Mathematics Syllabus
Primary

Ministry of Education
SINGAPORE

Year of implementation: from 2007

FOREWORD

The 2007 Primary Mathematics syllabus reflects the recent developments and trends in mathematics education. The revised syllabus continues to emphasise conceptual understanding, skill proficiencies and thinking skills in the teaching and learning of mathematics. These components are integral to the development of mathematical problem solving ability.

Emphasis is also given to reasoning, applications, and use of technology. Advances in technology have changed the way we teach and learn mathematics. The computer and hand-held calculator, for example, offer great potential to enhance the teaching and learning of mathematics.

Students will have opportunities to discover, reason and communicate mathematics. They will engage in stimulating discussions and activities where they can explore possibilities and make connections. These qualitative changes require a change in the teaching and learning approaches; incorporating activity-based and learner-centred methodologies.

The syllabuses are conceptualised after extensive consultation with teachers. We hope that teachers will find the document useful and continue to provide us with valuable feedback on syllabus matters.

We wish you an enjoyable and successful teaching experience.

Mathematics Unit
Curriculum Planning and Development Division

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PREFACE

This document consists of two parts.

Part A explains the philosophy of the syllabus and the spirit in which it should be implemented. It also spells out the aims of the mathematics curriculum.

The framework of the mathematics curriculum summarises the essence of mathematics teaching and learning in schools. The learning of mathematics at all levels involves more than the basic acquisition of concepts and skills. It also crucially involves an understanding of the underlying mathematical thinking, the general strategies of problem solving and positive attitudes to and appreciation of mathematics as an important and powerful tool in everyday life.

The framework serves as a guide for mathematics teaching and learning in schools.

Part B spells out the objectives of the mathematics curriculum and provides the syllabus content for each level.

A comparison of the specific topics covered in the Mathematics and Foundation Mathematics is also provided to assist teachers in planning their lessons according to students' proficiency and aptitude in the subjects.

Care has been taken to ensure that there is continuity from the primary to the secondary levels. Using a spiral design of the curriculum, each topic is revisited and introduced in increasing depth from one level to the next. This enables students to consolidate the concepts and skills learned and then further develop them. The concrete-pictorial-abstract development of concepts is advocated and this is evident in the teaching and learning approaches in the syllabus.

The content for Mathematics includes all the topics covered from P1 to P6. The content for Foundation Mathematics repeats some of the important topics covered from P1 to P4. This is to ensure that students doing Foundation Mathematics have a good understanding of basic mathematical concepts covered in P1 to P4. The pace of the Foundation Mathematics curriculum is also slower, giving more time and emphasis on hands-on activities to provide the concrete experience in the concrete-pictorial-abstract learning sequence.

This syllabus is a guide for teachers to plan their mathematics programmes. Teachers need not be bound by the sequence of topics presented but should ensure that the hierarchy and linkage are maintained. Schemes of work should be developed with the interests and abilities of the students uppermost in mind. Teachers should exercise flexibility and creativity when using the syllabus. They are encouraged to use a wide variety of strategies and resources to meet students' diverse range of abilities and needs, and to enhance the learning of mathematics.

PART A

INTRODUCTION

1 RATIONALE

Mathematics is an excellent vehicle for the development and improvement of a person's intellectual competence in logical reasoning, spatial visualisation, analysis and abstract thought. Students develop numeracy, reasoning, thinking skills, and problem solving skills through the learning and application of mathematics. These are valued not only in science and technology, but also in everyday living and in the workplace. The development of a highly skilled scientifically- and technologically-based manpower requires a strong grounding in mathematics. An emphasis on mathematics education will ensure that we have an increasingly competitive workforce to meet the challenges of the 21st century.

Mathematics is also a subject of enjoyment and excitement, which offers students opportunities for creative work and moments of enlightenment and joy. When ideas are discovered and insights gained, students are spurred to pursue mathematics beyond the classroom walls.

2 AIMS OF MATHEMATICS EDUCATION IN SCHOOLS

Mathematics education aims to enable students to:

(1) Acquire the necessary mathematical concepts and skills for everyday life, and for continuous learning in mathematics and related disciplines.

(2) Develop the necessary process skills for the acquisition and application of mathematical concepts and skills.

(3) Develop the mathematical thinking and problem solving skills and apply these skills to formulate and solve problems.

(4) Recognise and use connections among mathematical ideas, and between mathematics and other disciplines.

(5) Develop positive attitudes towards mathematics.

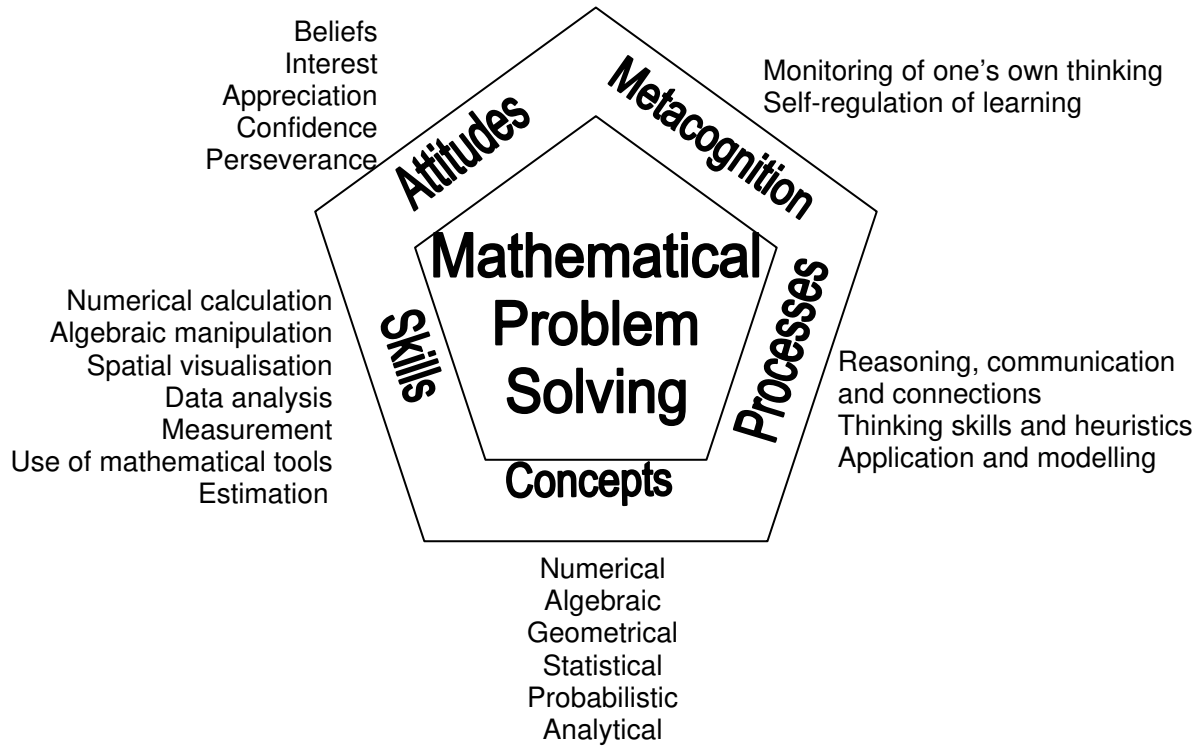
(6) Make effective use of a variety of mathematical tools (including information and communication technology tools) in the learning and application of mathematics.

(7) Produce imaginative and creative work arising from mathematical ideas.

(8) Develop the abilities to reason logically, communicate mathematically, and learn cooperatively and independently.

3 MATHEMATICS FRAMEWORK

This framework shows the underlying principles of an effective mathematics programme that is applicable to all levels, from the primary to A-levels. It sets the direction for the teaching, learning, and assessment of mathematics.



Mathematical problem solving is central to mathematics learning. It involves the acquisition and application of mathematics concepts and skills in a wide range of situations, including non-routine, open-ended and real-world problems.

The development of mathematical problem solving ability is dependent on five inter-related components, namely, *Concepts*, *Skills*, *Processes*, *Attitudes* and *Metacognition*.

3.1 CONCEPTS

Mathematical concepts cover numerical, algebraic, geometrical, statistical, probabilistic, and analytical concepts.

Students should develop and explore the mathematics ideas in depth, and see that mathematics is an integrated whole, not merely isolated piece of knowledge.

They should be given a variety of learning experiences to help them develop a deep understanding of mathematical concepts, and to make sense of various mathematical ideas, as well as their connections and applications, in order to participate actively in learning mathematics and to become more confident in exploring and applying mathematics. The use of manipulatives (concrete materials), practical work, and use of technological aids should be part of the learning experiences of the students.

3.2 SKILLS

Mathematical skills include procedural skills for numerical calculation, algebraic manipulation, spatial visualisation, data analysis, measurement, use of mathematical tools, and estimation.

The development of skill proficiencies in students is essential in the learning and application of mathematics. Although students should become competent in the various mathematical skills, over-emphasising procedural skills without understanding the underlying mathematical principles should be avoided.

Skill proficiencies include the ability to use technology confidently, where appropriate, for exploration and problem solving. It is important also to incorporate the use of thinking skills and heuristics in the process of developing skill proficiencies.

3.3 PROCESSES

Mathematical processes refer to the knowledge skills (or process skills) involved in the process of acquiring and applying mathematical knowledge. This includes reasoning, communication and connections, thinking skills and heuristics, and application and modelling.

Reasoning, communication and connections

Mathematical reasoning refers to the ability to analyse mathematical situations and construct logical arguments. It is a habit of mind that can be developed through the applications of mathematics in different contexts.

Communication refers to the ability to use mathematical language to express mathematical ideas and arguments precisely, concisely and logically. It helps students develop their own understanding of mathematics and sharpen their mathematical thinking.

Connections refer to the ability to see and make linkages among mathematical ideas, between mathematics and other subjects, and between mathematics and everyday life. This helps students make sense of what they learn in mathematics.

Mathematical reasoning, communication and connections should pervade all levels of mathematics learning, from the primary to A-levels.

Thinking skills and heuristics

Students should use various thinking skills and heuristics to help them solve mathematical problems. Thinking skills are skills that can be used in a thinking process, such as classifying, comparing, sequencing, analysing parts and wholes, identifying patterns and relationships, induction, deduction and spatial visualisation. Some examples of heuristics are listed below and grouped in four categories according to how they are used:

- To give a representation,
  e.g. draw a diagram, make a list, use equations
- To make a calculated guess,
  e.g. guess and check, look for patterns, make suppositions
- To go through the process,
  e.g. act it out, work backwards, before-after
- To change the problem,
  e.g. restate the problem, simplify the problem, solve part of the problem

Application and modelling

Application and modelling play a vital role in the development of mathematical understanding and competencies. It is important that students apply mathematical problem-solving skills and reasoning skills to tackle a variety of problems, including real-world problems.

Mathematical modelling is the process of formulating and improving a mathematical model to represent and solve real-world problems. Through mathematical modelling, students learn to use a variety of representations of data, and to select and apply appropriate mathematical methods and tools in solving real-world problems. The opportunity to deal with empirical data and use mathematical tools for data analysis should be part of the learning at all levels.

3.4 ATTITUDES

Attitudes refer to the affective aspects of mathematics learning such as:

- Beliefs about mathematics and its usefulness
- Interest and enjoyment in learning mathematics
- Appreciation of the beauty and power of mathematics
- Confidence in using mathematics
- Perseverance in solving a problem

Students' attitudes towards mathematics are shaped by their learning experiences. Making the learning of mathematics fun, meaningful and relevant goes a long way to inculcating positive attitudes towards the subject. Care and attention should be given to the design of the learning activities, to build confidence in and develop appreciation for the subject.

3.5 METACOGNITION

Metacognition, or "thinking about thinking", refers to the awareness of, and the ability to control one's thinking processes, in particular the selection and use of problem-solving strategies. It includes monitoring of one's own thinking, and self-regulation of learning.

The provision of metacognitive experience is necessary to help students develop their problem solving abilities. The following activities may be used to develop the metacognitive awareness of students and to enrich their metacognitive experience:

- Expose students to general problem solving skills, thinking skills and heuristics, and how these skills can be applied to solve problems.
- Encourage students to think aloud the strategies and methods they use to solve particular problems.
- Provide students with problems that require planning (before solving) and evaluation (after solving).
- Encourage students to seek alternative ways of solving the same problem and to check the appropriateness and reasonableness of the answer.
- Allow students to discuss how to solve a particular problem and to explain the different methods that they use for solving the problem.

PART B PRIMARY MATHEMATICS CURRICULUM

4 OBJECTIVES OF THE PRIMARY MATHEMATICS CURRICULUM PRIMARY 1 TO PRIMARY 4, PRIMARY 5 AND PRIMARY 6 (including Foundation Mathematics)

The objectives of the primary mathematics programme are to enable pupils to:

- Develop understanding of mathematical concepts:
  - Numerical
  - Geometrical
  - Statistical
  - Algebraic
- Recognise spatial relationships in two and three dimensions
- Recognise patterns and relationships in mathematics
- Use common systems of units
- Use mathematical language, symbols and diagrams to represent and communicate mathematical ideas
- Perform operations with
  - Whole numbers
  - Fractions
  - Decimals
- Use geometrical instruments
- Perform simple algebraic manipulation
- Use calculators
- Develop ability to perform mental calculation
- Develop ability to perform estimation
- Develop ability to check reasonableness of results
- Present and interpret information in written, graphical, diagrammatic and tabular forms
- Use mathematical concepts learnt to solve problems
- Use appropriate heuristics to solve problems
- Apply mathematics to everyday life problems
- Think logically and derive conclusions deductively
- Develop an inquiring mind through investigative activities
- Enjoy learning mathematics through a variety of activities

5 USE OF CALCULATOR AND TECHNOLOGY

Calculators and other technology tools are tools for learning and doing mathematics.

The introduction of calculators at P5 and P6 reflects a shift to give more focus to processes such as problem solving skills. The rationale for introducing calculators at the upper primary levels is to:

(1) Achieve a better balance between the emphasis on computational skills and problem solving skills in teaching and learning and in assessment
(2) Widen the repertoire of teaching and learning approaches to include investigations and problems in authentic situations
(3) Help students, particularly those with difficulty learning mathematics, develop greater confidence in doing mathematics

The introduction of calculators would not take away the importance of mental and manual computations. These skills are still emphasised as students need to have good number sense and estimation skills to check the reasonableness of answers obtained using the calculator.

The use of scientific calculators is encouraged, although only the basic keys are required. Students can continue to use the same calculator when they are in secondary schools.

There are many softwares and open tools that teachers can use to enhance the teaching and learning of mathematics. Basic word processing and spreadsheets skills would support the different strategies and activities that students could engage in. Technology also has an inherent motivating and empowering effect on students. Teachers and students should harness technology in the teaching and learning of mathematics.

6 SYLLABUS CONTENTS

6.1 PRIMARY 1

Topics/Sub-topics	Content
Primary 1	
1 WHOLE NUMBERS	
Numbers up to 100	Include: • counting to tell the number of objects in a given set, • comparing the number of objects in two or more sets, • use of ordinal numbers (first, second, up to tenth) and symbols (1st, 2nd, 3rd, etc.), • number notation and place values (tens, ones), • reading and writing numbers in numerals and in words, • comparing and ordering numbers, • number patterns. Exclude: • use of the terms 'cardinal number' and 'ordinal number', • use of the symbols > and <.
Addition and subtraction	Include: • concepts of addition and subtraction, • use of the addition symbol (+) or subtraction symbol (–) to write a mathematical statement for a given situation, • comparing two numbers within 20 to tell how much one number is greater (or smaller) than the other, • recognising the relationship between addition and subtraction, • building up the addition bonds up to 9 + 9 and committing to memory, • solving 1-step word problems involving addition and subtraction within 20, • addition of more than two 1-digit numbers, • addition and subtraction within 100 involving ∗ a 2-digit number and ones, ∗ a 2-digit number and tens, ∗ two 2-digit numbers, • addition and subtraction using formal algorithms.
Mental calculation	Include: • addition and subtraction within 20, • addition and subtraction involving ∗ a 2-digit number and ones without renaming, ∗ a 2-digit number and tens.

Topics/Sub-topics	Content
Primary 1	
Multiplication and division	Include: • multiplication as repeated addition (within 40), • use of the multiplication symbol (×) to write a mathematical statement for a given situation, • division of a quantity (not greater than 20) into equal sets: ∗ given the number of objects in each set, ∗ given the number of sets, • solving 1-step word problems with pictorial representation. Exclude: • use of multiplication tables, • use of the division symbol (÷).
2 MEASUREMENT	
Length and mass	Include: • measurement and comparison of the lengths/ masses of two or more objects in non-standard units, • use of the following terms: long, longer, longest short, shorter, shortest tall, taller, tallest high, higher, highest heavy, heavier, heaviest light, lighter, lightest Exclude finding the difference in length/ mass.
Time	Include telling and writing time to the hour/ half hour. Exclude 24-hour clock.
Money	Include: • identifying coins and notes of different denomination, • matching a coin/ note of one denomination to an equivalent set of coins/ notes of another denomination, • telling the amount of money ∗ in cents up to $1, ∗ in dollars up to $100. • use of the symbols $ and ¢, • solving word problems involving addition and subtraction of money in dollars only (or in cents only). Exclude combinations of dollars and cents.

Topics/Sub-topics	Content
Primary 1	
3 GEOMETRY	
Basic shapes: • rectangle • square • circle • triangle	Include: • identifying and naming the 4 basic shapes from 2-D and 3-D objects, • describing and classifying shapes.
Patterns	Include: • making/ completing patterns with 2-D cut-outs according to one or two of the following attributes ∗ shape ∗ size ∗ colour • making / completing patterns with 3-D models: ∗ cube ∗ cuboid (rectangular block) ∗ cone ∗ cylinder
4 DATA ANALYSIS	
Picture graphs	Include: • collecting and organising data, • making picture graphs, • use of a symbol/picture to represent one object, • reading and interpreting picture graphs in both horizontal and vertical forms. Exclude picture graphs with scales.

6.2 PRIMARY 2

Topics/Sub-topics	Content
Primary 2	
1 WHOLE NUMBERS	
Numbers up to 1000	Include: • counting in tens/ hundreds, • number notation and place values (hundreds, tens, ones), • reading and writing numbers in numerals and in words, • comparing and ordering numbers, • number patterns.
Addition and subtraction	Include: • addition and subtraction of numbers up to 3 digits, • solving up to 2-step word problems involving addition and subtraction.
Multiplication and division	Include: • building up the multiplication tables of 2, 3, 4, 5 and 10 and committing to memory, • use of the division symbol (÷) to write a mathematical statement for a given situation, • recognising the relationship between multiplication and division, • multiplication and division within the multiplication tables, • solving 1-step word problems involving multiplication and division within the multiplication tables. Exclude division with remainder.
Mental calculation	Include • addition and subtraction involving ∗ a 3-digit number and ones, ∗ a 3-digit number and tens, ∗ a 3-digit number and hundreds. • multiplication and division within the multiplication tables of 2, 3, 4, 5 and 10.
2 FRACTIONS	
Fraction of a whole	Include: • interpretation of fraction as part of a whole, • reading and writing fractions, • comparing and ordering ∗ unit fractions, ∗ like fractions. (Denominators of given fractions should not exceed 12.) Exclude fraction of a set of objects.

Topics/Sub-topics	Content
Primary 2	
Addition and subtraction	Include addition and subtraction of like fractions within one whole. (Denominators of given fractions should not exceed 12.)
3 MEASUREMENT	

Length, mass and volume	Include:
	• estimation and measurement of
	  ∗ length in metres/ centimetres,
	  ∗ mass in kilograms/ grams,
	  ∗ volume of liquid in litres,
	• drawing a straight line of given length,
	• use of the appropriate measures and their abbreviations cm, m, g, kg, ℓ,
	• comparing
	  ∗ lengths,
	  ∗ masses,
	  ∗ volumes,
	• solving word problems involving length/ mass/ volume.
	
	Exclude:
	• conversion of units,
	• measurement in compound units,
	• capacity of container,
	• volume of solid.

Time	Include: • telling and writing time to 5 minutes, • use of 'a.m.' and 'p.m.', • use of abbreviations h and min, • drawing hands on the clock face to show time, • duration of one hour/ half hour from an o'clock time. Exclude finding the duration of a time interval.
Money	Include: • counting the amount of money in a given set of notes and coins, • reading and writing money in decimal notation, • comparing two or three amounts of money, • converting an amount of money in decimal notation to cents only, and vice versa, • solving word problems involving money in dollars only (or in cents only).

Topics/Sub-topics	Content
Primary 2	
4 GEOMETRY	

2-D and 3-D figures	Include:
	• identifying, naming and describing
	  ∗ semicircle
	  ∗ quarter circle,
	• identifying the basic shapes that make up a given figure,
	• forming different 2-D figures with cut-outs of
	  ∗ rectangle
	  ∗ square
	  ∗ triangle
	  ∗ semicircle
	  ∗ quarter circle,
	• forming different 3-D figures with concrete models of
	  ∗ cube
	  ∗ cuboid
	  ∗ cone
	  ∗ cylinder,
	• copying figures on dot grid or square grid.

Patterns	Include making/ completing patterns with 2-D cut-outs according to one or two of the following attributes ∗ shape ∗ size ∗ orientation ∗ colour
Line, curve and surface	Include: • identifying lines (straight lines) and curves, • identifying flat faces of a 3-D object.
5 DATA ANALYSIS	
Picture graphs	Include: • making picture graphs with scales, • reading and interpreting picture graphs with scales, • solving problems using information presented in picture graphs. Exclude use of an incomplete symbol/picture.

6.3 PRIMARY 3

Topics/Sub-topics	Content
Primary 3	
1 WHOLE NUMBERS	
Numbers up to 10 000	Include: • number notation and place values (thousands, hundreds, tens, ones), • reading and writing numbers in numerals and in words, • comparing and ordering numbers, • odd and even numbers, • number patterns.
Addition and subtraction	Include: • addition and subtraction of numbers up to 4 digits, • use of the terms 'sum' and 'difference', • solving up to 2-step word problems involving addition and subtraction.
Multiplication and division	Include: • building up the multiplication tables of 6, 7, 8 and 9 and committing to memory, • use of the terms 'product', 'quotient' and 'remainder', • multiplication and division within the multiplication tables, • division with remainder, • multiplication and division of numbers up to 3 digits by 1 digit, • solving up to 2-step word problems involving the 4 operations.
Mental calculation	Include: • addition and subtraction involving two 2-digit numbers, • multiplication and division within the multiplication tables.
2 FRACTIONS	
Equivalent fractions	Include: • recognising and naming equivalent fractions, • listing the first 8 equivalent fractions of a given fraction, • writing the equivalent fraction of a fraction given the denominator or the numerator, • expressing a fraction in its simplest form, • comparing fractions with respect to half, • comparing and ordering unlike fractions. (Denominators of given fractions should not exceed 12.)

Topics/Sub-topics	Content
Primary 3	
Addition and subtraction	Include addition and subtraction of two related fractions within one whole. (Denominators of given fractions should not exceed 12.)
3 MEASUREMENT	

Length, mass and volume	Include:
	• measurement of
	  ∗ length in kilometres (km),
	  ∗ volume of liquid in millilitres (ml),
	• measurement of length/ mass/ volume (of liquid) in compound units,
	• conversion of a measurement in compound units to the smaller unit, and vice versa,
	  ∗ kilometres and metres,
	  ∗ metres and centimetres,
	  ∗ kilograms and grams,
	  ∗ litres and millilitres.
	• solving word problems involving length/ mass/ volume/ capacity.
	
	Exclude the 4 operations and word problems involving compound units.

Time	Include: • telling and writing time to 1 minute, • use of the terms 'past' and 'to', e.g. '10 minutes past 5' and '15 minutes to 12', • measurement of time in hours and minutes, • conversion of time in hours and minutes to minutes only, and vice versa, • finding the duration of a time interval, • finding the starting time/ finishing time, • solving word problems involving addition and subtraction of time given in hours and minutes.
Money	Include: • addition and subtraction of money in decimal notation, • solving word problems involving addition and subtraction of money in decimal notation.

Topics/Sub-topics	Content
Primary 3	
Area and perimeter	Include: • concepts of area and perimeter of a plane figure, • measurement of area in square units, • measurement of area in square centimetres (cm^2) / square metres (m^2), • calculation of the perimeter of ∗ rectilinear figure ∗ rectangle ∗ square • use of formula to calculate the area of a rectangle/ square, • solving word problems involving the area/ perimeter of squares and rectangles. Exclude conversion between cm^2 and m^2.
4 GEOMETRY	
Perpendicular and parallel lines	Include: • identifying and naming perpendicular and parallel lines, • drawing perpendicular and parallel lines on square grids.
Angles	Include: • angle as an amount of turning, • identifying angles in 2-D and 3-D objects, • identifying angles in 2-D figures, • identifying right angles, angles greater than/ smaller than a right angle. Exclude use of the terms ‘acute’, ‘obtuse’ and 'reflex’ angles.
5 DATA ANALYSIS	
Bar graphs	Include: • reading and interpreting bar graphs in both horizontal and vertical forms, • reading scales, • completing a bar graph from given data, • solving problems using information presented in bar graphs.

6.4 PRIMARY 4

Topics/Sub-topics	Content
Primary 4	
1 Whole Numbers	
Numbers up to 100 000	Include: • number notation and place values (ten thousands, thousands, hundreds, tens, ones), • reading and writing numbers in numerals and in words, • comparing and ordering numbers, • number patterns, • rounding off numbers to the nearest 10 or 100, • use of the approximation symbol (≈).
Multiplication and division	Include: • multiplication of a 4-digit number by a 1-digit number, • multiplication of a 3-digit number by a 2-digit number, • division of a 4-digit number by a 1-digit number, • solving up to 3-step word problems involving the 4 operations, • estimation of answers in calculations involving the 4 operations, • checking reasonableness of answers.
Factors and multiples	Include: • determining if a 1-digit number is a factor of a given number, • listing all factors of a given number up to 100, • finding the common factors of two given numbers, • recognising the relationship between factor and multiple, • determining if a number is a multiple of a given 1-digit number, • listing the first 12 multiples of a given 1-digit number, • finding the common multiples of two given 1-digit numbers. Exclude 'highest common factor' (H.C.F.) and 'lowest common multiple' (L.C.M.).
2 FRACTIONS	
Mixed numbers and improper fractions	Include: • concepts of mixed numbers and improper fractions, • expressing an improper fraction as a mixed number, and vice versa, • expressing an improper fraction/mixed number in its simplest form. (Denominators of given fractions should not exceed 12.)

Topics/Sub-topics	Content
Primary 4	
Addition and subtraction	Include addition and subtraction of ∗ like fractions, ∗ related fractions. (Denominators of given fractions should not exceed 12.) Exclude calculations involving more than 2 different denominators.
Fraction of a set of objects	Include interpretation of fraction as part of a set of objects.
Multiplication	Include: • multiplication of a proper/improper fraction and a whole number, • solving up to 2-step word problems involving addition, subtraction and multiplication, • using unitary method to find the whole given a fractional part.
3 DECIMALS	
Decimals up to 3 decimal places	Include: • notation and place values (tenths, hundredths, thousandths), • identifying the values of the digits in a decimal, • use of the number line to display decimals, • comparing and ordering decimals, • conversion of a decimal to a fraction, • conversion of a fraction whose denominator is a factor of 10 or 100 to a decimal, • rounding off decimals to ∗ the nearest whole number, ∗ 1 decimal place, ∗ 2 decimal places.
Addition and subtraction	Include: • addition and subtraction of decimals (up to 2 decimal places), • estimation of answers in calculations, • checking reasonableness of answers.

Topics/Sub-topics	Content
Primary 4	
Multiplication and division	Include: • division of a whole number by a whole number with answer in decimal form, • multiplication and division of decimals (up to 2 decimal places) by a 1-digit whole number, • solving up to 2-step word problems involving the 4 operations, • rounding off answers to a specified degree of accuracy, • estimation of answers in calculations, • checking reasonableness of answers.
4 MEASUREMENT	
Time	Include: • measurement of time in seconds (s), • 24-hour clock, • solving word problems involving time in 24-hour clock.
Money	Include: • multiplication and division of money in decimal notation, • solving word problems involving the 4 operations of money in decimal notation.
Area and perimeter	Include: • finding the area of a composite figure made up of rectangles and squares, • finding one dimension of a rectangle given the other dimension and its area/ perimeter, • finding the length of one side of a square given its area/ perimeter, • solving word problems involving the area/ perimeter of squares and rectangles. Exclude use of the symbol $\sqrt{\ }$.
5 GEOMETRY	
Perpendicular and parallel lines	Include: • drawing of perpendicular and parallel lines using ruler and set squares, • use of the terms ‘vertical’ and ‘horizontal’.

Topics/Sub-topics	Content
Primary 4	
Angles	Include: • using notation such as $\angle ABC$ and $\angle x$ to name angles, • estimation and measurement of angles in degrees, • drawing an angle using a protractor, • associating $\frac{1}{4}$ turn/ right angle with 90^o $\frac{1}{2}$ turn with 180^o $\frac{3}{4}$ turn with 270^o a complete turn with 360^o • 8-point compass. Exclude: • drawing and measuring reflex angles, • use of the notation $x°$.
Rectangle and square	Include: • properties of rectangle and square, • finding unknown angles. Exclude: • the term 'diagonal' and its related properties, • finding angles involving additional construction of lines.
Symmetry	Include: • identifying symmetric figures, • determining whether a straight line is a line of symmetry of a symmetric figure, • completing a symmetric figure with respect to a given horizontal/vertical line of symmetry, • designing and making patterns. Exclude: • finding the number of lines of symmetry of a symmetric figure, • rotational symmetry.
Tessellation	Include: • recognising shapes that can tessellate, • identifying the unit shape in a tessellation, • making different tessellations with a given shape, • drawing a tessellation on dot paper, • designing and making patterns.

Topics/Sub-topics	Content
Primary 4	
6 DATA ANALYSIS	
Tables	Include: • completing a table from given data, • reading and interpreting tables, • solving problems using information presented in tables.
Line graphs	Include: • reading and interpreting line graphs, • solving problems using information presented in line graphs. Exclude the distance-time graph.

6.5 PRIMARY 5

Topics/Sub-topics	Content
Primary 5 (Calculator is allowed unless otherwise stated.)	
1 WHOLE NUMBERS	
Numbers up to 10 million	Include: • reading and writing numbers in numerals and in words, • rounding off numbers to the nearest 1000.
Four operations	Include: • multiplication and division by tens, hundreds and thousands **without using calculators**, • solving word problems involving the 4 operations, • estimation of answers in calculations, • checking reasonableness of answers.
Order of operations	Include: • combined operations involving the 4 operations, • use of brackets.
2 FRACTIONS	
Concept of fraction as division	Include: • association of a fraction with division, • conversion between fractions and decimals.
Four operations	Include • * addition and subtraction of proper fractions **without using calculators**, • * addition and subtraction of mixed numbers, • multiplication of a proper fractions and a proper/ improper fraction **without using calculators**, • multiplication of an improper fraction and an improper fraction, • multiplication of a mixed number and a whole number, • division of a proper fraction by a whole number **without using calculators**, • solving word problems involving the 4 operations. Exclude: • calculations involving more than 2 different denominators, • multiplication of a mixed number by a proper fraction/improper fraction/mixed number, • division of an improper fraction/mixed number by a whole number/ proper fraction. • division by an improper fraction/ mixed number * (Denominators of given fractions should not exceed 12, for calculations without using calculators.)

Topics/Sub-topics	Content
Primary 5 (Calculator is allowed unless otherwise stated.)	
3 DECIMALS	
Four operations	Include: • multiplication and division of decimals (up to 3 decimal places) by tens, hundreds and thousands **without using calculators**, • solving word problems involving the 4 operations, • rounding off answers to a specified degree of accuracy, • estimation of answers in calculations, • checking reasonableness of answers. Exclude multiplication and division by a decimal.
4 PERCENTAGE	
Percentage	Include: • expressing a part of a whole as a percentage, • use of the percentage symbol (%), • writing fractions and decimals as percentages, and vice versa, • finding a percentage part of a whole, • solving up to 2-step word problems involving percentage, • discount, GST and annual interest. Exclude: • expressing one quantity as a percentage of another, e.g. "*A* is 60% of *B*". • comparison of two quantities by percentage, e.g. " *A* is 20% more than *B*."
5 RATIO	
Ratio	Include: • interpretation of $a : b$ and $a : b : c$, where a, b and c are whole numbers, • writing equivalent ratios, • expressing a ratio in its simplest form, • finding the ratio of two or three given quantities, • finding the missing term in a pair of equivalent ratios, • finding one quantity given the other quantity and their ratio, • solving up to 2-step word problems involving ratio. Exclude ratios involving fractions and decimals.

Topics/Sub-topics	Content
Primary 5 (Calculator is allowed unless otherwise stated.)	
6 MEASUREMENT	
Length, mass and volume	Include: • conversion of a measurement from a smaller unit to a larger unit in decimal form, and vice versa, ∗ kilometres and metres ∗ metres and centimetres ∗ kilograms and grams ∗ litres and millilitres
Area of triangle	Include: • identifying the base of a triangle and its corresponding height, • use of formula to calculate the area of a triangle. Exclude finding the base/ height of a triangle given its area.
Volume of cube and cuboid	Include: • building solids with unit cubes, • measurement of volume in cubic units, • drawing cubes and cuboids on an isometric grid, • measurement of volume in cubic centimetres (cm^3)/ cubic metres (m^3), • use of formula to calculate the volume of a cube/ cuboid, • finding the volume of liquid in a rectangular tank, • conversion between ℓ, ml and cm^3, • solving up to 3-step word problems involving the volume of a cube/ cuboid. Exclude conversion between cm^3 and m^3.
7 GEOMETRY	
Angles	Include use of the following properties to find unknown angles: ∗ angles on a straight line, ∗ angles at a point, ∗ vertically opposite angles.

Topics/Sub-topics	Content
Primary 5 (Calculator is allowed unless otherwise stated.)	

Triangle	Include:
	• identifying and naming the following types of triangles
	  ∗ isosceles triangle,
	  ∗ equilateral triangle,
	  ∗ right-angled triangle,
	• use of the property that the angle sum of a triangle is 180^{o},
	• finding unknown angles,
	• drawing a triangle from given dimensions using ruler, protractor and set squares.
	
	Exclude:
	• geometrical construction where the use of compasses is required,
	• finding angles involving additional construction of lines,
	• exterior angles.

Parallelogram, rhombus and trapezium	Include: • identifying and naming parallelogram, rhombus and trapezium, • properties of parallelogram, rhombus and trapezium, • finding unknown angles, • drawing a square/rectangle/parallelogram/rhombus/trapezium from given dimensions using ruler, protractor and set squares. Exclude: • the term 'diagonal' and its related properties, • geometrical construction where the use of compasses is required, • finding angles involving additional construction of lines.
8 DATA ANALYSIS	
Average of a set of data	Include: • interpretation of average as "total amount ÷ number of items", • calculation of the average number/quantity, • finding the total amount given the average and the number of items, • solving word problems involving average.

6.6 PRIMARY 6

Topics/Sub-topics	Content
Primary 6 (Calculator is allowed unless otherwise stated.)	
1 FRACTIONS	
Four operations	Include division of a whole number/proper fraction by a proper fraction **without using calculators.** Exclude: • division of an improper fraction/mixed number by a proper fraction, • division by an improper fraction/mixed number.
2 PERCENTAGE	
Percentage	Include: • finding the whole given a part and the percentage, • finding percentage increase/decrease, • solving word problems involving percentage. Exclude finding percentage profit/loss.
3 RATIO	
Ratio	Include: • expressing one quantity as a fraction of another, given their ratio, and vice versa, • finding how many times one quantity is as large as another, given their ratio, and vice versa, • expressing one quantity as a fraction of another given the two quantities, • finding the whole/ one part when a whole is divided into parts in a given ratio, • solving word problems involving 2 pairs of ratios.
4 SPEED	
Distance, time and speed	Include: • concepts of speed and average speed, • relationship between distance, time and speed ∗ Distance = Speed × Time, ∗ Speed = Distance ÷ Time, ∗ Time = Distance ÷ Speed, • calculation of speed, distance or time given the other two quantities, • writing speed in different units such as km/h, m/min, m/s and cm/s, • solving up to 3-step word problems involving speed and average speed. Exclude conversion of units, e.g. km/h to m/min.

Topics/Sub-topics	Content
Primary 6 (Calculator is allowed unless otherwise stated.)	
5 MEASUREMENT	
Area and circumference of circle	Include: • use of formulae to calculate the area and circumference of a circle, • finding the area and perimeter of ∗ semicircle (half circle) ∗ quarter circle • solving word problems involving area and perimeter. Exclude finding the radius/ diameter of a circle given its area or circumference.
Area and perimeter of composite figure	Include finding the area and perimeter of a figure made up of some of the following shapes: square, rectangle, triangle, semicircle and quarter circle.
Volume of cube and cuboid	Include: • finding one dimension of a cuboid given its volume and the other dimensions, • finding the length of one edge of a cube given its volume, • finding the height of a cuboid given its volume and base area, • finding the area of a face of a cuboid given its volume and one dimension, • use of the symbols $\sqrt{\ }$ and $\sqrt[3]{\ }$, • solving word problems involving volume of a cube/ cuboid.
6 GEOMETRY	
Geometrical figures	Include finding unknown angles in geometrical figures involving square, rectangle, parallelogram, rhombus, trapezium and triangle.
Nets	Include: • 2-D representation of cube, cuboid, cone, cylinder, prism and pyramid, • identifying nets of the following solids ∗ cube, ∗ cuboid, ∗ prism, ∗ pyramid, • identifying the solid which can be formed by a given net, • making 3-D solids from given nets. Exclude nets of cylinder and cone.

Topics/Sub-topics	Content
Primary 6 (Calculator is allowed unless otherwise stated.)	
7 DATA ANALYSIS	
Pie charts	Include: • reading and interpreting pie charts, • solving 1-step problems using information presented in pie charts. Exclude use of degrees for calculation.
8 ALGEBRA	
Algebraic expressions in one variable	Include: • representation of an unknown number using a letter, • simple algebraic expressions such as $y \pm 2$, $6 \pm y$ $y + y$ $3y$ $\frac{y}{2}$ $\frac{3 \pm y}{5}$ • interpreting ∗ $3y$ as $y + y + y$ or $3 \times y$ ∗ $\frac{y}{2}$ as $y \div 2$ or $\frac{1}{2} \times y$ ∗ $\frac{3 \pm y}{5}$ as $(3 \pm y) \div 5$ or $\frac{1}{5} \times (3 \pm y)$ • simplification of algebraic expressions, • evaluation of simple algebraic expressions by substitution, • solving word problems involving algebraic expressions. Exclude: • evaluation of expressions involving variable in the denominator such as $\frac{1}{x}$, • simplification of expressions involving ∗ fractional coefficients ∗ brackets

6.7 PRIMARY 5 FOUNDATION MATHEMATICS

Topics/Sub-topics	Content
Primary 5 Foundation Mathematics (Calculator is allowed unless otherwise stated)	
1 Whole Numbers	
Numbers up to 10 million	Include: • reading and writing numbers in numerals and in words, • comparing and ordering numbers up to 100 000, • rounding off numbers to the nearest 10, 100 or 1000.
Four operations	Include: • addition and subtraction involving two 3-digit numbers **without using calculators**, • multiplication and division of a 2-digit number by a 1-digit number **without using calculators**, • solving up to 3-step word problems involving the 4 operations, • estimation of answers in calculations, • checking reasonableness of answers.
Mental calculation	Include • addition and subtraction involving a 3-digit number and ones, tens or hundreds **without using calculators**, • multiplication and division within the multiplication tables **without using calculators**.
Factors and multiples	Include: • determining if a 1-digit number is a factor of a given number, • listing all factors of a given number up to 100, • finding the common factors of two given numbers, • recognising the relationship between factor and multiple, • determining if a number is a multiple of a given 1-digit number, • listing the first 12 multiples of a given 1-digit number, • finding the common multiples of two given numbers up to 12. Exclude 'highest common factor' (H.C.F.) and 'lowest common multiple' (L.C.M.).
Order of operations	Include: • combined operations involving the 4 operations, • use of brackets.

Topics/Sub-topics	Content
Primary 5 Foundation Mathematics (Calculator is allowed unless otherwise stated)	
2 FRACTIONS	
Concepts of fractions	Include: • fraction of a whole, • fraction of a set of objects.
Equivalent fractions	Include: • recognising and naming equivalent fractions, • listing the first 8 equivalent fractions of a given fraction, • writing the equivalent fraction of a fraction given the denominator or the numerator, • expressing a fraction in its simplest form, • comparing fractions with respect to half, • comparing and ordering unlike fractions. (Denominators of given fractions should not exceed 12.)
Mixed numbers and improper fractions	Include: • expressing an improper fraction as a mixed number, and vice versa, • expressing an improper fraction/mixed number in its simplest form. (Denominators of given fractions should not exceed 12.)
Four operations	Include: • * addition and subtraction of proper fractions **without using calculators**, • addition and subtraction of mixed numbers, • multiplication of a proper/improper fraction and a whole number **without using calculators**, • multiplication of two proper/improper fractions, • solving up to 2-step word problems involving addition, subtraction and multiplication, • using unitary method to find the whole given a fractional part. Exclude: • calculations involving more than 2 different denominators • multiplication involving mixed numbers. * (Denominators of given fractions should not exceed 12, for calculations without using calculators)

Topics/Sub-topics	Content
Primary 5 Foundation Mathematics (Calculator is allowed unless otherwise stated)	
3 DECIMALS	
Decimals up to 3 decimal places	Include: • notation and place values (tenths, hundredths, thousandths), • identifying the values of the digits in a decimal, • use of the number line to display decimals, • comparing and ordering decimals, • conversion of a decimal to a fraction, • conversion of a fraction whose denominator is a factor of 10 or 100 to a decimal, • rounding off decimals to ∗ the nearest whole number, ∗ 1 decimal place, ∗ 2 decimal places.
Addition and subtraction	Include: • addition and subtraction of decimals (up to 2 decimal places) **without using calculators,** • estimation of answers in calculations, • checking reasonableness of answers, • solving up to 2-step word problems involving addition and subtraction (including problems involving money).
4 MEASUREMENT	
Length, mass and volume	Include conversion of a measurement from a smaller unit to a larger unit in decimal form, and vice versa, ∗ kilometres and metres ∗ metres and centimetres ∗ kilograms and grams ∗ litres and millilitres
Time	Include: • finding the duration of a time interval, • 24-hour clock, • solving up to 3-step word problems involving addition and subtraction of time given in hours and minutes.

Topics/Sub-topics	Content
Primary 5 Foundation Mathematics (Calculator is allowed unless otherwise stated)	
Area and perimeter	Include: • finding the perimeter of a rectilinear figure, • finding the area of a figure made up of rectangles and squares, • finding one dimension of a rectangle given the other dimension and its area/ perimeter, • finding the length of one side of a square given its area/ perimeter, • solving up to 3-step word problems involving the area/ perimeter of squares and rectangles.
Volume of cube and cuboid	Include: • building solids with unit cubes, • measurement of volume in cubic units, • drawing cubes and cuboids on an isometric grid, • measurement of volume in cubic centimetres (cm^3)/ cubic metres (m^3), Exclude conversion between cm^3 and m^3.
5 GEOMETRY	
Perpendicular and parallel lines	Include: • identifying and naming perpendicular and parallel lines • drawing of perpendicular and parallel lines using ruler and set squares, • use of the terms 'vertical' and 'horizontal'.

Angles	Include:
	• using notation such as $\angle$ABC and $\angle x$ to name angles,
	• estimation and measurement of angles in degrees,
	• drawing an angle using a protractor,
	• use of the following properties to find unknown angles
	  * angles on a straight line,
	  * angles at a point,
	  * vertically opposite angles.
	
	Exclude:
	• drawing and measuring reflex angles,
	• use of the notation $x°$.

Rectangle and square	Include: • properties of rectangle and square, • drawing a rectangle/square from given dimensions using ruler, protractor and set squares, Exclude the term 'diagonal' and its related properties.

Topics/Sub-topics	Content
Primary 5 Foundation Mathematics (Calculator is allowed unless otherwise stated)	
6 DATA ANALYSIS	
Tables, bar graphs, line graphs	Include: • reading and interpreting tables, bar graphs and line graphs, • completing a table/ bar graph from given data, • solving problems using information presented in tables/ bar graphs/ line graphs.
Average of a set of data	Include: • interpretation of average as "total amount ÷ number of items", • calculation of the average number/ quantity, • finding the total amount given the average and the number of items, • solving up to 3-step word problems involving average.

6.8 PRIMARY 6 FOUNDATION MATHEMATICS

Topics/Sub-topics	Content
Primary 6 Foundation Mathematics (Calculator is allowed unless otherwise stated)	
1 FRACTIONS	
Concept of fraction as division	Include: • association of a fraction with division, • conversion between fractions and decimals.
Division	Include: • division of a whole number/proper fraction by a whole number/proper fraction, • solving up to 3-step word problems involving the 4 operations. Exclude: • division of an improper fraction/mixed number by a whole number/proper fraction, • division by an improper fraction/mixed number.
2 DECIMALS	
Multiplication and division	Include: • multiplication and division of decimals (up to 2 decimal places) by a 1-digit whole number **without using calculators,** • division of a whole number by a whole number with answer in decimal form, • solving up to 3-step word problems involving the 4 operations (including problems involving money), • rounding off answers to a specified degree of accuracy, • estimation of answers in calculations, • checking reasonableness of answers. Exclude multiplication and division by a decimal.

Topics/Sub-topics	Content
Primary 6 Foundation Mathematics (Calculator is allowed unless otherwise stated)	
3 PERCENTAGE	
Percentage	Include: • expressing a part of a whole as a percentage, • use of the percentage symbol (%), • writing fractions and decimals as percentages, and vice versa, • finding a percentage part of a whole, • solving up to 2-step word problems involving percentage, • discount, GST and annual interest. Exclude: • finding percentage profit/loss, • finding percentage increase/ decrease, • expressing one quantity as a percentage of another, e.g. "*A* is 60% of *B*", • comparison of two quantities by percentage, e.g. " *A* is 20% more than *B*."
4 MEASUREMENT	
Area of triangle	Include: • identifying the base of a triangle and its corresponding height, • use of formula to calculate the area of a triangle. Exclude finding the base/ height of a triangle given its area.
Area and perimeter of composite figure	Include finding the area and perimeter of a figure made up of some of the following shapes: square, rectangle and triangle.
Volume of cube and cuboid	Include: • use of formula to calculate the volume of a cube/ cuboid, • finding the volume of liquid in a rectangular tank, • conversion between ℓ, ml and cm^3, • solving up to 3-step word problems involving the volume of a cube/ cuboid.

Topics/Sub-topics	Content
Primary 6 Foundation Mathematics (Calculator is allowed unless otherwise stated)	
5 GEOMETRY	
Triangle	Include: • identifying and naming the following types of triangles ∗ isosceles triangle, ∗ equilateral triangle, ∗ right-angled triangle, • use of the property that the angle sum of a triangle is 180^{o}, • drawing a triangle from given dimensions using ruler, protractor and set squares. Exclude: • geometrical construction where the use of compasses is required, • exterior angles.
Angles in geometric figures	Include finding unknown angles in geometrical figures using the properties of: * angles on a straight line, * angles at a point, * vertically opposite angles, * a square, a rectangle and a triangle. Exclude: • properties related to diagonals of square and rectangle, • finding angles involving additional construction of lines.
6 DATA ANALYSIS	
Pie charts	Include: • reading and interpreting pie charts, • solving 1-step problems using information presented in pie charts. Exclude use of degrees for calculation.