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.
**Single National Curriculum 2020**

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

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

<table>
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<tr>
<th>Key Learning Strands</th>
<th>Standards</th>
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| 1. Numbers and Operations     | • identify numbers, ways of representing numbers, comparing numbers and effects of number operations  
                                | • compute fluently with fractions, decimals and percentages  
                                | • examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking |
| 2. Algebra                    | • analyse number patterns  
                                | • known facts, properties and relationships to analyse mathematical situations  
                                | • examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking |
| 3. Geometry and Measurement   | • identify measurable attributes of objects, construct angles and two-dimensional figures  
                                | • analyse characteristics and properties of geometric shapes and develop arguments about their geometric relationships  
                                | • examine real-life situations by identifying, mathematically valid arguments and drawing conclusion to enhance their mathematical thinking |
| 4. Data Handling              | • collect, organise, analyse, display and interpret data/ information  
                                | • examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking |
The Mathematics Curriculum Standards and Benchmarks – SNC 2020

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

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<th>Benchmarks Grade IV – V</th>
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<td><strong>Numbers and Operations</strong></td>
<td>The students will be able to:</td>
<td>The students will be able to:</td>
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<tr>
<td>- Identify numbers, ways of representing numbers, comparing numbers and effects of operations in various situations.</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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<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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<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>• 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></td>
<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>• 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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<tr>
<td></td>
<td>• recognise fractions and different forms of fractions with the help of objects and figures</td>
<td>• solve real-life situations involving addition, subtraction, multiplication and division of fractions</td>
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<td>Standards</td>
<td>Benchmarks Grade I – III</td>
<td>Benchmarks Grade IV – V</td>
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<tr>
<td>• express and match fractions in figures and compare fractions with same denominators using symbols &lt;, &gt; or, =</td>
<td>• apply unitary method for solving real-life situations</td>
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<td>• identify and write equivalent fractions for a given fraction</td>
<td>• identify and recognise decimal numbers</td>
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<td>• add and subtract two fractions with same denominators</td>
<td>• convert decimal numbers into fractions and vice versa</td>
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<td>• add and subtract numbers up to 3 decimal places</td>
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<td>• multiply and divide decimal numbers with whole numbers</td>
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<td></td>
<td>• round off decimal numbers up to specified number of decimal places</td>
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<td></td>
<td>• solve real-life situations involving decimal numbers (up to 3 decimal places)</td>
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<td></td>
<td>• convert percentage to fraction and to decimal and vice versa</td>
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<tr>
<td>Algebra</td>
<td>• develop the concept of equality using addition and subtraction of numbers</td>
<td>• develop the concept of equality using addition, subtraction, multiplication, and division of numbers</td>
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<td>• analyse number patterns</td>
<td>• identify and complete geometrical patterns on square grid according to attributes like shape, size and orientation</td>
<td>• identify and describe repeating pattern using relationship between consecutive terms and generate number patterns</td>
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<tr>
<td>• known facts, properties and relationships to analyse mathematical situations</td>
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<tr>
<td>• examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance mathematical thinking</td>
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<tr>
<td>Standards</td>
<td>Benmarks Grade I – III</td>
<td>Benmarks Grade IV – V</td>
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<tr>
<td>Geometry and Measurement</td>
<td>• use language to compare heights/ lengths, masses and capacity of different objects</td>
<td>• convert standard units of length, mass, capacity, and time</td>
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<tr>
<td>• identify measurable</td>
<td>• read, recognise and use units of length (kilometre, metre and centimetre), mass</td>
<td>• solve the real-life situations involving addition and subtraction of units of</td>
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<tr>
<td>attributes of objects,</td>
<td>(kilogram and gram) and capacity (litre and millilitre) and time (minute and second)</td>
<td>distance/ length, mass, capacity, and time</td>
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<tr>
<td>construct angles and two-</td>
<td>• add and subtract in units of length, mass, capacity and time for solving real-life</td>
<td>• distinguish parallel and non-parallel lines</td>
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<tr>
<td>dimensional figures</td>
<td>situations</td>
<td>• identify, classify and construct different types of angles</td>
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<td>• analyse characteristics</td>
<td>• use solar and Islamic calendar to find a particular date/ day</td>
<td>• describe and classify 2-D figures and 3-D geometrical objects</td>
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<td>and properties of geometric</td>
<td>• recognise and identify two- and three-dimensional figures</td>
<td>• determine perimeter and area of square and rectangle</td>
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<td>shapes and develop arguments about their geometric relationships</td>
<td>• determine perimeter of square, rectangle, and triangle</td>
<td>• describe and complete symmetric figures with respect to given line of symmetry and</td>
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<td>• examine real-life</td>
<td>• identify and differentiate straight line and curved line</td>
<td>point of rotation</td>
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<td>situations by identifying,</td>
<td>• identify and draw points, lines, line segments, and rays</td>
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<td>mathematically valid</td>
<td>• identify and describe symmetrical shapes</td>
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<td>arguments and drawing</td>
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<td>conclusion to enhance</td>
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<td>mathematical thinking</td>
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<tr>
<td>Data Handling</td>
<td>• read, interpret and represent data using</td>
<td>• read and interpret bar graphs, line graphs and pie charts</td>
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<tr>
<td>• collect, organize,</td>
<td>Carroll diagrams, picture graphs and tally charts</td>
<td>• represent real-life situations using pie chart</td>
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<td>analyse, display and interpret data/ information</td>
<td></td>
<td>• find an average of given quantities in the data</td>
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<tr>
<td>• examine real-life</td>
<td></td>
<td>• draw and read simple bar graphs both in horizontal and vertical form</td>
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<td>situations by identifying,</td>
<td></td>
<td>• solve real-life situations using simple bar graphs</td>
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Unit 1

Whole numbers

1.1 Numbers 0-9
i. Identify numbers 1-9.
ii. Identify 0 as a number.
iii. Read numbers up to 9 in numerals and in words.
iv. Write numbers up to 9 in numerals and in words.
v. Count objects up to 9 and represent in numbers.
vi. Match numbers 0-9 with objects.
viii. Arrange numbers in ascending and descending order (up-to 9).
ix. Identify which number (up to 9) comes
   • Before and after a given number
   • Between two given numbers.

1.2 Numbers up to 100
i. Identify 10 as a 2-digit number.
ii. Compare and order the numbers 0-10.
iii. Read numbers up to 99
iv. Write numbers up to 99
v. Count forward and backward up to 99
vi. Recognise the place value of a specific digit in a 2-digit numbers (tens and ones)
vii. Identify the place value of the specific digit in a 2-digit number
viii. Decompose a number up to 99 to identify the value of a number in ten's and one's place.
ix. Compare 1-digit and 2-digit numbers
x. Order the set of numbers from 0 to 99 in ascending and descending order.
xi. Identify which number (up to 99) comes
   • Before and after a given number
   • Between two given numbers.

1.3 Comparing and ordering
i. Compare two or more groups of objects in terms of numbers.
ii. Match objects having one to one correspondence
iii. Identify the number of objects in two groups to show “more than” and “less than”

Plan Ahead:
1.1. Numbers 1 to 9 6 lessons
1.2. Numbers up to 100 6 lessons
1.3. Comparing and Ordering 6 lessons

Before You Start:
Pupils have already learnt to identify the place value of numbers up to 3 digits. In the light of their previous knowledge they will read and write numbers up to 4 digits. Now, they will learn to read and write numbers up to 5 digits in numerals and words. They will also be able to write numbers in ascending and descending order, represent and identify a given value of number on a number line. They may have seen the Roman numbers on clocks and watches. They learn about the letters of the alphabet, which represent different Roman numbers and the order in which they are placed. Pupils are new to compare two numbers using symbols, but they are familiar with the idea of greater and lesser, so it shouldn’t be too difficult for them.
**Watch Out For:**
Students generally get confused between the symbols of greater than and lesser than, while comparing numbers. They might also struggle to remember which roman numeral is which. The introduction to new numbers may also seem intimidating, but they should feel more comfortable when they realise that it is simply an extension of something they already know.

**Plan Ahead:**
This unit should take approximately 4 weeks to conclude.

**This Pairs with:**
Math Lab 3, page 2 to 14.

**Make Sure You Have:**
- Roman numeral cards
- Chart papers
- Markers
- Tape
- Two differently coloured highlighters
- Bowl
- Chits
- Three-digit number cards

**If they’re Struggling:**
Roman numerals will be harder for the pupils to retain as they won’t necessarily be seeing or using them in their daily lives. The only solution is to give them plenty of practice so that they get the hang of it, and to take pauses throughout the unit to revise the. If the concept of rounding off seems pointless, use the example of time. People always round off when stating how long they need to do things. Explain that this is because when you are guessing, you might be quite sure about the fact that you need 17 minutes to do something, but because you are not absolutely sure, you will say twenty minutes, more likely. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent math lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a 4 or above, move on to the next activity.

**Let’s Begin**
Ask pupils why numbers are important. They will have many real-life examples of how and why they use numbers and see numbers being used in their lives. Ask them if they think that numbers are complicated. They have, so far, learnt a lot about numbers, and they realise they have much more to learn. Ask them to justify their answers. Point out though that everything they have learnt about numbers has been helpful for them when they work with them. For example, knowing about place value made it much easier for them to add and subtract big numbers. Ask them to think out loud about how their knowledge of numbers improves the quality of their lives.
### Activity 1
**10 minutes**
Roman numeral cards

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

#### Let’s try it

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

### Activity 2
**20 minutes**
chart paper markers tape two colours of highlighters

Ask the class, which numbers can be divided by 2. They should name even numbers at random. Explain then that can be divided by 2 are called even numbers. Ask them then to think of numbers that cannot be divided by 2. Tell them these are called odd numbers. Divide the group into 5 groups. Allot them each a portion of numbers 1 to ask each group to make cards for those numbers. Once they are done, tape them up on the walls around the class, in order, so that there is a sort of number lines all around the class. Then put out highlighters. Ask pupils to colour even number cards one colour, and odd number cards a different colour. Make sure they all know the colour code that you have decided, and also remind them not to highlight unless they are sure. Once they are done, ask them to take their seats, and ask them if they can think of any tricks to identify whether or not a number is divisible by 2. Especially since bigger numbers are harder to divide. After the discussion, point out to them that if the last digit of a number is divisible by 2, or if it is 0, then the number, for sure, is even.

#### Let’s try it

Write up to 20 random number sequences on the board. Ask pupils to copy these down, and highlight the even numbers. After, ask them to peer review.
Fill a bowl with chits and pass it around the class. Each chit should identify two two-digit numbers that have a difference of 10. For example, 35 and 45, or 76 and 86. Once everyone has picked their chits, pick one out yourself. Draw a line on the board, and make a number line, ranging from the smaller number on the chit to the larger one. Do it step by step so that the class can see how it is to be done. Then ask them to get into pairs and help each other make a ten-centimetre line and make a number line from the smaller number on their chits to the bigger one.

**Activity 5**
10 minutes
bowl chits

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

**Activity 4**
20 minutes

| Confusion level | 1 – Does not understand any concept | 2 – Does not understand most of the concepts | 3 – Understands some concepts but has questions | 4 – Understands all the concepts, just needs more practice | 5 – Feels confident solving questions |
|-----------------|-----------------------------------|------------------------------------------|---------------------------------|---------------------------------|---------------------------------
| Number of Pupils |                                    |                                          |                                 |                                 |                                 |

Refer to if they’re struggling

**Activity 3**
7 minutes

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

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

**Activity 4**
20 minutes

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

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

This exercise should be done individually. Ask each pupil to choose three two-digit numbers. Then ask them to make three number lines, one for each, that start from five numbers before, and extend to five numbers after. However, when they write the numbers along the lines, they should leave the spot for their chosen number blank. So if the chosen number was 45, the digits on the number line would read 40, 41, 42, 43, 44, __, 46, 47, 48, 49, 50. Give them about 5 minutes to do this, and then collect their notebooks, and redistribute them at random. Ask the class to open to the page with the number lines and fill in the three blank spots by looking at the surrounding numbers. Before collecting the books, ask pupils to be sure that they haven’t written the chosen numbers down. The number that comes just before a number is called the predecessor of that number (‘pre’ means before.) The number that comes just after a number is called the successor of that number (‘succeed’ means follow.)

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

<table>
<thead>
<tr>
<th>SLOs</th>
<th>Activity 6</th>
<th>5 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6i</td>
<td>Assign classwork from the textbook.</td>
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<table>
<thead>
<tr>
<th>Activity 7</th>
<th>13 minutes</th>
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<tbody>
<tr>
<td>1.6ii</td>
<td>three-digit number cards</td>
</tr>
<tr>
<td>Make groups of three and explain the activity. You will hand each group 7 three-digit number cards and ask them to arrange them in ascending order. They will need to do this as quickly as they can, because you will wait 30 seconds and hand them two more numbers that they will have to add to their arrangement, making sure that it remains ascending. This will happen five times, so the activity, once they get their numbers, should take no more than two and a half minutes. After time is up, they will have to stop touching their cards, so that you can check if they have done it right. If any of the groups have made mistakes ask them to take a second look, so you can know if they need help with the concept, or if they just ran out of time. Once all the arrangements have been checked, and if necessary, corrected, collect all the cards, shuffle the groups, and repeat it once more, but this time, making sure to ask them to arrange the cards in descending order instead.</td>
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</table>

Assign classwork from the textbook.
Explain to the class that although in many situations it is good to be very specific when using numbers, especially with measurements, but sometimes, we have to be intentionally non-specific. Write the number 9 on the board and use the example of time. If you need 9 minutes to do something, are you going to say 9 minutes, or 10? While some pupils may prefer to say 9, point out that most people don’t. Therefore, when using a number that we are not entirely sure about we round up. Any number can be rounded up, and they are not always rounded up to ten. In fact, they can be rounded up to tens and hundreds, and thousands. For this activity they will be rounding up to the nearest tens and hundreds. When you are asking to round up to ten, that means that you make it so that the number ends with one zero. If you are rounding up to the nearest hundred, then you make it so the number ends in two zeros. To explain how to do this, ask pupils to pick any number, with any number of digits, but it should be a number with no zeros. Once you have a number, that can be any number of digits, say that you will be rounding it up to the nearest ten. Then draw it on a number line. So for example, if the number is 839, draw a number line showing 820, 830, 840, and 850. Then mark 839 on it. Explain to pupils, when you say round up to the nearest ten, that means that you make it so that the number ends with one zero. Ask pupils then, what is the nearest ten. When asked, they should be able to tell that the nearest ten to 839 is 840. Explain that the midpoint between tens is five, so if the number had been 834, it would have rounded down to 830. Ask them at this point if they have questions. If no one asks, explain that if the number is at the midpoint, meaning that it ends in five, then it goes up. Repeat this, but now round the same number up to the nearest hundred, using a number line again. Do it on the board, and explain that the midpoint for rounding to 100 is 50, so if a number ends in 50, or 51, then it goes up, but if it is 49, it will go down.

### Let’s try it

Present pupils with the following numbers.

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

### Let’s talk Math

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

### Let’s get practical

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

Pupils can:

1.1. Numbers 1 to 9
1.2. Numbers up to 100
1.3. Comparing and Ordering

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

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

2) If a number ends in 0, is it:
   a) Even
   b) Odd
   c) It could be either

3) What is the missing symbol? 6 ?
   a) 62
   b) 65
   c) 70
Factors and Multiples

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

2.2 Prime and Composite Numbers
i. Identify and differentiate 2-digit prime and composite Numbers.

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

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

Learning Objectives:
2.1 Divisibility Tests
2.2 Prime and composite numbers
2.3 Factors and Multiples
2.4 Prime Factorization

Before You Start:
xxxxx

Watch Out For:
Pupils might misremember the times table, and also might confuse factors for multiples.

This Pairs with:
Math Lab 4, page
Make Sure You Have:

xxxxxxx

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
Introduce this chapter as a continuation of counting. Before explaining the concept of addition, teach them how to combine two numbers. For example, ask them how many books in this pile, and how many books in this pile. Then ask them how many books altogether. Show them how to count on their fingers if they don’t already know and show them that they simply need to count both piles of books together. Some pupils may count the books in one go without seeing them as separate. Encourage them to count each set one at a time, together. Do this by asking them how many books there would be in total if you remove one pile. Without pointing out the connection, make sure they grasp the idea that two and three together will make five, so removing two will leave three remaining. Do this with a few different objects that are familiar to them but keep the numbers in single digit. You can end with the fishing game, making a story as given below: ’I had 5 fish in my fish bowl. On my birthday, my friend gave me three more fish. How many fish do I have now?’ Ask the same question with different numbers of fish.

SLOs

Activity 1
10 minutes

In a fish bowl you will drop 5 fish and then 3 more fish. Now you will count by taking them out one by one. Now there are 8 fish altogether. The key word ‘altogether’ should be emphasised and explained here. Keep all numbers single digit. If they add them correctly, it means they have understood the concept clearly. Repeat the activity several times by calling students to perform on their own.

Let’s try it

Write ten sums on the board, but in each sum, swap out a number for a question mark. They should not sum up to more than 9. Ask the pupils to write down the completed sums in their notebooks.
SLOs

Activity 2
Set up two groups of objects and ask the pupils to make note of how many there are in each group. Then ask them how many objects there are total in both groups (the total should not be more than 20), and how many more/less there are in the one with more. After this, make groups of 3 to 4 pupils and give each group 20 objects. Ask them each to come up with three different pairs of numbers that will sum up to 20. This will familiarise them with the concept of adding. When they volunteer their answers e.g. 13 and 7, write them on the board as $13+7=20$ to familiarise them with the symbols. Make the first half of the questions with single digit numbers only, but slowly introduce 2-digit numbers.

Let’s try it
Assign up to ten sums that contain a 2-digit and a 1-digit number. Here are some examples. Ask the pupils to write down the completed sums in their notebooks.

Activity 3
Let students add sums horizontally with one Tens and one Ones number e.g. $16+3$. Guide them to solve the sum mentally. Ask them to keep the bigger number i.e. 16 in their minds. Then ask them to take out their fingers according to the other number i.e. 3. Now ask them to count after the number which is in mind i.e. 16. Close your fist and open your fingers one by one while counting and saying 17, 18, and 19. Say ‘the answer is 19’. Discuss with the class how 10 is an easier number to add than most because when you add 10, the number in the place of the tens just goes up by one. Conduct a rapid fire round of questions making sums with 10s like ten plus six, ten plus four, ten plus eight, and slowly progress to two-digit numbers. Call on pupils to answer at random.

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

Let’s Pause
Ask the pupils what the difference is between “more and less” and “plus and minus”. They should be able to work toward the conclusion that more and less are descriptions and plus and minus are actions. Encourage students to always count from the bigger number to avoid overcounting and undercounting. Make sure they realise that even if the smaller number comes first in the sum, it will make no difference if they switch them around. Also avoid chorus counting in class, and make sure pupils work individually.

Refer to If they’re struggling

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If pupil is below 3 use Math Lab

Assign 15 minutes of classwork from the textbook.
Let's try it

Repeat the exercise from the previous Let's Try It, but this time instead of only addition, add in subtraction as well. You may also go as high as the number 20. There are some example.

As done previously, stop after ten questions to address any confusion, and then give ten more questions.

Activity 4
7 minutes

After explaining the addition, subtraction, and equals sign, write numbers on the blackboard with no plus or minus sign, like so

\[ 4 \_ 8 = 12 \]

Then tell them to vote by raising their hands for an addition or subtraction sign. Gradually increase difficulty, but do not go over the number 2-digit numbers. This will help them see addition as an increase and subtraction as a decrease. Have the pupils then rearrange these equations, for example

\[ 4 + 8 = 12 \] would change to \[ 12 - 8 = 4 \] or \[ 12 - 4 = 8 \]

Activity 5
20 minutes
chalk/tape
coin

This activity is best done in an outdoor space. Use chalk, or tape to draw a hopscotch style line from 0 to 20. Make sure that each pupil gets a turn if possible. If needed, have multiple hopscotch lines. Have one child stand at 0, and one child roll a die. Another child will flip a coin. Decide beforehand that it is tails for subtract and heads for add. So, if you get a 4, and a heads, the child on 0 will hop from 0 to 4. If you then get a 3 and a tail, he or she will turn around and hop to 1. Before the child starts hopping, have the other children try to guess what number they will land on. If the answer ever goes above 20 or below 0, let a different child in the group start again from 0. If the children have trouble hopping allow them to jump or walk. However, they feel comfortable.

Let's Pause

Use this opportunity to point out how the previous activity showed us that subtraction is just addition in reverse.

Activity 6
6 minutes

Explain to the class what a number story is and give them an example of one. Then point out the addition or subtraction sentence in the number story. Explain that addition sentences are simply sums and point out the number sentence from your number story. For example, if the story was that Asad had two children, but then his wife had triplets yesterday. How many children does he have now? The number sentence would be \[ 2 + 3 = 5 \]. Ask the class for volunteers to tell number stories, asking them to alternate between addition and subtraction, and ask the rest of the class to try to guess what the number sentence is. Allow the pupil who made up the story to write down the number sentence on the board after the class is done guessing.
Let’s talk Math
Ask pupils what they have learnt in this chapter. Can they relate any of it to their daily lives? Tell them a number story and then encourage them to create their own. Allow them to move the conversation in whichever direction they please, but make sure it remains relevant to the chapter, and give them cues where necessary. Ask them how they might use adding and subtracting in their daily lives from now on. Ask them if they found it hard to move from counting to addition and subtraction. Spend 5 minutes on this discussion, and then give the class 5 minutes to write a reflective paragraph like the one mentioned in the previous “Let’s Talk”.

Let’s get practical
Link numbers to ages, and to age differences. Sort the pupils into pairs, and ask them to make note of each other’s ages, and siblings’ ages. To make the activity more interesting, ask them to include pets. If anyone is less than a year old, ask them to write 0. Beforehand, find out how many only children there are in the class, and bring in a bowl of chits, allowing each only child to pick out a chit. List names and ages on each chit so that they can use them to also participate in the exercise. Once everyone has all the information written down, ask them to use the age differences to make note of the addition for their own family and subtraction for their own family: Draw an example on the board before they start, and have the pupils help fill it in. After they have individually made their calculations, have them compare answers. This will reinforce in their minds that addition and subtraction are opposites.
Self Assessment

Pupils can:

2.1 Addition (without carrying)
2.2 Subtraction (without borrowing)

Explain the confusion levels to pupils and then ask them to raise their hands to indicate confusion level

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Multiple Choice Questions

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

1) Which of the following is the subtraction sign?
   a) +
   b) –
   c) =
   d) None of the above

2) 12 + 5 = ?
   a) 19
   b) 17
   c) 15
   d) 16

3) 13 – ? = 8
   a) 3
   b) 8
   c) 7
   d) 5
Chapter 3

Fractions

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

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

3.3. Addition and Subtraction of Fractions
i. Add fractions with like denominators.
ii. Subtract fractions with like denominators.

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

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

Plan Ahead:
Fractions 4 lessons
Types of Fractions 4 lessons
Addition and Subtraction of Fractions 4 lessons
Multiplication of Fractions 4 lessons
Division of Fractions 4 lessons
The approximate duration of this unit should be 20 lessons.

Before You Start:
Students already know that a fraction is a part of a whole. They are familiar with 1/2s and 1/4 s, as used in everyday life, as well as how to use number operations.

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

This Pairs with:
Math Lab 4, page 17 to 39.
Let's Begin

Ask the class to discuss how one might use fractions in their real lives. Examples they might give you from what they have learnt in previous classes may include cooking, or for working with objects that have multiple parts. Ask them to think about why we use fractions, instead of using whole numbers. For example, saying three slices of pizza might be simpler that saying 3/8th of a pizza. As they discuss whether this would be workable, encourage them to use the real-life examples discussed earlier.

This pairs with Math Lab page 19

Go through the following questions on the board with the class

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

If the class seems to be comfortable with adding and subtracting like fractions, introduce a set of blocks. Have at least ten pairs of blocks bound together with rubber bands beforehand. Then write on the board \(\frac{2}{6} + \frac{1}{3}\). Explain that even though these fractions do not have the same denominator, they can still be added. Be sure to mention that they are called unlike fractions. Like fractions, like the pairs in the questions previously solved on the board, have the same denominator. This pair \((\frac{2}{6} \text{ and } \frac{1}{3})\) does not have the same denominator, so they are unlike fractions. Place the blocks where everyone can see them, and draw the following diagram on the board, matching the blocks to it:

Insert drawing????????

Explain that the blocks that are bound together still represent one part. But also point out that the number of blocks for each fractions is the same. Then take apart the bound together blocks, writing on the board \((\frac{2}{6} = \frac{1}{3})\). Explain that although different numbers were used to represent these fractions, they have the same value. So while the fraction is \(\frac{1}{3}\) it can also be expressed as \(\frac{2}{6}\).
Prepare chits with fractions, with varying denominators. Ask pupils to come up to the board in pairs and pick out a fraction each. If they get like fractions, ask them both to choose again. Once they have picked, they must both race to try and work out, on the board, who has the greater fraction and who has the lesser one, or, if they are equal. As soon as they work out the answer, ask the rest of the class if they are right. Allow up to seven pairs to have a go, and once you have at least five pairs of unlike fractions, make groups of five to seven, handing out blocks and rubber bands. Ask pupils to work together to compare pairs of fractions. Remind them that if they do not find the blocks helpful, they may prefer to draw diagrams, and that they should try to simplify each fraction to its lowest form if they are stuck. They will know it is in its lowest form if it’s denominator is not divisible by its numerator. Encourage them to find the easiest way to make these calculations, keeping in mind that they may each have a different answer. Ask them to make note of any tricks they may want to share for later.

Similarly, \( \frac{2}{6} \) can be simplified into \( \frac{1}{3} \). Simplification means to simplify a fraction to its simplest form. This is often done to create like fractions so that they can be added or subtracted, but we may also simplify fractions just so that they were easier to remember. When working with objects like pizza, numbers remain one-digit, but if someone were to refer to thirty pages out of a one-hundred paged book, it would be easier to say \( \frac{3}{10} \) of a book, than \( \frac{23}{100} \). Return to the question and ask pupils if they can add the two fractions now that they know that they can be simplified into like fractions.

Let’s try it

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

1. \( \frac{2}{15} \) ? \( \frac{5}{15} \)
2. \( \frac{1}{5} \) ? \( \frac{2}{6} \)
3. \( \frac{1}{5} \) ? \( \frac{13}{25} \)
4. \( \frac{15}{32} \) ? \( \frac{2}{8} \)
5. \( \frac{3}{7} \) ? \( \frac{6}{7} \)
6. \( \frac{16}{30} \) ? \( \frac{16}{30} \)
7. \( \frac{3}{15} \) ? \( \frac{7}{35} \)
8. \( \frac{1}{5} \) ? \( \frac{2}{10} \)
9. \( \frac{21}{25} \) ? \( \frac{13}{50} \)
10. \( \frac{4}{8} \) ? \( \frac{2}{16} \)
This pairs with Math Lab page 33

There are different types of fractions. Explain that like and unlike fractions are also a type of fraction, but that can only apply to a group, or a pair of fractions. Write unit, proper, improper fractions and mixed numbers on the board. Ask pupils if they can explain what any of them are, if they cannot, put an example in front of each name, and ask them if they get any idea from them. Add two more examples to each type and prompt the class to discuss them. If they are not able to reach a conclusion, explain that unit fractions are fractions with one as a numerator. A proper fraction is a fraction with a smaller numerator than denominator. And Mixed numbers are fractions that include a whole number; these can be converted into improper fractions. Go over this explanation a few times and ask the class to give you more examples of each type. Solve the first three of the following questions on the board to demonstrate how fractions can be converted into different types, asking the class to solve the remaining seven questions in groups. Remind them to use diagrams to help them compare.

1. \(3\frac{2}{15} \ ? \ \frac{7}{3}\)
2. \(1\frac{6}{7} \ ? \ 2\frac{1}{5}\)
3. \(1\frac{4}{7} \ ? \ 1\frac{4}{7}\)
4. \(2\frac{2}{17} \ ? \ 2\frac{2}{17}\)
5. \(\frac{6}{8} \ ? \ 2\frac{4}{4}\)
6. \(\frac{16}{3} \ ? \ 1\frac{6}{16}\)
7. \(\frac{17}{5} \ ? \ 1\frac{7}{5}\)
8. \(\frac{12}{2} \ ? \ 7\frac{1}{5}\)
9. \(\frac{13}{40} \ ? \ 2\frac{21}{20}\)
10. \(\frac{2}{21} \ ? \ 1\frac{4}{3}\)

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

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

Assign questions from the textbook so that pupils can get used to different types of fractions.
Create groups of three to five each and ask them to solve the following questions using blocks and rubber bands, and any other manipulatives they think may be helpful. Ask pupils to get creative looking for objects to help them work with fractions, encouraging them to move around the classroom and interact with their environment. Here are the questions:

1. \( \frac{2}{15} \times \frac{5}{15} \)
2. \( \frac{1}{6} \times \frac{2}{6} \)
3. \( \frac{1}{5} \times \frac{13}{5} \)
4. \( \frac{16}{32} \times \frac{2}{32} \)
5. \( \frac{3}{7} \times \frac{6}{7} \)
6. \( \frac{16}{30} \times \frac{16}{30} \)
7. \( \frac{3}{15} \times \frac{7}{15} \)
8. \( \frac{1}{5} \times \frac{2}{5} \)
9. \( \frac{21}{25} \times \frac{13}{25} \)
10. \( \frac{4}{8} \times \frac{2}{8} \)

Write on the board \( \frac{2}{5} \times 2 \) and draw a diagram to represent it. Ask pupil to raise their hands to try and solve it. They may guess that the numerator should be multiplied by the whole number or that only fractions can only be multiplied by fractions, whereas whole numbers can only be multiplied by other whole numbers. Explain that since fractions are numbers too, they can certainly be multiplied by whole numbers. Point out that since we can use number operations with mixed numbers we can use them with whole numbers as well.

We can solve this question by looking at the whole number, 2, as an improper fraction, meaning \( \frac{2}{1} \). Since the number 2 represents two wholes, \( \frac{2}{1} \) is equal to \( \frac{2}{1} \). Show this on the board with diagrams. Now that the question is \( \frac{2}{5} \times 2 \), explain that the numerators will multiply, while the denominators will multiply with each other, so the answer will be \( \frac{4}{5} \). Unlike addition and subtraction, there is no need to simplify fractions when multiplying, but mixed numbers do need to be converted to improper fractions. If at the start, pupils had guessed that only the numerator would multiply, tell them that although they were technically right, they must keep in mind why that is.

### Let’s try it

Ask pupils to solve the following in pairs.

\(<, >, =, \text{ or } \text{not comparable}\)

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

Pupils can:

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

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Multiple Choice Questions

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

1. Which of the following are like fractions?
   a. \(\frac{2}{10}\) and \(\frac{5}{10}\)
   b. \(\frac{3}{8}\) and \(\frac{6}{4}\)
   c. None of the above

2. Which of the following is a unit fraction?
   a. \(\frac{1}{5}\)
   b. \(\frac{1}{1}\)
   c. \(\frac{5}{1}\)

3. Choose one of the following to fill in the blank: \(\frac{6}{12}\) ? \(3\frac{2}{4}\).
   a. <
   b. >
   c. =
Chapter 4

Decimals

4.1. Decimals

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

4.2. Conversion between fractions and decimal

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

4.3. Basic operations on numbers

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

4.4. Estimation

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

Plan Ahead:

xxx
xxx
xxx

Before You Start:

Students have already worked with units of length in their previous class. They are 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 unit (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, cent means 1100 and milli means 11000. When a bigger unit is to be converted to a smaller unit. 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.

SLOs

5.1
i
ii

Activity 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 neighbourhood. 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.
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 its 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 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.

**Activity 2**

| Chart paper | Child friendly scissors |

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. Ask them to peer review at the end.

**Activity 3**

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

---

### Let’s try it

Ask pupils to solve some realistic questions that involve 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?

---

### Let’s talk Math

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 get practical

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.
Pupils can:

5.1. Distance
5.2. Time

**Self Assessment**

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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) Zainab must 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 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
Chapter 5

Measurement

5.1. Length

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

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

iii. Add and subtract measures of length in same units

5.2. Mass

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

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

iii. Add and subtract measures of mass in same units

5.3. Capacity

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

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

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

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

Plan Ahead:

<table>
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<tr>
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<td>6</td>
</tr>
<tr>
<td>Mass</td>
<td>6</td>
</tr>
<tr>
<td>Capacity</td>
<td>6</td>
</tr>
<tr>
<td>Time</td>
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</table>

The approximate duration of this unit should be 24 lessons.

Before You Start:

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

Watch Out For:

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

This Pairs with:

Math Lab 4, page 43 to 45.
Let's Begin

Pupils are familiar with units from the previous class but have not converted them. Explain, that in some cases many of one unit can make up one of another unit. This can only apply when the units measure the same thing; length, mass, or capacity. So, The system of measurement based on multiples of 10 is called the metric system. The standard units of weight are kilograms (kg) and grams (g). The standard unit of volume/capacity is litres (l) and millilitres (ml).

\[
\begin{align*}
1 \text{ km} &= 1000 \text{ m} \\
1 \text{ kg} &= 1000 \text{ g} \\
1 \text{ l} &= 1000 \text{ ml}
\end{align*}
\]

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

SLOs

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

5.2

ii

iii

Activity 2

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

Let’s try it

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

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

Activity 3

Bring a weighing scale into the class, and ask a volunteer to stand on it. Record their weight in KGs, using up to one decimal place, then grams, and then milligrams. Do this on the board so that pupils can follow along and make the connection between the three units for mass. Once ten pupils have been weighed, ask the class to choose objects around the classroom that they would like to weigh. As they are weighed, ask them what unit they think would be right for each for each object.

Activity 4

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

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

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

**SLOs**

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

**Activity 5**

15 minutes

This pairs with Math Lab page 43

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

**Let's try it**

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

1. 505 l – 234 l
2. 729 ml + 108 ml
3. 913 ml + 341 ml
4. 22 l – 438 l
5. 820 ml + 2921 ml
6. 2032 l – 99 l
Let’s talk Math

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

Let’s get practical

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

Pupils can:

5.1. Length
5.2. Mass
5.3. Capacity
5.4. 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) 2.3 metres is how many centimetres?
   a) 230
   b) 2300
   c) 23
   d) 23000

2) What unit of measurement would one use to measure how much water was in a swimming pool?
   a) Millilitre
   b) Litre
   c) Kilometre
   d) Millimetre

3) Convert 100 g into kg.
   a) 0.1 kg
   b) 1 kg
   c) 10 kg
   d) 0.01 kg

Refer to If they’re struggling
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5 – Feels confident solving questions

If pupil is below 3 use Math Lab

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4 – Understands all the concepts, just needs more practice
5 – Feels confident solving questions

If pupil is below 3 use Math Lab

Number of Pupils
Chapter 6

Geometry

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

6.2. Angle
i. Recognise an angle formed by intersection of two rays.
ii. Measure angles in degree (°) by using protractor.
iii. Draw an angle of given measurement and use the symbol ° to represent it.
iv. Differentiate acute, obtuse and right angles.
v. Measure angles using protractor where
   • Upper scale of protractor reads the measure of angle from left to right.
   • Lower scale of protractor reads the measure of angle from right to left.
vi. Identify right angles in 2-D shapes.

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

6.4. Perimeter and Area
i. Find perimeter of a 2-D figures on a square grid.
ii. Recognise that perimeter is measured in units of length.
iii. Find area of 2-D figures on a square grid.
iv. Recognise that area of a square is measured in meter square (m²) and centimetre square (cm²).

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

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

Plan Ahead:
This unit should take approximately 4 weeks to conclude

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 unit.

This Pairs with:
Math Lab 1, page 67 to 71.
Let’s Begin
Ask the class to volunteer any information they remember about shapes, and which shapes they can name. As they name them, ask them to come up to the board and draw them. Write the name of each shape down next to them. When they are done, if there is a circle, a square, a rectangle, and a triangle on the board, group them together, and tell the class that these are the shapes they should focus on. If one of them is missing, add it, and explain to the class what it is called. For this activity, include all the shapes on the board. Ask pupils if they see any similarities, or differences. Try to prompt them to be aware of the lines. Which ones are curved, and which ones are straight, even if the circle is the only shape on the board that does have a curved line.

Make Sure You Have:
- Foam sheets
- Scissors
- Markers
- Rulers
- A4 Sheets
- 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.

SLOs

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<th>Scissors</th>
<th>Markers</th>
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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 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 must 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) 5 cm  
3) 9 m  
4) 10 cm  
5) 13 cm  
6) 17 cm

SLOs

Draw the following sequence on the board:

Let pupils 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.

Activity 5
15 minutes

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 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.
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, the 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 then 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 homework from your textbook

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 having 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 consider the resources available to create it, and, 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**

**Pupils can:**

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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.

1xxxxxx

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Lesson plans to be used in conjunction with the New Countdown book series.
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Number and Arithmetic Operations

Suggested Time Frame
12-14 periods

Learning Curve
Students have already worked with numbers up to 6 digits. Here, they will deal with numbers up to 9 digits. Previously they have added and subtracted numbers up to 4 digits, this will lead them to add and subtract numbers up to 6 digits. Students are familiar with multiplication and division (2 digit number by a 1 digit number) now they will be dealing with multiplication and division of 4-digit numbers by 2-digit numbers. They will be able to apply this knowledge to solve daily life problems involving four operations.

Real-life Application
We have numbers all around us. We use them in different ways.

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

Frequently Made Mistakes
- The students mix in place values while dealing with bigger numbers.
- They make mistakes in writing numbers in the correct columns while adding or subtracting.
- They get confused in distinguishing between the dividend and divisor.
- They make mistakes in multiplication and division sums because they have not learnt the times tables.
Summary of Key Facts

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

Model Lesson Plan

Topic
Introduction of numbers up to 9 digits.

Duration
80 minutes

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

Key Vocabulary
million, place value

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

Strategy
Starter: Engagement Activity (5 mins)
Write a number on the board, for example, 909 437. Ask the students the place value of each digit.
Help the students if there is any ambiguity.

Main Developmental Activity (20 mins)
Distribute place value chart cards to the students and ask them to paste in their notebooks.
Tell them to write 100 000 in the place value chart.

Ask the students to guess the biggest 6-digit number i.e. 999 999.

Tell them that the next number will be 1 000 0000 which is a 7-digit number. Ask them to put this number in the place value chart.

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

Similarly, make 8-digit and 9-digit numbers. Explain using the place value chart that a 7-digit number is a million, 8-digit number is ten million, and 9-digit number is hundred million.

Emphasise the abbreviations HM, TM, and M.

Give them several examples of 7, 8, and 9 digit numbers by writing on the board emphasising the place value of a million, ten millions, and hundred millions.

Tell them that ordering and comparing of 9-digit numbers follows the same rule as for 6-digit numbers.
Factors and Multiples

Suggested Time Frame
12-14 periods

Learning Curve
The students already know about multiples of 10. Here they find out the multiples of other numbers and then common multiples between two or more numbers. Thereafter, they find the LCM.

Next, the students list the factors of a number and identify the common factors between the two numbers. In this way they identify the HCF. To make the calculation of LCM and HCF easy, students are introduced to co-prime numbers, prime numbers, composite numbers, and prime factors.

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

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

Frequently Made Mistakes
- Students get confused in identifying factors and multiples.
- Errors due to not remembering the times tables.
Summary of Key Facts

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

Model Lesson Plan

Topic: HCF

Duration
80 minutes

Specific Learning Objectives
By the end of the lesson students will be able to find Highest Common Factors.

Key Vocabulary
factors, Highest Common Factors

Resources
Worksheets, cut-outs, glue stick.

Strategy
Starter: Engagement Activity (5 mins)
Ask multiplication facts randomly involving the whole class. For example, what is four times five, what is 8 × 4, or what is product of 3 and 2? This activity will reinforce the vocabulary related to multiplication and help the students recall the multiples and factors.

Main Developmental Activity (20 mins)
Write 3 numbers on the board. As students are already familiar with finding factors, ask them to find the factors of the given numbers in their notebooks.
Factors of 6 = 1, 2, 3, and 6  
Factors of 4 = 1, 2, and 4  
Factors of 8 = 1, 2, 4, and 8
Ask them to point out the factors which are common to all the given numbers. Tell them that the common factors of 6, 4, and 8 are 1 and 2. Therefore the highest common factor is 2.

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

Suggested Time Frame
12-14 periods

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

- Identify and compare two fractions.
- arrange fractions in ascending and descending order.
- simplify fractions to the lowest form.
- verify the commutative and associative law of addition and multiplication of like fractions.

Furthermore, they will apply their knowledge to solve real life problems involving fractions.

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

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

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

A mixed fraction is made up of a whole number and a proper fraction.

Fractions satisfy the commutative and associative laws of addition.

Fractions satisfy the commutative and associative laws of multiplication.

When a fraction is multiplied by its reciprocal, the product is always 1.

Two numbers whose product is 1 are the reciprocal of each other.

Dividing a whole number by a fraction: change the division sign to a multiplication sign and take the reciprocal of the fraction and simplify.

**Model Lesson Plan**

**Topic**

Fractions

**Duration**

80 (mins)

**Specific Learning Objectives**

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

**Key Vocabulary**

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

**Resources**

Worksheet

**Strategy**

**Starter: Engagement Activity**

**Recall (5 mins)**

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

**Main Developmental Activity (20 mins)**

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

Provide each student with one of the activity cards given below. Solve the first question on the board involving the students. They will solve the second question on their own.
Jasim’s mother gave him a recipe for cake mix, which included $\frac{5}{8}$ cup flour, $\frac{1}{3}$ cup peanuts, $\frac{1}{4}$ cup almonds, and $\frac{1}{2}$ cup raisins. Put the fractions in order from smallest to greatest in the boxes below.

Smallest  [ ]  [ ]  [ ]  [ ]  Greatest

In fifteen minutes, Ehsan walked $\frac{3}{5}$ km, Junaid walked $\frac{3}{4}$ km, and Kashif walked $\frac{1}{2}$ km. Compare the distances walked by each person, writing ‘more’ or ‘less’.

Ehsan walked ____________________ than Kashif.
Junaid walked ____________________ than Ehsan.
Kashif walked ____________________ than Junaid.

Who walked the furthest, and who walked the shortest distance?
________________________ walked the most. ____________________ walked the least.
Suggested Time Frame
8-10 periods

Learning Curve
Children have used the decimal point when working with money in Class 3. In this book they learn about decimal places: tenths, hundredths, and thousandths and carry out the four basic mathematical operations with decimal fractions.

Decimals have lots of importance in real life, especially when we purchase commodities or deal with interest rates of credit cards or see the average of any cricketer’s striking rate or run rate.

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

Summary of Key Facts
- The decimal point is a point that separates whole numbers from decimal fractions.
- The number of digits after the decimal point gives the number of places in a decimal number.
- Zeros to the right of a decimal point after the digits have no value.
- Zeros to the left of a decimal point before the digits have no value.
- Fractions can easily be converted to decimals, provided their denominators are multiples of 10 or 100.
• When we change a decimal into a fraction, we may need to reduce the fraction to its lowest terms.
• While adding and subtracting decimal numbers, keep the decimal points in the same column.
• When we multiply a decimal number by 10, 100, 1000, the value of the number increases by 10 times, 100 times, and 1000 times.
• When we divide a decimal number by 10, 100, 1000 the value of the number decreases by 10 times, 100 times, and 1000 times.

Model Lesson Plan

Topic
Addition of decimals involving real life situations.

Duration
80 minutes

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

Key Vocabulary
Decimals

Resources
Activity worksheet, gardening tools (toys).

Strategy
Starter: Engagement Activity (5 mins)
Ask the students where they find decimals in real-life? Start jotting down their responses on the board. Recalling their previous knowledge, proceed to the following activity. They have done addition subtraction, and multiplication of decimals.

Main Developmental Activity (20 mins)
You should have already collected the toy gardening tools as mentioned below. Tie a washing line in the classroom and hang the tools with price tags on them.
Divide the class into groups of 5. Provide the activity sheet to each group and ask them to check the price on washing line and solve the questions on the sheet. Ensure equal participation among the students.
Get the sheets peer checked in the end.
1. Price Tags will be as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawn mower</td>
<td>Rs 9455.75</td>
</tr>
<tr>
<td>Grass seeds</td>
<td>Rs 60.70</td>
</tr>
<tr>
<td>Large Pot</td>
<td>Rs 100.40</td>
</tr>
<tr>
<td>Spade</td>
<td>Rs 350.23</td>
</tr>
<tr>
<td>Hedge Trimmer</td>
<td>Rs 420.38</td>
</tr>
<tr>
<td>Fork</td>
<td>Rs 420.38</td>
</tr>
</tbody>
</table>

Look at the price tags answer the following questions.

1. What is the cost of a spade, a fork and some grass seeds?

2. How much change from Rs. 1000 would there be if you bought a spade?

3. What is the cost of two pots and a hedge trimmer?

4. What would be the total cost of 5 packets of grass seeds? What change would there be from Rs 500?

5. What is the difference in price between the lawn mower and hedge trimmer?

Feedback (10 mins)
Measurements

Suggested Time Frame
16-18 periods

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

They also have knowledge of how to use a.m. and p.m. to record time in analogue and digital clocks. The previous knowledge of conversion of units of time will help them to make conversions with years, months, weeks, days. This knowledge will enable them to solve real life problems including length, weight, capacity, and time.

Real-life Application
Time is a very important factor and we find it inevitable in our daily life, for example, travelling, working and other activities involve time.

Length, weight, and capacity are important in day to day life. The long and short distances (km and m), weighing grocery (kg and g), measuring liquid (l and ml) are units of measurements used in our daily life. The schedules, events, programmes, appointments, and meetings etc. involve time as the basic factor.

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

Summary of Key Facts
- The system of measurement based on multiples of 10 is called the metric system.
- The standard units of weight are kilograms (kg) and grams (g).
- The standard unit of volume/capacity is litres (l) and millilitres (ml).
  1 km = 1000 m
  1 kg = 1000 g
**Model Lesson Plan**

**Topic**
Conversion of units of length

**Duration**
80 minutes

**Specific Learning Objectives**
By the end of the lesson students will be able to convert different units of length.

**Key Vocabulary**
units of lengths, stair diagram, km, m, cm, mm

**Resources**
Worksheet

**Strategy (5 mins)**

**Starter:** Engagement Activity
Ask the students: What are the units of measurement for length?
Is it possible to convert units of measurement of length? Like km into m or m into km.

**Main Developmental Activity**

**Teacher’s Exposition (10 mins)**
Ask the students the factors of conversion from km to m, m to cm, and cm to mm. Reinforce the multiplication and division of numbers by powers of tens, then write a few conversion sums on the board and write the answers, taking students’ feedback.

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

**Individual Activity (25 mins)**

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

| Jawad ran 2 kilometres = __________ metres = __________ centimetres. |
| Taha ran 3500 metres = __________ centimetres and __________ millimetres. |
| Jibran ran 250000 centimetres = __________ millimetres and __________ kilometres. |
| In total, together they ran __________ kilometres = __________ metres = centimetres and __________ millimetres. |

Who ran the farthest? ____________________________
Suggested Time Frame

8-10 periods

Learning Curve

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

Real-life Application

Area and perimeter play an important role in our daily lives. Whenever we want to cover a room’s floor with tiles or carpet, we need to calculate the area of the floor. Similarly, in construction of any building or any infrastructure we need to know its perimeter and area.

Frequently Made Mistakes

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

Summary of Key Facts

• Perimeter is the boundary of a closed shape.
• To find the perimeter of a shape, start from a point and add all sides clockwise or anti-clock-wise until you reach the point from where you started.
• The amount of surface a shape covers is called its area.
Model Lesson Plan

Topic
Area and perimeter

Duration
80 minutes

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

Key Vocabulary
Area, perimeter, rectangle, length, and breadth

Resources
White boards, rulers, measuring tape, and activity sheets.

Strategy
Starter: Engagement Activity (5 mins)
Recall: Write down the following questions on the board.
1. What is the formula for the area of a square and a rectangle?
2. What is the formula for the perimeter of a square and a rectangle?
Students will write the answers of the above questions on the white boards. Ask students to raise their white board so that you can see their work.

Main Developmental Activity
Pair Activity (20 mins)
Instructions:
• Divide your class into pairs and ask them to walk around in the class and find one rectangular object.
• It can be their whiteboard, class door, the soft board, their lunch box, class window etc.
• Each pair will then measure the sides of their chosen rectangular object and calculate its area and perimeter in the given activity sheet.

Activity sheet:

<table>
<thead>
<tr>
<th>Shape</th>
<th>l = length</th>
<th>b = breadth</th>
<th>perimeter (P)</th>
<th>area (A)</th>
</tr>
</thead>
</table>

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

Give them some examples on the board.
Geometry

Suggested Time Frame

10-12 periods

Learning Curve

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

Real-life Application

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

Frequently Made Mistakes

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

Summary of Key Facts

• A line is a set of points, placed together.
• A line segment is the shortest distance between two points.
• A ray has one end point only, and goes on and on, in the direction of the arrow.
• There are 5 types of angles:
  Right angle
  Acute angle
  Obtuse angle
  Straight angle
  Reflex angle
• A circle has a complete turn of 360º.
• Half of a circle is called a semi-circle.
• The line joining two points on the circumference and passing through the centre of a circle is called the diameter.
• Half of the diameter is called the radius.
• There are many special kinds of quadrilaterals, for example, a square, a rectangle, a parallelogram, a trapezium, and a rhombus.

![Model Lesson Plan](Image)

**Topic**
- Identification of straight line, line segment, ray, and angle.
- Construction and measurement of angles.

**Duration**
80 minutes

**Specific Learning Objectives**
By the end of the lesson students should be able to:
- differentiate between a line segment and a ray.
- construct an acute angle.

**Key Vocabulary**
straight line, line segment, ray, angle, protractor

**Resources**
Big geometry box, Japanese fan and A4 size sheet.

**Strategy**
**Starter:** Engagement Activity (10 mins)
Draw two lines AB and CD of different length on the board. Start your lesson by giving a challenge to your students. Ask them if they can tell without measuring which line is longer, AB or CD?
Main Developmental Activity

They already know what a line is. Now introduce a ray and line segment. Tell them the specific points which differentiate between a line segment and a ray. Draw different diagrams on the board showing them line segments and rays.

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

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

1. When one arm is horizontally straight and the other is vertically straight, a right angle is formed.
2. When the angle is smaller than a right angle, it is called an acute angle.
3. When an angle is bigger than a right angle, but not big enough to form a straight line, it is called an obtuse angle.
4. When the angle goes beyond the straight line, it is called a reflex angle.

- Use wooden geometry box and demonstrate on the board, how to construct and measure the angle.
- Distribute white A4 size paper to individual students and ask them to follow your demonstration.

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

\[ \text{Diagram:} \quad \begin{array}{c}
\text{C} \\
\downarrow \text{70°} \\
\text{B} & \text{A}
\end{array} \]

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

4-6 periods

Learning Curve

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

Real-life Application

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

Frequently Made Mistakes

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

Summary of Key Facts

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

Topic
Bar graphs

Duration
80 minutes

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

Key Vocabulary
data, information, and bar graph or bar diagrams

Resources
Chart paper with a bar graph drawn on it.

Strategy
Starter: Engagement Activity (5 mins)
Display a chart paper showing the bar graph of students and their favourite subjects. Ask the students whether they understand what information is given in this bar graph? Can they think of the most favourite and least favourite subjects? Help them out if there is any difficulty or confusion.

Main Developmental Activity (10 mins)
Conduct a whole class discussion recalling the prior knowledge of data handling.

Pair Work (10 mins)
The same chart paper will remain on display, ask the following questions and try to involve each and every student and make them clear on each and every point.

1. Which subject is the most popular among students? Why do you think so?
2. Which subject is least popular among students? Why do you think so?
3. How many students are there in total?
4. How many students liked the subject English?
5. How many students liked the subject Urdu?
Students of grade 4 were asked about what they want to be when they grow up. Their responses are recorded in the given bar graph. Read the graph carefully and answer the questions given below:

How many students want to be scientists? ______________
How many students have chosen engineering as their future career? ______________
How many students are interested in sports? ______________
How many students want to take up the same career as their teachers? ______________
Which two occupations have the same number of votes? ______________
How many students were present on the day of this survey? ______________
8-point compass
An instrument that measures the 4 directions of North, South, West and East, and inter-directions (NE, SE, SW and NW).

Angle
An angle is formed by two rays. It is measured in degrees.
Example
\[ \angle ABC = 40^\circ. \]

Anticlockwise turn
It is a movement in a curve opposite to the movement of the hands of the clock.

Area
The amount of flat surface around a boundary of a figure.
It is measured in square units.

Clockwise turn
It is a movement in a curve corresponding to the movement of the hands of the clock.

Composite figure
A figure that is made of more than one basic figure.

Decimal
A decimal has whole number and its fractional part of a whole is placed after the decimal point.
Example
22.34 and 0.5 are decimals.

Factor
A number that divides a number completely without a remainder.
Example
5 is a factor of 20.
H

**Hundredth**
A hundredth is one out of 100 equal parts.
It is placed second to the right of the decimal point.
**Example**
There are 3 hundredths in 40.73.

L

**Line graph**
A data representation where the coordinates are joined by ruled lines.
**Example**

![Line graph example](image)

**Line of symmetry**
A mirror image line that cuts a figure into equal halves.
**Example**

![Line of symmetry examples](image)

M

**Mixed number**
A number consisting of a whole number and a proper fraction.
**Example**

$$3\frac{1}{4}$$ is a mixed number.

**Multiple**
A number is a multiple of a number when it is multiplied by an integer.
**Example**

20 is a multiple of 5.

N

**Number line**
A line on which numbers are marked at scaled intervals.
It is used to illustrate simple numerical operations.
**Example**

![Number line example](image)

**Number pattern**
A repetitive arrangement of numbers following a specific sequence.
**Example**

3400, 4400, 5400, 6400, 7400 is a number pattern.
Perimeter
The perimeter is the total distance around a figure.

Protractor
A mathematical instrument for measuring angles.

Rounding numbers
Rounding off numbers means keeping a simpler value closer to the exact answer.

Example
When rounding to the nearest ten, 7996 ≈ 8000.

Right angle
Two lines perpendicular to each other form a right angle.
It is equal to 90°.

Symmetric figure
A figure that can be folded or divided into equal halves.

Rotation
When an object is turned about a point and of a certain degree.

Example

Tenth
A tenth is one out of 10 equal parts.
It is placed right after the decimal point.

Example
There are 2 tenths in 5.2.

Translation
A periodic repetitive pattern of figures without any gap.
Lesson plans to be used in conjunction with the Maths Wise book series.
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<td>51, 52</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iv.  Recognize that area of a square is measured in meter square (m²) and centimeter square (cm²)</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>6.5.</td>
<td>Symmetry</td>
<td>i.   Recognize lines of symmetry in two-dimensional (2-D) shapes.</td>
<td>105, 106</td>
<td>53, 54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii.  Complete a symmetrical figure with respect to a given line of symmetry on square grid/dot pattern.</td>
<td>106</td>
<td>55, 56</td>
</tr>
<tr>
<td>6.6</td>
<td>Three Dimensional (3-D) objects</td>
<td>i.   Compare and sort 3 D objects (cubes, cuboids, pyramids, cylinder, cone, sphere)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit</td>
<td>Contents and Scope</td>
<td>SLOs</td>
<td>Page number</td>
<td>Math Lab pages</td>
</tr>
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</tr>
<tr>
<td></td>
<td>7.1. Bar Graph</td>
<td>i. Read simple bar graphs given in horizontal and vertical form.</td>
<td>128, 129</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Interpret real life situations using data presented in bar graphs.</td>
<td>129, 130, 133</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>7.2. Line Graph</td>
<td>i. Read line graph.</td>
<td>131</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Interpret real life situations using data presented in line graphs.</td>
<td>131</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.3. Pie Chart</td>
<td>i. Read Pie Chart.</td>
<td>132 - 133</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Interpret real life situations using data presented in Pie Chart.</td>
<td>136</td>
<td>58, 59</td>
</tr>
</tbody>
</table>
UNIT 1

REVIEW AND ASSESS 1

Teaching Objectives
• to revise concepts and skills learnt during the previous year

Learning outcomes
Students should be able to:
• work with the concepts learnt during the previous year
• work out sums based on the concepts taught without any help
• work out independently sums based on these concepts

UNIT 2

NUMBERS AND ARITHMETIC OPERATIONS

Teaching objectives
• to revise 6 digit numbers
• to introduce the Pakistan system of numbering
• to introduce place value up to 9-digit numbers
• to compare and order large numbers
• to learn about number pattern
• to explain addition of large numbers and the properties of addition
• to explain subtraction of large numbers and the properties of subtraction
• to explain multiplication of large numbers and the multiplication properties
• to explain division of large numbers and the properties of division

Learning outcomes
Students should be able to:
• Compare the international place value names and the Pakistani system
• identify 9-digit numbers
• recognise and complete a given increasing and decreasing number pattern
• add, subtract, multiply, and divide large numbers
• explain the properties of the binary operations listed above
• apply binary operations to real life situations
UNIT 3
FACTORS AND MULTIPLES

Teaching objectives
- to introduce the use of divisibility tests with different numbers
- to explain prime and composite numbers
- to explain the concept of factors of numbers
- to explain the concept of multiples of numbers
- to explain prime factorization of numbers, using the listing method, tree method and short division
- to explain how to find the HCF by Venn diagram
- to explain how to the find the LCM of 2 or more numbers by listing common multiples, prime factorization and short division

Learning outcomes
Students should be able to:
- use the rules of divisibility for different numbers
- differentiate between prime and composite numbers, using their properties
- identify the factors and multiples of a number
- calculate the factor and multiple of any given number
- apply the above concepts to real life situations

UNIT 4
FRACTIONS

Teaching objectives
- to introduce proper, improper, and mixed fraction
- to introduce equivalent fractions
- to compare fractions
- to introduce addition, subtraction, multiplication, and division of fractions

Learning outcomes
Students should be able to:
- identify correctly the different types of fractions
- generate a series of equivalent fractions
- compare and arrange fractions in order
- perform number operations using fractions
UNIT 5

DECIMAL FRACTIONS

Teaching objectives
• to introduce the concept of decimals: another way of writing fractions
• to introduce addition and subtraction of decimals
• to introduce multiplication of decimals
• to introduce division of decimals

Learning outcomes
Students should be able to
• explain clearly that decimals are a different form of fractions
• perform addition and subtraction of decimals with correct use of place value
• perform multiplication of decimal numbers
• perform division of decimal numbers

UNIT 6

MEASUREMENT: LENGTH, WEIGHT, AND CAPACITY

Teaching objectives
• to introduce standard units of measurement
• to explain conversion of units of length, weight, and capacity

Learning outcomes
Students should be able to:
• identify the standard units of measurement of length, weight, and capacity
• apply the correct units of measurement
• convert one unit to another
• apply conversion of units to real life problems

UNIT 7

TIME

Teaching objective
• to explain conversion of units of time
• to introduce addition, subtraction, and comparison of units of time
Learning outcomes
Students should be able to:
• inter-convert seconds to minutes and to hours
• inter-convert hours to days and to weeks
• add and subtract different units of time

UNIT 8
GEOMETRY
Teaching objectives
• to introduce angles and their components
• to introduce different types of angles
• to explain the use of a protractor
• to demonstrate how to draw an angles using angle flippers or protractor
• to explain the parts of a circle
• to demonstrate how to draw a circle using a ruler and a pair of compasses
• to explain the properties of quadrilaterals
• to explain different terms connected to quadrilaterals
• to introduce types of quadrilaterals
• to demonstrate how to construct a square and rectangle using a ruler and set-squares
• to learn about lines of symmetry

Learning outcomes
Students should be able to:
• identify an angle and its different parts
• state the different types of angles with their properties
• use a protractor to draw angles
• identify a circle and its different parts
• draw a circle of a given radius accurately using a pair of compasses
• recognise a quadrilateral by its properties
• use terms connected to quadrilaterals correctly
• recognise the different types of quadrilaterals and differentiate between them
• construct a quadrilateral when its sides are given
• recognise a line of symmetry and complete a symmetrical figure
UNIT 9
INFORMATION HANDLING

Teaching objectives
• to introduce Pie chart
• to introduce the parts of a graph and its labels
• to draw and interpret a bar graph
• to draw and interpret a line graph
• to draw and interpret pictograms
• to draw and interpret a pie chart

Learning outcomes
Students should be able to:
• read and interpret data presented in Pie chart
• identify a graphical representation of data
• label all the required parts of a graph
• draw a bar graph/line/pictogram/pie from data given
• draw conclusions from a bar/pictogram/line/pie

UNIT 10
REVIEW AND ASSESS 2

Teaching objectives
• to review place value
• to review decimal fractions
• to revise measurements of length, weight, and capacity
• to identify different types of angles
• to measure different angles
• to draw graphs and interpret date

Learning outcomes
Students should be able to:
• identify the place value of a given number
• solve problems and write answers as decimal fractions
• identify units of measurements
• name and draw angles
• identify a graphical representation of data
• draw conclusions from a bar/pictogram/line/pie