition and subtraction questions to pupils, using grams and kilograms as units, but only one unit at a time. Here are some examples of questions you can use:

1) An ice cream shop makes 10 kgs of ice cream every morning to sell. One evening, as they close, they have 1 KG leftover. How many kgs were sold?

2) A boy needs 100 g of apple slices to make apple pie. Using a digital scale, he sets aside 500 g of apples, but after he slices them, and removes all the peels and cores, he only has 65 g of slices. How many more grams will he need to have the whole 100 g?

3) A girl had 30 grams of sugar in a jar. After she accidentally knocks it over, only 13 g of sugar are left in the jar. How much sugar did she lose?

4) A box of highlighters weighs 99 g. After all the pink ones are removed, the remaining highlighters weigh 48 g. How many more grams will he need to have the whole 100 g?

5) Shehla’s luggage allowance on her flight is 30 kg. She has one bag that weighs 18 KG and one that weighs 6 kg. How many more kilograms of luggage can she add before meeting her limit?

Let's Pause

As you teach pupils to measure liquids, enforce the fact that they must place the container on a flat surface, and look at it from eye level to get an accurate measure of how full the container is. This is especially important when using measuring cups, as looking from the wrong angle will cause the surface of the water to align with the wrong measurement mark.

Refer to Confusion level

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Activity 7

15 minutes

water containers water

Ask pupils how much water they have in their water bottles. They may be confused about answering this question, so ask them if they can think of any non-standard units for measuring liquids, like hands for length. They will hopefully come up with ideas like jugs, cups, bottles. Some may suggest standard units but remind them to stick to non-standard. Then, provide as any water containers as possible. Examples are; fish bowls, cups, bottles, mugs, jugs. Remember that the same kind of container can be used in various sizes. Make the class into small groups and give each group a choice of up to three containers, making sure the groups swap every two minutes. While they have their containers, allow them access to water so that they can transfer water between each one, making note of how many times they could fill a cup for example without emptying a jug. This activity would be best done outdoors, to avoid a messy classroom, and also close to a tap and a drain if possible. Do remind pupils that water should never be wasted, so ask them to use as little as possible, and help you come up with a use for the water. At the end of the activity, explain the word capacity to the class.
### Activity 8

15 minutes measuring cups or other containers water

Ask pupils if they have any idea what the standard units for measuring liquids are. Let them make suggestions, and then write ML and L on the board. Write millilitre and litre under their respective abbreviations. Explain that these are the units that we use to measure liquid, but ask them, if you use a ruler or measuring tape to measure length, and a weighing scale to measure weight, how could one potentially measure capacity? Ask them if any of them ever help their parents in the kitchen, and if they’ve ever seen a liquid measured out. The ideal answer would be a measuring cup, but pupils might also just say cup, or tablespoon. Establish with the class that the only way to measure a liquid is by putting it into a container meant for measurement, and then produce a measuring cup, and any other measuring containers, that you could borrow from the science laboratory. Make groups and give each group a measuring cup that has markings in ML. Ask each group to fill the cups to the highest ML mark, and reduce it by 10 ML. Tell them to keep pausing to check the level, making sure they haven’t poured out more than 10 ML, reminding them that they will not get an accurate measure until they place the cup on a flat surface. Continue asking them to pour out small amounts, perhaps into plants around the school if the school staff is alright with that. Ask each group in advance to make sure to take note of how much they are pouring out and how much is left in the form of number sentences.

### Let’s try it

Assign up to ten addition and subtraction questions relating to real-life situations. The numbers should remain below 100. Here are some examples of questions you can use:

1. If Maryam buys 75 ML of chilli oil for a dinner party, and only 30 ML is used, how much chilli oil will she have left?
2. Aslam is making 100 ml of dip out of cream cheese, olive oil, and garlic puree. If he is using 10 ml of olive oil, and 20 ml of garlic puree, how much feta cheese should he use?
3. Syeda has two plants. Daily, she puts 30 ml in one, and 25 ml in the other. How much water do the two plants require in total, in a day?
4. In a day, Nusrat uses 11 ml of hand sanitizer. At the end of the day 23 ml remain in the bottle. How much sanitizer was in the bottle at the start of the day?
5. Sophia drops a new bottle of ink and 21 ml spill out. If there is are 19 ml left in the bottle, how much ink was there before she dropped it?
Let's Pause
Pupils might find it confusing to identify what is suitable for measuring with litres and ml. Explain that these units are meant only for liquids but explain that sometimes substances like butter and cheese are measured in ml, depending on the texture. Ultimately, it is up to everyone decide how best to measure what they need with the tools they have available.

Let's talk Math
Since these are the first measurement units the pupils will have learnt in class, ask them if they will be incorporating them into their lives at all. And if not now, do they think they will in the future? Where do they think measurement might be really important? Are there any situations where not properly measuring could lead to things going awry? Allow the pupils to try to come up with examples, and also examine their own lives to see where knowing one’s measurements could improve it. Also get them to think about when they see others using measurements. Ask them to try to come up with one example each. Allow the class 5 minutes to write a reflective writeup stating their thoughts on the chapter.

Let's get practical
For this activity, pupils will be working on a recipe. Make groups of up to six, and let them get to work. The recipe should include grams, millilitres, and centimetres. If you have access to an oven, try this recipe for biscuits. Be sure to handle the oven yourself, but let pupils do the measuring.
Multiple Choice Questions

Read the questions out, or write them on the board if necessary, and have all pupils silently make note of the right answer, and then have the entire classroom close their eyes. Then call out, question 1, a... b... c... d and make note of who is making mistakes and ask them to raise their hands when the right answer is called. Do the same for 2 and 3.

1) What can we measure with centimetre?
   a) The mass of a book
   b) The height of a bottle
   c) The capacity of a swimming pool

2) It takes 25 jugs of water to fill up Asim’s bath tub. After he pours in the 13th jug, the jug falls and breaks. How many more jugs would Asim have poured?
   a) 15
   b) 10
   c) 12
   d) 13

3) Which of the following is a measure of mass?
   a) Kilogram
   b) litre
   c) metre
   d) None of the above

Self Assessment

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4.1 Length
4.2 Mass
4.3 Capacity
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:
Distance 6 lessons
Time 6 lessons
The approximate duration of this unit should be 12 lessons.

Before You Start:
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.

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’ while 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 4, page

Make Sure You Have:
- Chart paper
- Scissors
- Colour pencils

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
Kilo means 1000, centi means 1 100 and milli means 1 1000. When a bigger unit is to be converted to a smaller unit: MULTIPLY. 5 1 43v When a smaller unit is to be converted to a bigger unit: DIVIDE. 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. you that something is heavy, but you may find it light. A standardized way to communicate the mass of an object, or the length or capacity is necessary. Ask pupils if they know of any.

SLOs

1. 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’s 2000 metres away. How many kilometres is it?

Assign classwork from the textbook to allow pupils to practice these skills.
### Activity 2

Make groups of four to six 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’s original shape). 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 1/60th of the chart paper is to the chart paper as a minute is to a second, and also as a second is to 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.

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<thead>
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</tbody>
</table>

### Activity 3

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 practicing 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: 

   0.5 hours later he takes a nap for 45 minutes.
   - Day: Time: 

   He goes for a bicycle ride with his friends for an hour at the same time next day.
   - Day: Time: 

Ask them to peer review at the end.
Let’s get practical

Distance is a numeral measurement which can be used to tell how far one object is from other. Time is used everywhere while travelling, working and cooking.

Let’s try it

Ask pupils to solve some realistic questions that involve measurements. 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

Pupils might not realise it, but they certainly must have made use of fractions in their lives at some point. Remind them that the introduction of the new concept, or units does not change the math, and even if they haven’t previously made precise conversions, they have still understood that a minute is a part of an hour.

Let’s get practical

Distance is a numeral measurement which can be used to tell how far one object is from other. Time is used everywhere while travelling, working and cooking.
Self Assessment

5.1 Distance
5.2 Time

Multiple Choice Questions

Read the questions out, or write them on the board if necessary, and have all pupils silently make note of the right answer, and then have the entire classroom close their eyes. Then call out, question 1, a... b... c... d and make note of who is making mistakes and ask them to raise their hands when the right answer is called. Do the same for 2 and 3.

1) Zainab has to drive 6.8 km to get to her mother’s house, and 3.4 km to her sisters. How much distance will she be driving if she visits both?
   a) 102 metres
   b) 11 km
   c) 100,000 cm
   d) All of the above

2) Rania’s daughter is only 7 weeks old right now. The doctor says to bring her in for a check up when she is four months old. How long will Rania wait between now and her daughter’s appointment?
   a) 9 weeks
   b) 10 weeks
   c) 2 months
   d) 1.5 months

3) A man takes 13242 minutes to finish writing a book, and when he is done, he waits 25,056 minutes for it to be published. How many hours did he have to wait from the time he started writing it?
   a) 66.48 hours
   b) 67 hours
   c) 70 hours
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:

Unitary Method 6 lessons

The approximate duration of this unit should be 6 lessons.

Before You Start:

Students are 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. Students in their previous classes learnt about fractions. Now, in this unit they will define the ratio of two numbers which will lead them to define and identify direct and inverse proportion. They will be able to solve real-life problems involving direct and inverse proportions.

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, page

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 a 4 or above, move on to the next activity.
Let's Begin

Explain that Ratio is the comparison of two quantities. Ratios can be written as a fraction or using a symbol. Ratios, like fractions, must be simplified to the lowest term and has no unit. Proportion is a statement, showing the relation of two equivalent ratios. Ask pupils if they ever make judgements by proportion. Like when they go to paint a picture, do they squeeze an amount of paint out of tube at random, or do they base it on the size of the paper they want to cover. Ask them to think of other things in their real lives that include ratios.

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. Explain that there are proportions here. If the pupils can not identify them on their own, point out that for every book, there are a hundred pages.

number of pages : number of books

100  :  1

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.

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:

<table>
<thead>
<tr>
<th>Grocery List</th>
<th>Price List</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 dozen eggs</td>
<td>cost of 1 egg Rs 8</td>
</tr>
<tr>
<td>2 dozen bananas</td>
<td>cost of 1 banana Rs 10</td>
</tr>
<tr>
<td>2 kg sugar</td>
<td>cost of 1 kg sugar Rs 80</td>
</tr>
<tr>
<td>5 liters of milk</td>
<td>cost of 1 litre of milk Rs 90</td>
</tr>
<tr>
<td>3 kgs of flour</td>
<td>cost of 1 kg of flour Rs 45</td>
</tr>
</tbody>
</table>

Ask them to make sure to write out the proportions in a ratio form...
Divide the class into pairs. Explain how to calculate ratios of different quantities. 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:
- 6 Tomatoes
- 1 Potato
- 1 Onion
- 1 Carrot
- 2 Table spoon of olive oil
- 2 Cups of vegetable stock
- 4 Pieces of bread

To make tomato soup for 8 people I need:
- _______ Tomatoes
- _______ Potato
- _______ Onion
- _______ Carrot
- _______ Table spoon of olive oil
- _______ Cups of vegetable stock
- _______ Pieces of bread

**Let’s try it**

Expose the students to the rules for expressing one quantity as a ratio of another in their simplest form. Give the following worksheet for students to work individually or in pairs. Take feedback of the strategies used to solve the worksheet.

1. What is the ratio of stars to squares? \[ \underline{\text{stars}} : \underline{\text{squares}} \]

2. What is the ratio of circles to triangles? \[ \underline{\text{circles}} : \underline{\text{triangles}} \]

3. What is the ratio of circles to triangles when simplified? \[ \underline{\text{circles}} : \underline{\text{triangles}} \]

4. What is the ratio of triangles to circles? \[ \underline{\text{triangles}} : \underline{\text{circles}} \]

5. What is the ratio of triangles to circles when simplified? \[ \underline{\text{triangles}} : \underline{\text{circles}} \]

6. What is the ratio of circles to triangles when simplified? \[ \underline{\text{circles}} : \underline{\text{triangles}} \]
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 proportions instead of just using fractions or simply numbers. Lead them to the conclusion that a ratio is a method that makes calculations easier when working with proportions, 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 above 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 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.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Cost per unit</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 packets</td>
<td>popcorn</td>
<td>Rs 10</td>
<td>Rs 200</td>
</tr>
<tr>
<td>2.5 kg</td>
<td>flour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.25 kg</td>
<td>butter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.25 litre</td>
<td>orange juice</td>
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Self Assessment

6.1 Unitary Method

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Multiple Choice Questions

Read the questions out, or write them on the board if necessary, and have all pupils silently make note of the right answer, and then have the entire classroom close their eyes. Then call out, question 1, a... b... c... d and make note of who is making mistakes and ask them to raise their hands when the right answer is called. Do the same for 2 and 3.

1) If a weight is 12 kg, and a shelf needs to be built to hold 6, how much weight should the shelf be able to carry?
   a) 12 kg  
   b) 72 kg  
   c) 62 kg  
   d) 70 kg

2) A jug with a capacity of 1200 millilitres can hold 6 small cartons of juice. How many ml of juice are there in one carton?
   a) 200 ml  
   b) 1200 ml  
   c) 600 ml  
   d) 300 ml

3) At a tuition centre, each pupil brings the same number of books each day. On a day when 6 pupils show up, there are 36 books present. How many books will be present if 13 pupils show up?
   a) 6  
   b) 78  
   c) 72  
   d) 130
Unit 7

Geometry

7.1. Angles

i. Recognize straight and reflex angle.

ii. Recognize 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 recognize 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.

7.2. 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.

7.3. Quadrilaterals

i. Recognize the kinds of quadrilateral (square, rectangle, parallelogram, rhombus, trapezium, and kite, and classify those using parallel sides, equal sides and equal angles.

ii. Identify and describe properties of quadrilaterals including square, rectangle, parallelogram, rhombus, trapezium, and kite.

7.4. Symmetry

i. Recognize 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:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Lessons</th>
</tr>
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<tbody>
<tr>
<td>Angles</td>
<td>5</td>
</tr>
<tr>
<td>Triangles</td>
<td>5</td>
</tr>
<tr>
<td>Quadrilaterals</td>
<td>5</td>
</tr>
<tr>
<td>Symmetry</td>
<td>5</td>
</tr>
<tr>
<td>Three Dimensional Objects</td>
<td>5</td>
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</table>

The approximate duration of this unit should be 25 lessons.
Before You Start:
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 confused with names. At this level their knowledge of shapes takes a slightly more formal shape.

Watch Out For:
Make sure to give plenty of time for pupils to get used to names, especially when introducing the 3D shapes at the end of the chapter.

This Pairs with:
Math Lab 1, page 67 to 71.

Make Sure You Have:
Foam sheets  Rulers
Scissors  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 a 4 or above, move on to the next activity.

Let’s Begin
Ask the class to volunteer any information they remember about shapes, and which shapes they can name. As they name them, ask them to come up to the board and draw them. Write the name of each shape down next to them. When they are done, if there is a circle, a square, a rectangle, and a triangle on the board, group them together, and tell the class that these are the shapes they should focus on. If one of them is missing, add it, and explain to the class what it is called. For 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.
Square, rectangle, triangle and circle are shapes that the class should already be aware of. The new introductions are only semi circles and quarter circle. Make groups of four to six pupils and hand out foam sheets, markers, and child friendly scissors. Ask each group to make cut outs of each shape, being very careful with the scissors, and making sure to draw them with a marker first. Remind them that with the semi circle and the quarter circle, it might be easier to draw a full circle and then draw a line through it, or even just cut it in half. Also remind them to make sure the sides of the square are as equal as possible.

Allow pupils to pass their foam shapes around during this activity and keep a square so that you can demonstrate. Ask the class if they know what vertices are. Explain that they are the corners of the shape, and that number of sides and number of vertices are two of the characteristics that are most often used to identify shapes. Ask the class to help you count the number of vertices and sides on the square you’re holding. At this point, ask them to stop passing their foam shapes. Ask each of them now, to stand at their desks for just long enough to hold up the shape they have and state the number of vertices and sides. The pupils holding the circle and semi circle and quarter circle need not count sides and vertices. They may simply name their shape.

Ask pupils about the previous activity. Which shapes did they not identify the vertices of? Ask a volunteer to come and draw all six shapes on the board. Ask pupils, what sets the square, the rectangle, and the triangle apart from the other three shapes. The aim is, that they should pick up on the fact that the circle, the semi circle, and the quarter circle involve curved lines, whereas the other shapes do not. Establish the fact that while all the lines in the first three shapes are straight, one of the lines in each of the last three shapes is curved. Ask pupils to come to the board and draw an example of a curved line and a straight line. Then tell them to look around the classroom and point out where they see curved lines and straight lines.

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Let's try it

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

Ask pupils about the straight lines they see in their immediate environment. Point out the ceiling, the windows, the door, and how all of these things had to be made of a very precise size. Discuss how when, constructing lines, for a purpose, as a designer, or an architect, or even just when you are making a drawing. Ask pupils to come to the board and ask them to draw a line. When they have done so, ask how they decided how long it should be. How did you know where to start it and where to end it. Explain to the class that while this pupil chose for themselves what the length of their line would be, sometimes, when drawing a line for a reason, it has to be a certain length. Ask pupils how they would go about drawing a line of a prescribed length. What tools would they use? At this point, some of them may have reached the conclusion that they would be able to use a ruler. Ask if anyone would like to come to the board to show the class how to do it. If no one volunteers, draw a line yourself, keeping in mind the only distance measuring units pupils have learnt so far are metres and centimetres.

Let's try it

Ask pupils to draw lines of the following lengths in their notebooks, or on an A4 sheet if the notebooks are too small. Remind them that drawing a line diagonally will make it fit better. This is individual work to be done at their desks.

1) 2 cm   2) 5cm   3) 9 m   4) 10 cm   5) 13 cm   6) 17 cm

Draw the following sequence on the board:

Ask pupils to help you continue it, and then ask what the pattern is. Previously, they learnt about patterns that had different shapes. This pattern has the same shape, but it has one key difference. They should pick up on this, so when they point it out, be sure to highlight that even though the patterns they learnt previously had a series of different shapes, one can make a pattern with anything. Then, present this.

Orientation is another way that one could make a pattern. Write the following on the board; shape, size, orientation. These are the three ways in which an object in a pattern could differ from another. Pupils must be conscious of all three when working to identify pattern. Present the class with at least four more patterns to solve on the board before wrapping up the activity.
Let’s try it

Present pupils with up to twenty patterns on the board to copy down and complete. They should only include circles, triangles, squares, rectangles, and the variations should be based on size, shape, and orientation. Here are some examples of patterns you could use:

Divide the class into two groups that are as equal as can be. Make sure that there are pupils of varying ability in each group. Tell them they will be having a competition, and the group that is the best at working as a team will win. Hand each child an A4 sheet, and ask them to draw three patterns on them, making sure to leave plenty of space so that the patterns can be continued. Explain that once they have each made a sheet of three patterns that need completing, they should write their name in the corner, and all hand their sheets to you. Then make two stacks of worksheets, one from each group, and swap them, giving each group, the other team’s worksheets. Each team must then distribute the worksheets, there should be one per pupil, and solve them. The first team to get through all the worksheets will win. They can definitely help, or seek help from, teammates. An important rule is that if anyone designs a worksheet of patterns that does not make sense, or is unsolvable, then they will be disqualified. If any worksheets remain unsolved at the end of the game, solve them on the board. Make sure to give pupils at least six minutes to design their worksheets and remind them they can brainstorm in their notebooks.

Refer to
If they’re struggling
Confusion level

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</table>

Assign 15 minutes of homework from your textbook.
Activity 7
20 minutes playdough

Give each pupil a lump of playdough. Ask them to make squares. Make one yourself as well. After a minute, draw a square on the board. Then ask the class, “What’s the difference between the square on the board and the playdough square?”. Allow them to guess, and then explain the concept of the third dimension. Explain that the square on the board has height and width, but the play dough square, even if they are quite flat, still have some depth. Use the idea of 3D movies as an example of depth. Then draw on the board, next to the square; a circle, a rectangle, a triangle. Explain that a 3-dimensional square is called a cube. They are not the same shape, but since they are quite similar, they often are linked together. This is because the cube’s faces are squares. Ask the class if they know a 3D shape that could be linked to the other three shapes. If they come up with anything other than cuboid, cone, cylinder, and sphere, write it down, and draw it in the corner of the board, but say that it is not what you’re looking for. Give them two minutes to guess, before drawing the aforementioned 3D shapes. Ask the class now, to pay attention to how the cube has been drawn differently from the square, and the same with the cuboid. The sphere, however, on the board, will look just like a 2D circle. Explain that a sphere is hard to draw because of its lack of edges, but that’s what the playdough is for. Ask the pupils to copy you, as you roll your playdough, allowing the class to follow you. Then do the same with the cylinder, the cuboid, and finally, the cube.

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

Let’s talk Math
Discuss how we have different sized and shaped objects around us. We can see triangles, squares, and circles everywhere. Some of these shapes have length, breadth, and height and are the 3D or the three-dimensional objects. For example, houses have length, breadth, and height and are 3D objects. Others like a sheet of paper can be imagined to have a length and a breadth only. Such objects are two-dimensional objects and are 2D shapes. Ask pupils why they think it is important to have different names for 3D shapes and 2D shapes. Why not call a cube a 3D square? Prompt them to discuss what kind of confusion it would lead to. Encourage them to think about the third dimension, and ask them how much it changes the shape. Remind them that once a square becomes a cube, it has more vertices, and more sides, so it is not really the same shape. A 2D shape can be the face of a 3D shape, but that doesn’t make them the same shape.

Let’s get practical
Divide the class into groups of 4 to 5 pupils. Ask each group to create a sequence of shapes but using the 3-dimensional shapes they have just learnt about. Give them 10 minutes to plan the sequence, reminding them to take into account the resources available to create it, and also, how much time they have. Then ask them to create the sequence. Give each team an equal amount of playdough, and tell them to leave just enough to make 4 more shapes. It should be clear when they are finished what the pattern is. Once they are finished, ask all the groups to arrange their shapes at the front of the class, and allow them all to take their seats. Then have the class help you add 4 more shapes to each sequence, asking to group that created it not to help.
Self Assessment

7.1. Angles
7.2. Angles
7.3. Angles
7.4. Angles
7.5. Angles

Multiple Choice Questions

1. A reflex angle is over
   a) 45°
   b) 90°
   c) 180°

2. Which triangle has no equal sides?
   a) Isosceles
   b) Equilateral
   c) Scalene

3. Angles are measured with a
   a) Compass
   b) Protractor
   c) Ruler
Unit 8

Perimeter and Area

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:
Area and Perimeter 6 lessons
The approximate duration of this unit should be 6 lessons.

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.

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.

This Pairs with:
Math Lab 5, page

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 a 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 chain, 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.

**SLOs**

**Activity 1**

Draw the following 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 or 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 height and width 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.

**Activity 2**

Having explained area and perimeter to the class, as well as the methods for finding them, draw the following 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

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.
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 chapter from the pupils and write them on the board. Make sure that they copy it down before the activity ends.

Assign 15 minutes of homework from your textbook.

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 learn in this unit, hey must collect data, like the dimensions of the room, and use it to calculate the area and perimeter.
8.1 Perimeter and area

Multiple Choice Questions
Read the questions out, or write them on the board if necessary, and have all pupils silently make note of the right answer, and then have the entire classroom close their eyes. Then call out, question 1, a... b... c... d and make note of who is making mistakes and ask them to raise their hands when the right answer is called. Do the same for 2 and 3.

1. Perimeter is:
   a) The total space inside a shape
   b) They length of one side of a shape
   c) The total of length of all side of a shape.

2. The formula to find the area of a square and rectangle is the same, or different?
   a) It is the same
   b) It is different
   c) It is sometimes different

3. A cube is?
   a) A quadrilateral and 3D shape
   b) Only 2 quadrilateral
   c) Only a 3D shape
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. Organize 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:
Average 5 lessons
Bar Graphs 5 lessons
The approximate duration of this unit should be 10 lessons.

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 4, page

Make Sure You Have:
Deck of 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.

<table>
<thead>
<tr>
<th>SLOs</th>
<th>Activity 1</th>
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<tbody>
<tr>
<td>9.1 i</td>
<td>Divide the class into pairs. Take out any 10 cards randomly out of the deck. Provide each pair with the cards. Instruct students to find the total value of the numbers on the cards and divide it by the total cards. One student will arrange the cards and the other will add all the numbers of the cards. Take feedback from each pair, ask them how they calculated the mean. 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.</td>
</tr>
</tbody>
</table>

| Activity 2 |
| 9.1 ii |
| 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). |

\[
\frac{10 + 8 + 9 + 9 + 8 + 10 + 9 + 10 + 8 + 9}{10} = 9
\]

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.

| Activity 3 |
| 9.2 i |
| Talk to your students about the importance of having breakfast in the morning. Discuss healthy options for breakfast. Give one paper plate to each student. Ask students to write down what they had for breakfast that morning, and to draw an image of it. Students who did not have breakfast should just write ‘nothing’. Group the breakfast items into categories such as ‘milk and cereal’, ‘fruits’, ‘toast’, ‘eggs’, etc. Explain that a bar graph will make it easy to organise the students’ responses. 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. Spread the chart paper on the board. Call out each group one by one. They will tell the data of the particular category which they had on their table. Construct a bar for the particular breakfast category on the chart paper. Repeat the same steps for each of the remaining categories. Analyse the bar graph and discuss the data. |

| ii |

| iii |
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 for example of how what they learnt in this chapter can be helpful to people. 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 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 five 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 2 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

Multiple Choice Questions

Read the questions out, or write them on the board if necessary, and have all pupils silently make note of the right answer, and then have the entire classroom close their eyes. Then call out, question 1, a... b... c... d and make note of who is making mistakes and ask them to raise their hands when the right answer is called. Do the same for 2 and 3.

1) In a group of ten, three people are 8 years old, 6 people are 10 years old, and one person is 26. What is the average age of this group?
   a) 11
   b) 10
   c) 15
   d) 20

2) Which of the following would not be good to represent with a bar graph?
   a) The total number of people on a plane
   b) How many scoops of each flavour an ice cream shop sold
   c) It could be either cream shop sold

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

Refer to the confusion level if they're struggling:

<table>
<thead>
<tr>
<th>Confusion level</th>
<th>1 - Does not understand any concept</th>
<th>2 - Does not understand most of the concepts</th>
<th>3 - Understands some concepts but has questions</th>
<th>4 - Understands all the concepts, just needs more practice</th>
<th>5 - Feels confident solving questions</th>
<th>If pupil is below 3 use Math Lab</th>
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<tbody>
<tr>
<td>Number of Pupils</td>
<td></td>
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If pupil is below 3 use Math Lab.
Lesson plans to be used in conjunction with the New Countdown book series.
# Syllabus Matching Grid of New Countdown Book 5 with the Single National Curriculum 2020

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<td></td>
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| Unit 2: Highest Common Factor (HCF) and Least Common Multiple (LCM) | 2.1. HCF | i. Find HCF of  
• two numbers up to 2-digit numbers  
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| | | | | |
| | 2.2. LCM | i. Find LCM of  
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| | 3.2. Multiplication of Fractions | i. Multiply a fraction by a 1-digit numbers and demonstrate with the help of diagram | | 40 |
| | | ii. Multiply two or three fractions involving proper, improper fractions, and mixed numbers. | | 43 - 44 |
| | | iii. Solve real life situations involving multiplication of fractions. | | 45, 46 |
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<td>iv. Multiply a 3-digit number up to 2 decimal places by 10, 100, and 1000</td>
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<td>i. Convert • hours to minutes and vice versa • minutes to seconds and vice versa</td>
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<td>ii. Convert years to months and vice versa, months to days and vice versa, weeks to days and vice versa</td>
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<td>ii. Recognize the standard units for measuring angles is 1°, which is defined as 1/360 of a complete revolution.</td>
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<td>119</td>
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<td>7.2. Triangles</td>
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<td>i. Identify and describe triangles with respect to their sides. (isosceles, equilateral, and scalene)</td>
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<td></td>
<td></td>
<td>ii. Identify and describe triangles with respect to their angles. (Acute angled triangle, Obtuse angled triangle and right-angled triangles)</td>
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<td>49</td>
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</table>
|  |  | iii. Use protractor and ruler to construct a triangle when  
|  |  | • two angles and their included side is given.  
<p>|  |  | • two sides and included angle is given. | 125 | 50 |
|  |  | iv. Measure the lengths of the remaining two sides and one angle of the triangle. | 132, 135 |  |
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|  |  | 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. | 138 | 52 |
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Numbers and Arithmetic Operations

Suggested Time Frame
10-12 periods

Learning Curve
Students have already worked with numbers up to 9 digits. Here they 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 $200 \times 37 \times 8 = 59200$ 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 $97 \times 365 \times 24 \times 60 = 50983200$
- Finding the height of a certain mountain in inches! etc.

Frequently Made Mistakes
Students generally make mistakes when they 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.

Students can make mistake when they deal with subtraction/ addition questions given in words, they need to be careful while placing one number under the other (correct place
value) in case of subtraction if given in words, the word FROM causes a confusion, and students generally write the number first which is written before the word FROM. Students can also be confused by the BODMAS rule and its application with the arithmetic operation rule, so teachers should take time to ensure that the BODMAS rule is clearly understood by all.

### Summary of Key Facts
- According to International Place Value Chart, commas are replaced by spaces.
- Columns should be written neatly and carefully while dealing with addition and subtraction of very big numbers with 7 or 8 digits.
- 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.
- When a number is multiplied by 1 the result remains the same.
- Division is the inverse of multiplication.
- The number which is being divided is called the dividend.
- A number by which another number is to be divided is called the divisor.
- Quotient is the quantity produced by the division of two numbers.
- The number which is left over after the division is complete is called the remainder.
- When we have problems with two or more of the four operations without brackets, the rule of DMAS should be used for simplification. [Tip: A simple mnemonic to remember DMAS, 'Do Musicians Always Sing?']
- Brackets are also called grouping symbols, brackets help us to solve problems

### 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
Starter: Engagement Activity (5 mins)
Math Game Double Trouble
Tell students to use their whiteboard 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 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 31536000 and her brother Ali bought property worth Rs 31341200. Who has spent more money and how much more?

\[
\begin{align*}
\text{Rs 31536000} & \\
- \text{Rs 31341200} & \\
\hline
\text{Rs 194800} & \\
\end{align*}
\]
Sana spent Rs 194800 more than her brother
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 and Venn diagram. 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

- Rules of divisibility of 4, 6, 8, and 9.
- 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 stands for highest common factors.
- LCM stands for lowest common multiple.
- 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 3 sets of double digit numbers using the long division method.

Key Vocabulary
factors, common factors, highest common factors (HCF)

Resources
Chart papers, markers

Strategy
Starter: 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:
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:

\[
\begin{array}{c}
  18 \left\lfloor \begin{array}{r}
    27 \\
    -18 \\
    \hline
    9
  \end{array} \right.
\end{array}
\]

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.

\[
\begin{array}{c}
  9 \left\lfloor \begin{array}{r}
    18 \\
    -18 \\
    \hline
    0
  \end{array} \right.
\end{array}
\]

**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.

\[
\begin{array}{c}
  9 \left\lfloor \begin{array}{r}
    45 \\
    -45 \\
    \hline
    0
  \end{array} \right.
\end{array}
\]

Hence, the HCF of 18, 27, and 45 is 9.
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:
- in baking to tell what quantity of an ingredient to use.
- in telling time; each minute is a fraction of the hour.
- on a doctor’s prescription to tell how much of a medicine should be taken.

Frequently Made Mistakes
Students make the following mistakes:
- While simplifying fractions they 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.
  For example. \( \frac{1}{2} \times \frac{28}{35} \)
- When dividing fractions, they find the reciprocal of the first fraction instead of the second fraction.
Summary of Key Facts

- In proper fractions the numerator is smaller than the denominator.
- In improper fractions the numerator is greater than the denominator.
- A mixed fraction is made up of a whole number and a proper fraction.
- 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
Starter: 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.
Since, the two fractions now have the same denominator, they can easily be added together.
Decimal 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 already learnt to apply four operations on numbers. They can convert decimals to 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.
• 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 jewelry 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 adding or subtracting decimal numbers, students forget to put the decimal point in the correct place.
- When multiplying or dividing fractions they don't remember whether the decimal appear to move towards the right or left (although the decimal point does not move).

Summary of Key Facts

- It is important to write sums neatly, with the decimal point and the columns properly aligned.
- 'Unlike decimals' are numbers with different decimal places.
- Numbers with the same number of decimal places can be easily added or subtracted by writing each digit under the other.
- It is important to keep in mind that whenever you multiply or divide by a whole number, you count from the extreme right of the decimal fraction the number of places after which the decimal point is placed in the multiplicand or dividend, and then mark it exactly in the same place in the product and quotient respectively.
- **Multiplying decimal fractions by 10 and its multiples**: Students know that when they multiply a whole number by 10, 100, or 1000, the number jumps one, two, or three column(s) to the left respectively. A decimal fraction also moves in the same direction, corresponding to the number of zeroes in the multiplicand.
- Another way of working out such problems is to count the number of zeros in the multiplier and then shift the multiplicand the same number of zeros to the left or, alternatively, shift the decimal point the same number of places to the right. No need to actually multiply.
- **Dividing decimal fractions by 10 and its multiples**: When a number is divided by 10, its value decreases whether it is a whole number or a decimal number.
- Multiplication gives a bigger number as the answer while division gives a smaller number as the answer. So, move your decimal point accordingly.
- **Multiplying a decimal fraction by a decimal fraction**: In order to multiply two numbers with decimals, it is easy to change the numbers into common fractions and then multiply them.
- **Dividing a decimal fraction by a decimal fraction**: 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 zeroes in the divisor, then shift the dividend the same number of columns to the right.
• Apply the BODMAS rule to simplify the decimal sums where two or more operations are used.
• Rounding off means making an estimate but maintaining its value close to the original figure.
• To round off a whole number to its nearest 10, we look at the ones digit. If it is less than 5, we round it down and if it is equal to 5 or greater than 5, round it up.
• Rounding off and approximation is especially useful when adding, subtracting, multiplying, and dividing a group of numbers.
• Always keep in mind that half way numbers are to be rounded upwards. The numbers with a decimal can also be rounded off to the nearest whole number by using a number line.
• The word ‘percentage’ is based on the Latin word ‘Centum’. A percentage is a special kind of a fraction with 100 as a denominator.
  % is the symbol used for percentage, 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

Starter: 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,
\[ \frac{15}{100} \times 100 = 15 \% \]
Distance, Time, and Temperature

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.
- Time is used everywhere while travelling, working and cooking.

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 (e.g. $5 \text{ m} = 5 \times 100 = 500 \text{ cm}$). On the other hand we 'divide' when converting a smaller unit to a bigger units (e.g. $200 \text{ cm} = 200 \div 100 = 2 \text{ m}$)

Summary of Key Facts
- Kilo means $1000$, centi means $\frac{1}{100}$ and milli means $\frac{1}{1000}$.
- When a bigger unit is to be converted to a smaller unit: MULTIPLY.
• When a smaller unit is to be converted to a bigger unit: DIVIDE.
• 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.

**Model Lesson Plan**

**Topic**
Temperature

**Duration**
2 Periods

**Specific Learning Objectives**
By the end of the lesson students will be able to convert numbers given on the Celsius scale to the Fahrenheit scale.

**Key Vocabulary**
temperature, Celsius scale, Fahrenheit scale

**Resources**
Thermometer, Activity Worksheet

**Strategy**
**Starter: Engagement Activity**
Whole class discussion (5 mins)
Show a thermometer to the students and tell them that temperature is measured using a thermometer. It can be measured in two units Celsius and Fahrenheit.

**Main Developmental Activity**
Demonstration (10 mins)
A conversation with the students is useful to gauge their knowledge about temperature and the thermometer. This may be followed up with a little discussion on how a thermometer works and a practical demonstration with a real-life thermometer.

Tell the students that when we place a pan full to the rim with water on a fire, and the water heats, it bubbles over the rim and spills. The mercury thermometer also behaves similarly. When it is heated, it expands and spills into the bore.

The mercury in the thermometer contracts when there is a fall in temperature.

Explain how to convert the two units of temperature by using the following formulas:

\[ ^\circ C = ^\circ F - 32 \times \frac{5}{9} \]

\[ ^\circ F = ^\circ C \times \frac{9}{5} + 32 \]
Suggested Time Frame
8-10 periods

Learning Curve
Students are 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. Students in their previous classes learnt about fractions. Now, in this unit they will define the ratio of two numbers which will lead them to define and identify direct and inverse proportion. They will be able to solve real-life problems involving direct and inverse proportions.

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
- Ratio is the comparison of two quantities.
- Ratios can be written as a fraction or using a symbol.
- Ratios must be simplified to the lowest term.
- A ratio has no unit.
- Proportion is a statement, showing the relation of two equivalent ratios.
• There are two types of proportion: direct proportion and inverse proportion.
• When one quantity increases as the other increases or one quantity decreases as the other decreases, the quantities are said to be in direct proportion.
• When one quantity increases as the other decreases, or one quantity decreases and the other increases, they are set to be inversely proportion.

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
Starter: 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 shopkeepers, 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.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Cost per unit</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 packets</td>
<td>popcorn</td>
<td>Rs 10</td>
<td>Rs 200</td>
</tr>
<tr>
<td>2.5 kg</td>
<td>flour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.25 kg</td>
<td>butter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.25 litre</td>
<td>orange juice</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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
Starter: 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 $360^\circ$.

- a reflex angle is greater than $180^\circ$. Reflex angles can be drawn in two ways.

Look at the following figures:

Use a protractor to draw an acute angle. Let angle $ABC = 30^\circ$

Subtract: $360^\circ - 30^\circ = 330^\circ$

The outer angle $ABC = 330^\circ$ which is the required reflex angle.
Suggested Time Frame

8-10 periods

Learning Curve

In Grade 3, students have calculated the perimeter of a square and a rectangle and in Grade 4 they 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.
Suggested Activities

1. Activity: Group Work
Learning Outcome: Find the perimeter of the given region.
Resources: Activity Worksheet
Instructions:
- Divide the class into groups.
- Provide each group with a worksheet as shown in the sample.
- Ask the students to solve the worksheet and exchange it with the other group for peer checking.

2. Activity: Pair Work
Learning Outcome: Find the area and perimeter of the given simple shapes.
Resources: Activity Worksheet
Instructions:
- Divide the class into pairs.
- Time the students and give a reward to the winning pair.
1. What is the height and width of each side?
2. What is the perimeter?
3. What is the area?
4. What is the area?
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
Starter: 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 a rectangle?

Square
Area of a square = length \times length = (length)^2
Perimeter = 4 (length)

Rectangle
Area of a rectangle = length × breadth
Perimeter = 2 (length + breadth)

**Main Developmental Activity**

**Setting:** Divide the class into groups. Each group will consist of 4 members.

**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.

![Composite shape diagram](image)

**Feedback (15 mins)**
Ask each group to represent their work and tell the other groups to give remarks on each other’s work.
Information 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 don’t 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
Starter: 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.
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

\[ \angle a + \angle b + \angle c + \angle d = 360° \]

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

equilaterial triangle

a triangle with three sides of equal length and three equal angles, where each angle is 60°

C

cubic unit

Unit of measure of volume

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°)

**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.

**probability**

the chance of an event occurring and is measured on a scale between 0 and 1

**R**

**rate**

the ratio between two related quantities

**ratio**

the relationship between similar quantities displaying the number of times is one of the other
rhombus

![Diagram of a rhombus]

A quadrilateral with opposite sides that are parallel, all sides equal in length and opposite angles that are equal.

right-angled triangle

![Diagram of a right-angled triangle]

A triangle with a right angle (a 90° angle)

Example

![Diagram of vertically opposite angles]

∠a and ∠b are vertically opposite angles, where \( \angle a = \angle b \).
∠c and ∠d are vertically opposite angles, where \( \angle c = \angle d \).

volume

The measure of the amount of three-dimensional space an object contains

Vertically opposite angles

Angles that are formed when two lines intersect, where the angles are equal to each other
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UNIT 1

ASSESS AND REVIEW 1

Teaching objectives
• to reinforce learning from Maths Wise Book 4
• to work with numbers up to 100 million
• to recap decimal numbers
• to revise weights and measurements and their units
• to recap fractions, time, and shapes learnt

Learning outcomes
Students should be able to:
• demonstrate understanding of concepts learnt in Maths Wise Book 4
• perform the four operations with numbers up to 100 million
• compare decimal fractions
• work with units of weights and measurements to solve real-life problems
• demonstrate understanding of fractions, time, and shapes

UNIT 2

NUMBERS AND ARITHMETIC OPERATIONS

Teaching objectives
• to revise large numbers
• to introduce the Pakistani system of place value
• to introduce place value up to 10-digit numbers and introduce the concept of a billion
• to compare and order numbers up to 10 digits
• to revise properties of addition and introduce addition of large numbers
• to revise properties of subtraction and introduce subtraction of large numbers
• to demonstrate multiplication of 3-digit numbers and verify multiplication properties
• to introduce division of 2- and 3-digit numbers
• to introduce multiplication and division by 10, 100, 1000
• to explain the order of number operations
• to learn about Pattern and their rules

Learning outcomes
Students should be able to:
• differentiate between the international place value system and the Pakistani system of notation
• identify numbers up to a billion, and 10-digit numbers
• add, subtract, multiply, and divide large numbers
• apply binary operations to real-life situations
• perform multi-operation simplification using BODMAS
• identify and apply pattern rules to find next three terms

UNIT 3

HCF AND LCM

Teaching objectives
• to revise factors and multiples
• to recap prime and composite numbers
• to reinforce divisibility tests
• to introduce prime factorization using the listing method, tree method, and short division
• to introduce HCF using the Venn diagram, prime factorization, and long division
• to find the LCM by listing common multiples, prime factorization, and short division of 4 numbers
• to introduce square numbers

Learning outcomes
Students should be able to:
• use divisibility rules when dividing given numbers
• differentiate between prime and composite numbers
• identify and find factors and multiples of a number
• find the HCF using the listing method, short division, and long division
• find the LCM of 4 numbers by prime factorization and the short division method

UNIT 4

FRACTIONS

Teaching objectives
• to recall various types of fractions proper/improper/mixed)
• to recall equivalent fractions and their uses
• to introduce addition and subtraction of unlike fractions
• to introduce multiplication of two fractions
• to introduce division of fractions by a whole number and by another fraction
• to explain BODMAS problems using fractions
• to solve real-life problems involving fractions
Learning outcomes
Students should be able to:
• identify correctly different types of fractions
• use equivalent fractions to compare, add, and subtract unlike fractions
• multiple a fraction by another fraction
• divide a fraction by another fraction
• perform number operations involving fractions following BODMAS
• solve real-life problems using fractions

UNIT 5
DECIMAL FRACTIONS
Teaching objectives
• to introduce like and unlike decimals
• to add and subtract decimals
• to introduce multiplication of decimals
• to introduce division of decimals
• to apply BODMAS rules to decimals
• to convert fractions to decimals and vice versa
• to practice rounding off to a given decimal place
• to estimate the numbers up to 4 digits
• to introduce percentage as a special type of fraction

Learning outcomes
Students should be able to:
• explain that decimals are fractions with a special/standard denominator
• interconvert fractions and decimals
• perform addition and subtraction of decimals with correct use of place value
• perform multiplication of decimals
• perform division of decimal numbers
• apply BODMAS to decimals
• estimate sum or difference of the numbers
• identify percentage as a special fraction
• apply the concept of fractions, decimals and percentages in real-life situations
UNIT 6

MEASUREMENTS: DISTANCE, TIME, AND TEMPERATURE

Teaching objectives
• to explain conversion from one unit of length to another
• to practise conversion between units of time
• to introduce smaller and larger units of length and time
• to add and subtract by converting unlike units to like units
• to introduce measurement of temperature
• to introduce the Fahrenheit and Celsius temperature scales
• to explain conversion between the Fahrenheit and Celsius temperature scales

Learning outcomes
Students should be able to:
• apply the correct units of measurement
• convert from one unit to another
• apply conversion of units to real-life problems
• use the units of temperature and inter-convert them correctly

UNIT 7

UNITARY METHOD; RATIO AND PROPORTION

Teaching objectives
• to compare quantities of the same kind as a ratio
• to compare the relationship between 2 quantities as a proportion
• to introduce direct and inverse proportion
• to introduce percentage ratio
• to introduce the unitary method

Learning outcomes
The students should be able to:
• compare 2 quantities by expressing them as a ratio in the simplest term
• differentiate quantities which are directly/inversely proportional
• use the unitary method to solve real-life problems (both direct and inverse)
UNIT 8

GEOMETRY

Teaching objectives
• to demonstrate the use of a protractor to construct a right angle, straight angle, and reflex angle
• to explain adjacent angles, complementary angles, supplementary angles
• to define a triangle
• to explain classification of triangles based on i) sides ii) angles
• to show construction of triangles
• to define quadrilaterals
• to demonstrate construction of a square and a rectangle using a set-square and ruler
• to learn about different types of symmetry
• to learn about nets of 3D figures

Learning outcomes
Students should be able to:
• use a protractor to construct angles
• differentiate between complementary and supplementary angles
• calculate the complement and supplement of a given angle
• define and classify triangles based on the sizes of their angles and lengths of sides
• construct a triangle using a pair of compasses and a ruler when the lengths of its 3 sides are given
• identify and define quadrilaterals
• construct a quadrilateral using set-square and a ruler
• find order of rotational symmetry
• to identify cube, cuboid, and pyramid from their nets

UNIT 9

PERIMETER AND AREA

Teaching objectives
• to introduce the concept of perimeter and its practical applications
• to introduce the formula for finding the perimeter of a square and a rectangle
• to introduce the concept of area
• to introduce the formula for finding the area of a square and a rectangle
• to explain the application of area in practical situations
• to explain how to calculate the area and perimeter of irregular shapes
Learning outcomes
Students should be able to:
• explain the concept of perimeter and apply it in practical situations
• use the formula to find the perimeter of a square and a rectangle
• explain the idea of area
• use the formula to find the area of a square and a rectangle
• apply the concept of area in practical situations
• find the areas and perimeters of irregular shapes using a square grid and approximation

UNIT 10
INFORMATION HANDLING
Teaching objectives
• to draw and interpret a bar graph/column graph
• to draw and interpret a pie chart
• to introduce averages

Learning outcomes
Students should be able to:
• identify a graphical representation of data
• draw a bar graph, a column graph, or a pie chart from given data
• draw conclusions from a bar chart, a column graph, and a pie chart
• calculate averages

UNIT 11
ASSESS AND REVIEW 2
Teaching objectives
• to revise the concepts learnt throughout the year
• to recap place value
• to revise fractions and percentages
• to solve problems using the four operations, i.e. addition, subtraction, multiplication, and division
• to revise measurement of distance, time, and temperature
• to revise the divisibility rules
• to recap ratio and proportion
• to identify complementary and supplementary angles, and adjacent angles
• to solve problems related to perimeter and area
• to revise the concept of average and interpret data presented in bar graphs and pie charts
Learning outcomes

The students should be able to:

• identify the place values in given numbers
• demonstrate an understanding of fractions and percentages
• solve problems using the four operations, i.e. addition, subtraction, multiplication, and division
• demonstrate an understanding of measurement distance, time, and temperature
• use the divisibility rules
• solve problems related to ratio and proportion
• demonstrate understanding of complementary, supplementary angles, and adjacent angles
• solve problems related to perimeter and area
• solve problems related to averages and interpret data presented in bar graphs and pie charts