



# **Mathematics in the National Curriculum**

## **Key Stage 3 (Grades 7 and 8)**



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## Introduction

### ***Rationale***

As we embark on to the information technology era, we require individuals, who are able to think critically about complex issues, analyze and adapt to new situations, solve problems of various kinds, and communicate their thinking and ideas effectively. The study of mathematics equips students with knowledge, skills and values that are essential for successful and rewarding participation in an information technology-based society.

Learning mathematics results in more than a mastery of basic skills. It equips students with a concise and powerful means of communication. Mathematical structures, operations, processes, and language provide students with a framework and tools for reasoning, justifying conclusions, and expressing ideas clearly. To learn mathematics in an effective way, students need classroom experiences that help them develop mathematical understanding; learn important facts, skills, and procedures; develop the ability to apply the processes of mathematics; and acquire a positive attitude towards mathematics.

Through mathematical activities that are practical and relevant to their lives, students develop mathematical understanding and problem-solving skills, that they can apply in their daily lives and, eventually, in the workplace.

Mathematics is a powerful learning tool which helps the students to develop the ability to use mathematics to extend and apply their knowledge in other curriculum areas, including sciences, arts and languages.

### ***Overview***

Mathematics is one of the main Key Learning Areas identified in the National Curriculum Framework. Knowledge, skills, values and attitudes taught through this subject would be a tool for the pupils to function and excel in all aspects of life. It also helps to think logically, be creative, solve problems and appreciate the aesthetics of Allah (SWT)'s creation. Mathematics is divided into many branches such as arithmetic, geometry, algebra, and trigonometry.

### ***Primary***

At this level students learn basic mathematical knowledge, skills and understanding. These include basic understanding of the number system, computational skills, and the ability to solve simple problems related to their day to day life. Emphasis is also given to practical understanding of the ways in which information is gathered and presented.

### ***Lower Secondary***

At this level students learn basic mathematical principles and its application for problem solving. Use mathematics as a mode of communication, with special attention on the use of clarity of expressing concepts, in acquiring a base that will assist students in their further study of mathematics and in other fields. Students' confidence is developed by helping them to feel for numbers, patterns and relationships, and places a strong emphasis on solving problems and presenting and interpreting results. Students also learn how to communicate and reason using mathematical concepts.

### ***Higher Secondary***

At this level, students construct rigorous mathematical arguments and proofs through the use of precise statements, logical deduction and inference and by the manipulation of mathematical expressions, including the construction of extended arguments for handling substantial problems and hence acquiring a base that will assist students in their further study of mathematics and in other fields.

## Mathematics in the National Curriculum

Along with the other subjects in the National Curriculum, mathematics curriculum contributes to the development of the student in all aspects. It aims to achieve the vision of the National Curriculum along with the eight principles identified, incorporating the key competencies and also relates to the effective pedagogical approaches emphasized in the National Curriculum.

### ***The Vision***

The Mathematics curriculum is structured in such a way that it paves the road to achieve the vision of the National Curriculum.

The National Curriculum envisions the development of:

- successful individuals who are motivated to learn and explore; who are inquisitive and eager to seek, use and create knowledge.
- confident and competent individuals who have a firm belief in Islam, a strong sense of self and cultural identity, and believe in their own capabilities; and
- responsible and productive contributors to their own family, their local community and the global society.

The main goals of mathematics education are to prepare students to

- use mathematics confidently to solve problems
- communicate and reason mathematically
- appreciate and value mathematics
- make connections between mathematics and its applications
- commit themselves to lifelong learning
- become mathematically literate adults, using mathematics to contribute to society

Mathematics learning experiences assist students to develop and understand mathematical concepts along with process skills and the pedagogical approaches, emphasize students to participate in practical hands-on experiences, to explore and find ways to solve real life problems using mathematical knowledge and skills. During this process of solving problems, the students are required to pose questions, predict and find answers for themselves and develop themselves as successful learners who are eager to learn and explore more.

Mathematics provides ample opportunities for students to develop their critical thinking skill along with values that would build their self-confidence and self-esteem. Students will be given opportunities to relate learning beyond their classroom, such as working on authentic tasks. Engagement and involvement in these ensures that student acquire the knowledge, skills and values to be competent citizens in the society.

A blend of the above mentioned experiences ensure that students are fully equipped to as active participants in the ever changing world.

### ***The Principles***

The National Curriculum identifies eight fundamental principles that need to be taken into account when designing and implementing learning and other school activities. Mathematics curriculum is also designed to take into account these principles.

The teaching and learning of Mathematics highly emphasizes linking Mathematics and Islam. Essentially, mathematics provides the understanding of Allah's creation and accepting the natural beauty of such creations through the study of inquiry, based on experiments and investigations. Facts, figures and theories contribute to the understanding of various mathematical concepts. Linking these to Islam strengthens the Islamic faith in students.

### **The Principles underlying mathematics curriculum**

Mathematics curriculum recognizes that all students do not necessarily learn mathematics in the same way, using the same resources, and within the same time frames. It aims to challenge all students by including expectations that require them to use higher-order thinking skills and to make connections between related mathematical concepts and between mathematics, other disciplines, and the real world.

It is based on the belief that students learn mathematics most effectively when they are given opportunities to investigate ideas and concepts through problem solving, and are then guided carefully into an understanding of the mathematical principles involved. The acquisition of operational skills remains an important focus of the curriculum.

### **Process Skills**

Attention to the *processes* that support effective learning of mathematics is also considered to be essential to a well organised mathematics program. Seven mathematical processes are identified: *problem solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating*. The mathematical processes can be seen as the processes through which students acquire and apply mathematical knowledge and skills. These processes are interconnected. Problem solving and communication in Mathematics have strong links to all the other processes. A problem-solving approach encourages students to reason their way to a solution or a new understanding. As students engage in reasoning, teachers further encourage them to make conjectures and justify solutions, orally and in writing. The communication and reflection that occur during and after the process of problem solving help students not only to articulate and refine their thinking, but also to see the problem they are solving from different perspectives. This opens the door to recognize the range of strategies that can be used to arrive at a solution. By seeing how others solve a problem, students can begin to reflect on their own thinking (a process known as "metacognition") and the thinking of others, and to consciously adjust their own strategies in order to make their solutions as efficient and accurate as possible.

The mathematical processes cannot be separated from the knowledge and skills that students acquire throughout the year. Students must solve problem, communicate, reason, reflect, and so on, as they develop the knowledge, the understanding of concepts, and the skills required in all the strands in every grade.

The development of mathematical knowledge is a gradual process. A continuous, cohesive program throughout the grades is necessary to help students develop an understanding of the

"big ideas" of mathematics – that is, the interrelated concepts that form a framework for learning mathematics in a coherent way. Similarly, in-depth understanding of Mathematical knowledge, concepts and skills ensure that students develop holistically, and relating these concepts and processes to their real life, ensuring relevance to students and preparing them for life and to reach for personal excellence.

### **The Key Competencies**

The eight key competencies outlined in the National Curriculum encompasses knowledge, skills, values and attitudes and dispositions to be explicitly taught in various key learning areas and through various

school activities.

The mathematics curriculum provides a rich context in which these key competencies can be developed. The strands in the syllabus involve a lot of opportunities for students to explore mathematical knowledge, ask questions, use higher order thinking to analyse and solve issues. In addition, the curriculum allows students to design and invent new things based on their prior knowledge and using their creative thinking. It asks students to understand abstract concepts which require a high level of cognition.

The key competency, *thinking critically and creatively* is very much part and parcel of the mathematics curriculum which encompasses many of the aspects highlighted. Students are expected to be adaptable to change and be equipped with thinking and creative abilities to face the challenges of the future. These include a wide range of cognitive skills and intellectual dispositions such as using a wide range of techniques to create ideas, working creatively with others, reasoning effectively, solving problems, and making judgments and decisions.

In addition, students are given many opportunities to be creative and think critically; use broad in-depth analysis of evidence to make decisions and communicate their beliefs clearly and accurately. They also use skills such as comparing, classifying, reasoning, hypothesizing, analyzing, and synthesizing which help them gain confidence in their ability to learn and make judgments. These individuals are innovative, flexible and apply what they learn to new or different situations and solve problems in innovative ways.

At the same time, the mathematics curriculum provides many opportunities for students to *Understand and manage self* by developing motivation and goal setting skills. They acquire the ability to plan, implement plans and evaluate one's performances which are aspects of self-management and are essential in developing an enterprising attitude in students.

In addition, students get the opportunity to identify what is important to them and direct their attention and efforts towards those things, by setting personal goals. They also develop an eagerness to pursue personal excellence in all aspects of life.

Moreover, students are required to use language, symbols and text which is one of the most fundamental competencies individuals need to acquire in order to be active and contributing members of a society. In addition, students are required to explore and interpret symbolic representations as well as visual texts to make meaning in various contexts. Hence, there would be many opportunities to develop the key competency of *making meaning*.

## How is Mathematics structured

In *Mathematics* students learn the process of enquiry, discovery and verification and to apply mathematical ideas, rules and procedures to particular situations and problems.

In this learning area, learning is structured and organized under FIVE MAIN STRANDS throughout all the key stages. They are namely, numbers, measurements, shape and space, patterning and algebra and chance and handling data.

From key stages 3 (lower secondary) onwards, an in-depth study of those strands and sub strands will be discussed with the students. In key stage 5 (higher secondary) students can choose a specific area of mathematics under 3 different branches, namely pure mathematics, statistics and mechanics.

**Strand 1: Numbers:** Students learn number concepts, four basic operations involving fractions, decimals, percentages, negative numbers and rate & ratio. Students will explore, estimate and manipulate numbers to carry out day to day activities.

**Strand 2: Measurement:** In this strand, students would learn mensuration, time and speed. This strand would equip the students to estimate, measure and calculate perimeter, area or volume of various things accurately.

**Strand 3: Shape and space:** Under this strand, students would master in 3D & 2D shapes, position and angles.

Geometry and trigonometry come under this strand. Students would be able to visualize spatial aspects of things and perceive them better.

**Strand 4: Chance and Data:** Students learn about handling data and probability under this strand. Statistics is a topic that comes under handling data. Students would be able to represent and interpret different data collected in a more meaningful manner.

**Strand 5: Patterning and Algebra:** Under patterning and algebra students would learn sequences, number properties, algebra and problem solving & puzzles. Students' confidence is built by helping them to develop a feel for numbers, their properties, and the relationships. Algebra is one of the very important topics that students learn in their entire schooling, which broadens their thinking skills.

## Outcomes

*Outcomes are statements of knowledge, understanding, skills and values expected to be achieved by students at the end of a given stage.*

All outcomes are of equal importance. The presentation of the outcomes does not imply a sequence of teaching and learning activities.

## Indicators

*An indicator is an example of the behaviour that students may display as they work towards the achievement of the syllabus outcomes. Indicators reflect and describe aspects of knowledge, understanding, skills and values.*

An indicator may describe part or all aspects of an outcome. Outcomes and indicators together assist teachers in identifying student's current achievement and in planning future learning experiences.

## Planning, Teaching and Assessing Mathematics

### *The Planning Stage*

When planning a program in mathematics, teachers must take into account considerations in a number of important areas.

The following are some key features to consider in planning mathematics education:

### *Teaching Approaches*

Students in a mathematics class typically demonstrate diversity in the ways they learn best.

It is important, therefore, that students have opportunities to learn in a variety of ways –individually, cooperatively, independently, with teacher’s direction, through hands-on experience, and through examples followed by practice. In addition, mathematics requires students to learn concepts and procedures, acquire skills, learn and apply mathematical processes.

These different areas of learning may involve different teaching and learning strategies. It is assumed, therefore, that the strategies teachers employ will vary according to both the object of the learning and the needs of the students.

In order to learn mathematics and to apply their knowledge effectively, students must develop a solid understanding of mathematical concepts. Research and successful classroom practice have shown that an investigative approach, with an emphasis on learning through problem solving and reasoning, best enables students to develop the conceptual foundation they need.

When planning mathematics programs, teachers will provide activities and assignments that encourage students to search for patterns and relationships and engage in logical inquiry.

Teachers need to use rich problems and present situations that provide a variety of opportunities for students to develop mathematical understanding through problem solving.

All learning, especially new learning should be embedded in well-chosen contexts for learning – that is, contexts that are broad enough to allow students to investigate initial understandings, identify and develop relevant supporting skills, and gain experience with varied and interesting applications of the new knowledge. Such rich contexts for learning open the door for students to see the “big ideas”, or key principles and concepts of mathematics, such as a pattern or relationship. This understanding of key principles will enable and encourage students to use mathematical reasoning throughout their lives.

Effective instructional approaches and learning activities draw on students’ prior knowledge, capture their interest, and encourage meaningful practice both inside and outside the classroom.

Students’ interest will be engaged when they are able to see the connections between the mathematical concepts they are learning and their application in the world around them and in real-life situations.

Students will investigate mathematical concepts using a variety of tools and strategies, both manual and technological. Manipulatives are necessary tools for supporting the effective learning of mathematics by all students. These concrete learning tools invite students to explore and represent abstract mathematical ideas in varied, concrete, tactile, and visually rich ways. Moreover, using a variety of manipulatives help deepen and extend students’ understanding of mathematical concepts. For example, students who

have used only base ten materials to represent two-digit numbers may not have as strong a conceptual understanding of place value as students who have also bundled craft sticks into tens and hundreds and used an abacus.

Manipulatives are also a valuable aid to teachers. By analysing students' concrete representations of mathematical concepts and listening carefully to their reasoning, teachers can gain useful insights into students' thinking and provide support to help enhance their thinking.

Fostering students' communication skills is an important part of the teacher's role in the mathematics classroom. Through skillfully led classroom discussions, students build understanding and consolidate their learning. Discussions provide students with the opportunity to ask questions, make conjectures, share and clarify ideas, suggest and compare strategies, and explain their reasoning. As they discuss ideas with their peers, students learn to discriminate between effective and ineffective strategies for problem solving.

Students' understanding is revealed through both oral communication and writing, but it is not necessary for all mathematics learning to involve a written communication component.

Young students need opportunities to focus on their oral communication without the additional responsibility of writing. Whether students are talking or writing about their mathematical learning, teachers can prompt them to explain their thinking and the mathematical reasoning behind a solution or the use of a particular strategy by asking the question "How do you know?". And because mathematical reasoning must be the primary focus of students' communication, it is important for teachers to select instructional strategies that elicit mathematical reasoning from their students.

### ***Promoting Positive Attitudes Towards Mathematics***

Students' attitudes have a significant effect on how they approach problem solving and how well they succeed in mathematics. Teachers can help students develop the confidence they need by demonstrating a positive disposition towards mathematics. Students need to understand that, for some mathematics problems, there may be several ways to arrive at the correct answer. They also need to believe that they are capable of finding solutions. It is common for people to think that if they cannot solve problems quickly and easily, they must be inadequate. Teachers can help students understand that problem solving of almost any kind often requires a considerable expenditure of time, energy and a good deal of perseverance. Once students have this understanding, teachers can encourage them to develop the willingness to persist, to investigate, to reason and explore alternative solutions, and to take the risks necessary to become successful problem solvers.

### ***Cross-Curricular and Integrated Learning***

The development of skills and knowledge in mathematics is often enhanced by learning in other subject areas. Teachers should ensure that all students have ample opportunities to explore a subject from multiple perspectives by emphasizing cross-curricular learning and integrated learning, as follows:

a) In cross-curricular learning, students are provided with opportunities to learn and use related content and/or skills in two or more subjects. Students can use the concepts and skills of mathematics in their science or social studies lessons. Similarly, students can use what they have learned in science to illustrate or develop mathematical understanding. For example, in Grade 6, concepts associated with the fulcrum of a lever can be used to develop a better understanding of the impact that changing a set of data can have on the mean.

b) In integrated learning, students are provided with opportunities to work towards *meeting expectations from two or more subjects* within a single unit, lesson, or activity. By linking expectations from different subject areas, teachers can provide students with multiple opportunities to reinforce and demonstrate their knowledge and skills in a range of settings. Also, the mathematical process expectation that focuses on connecting encourages students to make connections between mathematics and other subject areas.

### ***Recommended time allocation for teaching Mathematics Syllabus***

<b>Key Stage</b>	<b>Contact Time/Weeks</b>	<b>Minimum Contact Time/Year</b>
3 (Grades 7 & 8)	225 minutes (5 periods/week)	137hrs (182 periods of 45 min)

The above table shows the allocated time for a week with 5 periods of 45 minutes for key stage 3.

## Assessment Practices

Assessment is an integral part of teaching and learning. Assessment is the ongoing systematic process of gathering and using evidence of student learning to make informed decisions regarding student achievement. Thus, the main purpose of assessment is to improve student learning.

### Three major types of assessments in Key Stage 3

#### Assessment for learning (formative assessment)

It is used for purposes of greater achievement. Classroom assessment should provide opportunities for students to become actively involved in their learning and achievement. In this type of assessment, student knows what they need to do in order to be successful and know what is considered as 'good work'.

Assessment for learning is criterion referenced where students compare their work with a criterion. The criteria are based on the outcomes and indicators mentioned in the Mathematics Syllabi.

In addition to this, students, peers and teachers provide appropriate and ongoing feedback. Through feedback students identify their strengths and areas for improvement. This helps students to redirect their efforts and energy in making plans on ways to improve learning.

As for teachers, this provides the opportunity to change instruction in accordance with the student's needs.

#### Assessment as learning (formative assessment)

Assessment as learning is student driven whereby students are actively involved in their own learning. This is done through continuous self-assessments whereby students identify areas to improve. Students are required to reflect and critically evaluate their work.

#### Assessment of learning (summative assessment)

This is usually addressed through summative assessment. This includes topic assessment at the end of a topic and term exams. The information gathered through the summative process should be used formatively to enhance student progress.

In order to gather evidence of student learning the following are some of the methods that can be used:

- Informal assessment- student and teachers make judgments about their learning based on discussions.
- Formal assessment- students and teachers making judgments based on success criteria that are shared by students and the teacher before the learning task is carried out.
- Observation – use of checklists, rating scales and rubrics
- Self and peer assessment
- Quizzes
- Tests
- Sample student work
- Projects

- Reports
- Journals/Logs
- Performance reviews
- Portfolios

### The Weightage of Assessment types in Key Stage 3

Key Stage	Type of Assessment	Weightage
Key Stage 3 (Grades 7 and 8)	Assessment for learning	60%
	Assessment of learning	40%

# **GRADE 7 Maths Syllabus**

**Strand: Numbers (N)**
**Sub-strand: Number Types (N1)**

Outcome:	Indicators:	Notes/Examples
<b>N1.1:</b> <i>Understand the concept of numbers, identify and apply the knowledge of different types of numbers.</i>	a. Recognize the natural numbers as counting numbers, whole numbers and integers.	
	b. Represent the integers on the number line, arrange the integers in increasing and decreasing order.	
	c. Find the sum, difference, product of integers using number line and rapidly answer the oral and written questions.	
	d. Add and subtract the given natural numbers with suitable strategies.	Add $-24$ , $-6$ and $46$ , what should be added to $72$ to get $-38$ ? How many integers are there between $-10$ to $6$ ?
	e. Recognize the commutative, associative and distributive properties with respect to addition and multiplication of integers.	Include identity property:  Example: $-15 + 0 = 0 + (-15) = -15$ , in general $a + 0 = 0 + a = a$ , where $a \in \mathbb{Z}$ hence $0$ is an additive identity. Similarly $1$ as additive identity.  Declares subtraction is not commutative.
	f. Find the absolute value of given integers.	Find the value of $ -5 $ .

**Sub-strand: Four Operations (N2)**

Outcome:	Indicators:	Notes/Examples
<b>N1.1:</b> <i>Understand the concept of numbers, identify and apply the knowledge of different types of numbers.</i>	a. Uses appropriate vocabulary to support multiplication and division problems.	As much, by, equal groups, groups of, lots of, multiply, multiplied by, per, product of, times, average, divide, each, equal parts, evenly, every, out of, quotient, ratio, shared equally, split, same, even, repeated addition so on.

- |  |  |
|--|--|
| <p>b. Determine and explain why a number is divisible by 2, 3, 4, 5, 6, 8, 9 or 10 using suitable strategies without actual division and explain why a number is not divisible by 0.</p> | <p>Divisibility rules</p>  |
| <p>c. Understand the terminology used in word problems to use the addition, subtraction, multiplication and division to find the solutions.</p>  | <p>Use the above mentioned vocabulary in real life situations and to solve application level questions.</p>  |
| <p>d. Rapidly use the associative property and distributive property to find the solutions.</p>  | <p>Solve: <math>(-36) \times 85 + (-36) \times 15</math><br/> <math>= (-36) \times (85 + 15)</math> (Multiplication distributed over addition)<br/> <math>= (-36) \times 100 = -3600</math><br/>                     Solve: <math>20 \times (-85) \times (-50)</math><br/> <math>= (-50 \times 20) \times (-85)</math><br/>                     (Regrouping the factors using associative property)<br/> <math>= (-100) \times (-85)</math><br/> <math>= 8500</math></p> |
| <p>e. Use order of operations, including use of parenthesis to solve multi-step problems.</p>  | <p>Evaluate: <math>(-15 + 43) \div (-14) + 2</math><br/> <math>(14 - 3) - 8 \times (-2)</math></p>   |
| <p>f. Solve word problems including with respect to all 4 operations and suitable operations to solve problems.</p>  |  |

**Outcome:**

**N2.2:** *Understand and use the knowledge of multiples of whole numbers.*

**Indicators:**

- a. Find common factors and common multiples of given numbers using Venn-diagrams.

**Notes/Examples**

**Outcome:**

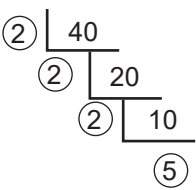
**N2.3:** *Understand the characteristics of prime numbers*

**Indicators:**

- a. Recognize the prime numbers and composite numbers and identify the difference between prime numbers and co-prime numbers.

**Notes/Examples**

Answer the questions:  
 Is it true to say that co-prime numbers are prime numbers? Justify your answer.  
 State that 1 is neither a prime number nor a composite number.

- |  |   |
|--|---|
| <p>b. Represent the given numbers as product of prime factors using various strategies (prime factorisation)</p> | <p>-Factor trees -</p> <p>Upside down division</p>  <p style="text-align: center;"><math>40 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5</math></p> |
| <p>c. Find the LCM of numbers using suitable strategies</p>  | <p>Prime factorization method<br/>Division method<br/>Writing multiples<br/>Factor tree method</p>  |
| <p>d. Determine HCF of given numbers.</p>  | <p>Prime factorization method<br/>Long division method</p>  |
| <p>e. Recognize square of a number as the product of two same factors.</p>                                       | <p>Multiplying the two same factors as squaring of a number and use the notation to represent <math>2^2</math>, <math>3^2</math>, .....</p>   |

**Sub-strand: Fractions, Decimals and Percentages (N3)**

<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<p><b>N3.1:</b> <i>Understand the knowledge of fractions, decimals, percentages and apply it in real-life situations.</i></p>	<p>a. Understand and use the knowledge of fractions as part of a whole.</p> <p>b. Understand and use the knowledge of proper, improper, mixed numbers and equivalent fractions.</p> <p>c. Understand the concept of addition, subtraction, multiplication and division of fractions to solve problems.</p>	<p>Use concrete materials and drawings to demonstrate the concept of fractions.</p> <p>Why <math>\frac{3}{6}</math> is the same as <math>\frac{1}{2}</math>?</p> <p>Compare the values of two fractions by converting them to fractions with the same denominator.</p> <p>Solve problems involving combined operations of addition, subtraction, of fractions.</p> <p>Solve problems involving combined operations of multiplication and division of fractions.</p>

<p>d. Perform computations involving combined operations of addition, subtraction, multiplication and division of fractions to solve problems.</p>	<p>Pose problems related to real-life situations.</p> <p>Use concrete materials and diagrams to demonstrate computations.</p> <p>Emphasize the order of operations, including the use of brackets</p>
<p>e. Determine through analysis, the relation between fractions, decimals and percentages.</p>	<p>Use concrete materials, drawings, calculators to explain the relationship between decimals, percentages and fractions.</p>
<p>f. Convert between fractions, decimals and percentages.</p>	<p>Convert fractions to decimals using equivalent fractions and using division method, know that a recurring decimal is a fraction.</p> <p>Use concrete materials and drawings to demonstrate percentages.</p> <p>Example: Use ten by ten grids to discuss the equivalent percentages of fractions and decimals. For example the fraction <math>\frac{1}{2}</math> has a decimal equivalent of 0.5, and 0.5 has a percentage equivalent of 50%.  <math>(\frac{1}{2} = 0.5 \text{ or } 50\%)</math></p>
<p>g. Apply the knowledge of fractions, decimals and percentages in real life situations.</p>	<p>Example: Fractions are used to help measure the proper amount of something to use in a baking recipe. Decimals are used in money. Finally percents are used in sales or coupons.</p>

**Sub-strand: Estimation (N4)**

<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<p><b>N4.1:</b> <i>Estimate numbers, quantities and apply the knowledge of estimation in real-life situations.</i></p>	<p>a. Make estimates of numbers, quantities, and lengths, and give approximations.</p> <p>b. Round off the decimals to nearest tenths, hundredths and thousandths</p>	<p>22567m to nearest thousands as 23000.</p> <p>24m 99cm can be estimated as 25m</p> <p>35.378 to nearest tenth place as 35.4</p>

- c. Make approximations to estimate to the nearest whole numbers.

Example: A farmer is planting rows of flowers; each row is 58.3cm long. The flower plants should be 6cm apart. How many plants does he need?

58.3cm is nearly 60cm, and 60 divided by 6 is 10, so 10 plants should be enough.

**Sub-strand: Ratio and Proportion (N5)**

**Outcome:**

**N5.1:** *Understand the concept of ratio and proportion, solve problems and relate it to fractions, decimals and percentages.*

**Indicators:**

- a. Use ratio notation to compare two and three quantities.
- b. Find equivalent ratios and simplify ratios, use ratios to solve problems.
- c. Relate ratios to fractions of a quantity.
- d. Solve problems involving changing ratios and relate ratios to proportions.
- d. Determine through investigations, the relationships among fractions, decimals, per cents and ratios.

**Notes/Examples**

Ratio of fruits in a fruit basket is as follows:

apple : orange : grapes

2 : 1 : 3

If there are 5 oranges, find number of apples and grapes.

12:24 = 1:2 (simplified by dividing both the terms by 12)

12:24 and 1:2 are equivalent ratios.

2:3 =  $\frac{2}{3}$  We can express every ratio as a fraction

Abdul Rahman bought 5 books at the rate of 2 MVR each book. If he buys three more books, what is the total price of the book? Does he need more money or less money to buy more books?

Example: Write each ratio as a fraction, a decimal, and a percent: 4 to 100, 63 to 100, 17 to 100

Solution			
Ratio	Fraction	Decimal	Percent
4 to 100	4/100	.04	4%
63 to 100	63/100	.63	63%
17 to 100	17/100	.17	17%

**Sub-strand: Money (N6)**

Outcome:	Indicators:	Notes/Examples
<p><b>N6.1:</b> <i>Solve problems related to personal and household finance and apply the knowledge of currency exchange in necessary contexts.</i></p>	<p>a. Solve problems related to household finance including daily expenses.</p>	<p>How much do students spend for their interval in a day? How much do they spend in a month and in a year?</p>
	<p>b. Convert from one currency to another using the given exchange rate and calculate exchange rate when currencies are given.</p>	



**Sub-strand: Powers (N7)**

Outcome:	Indicators:	Notes/Examples
<p><b>N7.1:</b> <i>Demonstrate an understanding of exponential form. Recognize and change the given numbers to standard form, changing to decimal numerals</i></p>	<p>a. Uses vocabulary related to exponential form.</p>	<p><math>3 \times 3 \times 3 \times 3 \times 3 = 3^5</math></p> <p>This form is exponential form.</p> <p> <math>3^5</math> → Index                ↘ Base             </p> <p>Read as three to the power of five.</p>
	<p>b. Expressing bigger/smaller numbers in standard form or in scientific notation.</p>	<p>The width of the Milky Way galaxy from edge to edge is about 946,000,000,000,000,000km can be expressed in standard form as <b>9.46 x 10<sup>17</sup>km</b>.</p>

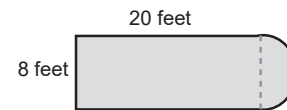
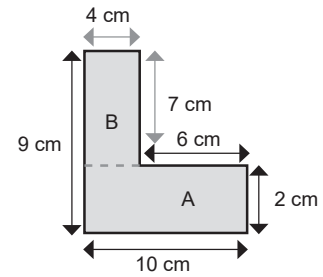
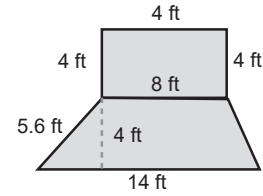
**Strand: Measurement (M)**
**Sub-strand: Conversion of Units (M1)**

Outcome:	Indicators:	Notes/Examples
<b>M1.1:</b> <i>Convert units of length, area, volume, mass, temperature and time and apply in real context.</i>	Identify the relationship between metric units and convert between different units of measurement.	Include units of length, mass, volume, area, temperature and time.

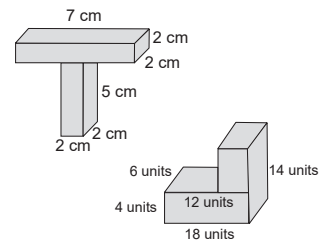
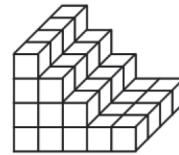
**Perimeter, Area and Volume (M2)**

Outcome:	Indicators:	Notes/Examples
<b>M2.1:</b> <i>Understand the concept of area, perimeter and volume to solve problems.</i>	<p>a. Investigate the derivation of formulae to find the area of circles and semi circles.</p> <p>b. Investigate the derivation of formulae to find the area and perimeter of rectangles, parallelograms, triangles, trapezium and squares.</p>	<p>Determine, through investigation using a variety of tools (Example: bottle cap, bangle and string) and strategies, for calculating the circumference of a circle and find the relation between circumference and diameter.</p> <p>Derive the following formulae of area of a circle and a semi-circle through investigation.</p> <p>Perimeter of rectangle  <math>= 2 \times \text{length} + 2 \times \text{breadth}</math>  <math>= 2 \times (\text{length} + \text{breadth}) = 2 \times (l + b)</math>                      units</p> <div style="text-align: center;">  </div> <p>Area of rectangle = length <math>\times</math> breadth  <math>= l \times b</math> square units</p> <div style="text-align: center;">  </div> <p>Perimeter of square = <math>4 \times \text{side } s</math>  <math>= 4s</math> units</p> <p>Area of square = side <math>\times</math> side = <math>s^2</math></p>

- c. Investigate the derivation of formulae to find the volume of cube, cuboids and prisms.
- d. Find the perimeters and areas of combined shapes from simple to complex.

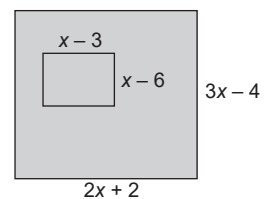
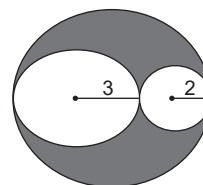


- e. Calculate the volume of compound shapes.



- f. Calculate the area and perimeter of shaded regions.

For example, find the area of shaded regions in the following figures.



- g. Analyse the changes in perimeter and area in relation with increasing or decreasing the dimensions of figures.
- Example: Compute the area of a circle whose radius is 7cm. If radius is doubled then how many times its area and circumference increase? Find the area of a circle whose circumference is same as the perimeter of a square of side 11cm.

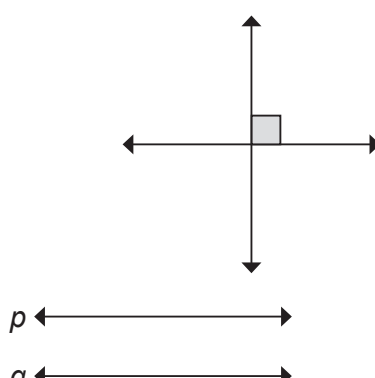
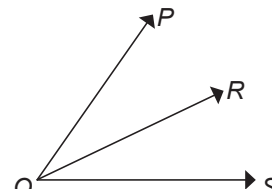
### Sub-strand: Time (M3)

Outcome:	Indicators:	Notes/Examples
<b>M3.1:</b> <i>Understand and use the concept of time to solve problems.</i>	a. Understand the concept of time in seconds, minutes, hours, days, weeks, months and years.	1 millennium = 1000 years 1 century = 100 years 1 year = 12 months = 52 weeks = 365 days 1 week = 7 days 1 day = 24 hours 1 hour = 60 minutes 1 minute = 60 seconds
	b. Determine the appropriate measurement of time for certain events.	
	c. Convert time in twelve-hour system to twenty-four hour system and vice-versa.	Examples 9:05 am is 09:05    9:05 pm is 21:05 7:27 am is 07:27    7:27 pm is 19:27 12:10 am is 00:10    12:10 pm is 12:10
	d. Determine the interval between two given times.	A bus leaves the station at 1500hours and reaches its destination at 2300hours. How much time does it take to complete the journey?
	e. Use the four operations to solve problems involving time.	Zaheer spent 3hrs to complete task 1, spent 30min for task 2 and one hour for task 3. He was given 250 min to complete all these tasks. Is Zaheer able to finish the task in the given time?

**Sub-strand: Temperature (M4)**

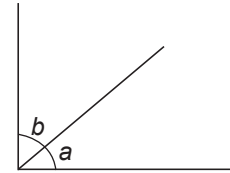
<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<b>M4.1:</b> <i>Understand and use the concept of temperature to solve problems</i>	<p>a. Measure temperature using a thermometer, read and record the information correctly.</p> <p>b. Convert from one temperature scale to other and use the four operations to solve problems related to temperature.</p>	<p>Record the temperature of water using a thermometer while boiling for every 10s and write your observations.</p> <p>Fahrenheit to Celsius and Celsius to Fahrenheit.</p>

**Strand: Shape and Space (SS)**
**Sub-strand: Lines and Angles (SS1)**

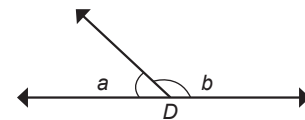
Outcome:	Indicators:	Notes/Examples
<b>SS1.1:</b> <i>Identify types of angles, line segments, rays, parallel lines, intersecting lines, pair of angles and types of triangles and understand its properties. Measure lines and angles accurately. Construct angle bisectors and perpendicular bisectors.</i>	a. Identify the types of angles.  b. Determine the angle around a point as $360^\circ$ , angle at the center of semicircle as $180^\circ$ , angle at centre of a quadrant as $90^\circ$ .	Acute angle Right angle Obtuse angle Straight line Complete angle
	c. Understand the concept of parallel and per-pendicular lines.	Lines that are at $90^\circ$ to each other are called perpendicular lines.   <p><math>p</math> and <math>q</math> are parallel lines. They do not intersect at any point.</p>
	d. Understand and use properties of angles associated with intersecting lines to solve problems.	In the given figure $\angle PQR + \angle RQS$ are adjacent angles   <p>They share a vertex <math>Q</math> and one common arm <math>QR</math>.</p>

$$\angle PQR + \angle RQS = \angle PQS$$

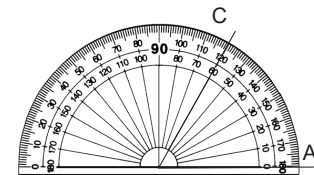
In the following figure,  $a + b = 90^\circ$ ,  $a$  and  $b$  are complementary angles.



In the following figure  $a + b = 180^\circ$ ,  $a$  and  $b$  are supplementary angles.



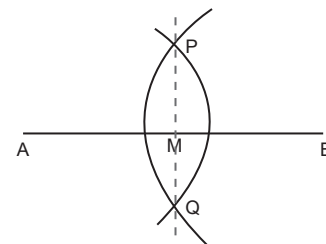
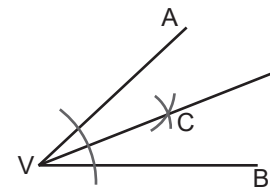
- e. Construct the angles with the given magnitude using the ruler, compass and protractor.



With the help of straight edge of protractor angle  $ABC = 60^\circ$

- f. Construct angle bisectors and perpendicular bisectors using straight edge and pair of compass only.

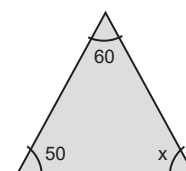
VC is the bisector of angle AVB.



PQ bisects AB at M.

- g. Find the unknown angles of different types of triangles.

Find the value of  $x$  from the following figure.



h. Identify quadrilaterals and its properties.

In a parallelogram, opposite angles are congruent.

In rectangles and squares, all angles are right angles.

In a kite, one pair of opposite angles are congruent.

i. Compare the given two triangles and identify whether they are congruent or not using congruency properties SSS, SAS, ASA, AAS, RHS congruency rules. Rule out why AAA property is not true with respect to congruency.

SSS: side, side, side congruence

SAS: side, angle and side congruence

ASA: angle, angle and angle congruence

AAS: angle, angle and side congruence

AAA: angle, angle and angle congruency rule

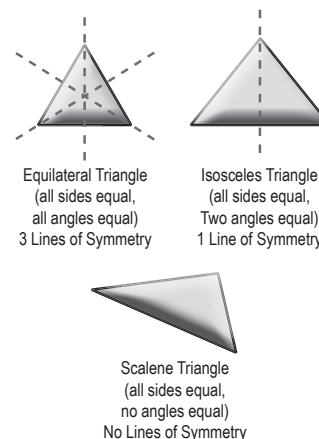
**Sub-strand: Symmetry (SS2)**

**Outcome:**

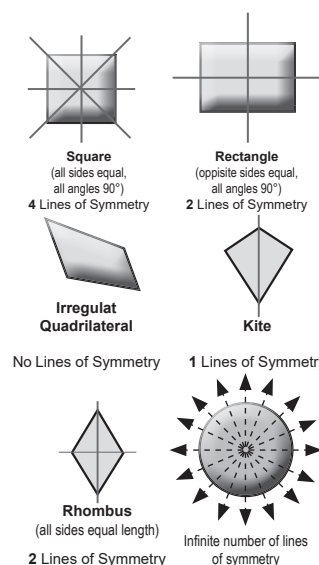
**SS3.1:** Understand the concept of symmetry.

**Indicators:**

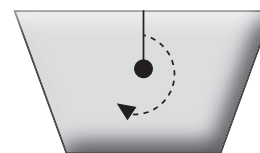
a. Determine and draw the line(s) of symmetry of shapes (triangles, quadrilaterals and circles).



**Notes/Examples**



- b. Identify and describe line and order of rotational symmetry in triangles, quadrilaterals and circles in two dimensions.



A trapezium does not have rotational symmetry



A parallelogram has rotational symmetry of order 2



A regular octagon has rotational symmetry of order 8

**Sub-strand: Similar Figures (SS4)**

**Outcome:**

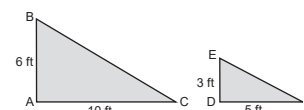
**SS4.1:** Use proportions to express relationships among corresponding parts of similar figures.

**Indicators:**

- a. Understand the concept of similarity and give examples from nature.
- b. Describe the scale factor of drawings, shapes and maps.

**Notes/Examples**

Find the scale



Scale factor with respect to triangle ABC to triangle DEF is

$$\frac{AB}{DE} = \frac{6}{3} = \frac{2}{1} = 2:1$$

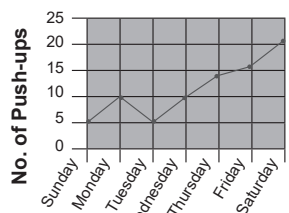
$$\frac{AC}{DF} = \frac{10}{5} = \frac{2}{1} = 2:1$$

Angle BAC and Angle EDF are each 90°.

∴  $\triangle ABC \sim \triangle DEF$  with scale factor 2:1.

**Strand: Chance and Handling Data (CH)**

**Sub-strand: Handling Data (CH1)**

Outcome:	Indicators:	Notes/Examples																
<p><b>CH1.1:</b> <i>Understand the concept of handling data and present data to solve problems.</i></p>	<p>a. Find mean, median, mode and range of a given set of data.</p> <p>b. Recognise appropriate statistical data for collection and develop the skills of collecting and organising data.</p> <p>c. Draw line graphs for given data and/or answer questions related to given line graph.</p>	<p>Find the mean of first ten prime numbers.</p> <p>Find the median of 2, 3, 9, 3, 8, 10, 11, 1.</p> <p>Find the mode of 22, 23, 22, 24, 22, 28, 36, 12, 23 and 37.</p> <p>1. Draw the line graph for the following data which represents temperatures recorded in the month of May in a city:</p>																
		<table border="1"> <tr> <td>Temperature in °C</td> <td>28</td> <td>32</td> <td>35</td> <td>37</td> <td>39</td> </tr> <tr> <td>Number of days</td> <td>5</td> <td>6</td> <td>12</td> <td>5</td> <td>3</td> </tr> </table>	Temperature in °C	28	32	35	37	39	Number of days	5	6	12	5	3				
Temperature in °C	28	32	35	37	39													
Number of days	5	6	12	5	3													
		<p>2. Following line graph is about a person's work out, answer the following questions.</p>																
		<p style="text-align: center;"><b>Push-ups</b></p>  <table border="1"> <caption>Data for Push-ups Line Graph</caption> <thead> <tr> <th>Days of the Week</th> <th>No. of Push-ups</th> </tr> </thead> <tbody> <tr><td>Sunday</td><td>5</td></tr> <tr><td>Monday</td><td>10</td></tr> <tr><td>Tuesday</td><td>5</td></tr> <tr><td>Wednesday</td><td>10</td></tr> <tr><td>Thursday</td><td>15</td></tr> <tr><td>Friday</td><td>15</td></tr> <tr><td>Saturday</td><td>20</td></tr> </tbody> </table>	Days of the Week	No. of Push-ups	Sunday	5	Monday	10	Tuesday	5	Wednesday	10	Thursday	15	Friday	15	Saturday	20
Days of the Week	No. of Push-ups																	
Sunday	5																	
Monday	10																	
Tuesday	5																	
Wednesday	10																	
Thursday	15																	
Friday	15																	
Saturday	20																	
		<p>Name the days on which he did less number of push-ups?</p>																
		<p>Which day he did maximum push-ups?</p>																
	<p>d. Read the pie chart and answer the questions related to it, create the suitable data to draw the pie charts for given information.</p>	<p>Mr. Rasheed's monthly Income in MVR is 2400.</p> <p>He spent from it 500 on house rent, 450 for food, 350 for education, 100 for health, 200 for transport and remaining amount he saved. Depict the given data in pie-chart.</p>																

- e. Organize the data and depict the data using suitable pictorial graphs.

A car manufacturing company in the first year manufactured 150 cars, second year 200, third year 210 and fourth year 380. Depict the information given here using pictograph.

**Sub-strand: Data Analysis and Probability (CH2)**

**Outcome:**

**CH2.1:** *Understand and use the concept of data analysis and probability to make conclusions and predictions.*

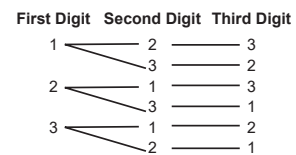
**Indicators:**

- a. Interpret data by looking for patterns and relationships, draw and justify conclusions, and answer related questions.
- b. Collect, organize, display and interpret data for a specific purpose or need.
- c. Find all possible outcomes of simple experiments or problem situations, using methods such as lists, arrays and tree diagrams.

**Notes/Examples**

Collect your class children heights, prepare the frequency table for the data, interpret and analyze; who is the tallest, etc.

**Tree diagram**



**Array**

What are the possible combinations?

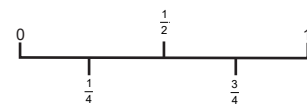
HHHH	HHHT	HHTT	TTHT
THHH	TTHH	HTHT	THTT
HTHH	HTHT	THHT	HTTT
HHTH	HTTH	TTTH	TTTT

Number of possible combinations =  $2^4 = 16$

**List**

HH, HT, TH and TT when two coins rolled simultaneously.

Probability number line.



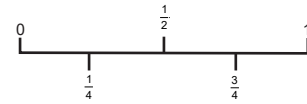
- d. Determine the probability of an event using ratios, including fractional notation. Understand the probability number line and apply it to solve the problems.
- e. Apply the probability models to make predictions about real-life events.

For example: *Tossing a coin; Fortune wheeler; Share value predictions;*

- f. Apply the probability models to make predictions about real-life events.
- g. Determine the probability of an event using ratios, including fractional notation. Understand the probability number line and apply it to solve the problems.
- h. Apply the probability models to make predictions about real-life events.

**For example:** Tossing a coin; Fortune wheeler; Share value predictions.

Probability number line.



**For example:** Tossing a coin; Fortune wheeler; Share value predictions.

### Strand: Patterns and Algebra (PA)

Outcome:	Indicators:	Notes/Examples
<b>PA1.1:</b> <i>Understand and use the concept of algebra to solve problems</i>	a. Express the given statement symbolically using suitable signs and frame the algebraic expressions.	Four more than twice the number is same as 10 reduced by the same number. $2x + 4 = 10 - x$
	b. Evaluate algebraic expressions by substitution	Evaluate for $x = 2$ $3x^5 + 7$
	c. Simplify algebraic expressions with parenthesis	Example: $7(2x - 3) - 5(3x - 2)$
	d. Expand single and double brackets	$a(a + b)$ or $(a + b)(a + b)$ $(a - b)(a - b)$ $(a + b)(a - b)$ $(a - b)(a + b)$ And $(a \pm b)(a \pm b) = (a \pm b)^2$
	e. Factorize algebraic expressions	$ab - ac$ $ab + ac + bd + cd$ $x^2 + 2xy + y^2$ $a^2 - b^2$
	f. Add or subtract two algebraic fractions with the same denominator.	For example: $A = 5p / (4q + 7r)$ ; $B = 3p / (4q + 7r)$ , then find $A - B$ , $A + B$
	g. Multiply and divide two algebraic fractions.	Find the product: $2x \times (3xy)$ $8a \times \left(\frac{3}{4}a + b\right)$
	h. Solve problems using formulae	Write a formula based on a given: a) statement b) situation Identify the subject of a given formula. Express a specified variable as the subject of a formula involving:

- i. Solve linear equations involving fractional coefficients

- a) one of the basic operations: +, −, x, ÷
- b) powers or roots
- c) combination of the basic operations

Example:

$$\frac{2}{3}x + 4x - \frac{1}{6}(2x - 5) = 8$$

- j. Use rules and variables to describe patterns, functions and other relationships.

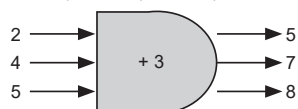
Find the rule:

- A. 1, 3, 5, 7, 9..... the pattern rule is “double the term number and subtract 1” called as term to term rule, written as  $2n - 1$ .

- B. Find the next two figures in the given pattern:

→ ↓ ← ↑ → ↓.....

£ £ \$ £ £ \$ £ £ \$ £

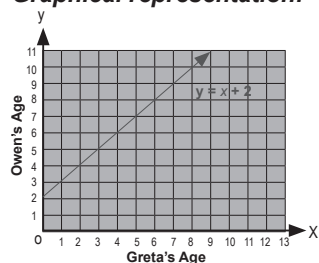


- k. Use representations to model situations.

**Situation:**

Owen was 2 year old when his sister Greta was born.

**Graphical representation:**



**Table Representation:**

Greta's age (x)	0	1	2	3	4
Owen's age (y)	2	3	4	5	6

**Algebraic representation:**  
 $y = x + 2$   
*addictive relationship*

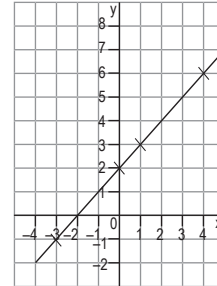
- l. Understand the equation of straight line and write the given equation in the form:  $y = mx + c$ .

$y = mx + c$   
 Identify positive and negative gradient, means of constant value and variable.

For the equation,  $y = x + 2$ , the different coordinates are

a. if  $x = 4$ , then  $y = 6$

b. if  $x = 1$ , then  $y = 3$ ....so on



m. Demonstrate familiarity with Cartesian coordinates and draw graph for a given linear equation.

n. Continue a given number sequence.

For example:

1, 3, 6, 10, 15, 21, \_\_\_\_\_, \_\_\_\_\_

7, 12, 17, 22, 27, \_\_\_\_\_, \_\_\_\_\_

o. Recognise patterns in sequences and relationships between different sequences.

Fibonacci sequence; term to term rule of

2, 4, 6, 8... is add 2

1, 6, 31, 156, ..., ... is multiply by 5 and add 1

Pattern 1 ^	Pattern 2 ^ ^	Pattern 2 ^ ^ ^
3 matchsticks	6 matchsticks	9 matchsticks

Pattern number: 1 2 3 ...

Number of sticks: 3 6 9...

# **GRADE 8 Maths Syllabus**

## Strand: Numbers (N)

### Strand: Numbers (N)

#### Process-strand: Use of Calculator

Outcome:	Indicators:	Notes/Examples
<i>Understand how to use a calculator efficiently</i>	a. Understand basics of a calculator	On/off, Operations, fractions, brackets, squares
	b. Apply appropriate checks of accuracy	Square, cube, Square roots, cube roots, standard form

#### Sub-strand: Number Types (N1)

Outcome:	Indicators:	Notes/Examples
<b>N1.1:</b> <i>Understand the concept of numbers, identify and apply the knowledge of different types of numbers</i>	a. Recognize the natural numbers as counting numbers, whole numbers and integers.	
	b. Represent the integers on the number line, arrange the integers in increasing and decreasing order.	
	c. Identify square numbers, cube numbers. Calculate squares, cubes, square roots and cube roots.	
	d. Recognize the prime numbers, find the factors and multiples of given numbers and identify composite numbers. List out the common multiples of a given set of numbers and find LCM and HCF of a given set of numbers.	
	e. Identify the difference between rational and irrational numbers.	<p><math>\sqrt{\frac{36}{49}} = \frac{6}{7}, \sqrt{\frac{15}{29}}</math> cannot be expressed as rational number such numbers are irrational numbers. Few examples <math>\sqrt{2}, \sqrt{3} \dots\dots\dots</math></p> <p>Identify as an irrational number.</p>

- f. Understands the difference between terminating decimals and recurring decimals
- Terminating decimal  
 Non-terminating decimal.  
 Non-terminating, non-recurring decimals cannot be expressed in the form of  $p/q$  where  $p$  and  $q$  are integers and  $q \neq 0$ .

**Sub-strand: Indices (N2)**

Outcome:	Indicators:	Notes/Examples
<b>N1.1:</b> <i>Understand the indices</i>	<p>a. Explore indices using calculators.</p> <p>b. Explore the laws of indices using repeated multiplication and calculators.                      perform computations involving multiplication of numbers in index notation.</p> <p>c. Explore the laws of indices using division and calculators.                      Perform computation involving division of numbers in index notation.</p>	<p>Begin with squares and cubes.                      'a' is a real number.                      Include algebraic terms.                      Emphasise base and index.  <math>a \times a \times \dots \times a = a^n</math>                      Factor a is the base, <math>n</math> is the index.</p> <p>Verify <math>a^m \times a^n = a^{m+n}</math>                      Simplify multiplication of:</p> <p>i) Numbers                      ii) Algebraic terms expressed in index notation with the same base.</p> <p>Verify <math>a^m \div a^n = a^{m-n}</math>                      Simplify division of:</p> <p>i) Numbers                      ii) Algebraic terms expressed in index notation with the same base.                      Emphasize <math>a^0 = 1</math></p>

- d. Perform computations involving algebraic terms and numbers in index notation.

$$(a)^{mn} = a^{mn}$$

$m$  and  $n$  are positive integers.

Limit algebraic terms to one unknown.

Emphasise:

$$(a^m \times b^n)^p = a^{mp} \times b^{np}$$

$$\left(\frac{a^m}{b^n}\right)^p = \frac{a^{mp}}{b^{np}}$$

- e. Perform computations involving negative indices.

$$\text{Verify: } a^{-n} = \frac{1}{a^n}$$

- f. Perform computations involving fractional indices.

- i) Verify  $a^{\frac{1}{n}} = \sqrt[n]{a}$ ,  
where  $a$  and  $n$  are positive integers.  
Begin with  $n = 2$ .

- ii) Find the value of  $a^{\frac{1}{n}}$

- iii) State  $a^{m/n}$  as  
 $-(a^m)^{\frac{1}{n}}$  or  $\left(a^{\frac{1}{n}}\right)^m$

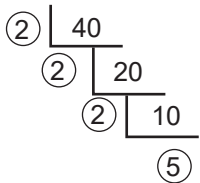
$$-\sqrt[n]{a^m} \text{ or } \left(\sqrt[n]{a}\right)^m$$

- iv) Find the value of  $a^{\frac{m}{n}}$

- g. Perform computation involving laws of indices.

Multiplication, division, raised to a power or combination of these operations on several numbers expressed in index notation.

Combined operations of multiplication, division and raised to a power involving positive, negative and fractional indices

Outcome:	Indicators:	Notes/Examples
<b>N2.2:</b> <i>Understand and apply the rule of standard form</i>	a. Use the standard form $A \times 10^n$ where $n$ is a positive or negative integer, and $1 \leq A < 10$ .  Upside down division  $40 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5$	The charge of an electron is 0.00000000000000000016 coulomb in standard form as $1.6 \times 10^{-19}$ coulomb.  The distance of the earth from the sun is approximately 144,000,000,000 metres can be written in standard form as $1.44 \times 10^{11}$ metres

### Sub-strand: Fractions, Decimals and Percentages (N3)

Outcome:	Indicators:	Notes/Examples
<b>N3.1:</b> <i>Understand the knowledge of fractions, decimals, percentages and apply it in real-life situations.</i>	a. Understand and use the knowledge of fractions as part of a whole.  b. Understand and use the knowledge of proper, improper, mixed numbers and equivalent fractions.  c. Understand the concept of addition, subtraction, multiplication and division of fractions to solve problems.  d. Perform computations involving combined operations of addition, subtraction, multiplication and division of fractions to solve problems.	Use concrete materials and drawings to demonstrate the concept of fractions.  Why $\frac{3}{6}$ is the same as $\frac{1}{2}$ ? Compare the values of two fractions by converting them to fractions with the same denominator. Solve problems involving combined operations of addition, subtraction, of fractions. Solve problems involving combined operations of multiplication and division of fractions. Pose problems related to real-life situations. Use concrete materials and diagrams to demonstrate computations. Emphasize the order of operations, including the use of brackets

e. Understand the relationship between decimals, percentages and fractions.

Use concrete materials, drawings, calculators to explain the relationship between decimals, percentages and fractions.

f. Convert between fractions, decimals and percentages.

Convert fractions to decimals using equivalent fractions and using division method, know that a recurring decimal is a fraction.

For example, use concrete materials and drawings to demonstrate percentages.

For example: Use ten by ten grids to discuss the equivalent percentages of fractions and decimals. For example

the fraction  $\frac{1}{2}$  has a

decimal equivalent of 0.5, and 0.5 has a percentage equivalent

of 50%. ( $\frac{1}{2} = 0.5$  or 50%)

g. Apply the knowledge of fractions, decimals and percentages in real life situations.

Fractions are used to help measure the proper amount of something to use in a baking recipe. Decimals are used in money. Finally percents are used in sales or coupons.

**Sub-strand: Estimation (N4)**
**Outcome:**

**N4.1:** *Estimate numbers, quantities and apply the knowledge of estimation in real life situations.*

**Indicators:**

- a. Make estimates of numbers, quantities, lengths and give approximations.
- b. Round off whole numbers to the nearest 10, 100, 1000 or 10,000.
- c. Round off decimals to a specified number of decimal places
- d. Give approximations to the specified number of significant figures
- e. Round off answers to reasonable accuracy in the context of a given problem

**Sub-strand: Ratio and Proportion (N5)**
**Outcome:**

**N5.1:** *Understand and solve problems involving ratios and directly proportional relationships in various contexts.*

**Indicators:**

- a. Solve problems involving changing ratios and relate ratios to proportions.
- b. Recognise when fractions or percentages are needed to compare different quantities.
- c. Recognises direct and indirect proportion, and solves problems.
- d. Determine the rate involved in given situations and identify the two quantities involved.

**Notes/Examples**

Include two, three, four quantities

Identify and describe everyday examples of inverse (indirect) proportion, eg as speed increases, the time taken to travel a particular distance decreases

Use the equations to model direct and indirect proportion where  $k$  is the constant of proportionality.

Example: Aisha works 60 hours every 3 weeks. At this rate, how many hours will she work in 12 weeks?

3 week = 60 hours

12 weeks = 240 hours

e. Convert between units for rates.

Example: Aisha works 60 hours every 3 weeks. Unit rate of this

$$\text{is } \frac{60}{3} = \frac{20}{1}$$

1 week = 20 hours

f. Recognise direct and inverse proportion from graphs

Identify:

If x increases y increases- direct variation

If x decreases y decreases- direct variation

If x increases y decreases- inverse variation

If x decreases, y increases- inverse variation

### Sub-Topic: Money (N6)

#### Outcome:

**N6.1:** Solve problems related to personal and household finance and apply the knowledge in necessary contexts.

#### Indicators:

- Solve problems related to household finance, including daily expenses.
- Convert from one currency to another using the given exchange rate and calculate exchange rate when currencies are given.
- Analyse the difference between simple interest and compound interest and solve problems.
- Understand the knowledge of depreciation, tax, commission and solve problems.

#### Notes/Examples

**Strand: Measurement (M)**

**Sub-strand: Conversion of Units (M1)**

**Outcome:**

**M1.1:** *Identify the appropriate unit for a specific situation and apply the knowledge of conversion in real contexts.*

**Indicators:**

Identify the relationship between metric units and convert between different units of measurement.

**Notes/Examples**

Include units of length, mass, volume, area, temperature time and speed.

**Topic: Perimeter, Area and volume (M2)**

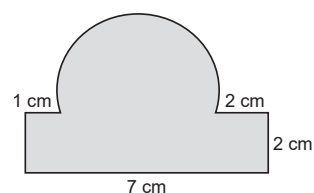
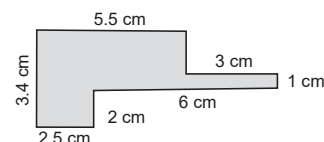
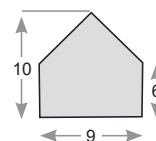
**Outcome:**

**M2.1:** *Analyse and understand the concept of area, perimeter and volume to solve problems*

**Indicators:**

- a. Investigate and derive the formulae to find the solutions of the problems involved with perimeter and areas of triangle, rectangle, square, parallelogram, trapezium, circle and semicircle.
- b. Compute the perimeters and areas of compound figures formed with rectangles, squares, parallelograms, trapeziums and triangles.

**Notes/Examples**



- c. Identify tangent of a circle and investigate the relation between a tangent to the circle and radius drawn at the point of contact.
- d. Solve problems involving the arc length, sector, tangent, chord circumference and radius.

Determine that:

- a) a radius that is perpendicular to a chord divides the chord into two equal parts and vice versa.

- b) perpendicular bisectors of two chords intersect at the centre.
- c) two chords that are equal in length are equidistant from the centre and vice versa.
- d) chords of the same length cut arcs of the same length.

- e. Investigate the derivation of formulae to find the volume of cubes, cuboids and prisms.
- f. Calculate volume of cubes, cuboids and prisms.
- g. Analyse the changes in perimeter, area and volume in relation with increasing or decreasing the dimensions of figures.

**Sub-strand: Time (M3)**

<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<b>M3.1:</b> <i>Understand and use the concept of time to solve problems.</i>	<ul style="list-style-type: none"> <li>a. Select appropriate tools, measure and convert times between 12 hour and 24 hour hour clock.</li> <li>b. Convert decimal or fraction time to actual time.</li> <li>c. Solve problems related to time in day to day life.</li> </ul>	<ul style="list-style-type: none"> <li>– Days to time Example: 3.2 days to hours</li> <li>– Decimal hours to time</li> <li>– Decimal seconds to time</li> <li>Example: finding time intervals</li> </ul>

**Sub-strand: Temperature (M4)**

<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<b>M4.1:</b> <i>Measure and read temperature in degree Celsius and in Fahrenheit</i>	<ul style="list-style-type: none"> <li>a. Measure temperature using a thermometer, read and record the information correctly.</li> <li>b. Convert from one temperature scale to other</li> <li>c. Solve problems related to temperature</li> </ul>	<ul style="list-style-type: none"> <li>Fahrenheit to Celsius and Celsius to Fahrenheit.</li> <li>Example: At 6pm, the temperature was 3°C. By midnight, it had dropped to -5°C. How great was the fall in temperature?</li> </ul>

**Strand: Shape and Space (SS)**
**Sub-strand: Trigonometry**

<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<b>SS1.1:</b> <i>Understand the concept of trigonometry to solve problems</i>	a. Understand and use tangent of an acute angle in a right-angled triangle.	Explore tangent of a given angle when: a) The size of the triangle varies proportionally. b) The size of angle varies.  Identify the: a) hypotenuse b) the opposite side and the adjacent side with respect to one of the acute angles.  Determine the tangent of an angle.  Calculate the tangent of an angle given the lengths of sides of the triangle.  Calculate the lengths of sides of a triangle given the value of tangent and the length of another side.
	b. Understand and use sine of an acute angle in a right-angled triangle.	Explore sine of a given angle when: a) The size of the triangle varies proportionally. b) The size of the angle varies Determine the sine of an angle. Calculate the sine of an angle given the lengths of sides of the triangle.  Calculate the lengths of sides of a triangle given the value of sine and the length of another side.
	c. Understand and use cosine of an acute angle in a right-angled triangle.	Explore cosine of a given angle when: a) The size of the triangle varies proportionally. b) The size of the angle varies. Determine the cosine of an angle. Calculate the cosine of an angle given the lengths of sides of the triangle.

- d. Use the values of tangent, sine and cosine to solve problems.

Calculate the lengths of sides of a triangle given the value of cosine and the length of another side.

Calculate the values of other trigonometric ratios given the value of a trigonometric ratio.

Convert the measurement of angles from:

- a) degrees to degrees and minutes.

Find the value of:

- a) tangent  
b) sine  
c) cosine of  $30^\circ$ ,  $45^\circ$  and  $60^\circ$  without using scientific calculator.

Find the value of:

- a) tangent  
b) sine  
c) cosine using scientific calculator.

Find the angles given the values of:

- a) tangent  
b) sine  
c) cosine using scientific calculators.

- e. Solve problems involving trigonometric ratios.

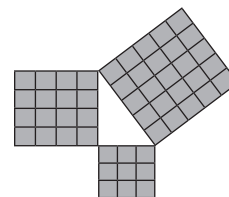
$$\text{Sine } \theta = \frac{\text{opposite side to } \theta}{\text{hypotenuse}}$$

$$\text{Cosine } \theta = \frac{\text{adjacent side to } \theta}{\text{hypotenuse}}$$

$$\text{Tangent } \theta = \frac{\text{opposite side to } \theta}{\text{adjacent side to } \theta}$$

- f. Use Pythagoras, theorem to solve problems

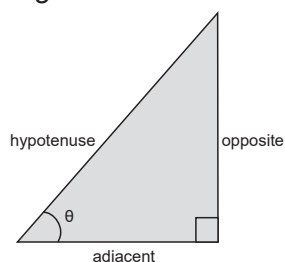
Using three squares whose lengths form a Pythagorean triplet by forming right triangle



The measures of sides of squares are 3cm, 4cm and 5cm.

$$3^2 + 4^2 = 9 + 16 = 25 = 5^2$$

- g. Solve problems involving trigonometric ratios.



### Sub-strand

#### Outcome:

**SS2.1:** *Understand the concept of Angles and Lines*

#### Indicators:

- Construct the triangles with respect to given measures using compass and ruler.
- Construct simple geometric figures from the given data using ruler and protractor
- Construct angle bisectors and perpendicular bisectors of side of given triangle to locate center
- Calculate unknown angles on a straight line, angles at a point, quadrilaterals and different types of triangles.
- Investigate the derivation of the formula to find sum of interior angles of a regular polygon and each interior angle of a regular polygon.
- Solve problems involving angles and sides of regular and irregular polygons

#### Notes/Examples

Construct triangle PQR in which  $PQ = 5\text{cm}$ ,  $QR = 6\text{cm}$  and  $RP = 7\text{cm}$ ; Construct triangle XYZ in which  $\angle X = 75^\circ$ ,  $\angle Y = 30^\circ$  and  $YZ = 8\text{cm}$ .

Measure the interior and exterior angles of a pentagon. Note down the degree of angles and then use the formulae to find the interior and exterior angles to compare the both methods.

**Sub-strand: Symmetry (S3)**

<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<b>SS3.1:</b> <i>Understand the concept of symmetry</i>	<ul style="list-style-type: none"> <li>a. Determine and draw the line(s) of symmetry of shapes</li> <li>b. Identify and describe line and order of rotational symmetry in two dimensions.</li> <li>c. Recognise symmetry properties of prisms.</li> <li>d. Use the properties of circles to identify its symmetry.</li> </ul>	<p>Include properties of triangles, quadrilaterals and circles directly related to their symmetries.</p> <p>Cylinder, pyramid, cone</p>

**Sub-strand: Similar Figures**

<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<b>SS4.1:</b> <i>Understand the concepts of similarity to solve problems.</i>	<ul style="list-style-type: none"> <li>a. Identify similar figures and differentiate between similarity and congruence</li> <li>b. Solve problems involving similarity</li> <li>c. Describe the scale factor of drawings, shapes and maps</li> </ul>	<p>Congruent figures are similar and all similar figures may not be congruent.</p> <p>Scale factor</p> <p>Length of unknown sides of two similar shapes</p> <p>Calculate the:</p> <ul style="list-style-type: none"> <li>a) scale factor</li> <li>b) the lengths of sides</li> <li>c) the lengths of sides of the object of an enlargement.</li> </ul>

## Strand: Chance and Handling Data (CH)

### Sub-strand: Handling Data (CH1)

Outcome:	Indicators:	Notes/Examples
<p><b>CH1.1:</b> <i>Understand the concept of handling data and present data to solve problems</i></p>	<ul style="list-style-type: none"> <li>a. Calculate the mean, median, mode and range for individual and discrete data and distinguish between the purpose for which they are used.</li> <li>b. Recognise appropriate statistical data for collection and develop the skills of collecting and organising data.</li> <li>c. Read, create and use line graphs, histograms, pictographs, pie charts, and other representations when appropriate.</li> <li>d. Answer questions related to given line graphs, pictographs, histograms, pie charts, and other representations</li> <li>e. Organize the data and depict the data using suitable pictorial graphs</li> </ul>	<p>Data collection using simple questionnaires, conducting surveys or experiments to do with environment, issues in the school or community and record observations or measurements.</p>

### Sub-strand: Data Analysis and Probability (CH2)

Outcome:	Indicators:	Notes/Examples
<p><b>CH2.1:</b> <i>Understand and use the concept of data analysis and probability to make conclusions and predictions.</i></p>	<ul style="list-style-type: none"> <li>a. Interpret data by looking for patterns and relationships, draw and justify conclusions, and answer related questions.</li> <li>b. Collect, organize, display and interpret data for a specific purpose or need.</li> <li>c. Evaluate interpretations and conclusions as additional data are collected, modify conclusions and predictions, and justify new findings.</li> </ul>	

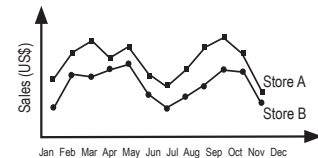
- d. Differentiate the data representation such as multiple sets of data on same graph.

For example The number students in a class arriving late for school one week was:

	Week 1	Week 2
Saturday	4	6
Sunday	5	3
Monday	2	4
Tuesday	3	1
Wednesday	2	2
Thursday	2	4

Depict the above information in the same graph using suitable representation.

Read the following data representing sales of two stores A and B in a particular year and answer the following questions:



- Which month two companies have maximum sales?
- Name the months where the sales are low in both the companies?

- e. Write the possible outcomes in an experiment, recognize the probability of impossible event and sure event.
- f. Write the possible outcomes in an experiment, recognize the probability of impossible event and sure event.
- g. Express the probability of an event using ratios, including fraction notation.

Probability of getting a number more than 6 when a die is rolled is an impossible event and its probability is 0; Probability of getting a number less than equal to 6 is a sure event and its probability is 1.

Probability of getting a number more than 6 when a die is rolled is an impossible event and its probability is 0; Probability of getting a number less than equal to 6 is a sure event and its probability is 1.

Probability of getting a prime number when a die rolled is  $3:6 = 1:2$  (ratio form);  $\frac{1}{2}$  (fraction form)

h. Use probability models to make predictions about real-life events.

Numbers 1 to 10 were written on ten identical cards and shuffled well, find the probability of choosing a card randomly will be a card holding

1. An even number
2. A factor of 8  
Multiple of 3.

**Strand: Patterns and Algebra (PA)****Sub-strand: Patterns and Algebra (PA1)**

<b>Outcome:</b>	<b>Indicators:</b>	<b>Notes/Examples</b>
<b>PA1.1:</b> <i>Understand and use the concept of algebra to solve problems</i>	a. Express the given statement symbolically using suitable signs and frame the algebraic expressions.	One-third of a number increased by seven is five less than twice the number. $\frac{1}{3}n + 7 = 2n - 5$
	b. Identify the difference between linear and non-linear expressions	Discuss why $x^2$ is not a linear expression.
	c. Evaluate algebraic expressions by substitution	
	d. Simplify algebraic expressions with parenthesis	Identify like terms and unlike terms $2x(3x^4 + 4) + 5x(6 - 3x^2)$
	e. Transform formulae and evaluate algebraic expressions	
	f. Factorize algebraic expressions	<ul style="list-style-type: none"> <li>• <math>ab - ac</math></li> <li>• <math>ab + ac + bd + cd</math></li> <li>• <math>x^2 + 2xy + y^2</math></li> <li>• <math>a^2 - b^2</math></li> </ul>
	g. Add or subtract two or more algebraic fractions with same and different denominator.	
	h. Multiply and divide two or more algebraic fractions.	
	i. Solve problems using formulae	Write a formula based on a given: <ul style="list-style-type: none"> <li>a) statement</li> <li>b) situation</li> </ul> Identify the subject of a given formula. Express a specified variable as the subject of a formula involving: <ul style="list-style-type: none"> <li>a) two or more operations</li> <li>b) powers or/and roots</li> <li>c) combination of the basic operations and powers or roots.</li> </ul>

- j. Solve linear equations involving fractional coefficients.

For example,

$$\frac{2}{3}x + 6 = 1$$

$$\frac{3}{4}x - \frac{7}{2} = \frac{5}{6}$$

$$\frac{5x-4}{8} - \frac{x-3}{5} = \frac{x+6}{4}$$

- k. Use representations to model situations and to solve problems.

Use tables, graphs and equations.

- l. Use rules and variables to describe patterns, functions and other relationships.

- m. Understand the equation of straight line and write the given equation in the form:  $y = mx + c$ .

- n. Demonstrate familiarity with Cartesian coordinates and draw graph for a given linear equation.

- o. Find gradient, mid-point and length of a straight line.

- p. Solve simultaneous linear equations.

Use graphical and Substitution method

- q. Express direct and inverse variation in algebraic terms and use this form of expression to find unknown quantities.

- r. Continue a given number sequence.

- s. Continue a given number sequence.

- t. Find the nth term of simple sequences.