MATHEMATICS SYLLABUS

Primary One to Six

Implementation starting with
2021 Primary One Cohort

Ministry of Education
SINGAPORE

Year of Implementation from 2021

Content

[1] In 2025, the 2021 primary mathematics syllabus applies to Primary 1 to Primary 5 only. Students in Primary 6 will continue to use the 2013 syllabus. The 2021 mathematics syllabus will be applicable to Primary 6 from 2026 onwards.

Section 1: Introduction

Importance of Learning Mathematics

Primary Mathematics Curriculum

Key Focus Areas

1. INTRODUCTION

Importance of Learning Mathematics

Mathematics contributes to the development and understanding in many disciplines and provides the foundation for many of today's innovations and tomorrow's solutions. It also underpins many aspects of our everyday activities, from making sense of information around us to making informed decisions about personal finances.

Primary Mathematics Curriculum

Primary education is a stage where students acquire important basic numeracy as well as develop logical reasoning and problem-solving skills that are required in many disciplines. It lays the foundation for the learning of mathematics for all students, equipping them with a tool for everyday life and the knowledge and skills for learning mathematics at the next level. It is also a stage where students' confidence and interest in the subject are built and their attitudes towards the discipline are shaped.

For these reasons, the Primary Mathematics Syllabus aims to enable all students to:

- acquire mathematical concepts and skills for everyday use and continuous learning in mathematics;
- develop thinking, reasoning, communication, application and metacognitive skills through a mathematical approach to problem solving; and
- build confidence and foster interest in mathematics.

The Primary Mathematics Syllabus assumes no formal learning of mathematics. However, early numeracy skills such as matching, counting, sorting, comparing and recognising simple patterns are useful in providing a good grounding for students to begin learning at Primary 1 (P1).

The P1-4 syllabus is common to all students. The P5-6 Standard Mathematics syllabus continues the development of the P1-4 syllabus whereas the P5-6 Foundation Mathematics syllabus re-visits some of the important concepts and skills in the P1-4 syllabus. The new concepts and skills introduced in Foundation Mathematics is a subset of the Standard Mathematics syllabus.

Key Focus Areas

The previous syllabus emphasised the development of critical mathematical processes such as reasoning and communication. It made explicit the learning experiences that students should have in the course of learning because how students experience the learning of mathematics is critical in the development of these processes.

The revised syllabus builds on this effort to further improve the teaching and learning of mathematics at the primary level and to ensure that the curriculum remains relevant and continues to prepare students well for learning of mathematics at the secondary level.

Key focus areas of this revised syllabus:

1. Continue to develop critical mathematical processes that support the development of 21st century competencies;

2. Develop a greater awareness of the big ideas in mathematics that will deepen students' understanding and appreciation of mathematics; and

3. Give greater emphasis to the development of metacognition to promote self-directed learning and reflection.

Section 2: Mathematics Curriculum

Nature of Mathematics

Themes and Big Ideas

Mathematics Curriculum Framework

Mathematics and 21st Century Competencies

2. MATHEMATICS CURRICULUM

Nature of Mathematics

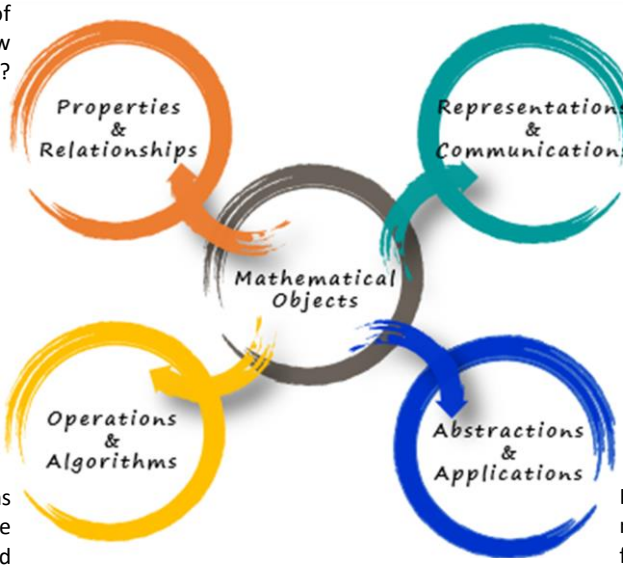
Mathematics can be described as a study of the *properties*, *relationships*, *operations*, *algorithms*, and *applications* of numbers and spaces at the very basic levels, and of abstract objects and concepts at the more advanced levels. Mathematical objects and concepts, and related knowledge and methods, are products of insight, logical reasoning and creative thinking, and are often inspired by problems that seek solutions. *Abstractions* are what make mathematics a powerful tool for solving problems. Mathematics provides within itself a language for *representing* and *communicating* the ideas and results of the discipline.

Themes and Big Ideas

From the above description of the nature of mathematics, four recurring *themes* in the study of mathematics are derived.

What are the properties of mathematical objects and how are they related?

How can the mathematical objects and concepts be represented and communicated within and beyond the discipline?



What meaningful actions can we perform on the mathematical objects and how do we carry them out?

How can the mathematical objects be further abstracted and where can they be applied?

1. ***Properties and Relationships*****:** What are the properties of mathematical objects and how are they related?

   Properties of mathematical objects (e.g. numbers, lines, figures etc.) are either inherent in their definitions (e.g. geometrical properties of shapes) or derived through logical argument and rigorous proof. *Relationships* exist between mathematical objects. They include the proportional relationship between two quantities and the equivalence of two expressions or statements. Understanding *properties and relationships* enable us to gain deeper insights into the mathematical objects and use them to model and solve real-world problems.

2. ***Operations and Algorithms*****:** What meaningful actions can we perform on the mathematical objects and how do we carry them out?

   Operations are meaningful actions performed on mathematical objects. They include arithmetic operations, algebraic manipulations, geometric transformations and many more. *Algorithms* are generalised sequences of well-defined smaller steps to perform a mathematical operation or to solve a problem. Some examples are adding or multiplying two numbers and finding factors and multiples. Understanding the meaning of these *operations and algorithms* and how to carry them out enable us to solve problems mathematically.

3. ***Representations and Communications*****:** How can the mathematical objects and concepts be represented and communicated within and beyond the discipline?

   Representations are integral to the language of mathematics. They include symbols, notations, and diagrams such as tables, graphs, charts and geometrical figures that are used to express mathematical concepts, properties and operations in a way that is precise and universally understood. *Communication* of mathematics is necessary for the understanding and dissemination of knowledge within the community of practitioners as well as general public. It includes clear presentation of mathematical statements as well as choosing appropriate representations (e.g. list, chart, drawing) to communicate mathematical ideas that can be understood by the masses.

4. ***Abstractions and Applications*:** How can the mathematical objects be further abstracted and where can they be applied?

   Abstraction is at the core of mathematical thinking. Working with numbers without units is an example of abstraction. The processes of abstraction make visible the structure and rich connections within mathematics and makes mathematics a powerful tool. *Application* of mathematics is made possible by abstractions. From simple counting to complex modelling, the abstract mathematical objects, properties, operations, relationships and representations can be used to model and study real-world phenomena.

Big ideas express ideas that are central to mathematics. They appear in different topics and strands. There is a continuation of the ideas across levels. They bring coherence and show connections across different topics, strands and levels. The big ideas in mathematics could be about one or more themes, that is, it could be about *properties and relationships* of mathematical objects and concepts and the *operations and algorithms* involving these objects and concepts, or it could be about *abstractions and applications* alone. Understanding the big ideas brings one closer to appreciating the nature of mathematics.

Six clusters of big ideas are listed in this syllabus. These are not meant to be authoritative or comprehensive. They relate to the four themes that cut across and connect concepts from the different content strands, and some big ideas extend across and connect more concepts than others. Each cluster of big ideas is represented by a label e.g. big ideas about Equivalence, big ideas about Proportionality, etc.

Big Ideas about Diagrams

Main Themes: Representations and Communications

Diagrams are succinct, visual representations of real-world or mathematical objects that serve to communicate properties of the objects and facilitate problem solving. Understanding what different diagrams represent, their features and conventions, and how they are constructed help to facilitate the study and communication of important mathematical results.

Big Ideas about Equivalence

Main Themes: Properties and Relationships, Operations and Algorithms

Equivalence is a relationship that expresses the 'equality' of two mathematical objects that may be represented in two different forms. The conversion from one form to another equivalent form is the basis of many manipulations for analysing, comparing, and finding solutions. In every statement about equivalence, there is a mathematical object (e.g. a number, an expression or an equation) and an equivalence criterion (e.g. value(s) or part-whole relationships).

Big Ideas about Invariance

Main Themes: Properties and Relationships, Operations and Algorithms

Invariance refers to a property of a mathematical object which remains unchanged when the object undergoes some form of transformation. Many mathematical results are about invariance. These are sometimes expressed as a general property of a class of objects. In each instance, there is a mathematical object (e.g. a sequence of numbers, a geometrical figure or a set of numerical data), there is an action (e.g. re-arrangement or manipulation), and there is a property of the mathematical object that does not change.

Big Ideas about Measures

Main Themes: Abstractions and Applications

Numbers are used as measures to quantify a property of real-world or mathematical objects so that these properties can be analysed, compared and ordered. Many measures have units. Zero means the absence of the property in most cases. Special values such as one unit serve as useful reference. Some measures are governed by certain formula, e.g. area = length $\times$ breadth.

Big Ideas about Notations

Main Themes: Representations and Communications

Notations represent mathematical objects, their operations and relationships symbolically. They are written in a concise and precise manner that can be understood by users of mathematics. These form a writing system that facilitates the communication of mathematical ideas. Understanding the meaning of mathematical notations and how they are used, including the rules and conventions, help to facilitate the study and communication of important mathematical results, properties and relationships, reasoning and problem solving.

Big Ideas about Proportionality

Main Themes: Properties and Relationships

Proportionality is a relationship between two quantities that allows one quantity to be computed from the other based on multiplicative reasoning. Proportionality is common in many everyday applications of mathematics. Problems involving fractions, ratios, rates and percentages often require the use of proportionality. Underlying the concept of proportionality are two quantities that vary in such a way that the ratio between them remains the same.

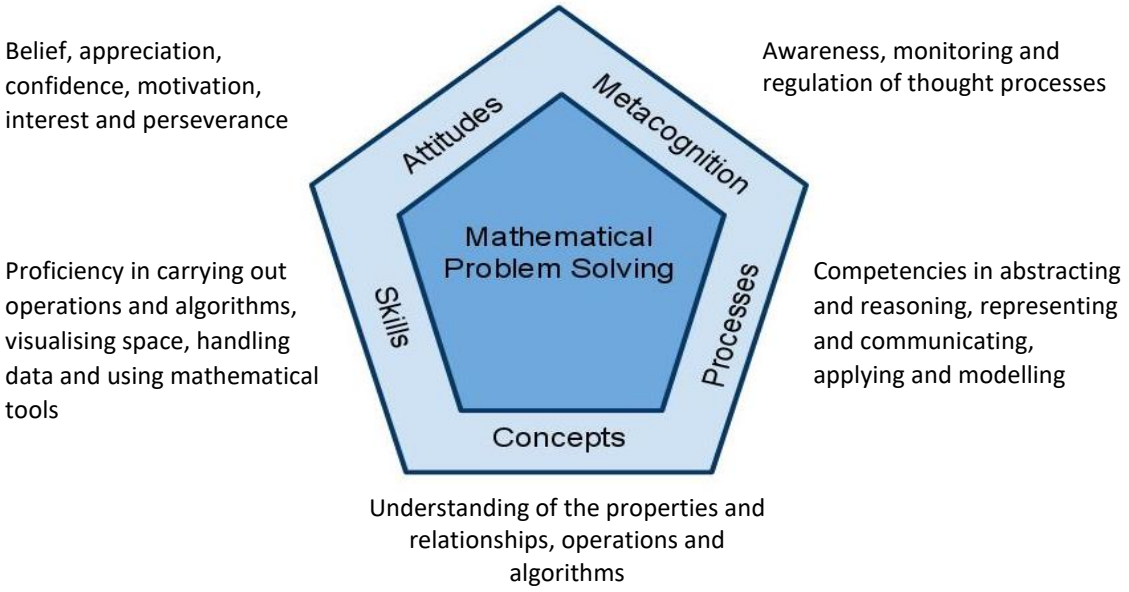
Mathematics Curriculum Framework

The central focus of the mathematics curriculum is the development of mathematical problem-solving competency. Supporting this focus are five inter-related components – concepts, skills, processes, metacognition and attitudes.

Mathematical Problem Solving

Problems may come from everyday contexts or future work situations, in other areas of study, or within mathematics itself. They include straightforward and routine tasks that require selection and application of the appropriate concepts and skills, as well as complex and non-routine tasks that requires deeper insights, logical reasoning and creative thinking. General problem-solving strategies, e.g. Pólya's 4 steps to problem solving and the use of heuristics, are important in helping one tackle non-routine tasks systematically and effectively.

<u>Mathematics Curriculum Framework</u>



Concepts

The understanding of mathematical concepts, their *properties and relationships* and the related *operations and algorithms*, are essential for solving problems. Concepts are organised by strands, and these concepts are connected and inter-related. In the primary mathematics curriculum, concepts in numbers, algebra, measurement, geometry and statistics are explored.

Skills

Being proficient in carrying out the mathematical operations and algorithms, visualising space, handling data and using mathematical tools is essential for solving problems. In primary mathematics, numerical calculation, algebraic manipulation, spatial visualisation, data analysis, measurement, use of mathematical tools and estimation are explicitly taught.

Processes

Mathematical processes refer to the practices of mathematicians and users of mathematics that are important for one to solve problems and build new knowledge. These include abstracting, reasoning, representing and communicating, applying and modelling. Abstraction is what makes mathematics powerful and applicable. Justifying a result, deriving new results and generalising patterns involve reasoning. Expressing one's ideas, solutions and arguments to different audiences involves representing and communicating, and using the notations (symbols and conventions of writing) that are part of the mathematics language. Applying mathematics to real-world problems often involves modelling[2], where reasonable assumptions and simplifications are made so that problems can be formulated mathematically, and where mathematical solutions are interpreted and evaluated in the context of the real-world problem.

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 and regulation of one's own thinking and learning. It also includes the awareness of one's affective responses towards a problem. When one is engaged in solving a non-routine or open-ended problem, metacognition is required.

Attitudes

Having positive attitudes towards mathematics contributes to one's disposition and inclination towards using mathematics to solve problems. Attitudes include one's belief and appreciation of the value of mathematics, one's confidence and motivation in using mathematics, and one's interests and perseverance to solve problems using mathematics.

[2] Students are exposed to mathematical modelling at the secondary level. At the primary level, students should be exposed to real-world problems, where they have to formulate the problems mathematically and check the reasonableness of answers in the context of the problems. These are important skills and habits that will support mathematical modelling at the secondary level.

Mathematics and 21st Century Competencies

The learning of mathematics creates opportunities for students to develop key competencies that are important in the 21st century, in particular, *Critical, Adaptive and Inventive Thinking*. For example, when students pose questions, they are engaged in not only mathematical reasoning, but also critical thinking. When students devise different strategies to solve an open-ended problem or formulate different mathematical models to represent a real-world problem, they are engaged in inventive thinking. When students vary their approaches to solve different but related problems , they are engaged in adaptive thinking.

As an overarching approach, the primary mathematics curriculum supports the development of 21st century competencies (21CC) in the following ways:

1. The content is relevant to the needs of the 21st century. They provide the foundation for learning many of the advanced applications of mathematics that are relevant to today's world.

2. The pedagogies create opportunities for students to think critically, adaptively and inventively, reason logically and communicate effectively using mathematics, work individually as well as in groups, using ICT tools where appropriate in learning and doing mathematics.

3. The problem contexts raise students' awareness of local and global issues around them. For example, problems involving savings, donations, waste reduction, sustainability etc. create opportunities for discussion of local and global issues around them.

Section 3: Pedagogy

Teaching Processes

Phases of Learning

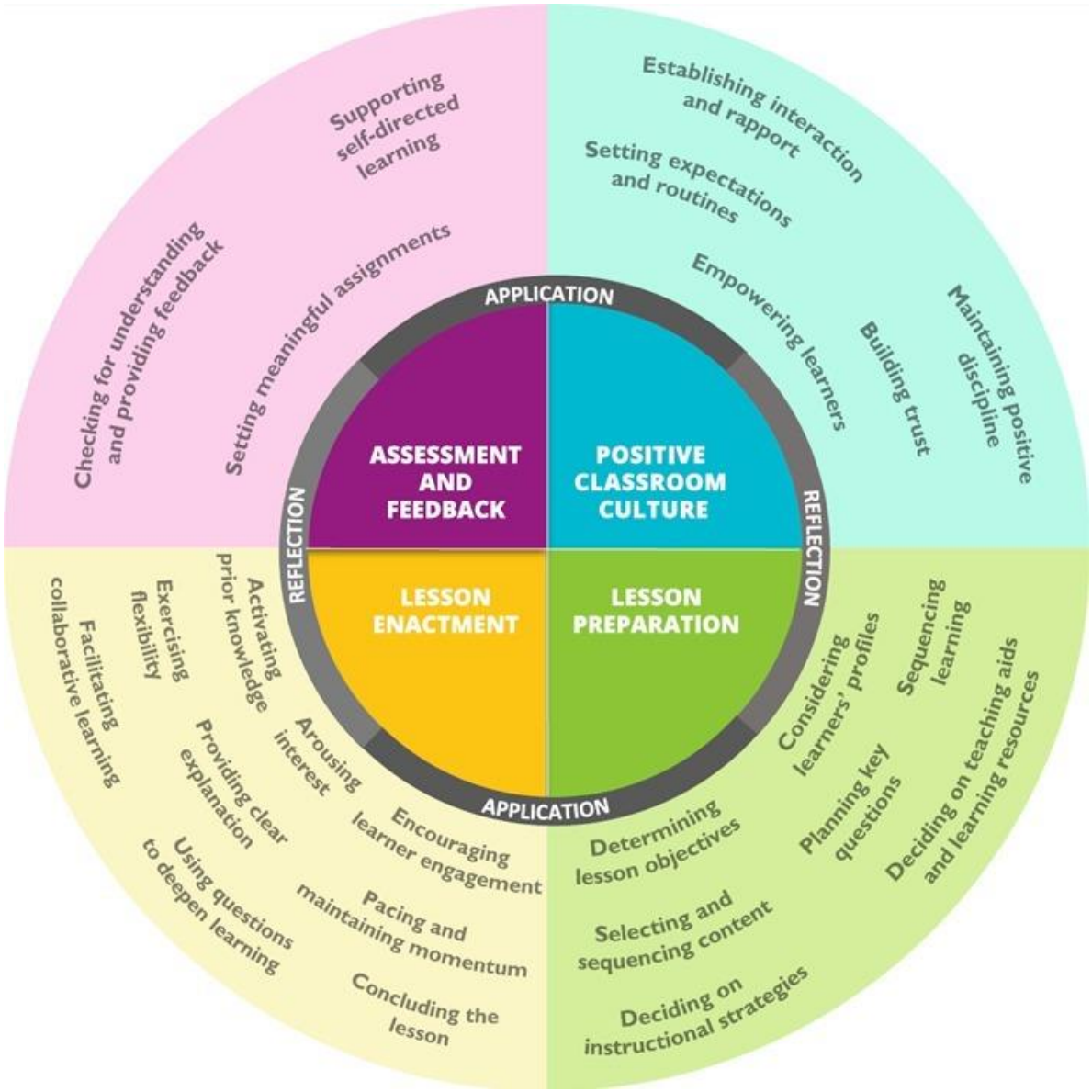
Addressing the Focus Areas and Framework

Use of Technology

3. PEDAGOGY

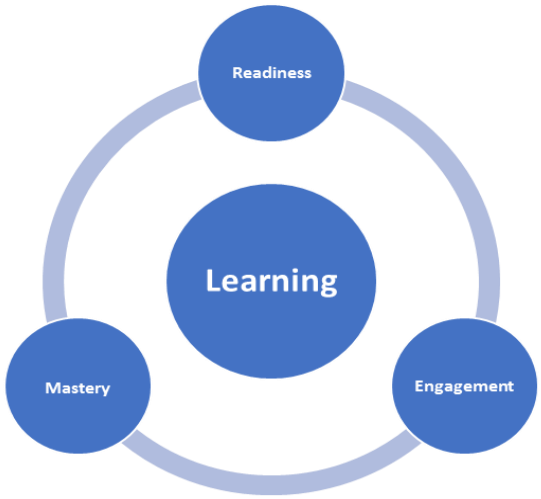
Teaching Processes

The Singapore Teaching Practice (STP) explicates a set of Pedagogical Practices (PP) that comprise four fundamental Teaching Processes that lie at the heart of good teaching. The four Teaching Processes are presented below:



Phases of Learning

The Teaching Areas of the STP could be drawn on to plan and deliver effective lessons using the three phases of learning – *Readiness*, *Engagement* and *Mastery* – reflected below.



Readiness Phase

Student readiness to learn is vital to success in learning. Teachers have to consider the *learning environment*, students' profile, students' *prior and pre-requisite knowledge*, and *motivating contexts* that will interest students.

Engagement Phase

This is the main phase of learning where students engage with the new materials to be learnt *(Encouraging Learner Engagement)*. As students have diverse learning needs and bring with them a wide range of experiences, beliefs, knowledge and skills, it is important to consider the pace of the learning and transitions *(Pacing and Maintaining Momentum)* using a repertoire of pedagogies.

Three pedagogical approaches form the spine that supports most of the mathematics instruction in the classroom. They are not mutually exclusive and could be used in different parts of a lesson or unit. Teachers make deliberate choices on the instructional strategies *(Deciding on Instructional Strategies)* based on learners' profiles and needs, and the nature of the concepts to be taught. The engagement phase can include one or more of the following:

- *Activity-based Learning*
- *Inquiry-based Learning*
- *Direct Instruction*

Regardless of the approach, it is important for teachers to plan ahead, anticipate students' responses, and adapt the lesson accordingly *(Exercising Flexibility)*.

Mastery Phase

The mastery phase is the final phase of learning where students consolidate and extend their learning. To consolidate, teachers summarise and review key learning points at the end of a lesson and make connections with the subsequent lesson *(Concluding the Lesson).* The mastery phase can include one or more of the following:

- *Motivated Practice*
- *Reflective Review*
- *Extended Learning*

Addressing the Focus Areas and Framework

General Approach

Developing problem-solving skills requires attention to all five components of the framework. Even though there are many facts and procedures in mathematics, where automaticity and fluency are important, there must be emphasis on conceptual understanding and problem solving, where reasoning and strategic thinking are important. Therefore, an overarching pedagogical approach that promotes relational understanding over instrumental understanding (Skemp, 1976)[3] is advocated. This means knowing the *why*, not just the *what* and *how*. A focus on relational understanding benefits all students as it helps students apply facts and procedures more skilfully, improve their problem-solving strategies and it deepens their appreciation of the nature of mathematics.

Teaching towards Big Ideas

One of the foci of this syllabus is to develop a greater awareness of the nature of mathematics. To do so, the big ideas that are central to the discipline and bring coherence and connection between different topics should be discussed. This requires teachers to *teach towards big ideas*, where they help students see and make connections among mathematical ideas within a topic, or between topics across levels or strands. An understanding of big ideas can help students develop a deeper and more robust understanding of mathematics and better appreciation of the discipline.

Use of Technology

Teachers should consider the affordance of ICT to help students learn. As the ability to use ICT effectively is part of the 21st century competencies, teachers should provide

[3] Skemp, R. R. (1976). Relational understanding and instrumental understanding. *Mathematics Teaching, 77*, 20-26.

opportunities for students to use ICT tools to understand mathematical concepts through visualisations, simulations and representations. ICT can support exploration, experimentation and extend the range of problems accessible to students. Students can also use ICT to communicate ideas and collaborate with one another as part of the knowledge building process while teachers can assess learning and provide feedback in a timely manner.

Section 4: Assessment

Formative Assessment

Summative Assessment

4. ASSESSMENT

Assessment is an integral part of the teaching and learning process. A balanced assessment system includes both summative and formative assessments. While it is essential to know how competent a student is at a certain point of learning, it is just as important to monitor the student's learning and involve him or her in peer or self-assessment as part of the learning process (Huinker & Freckmann, 2009)[4]. An assessment system that solely relies on summative assessment will lead to teaching that is overly focused on assessment. This will restrict the learning opportunities for students thus affecting their motivation for learning.

Formative Assessment

Formative assessment provides information on how well students are progressing toward the desired learning goal(s).

Why assess?

The purpose of formative assessment is to help students improve their learning and be self-directed in their learning. In the learning of mathematics, just as in other subjects, information about students' understanding of the content must be gathered *before*, *during* and *after* the lesson. For teachers, this information should inform the starting point of teaching, the development of the concepts, and the remedial actions that may be necessary. For students, formative assessment informs them of their specific areas of strengths and weaknesses.

What to assess?

The outcomes of the mathematics curriculum go beyond just the recall of mathematical concepts and skills. Since mathematical problem solving is the focus of the mathematics curriculum, assessment should also focus on students' understanding and ability to apply what they know to solve problems. In addition, there should be emphasis on processes such as reasoning and communicating.

[4] Huinker, D., & Freckmann, J. (2009). Linking principles of formative assessment to classroom practice. *Wisconsin Teacher of Mathematics, 60*(2), 6-11.

The overarching objectives of assessment should focus on students':

- understanding of mathematical concepts (going beyond simple recall of facts);
- ability to reason, communicate, and make meaningful connections and integrate ideas across topics;
- ability to formulate, represent and solve problems within mathematics and to interpret mathematical solutions in the context of the problems; and
- ability to develop strategies to solve non-routine problems.

In addition, teachers must be mindful of the impact of assessment on students' self-belief about their ability and confidence. It is therefore important that assessment be pitched appropriately to develop positive attitudes towards the learning of mathematics.

How to assess?

The process of assessment must be embedded in the planning of the lessons. Various teaching actions can be integrated into classroom instruction to help teachers to check if learning is taking place as intended, and how students can build on past knowledge and experiences to move forward in their learning. The embedding of assessment process may take the following forms:

- **Diagnostic Assessment**. Mathematics consists of concepts and skills that are arranged in a largely hierarchical manner. Progress in mathematics learning is dependent on the mastery of pre-requisite concepts and skills. For each mathematics lesson prior to learning new concepts, teachers need to set aside some time to conduct diagnostic assessment such as a short quiz (verbal or written) or use diagnostic tests to draw out students' prior knowledge of the content and related concepts required for the lesson. This allows teachers to build on the preconceptions the students bring with them to the classroom. Appropriate use of these tests can help teachers identify gaps and difficulties in learning and provide useful information for focused instruction and remediation strategy.

- **Class Activities.** Teachers can elicit evidence of students' learning through class activities. For example, teachers may observe how students solve problems required in the activities and get them to explain their strategies. Teachers can also engage students in assessing their own work and reflecting on their own learning and how to improve it. In addition, teachers can use different examples of work produced by students for class discussion, to help students to understand different standards of work and how students can work towards producing work of better quality next time.

- **Classroom Discourse.** Getting students to share their thoughts and their ideas creates teachable moments for teachers to correct a misconception, provide feedback, reinforce a learning point or expand on an idea. Such discourse, facilitated by effective questioning and the use of talk moves, provides opportunities to probe and assess students' understanding of the concepts and skills. In the process, students also learn to articulate their thinking and deepen their understanding, and develop confidence in talking about mathematics and using it.

- **Individual or Group Tasks**. Teachers can assign mathematical tasks for students to work on individually or as a group. These tasks require students to apply their knowledge and skills in context, giving focus to mathematical processes. A rubric is useful to indicate what is expected of students in terms of processes and quality of work. It is important that students have an idea of where they stand in relation to the lesson objectives, so that they can chart and take ownership of their progress. The rubric also provides a structured means of giving qualitative feedback. Teachers can consider getting students to assess their own performances so that students can reflect on their work and make improvements.

Assessment provides feedback for both students and teachers. The following are considerations for the different types of feedback between teachers and students and among students:

- Feedback from teachers to students must inform students where they are in their learning and what they need to do to improve their learning. They must be timely and should focus on both strengths and weaknesses of the work done. Additionally, feedback should include ideas on how students can move forward in their learning.

- Feedback from students to teachers comes from their responses to the assessment tasks designed by teachers. They provide information to teachers on what they need to do to address learning gaps, how to modify the learning activities students engage in, and how they should improve their instruction. Teachers should design their assessment tasks carefully in order to elicit the relevant information from their students.

- Feedback between students is important as well because peer-assessment is useful in promoting active learning. It provides an opportunity for students to learn from each other and also allows them to develop an understanding of what counts as quality work by critiquing their peers' work in relation to a particular learning outcome.

The abovementioned teaching actions are not exhaustive. Ultimately, the choice must be guided by its purpose, that is, assessment must be fit-for-purpose. Teachers need to be very clear about what they want students to learn, how students should learn, and decide how best to assess, and what assessment strategies are suitable to gather information about students' learning.

Summative Assessment

Summative assessment gathers information on students' attainment and progress at the end of instruction. It is usually conducted at critical points of students' learning across a range of activities that are associated with tests.

Why assess?

The purpose of summative assessments, such as tests and examinations, is to measure the extent to which students have achieved the learning objectives of the syllabuses. As the results of these assessments are used for making decisions such as progression, it is important that these assessments are pitched appropriately and consistently to provide accurate information about students' achievements.

- For students, the information gives them a sense of the overall level of mastery as well as an indicator of progress. The marks and grades show the levels of their achievement.

- For teachers, the information gives them a sense of the overall performance of the class as a whole as well as of the students as individuals. Considering the profiles of the students, the information provides evidence of the overall effectiveness of teaching.

- For school leaders, the information gives them a sense of the overall performance of the cohort as well as of the individual classes. The information is useful for planning and decision-making (e.g., curriculum revision) within the school. The information of individual students' achievement will also be used to make decisions such as awards, promotion, placement, remediation, etc.

- For parents, the information gives them a sense of their children's achievement and progress and helps them take specific actions to ensure the children's progress in learning.

What to assess?

Summative assessment assesses the extent to which students have achieved the learning outcomes specified in the syllabus. The learning outcomes cover mathematical concepts, skills and processes in the syllabus. It may also assess the learning outcomes from the *previous year* that support current learning.

All summative assessment must be appropriately pitched according to the syllabus. Otherwise, the information gathered from the assessment will lead to wrong conclusion about the students' mastery level and teachers' teaching effectiveness. It may also cause unwarranted psychological responses. For example, above-level testing may result in loss of motivation for learning, anxiety and work avoidance amongst students.

How to assess?

Summative assessments usually take the form of pen-and-paper tests. All summative assessment should have a Table of Specification (TOS). The TOS gives the relative distribution of the topics to be assessed and the cognitive levels of the items. While it is not possible to assess all learning objectives, having each topic weighting indicated in the TOS will help to ensure no topics is overly assessed in the same test paper. Tests that focus on a few topics and exclude other important content, will not be able to accurately assess students' mastery of the subject. A well-designed TOS not only helps to support teachers' professional judgment when setting a test, but also help them in making clear connections between planning, instruction and assessment (Fives, Helenrose & Nicole, 2013)[5].

The overall difficulty level of the paper must be carefully planned, with an appropriate distribution of easy, moderate and difficult items. An appropriately pitched paper allows students to experience success and gives a fair reflection of the effectiveness of teaching and learning.

While pen-and-paper tests are useful, there is value in exploring a wider variety of assessment methods and strategies, in particular, those that will allow teachers to gather information that is not easily available through such tests but are valuable in supporting learning.

[5] Fives, Helenrose & DiDonato-Barnes, Nicole (2013). Classroom Test Construction: The Power of a Table of Specifications. *Practical Assessment, Research & Evaluation, 18(3*).

Section 5:

Primary Mathematics Syllabus

Syllabus Organisation

Content by Level

5. PRIMARY MATHEMATICS SYLLABUS

Section 5 presents the organisation and content for Primary Mathematics. A level-by-level elaboration of the content[6] is given.

Syllabus Organisation

The concepts and skills covered in the syllabus are organised along 3 content strands.

Concept and Skills		
Number and Algebra	Measurement and Geometry	Statistics

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Content by Level [7]

PRIMARY ONE

NUMBER AND ALGEBRA

SUB-STRAND: WHOLE NUMBERS

1. Numbers up to 100

1.1 counting to tell the number of objects in a given set
1.2 number notation, representations and place values (tens, ones)
1.3 reading and writing numbers in numerals and in words
1.4 comparing the number of objects in two or more sets
1.5 comparing and ordering numbers
1.6 patterns in number sequences
1.7 ordinal numbers (first, second, up to tenth) and symbols (1st, 2nd, 3rd, etc.)

2. Addition and Subtraction

2.1 concepts of addition and subtraction
2.2 use of +, – and =
2.3 relationship between addition and subtraction
2.4 adding more than two 1-digit numbers
2.5 adding and subtracting within 100
2.6 adding and subtracting using algorithms
2.7 mental calculation involving addition and subtraction
- within 20
- of a 2-digit number and ones without renaming
- of a 2-digit number and tens

3. Multiplication and Division

3.1 concepts of multiplication and division
3.2 use of x
3.3 multiplying within 40
3.4 dividing within 20

SUB-STRAND: MONEY

1. Money

1.1 counting amount of money
- in cents up to $1
- in dollars up to $100

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PRIMARY ONE

MEASUREMENT AND GEOMETRY

SUB-STRAND: MEASUREMENT

1. Length

1.1 measuring length in centimetres
1.2 use of abbreviation cm
1.3 comparing and ordering lengths in cm
1.4 measuring and drawing a line segment to the nearest cm

2. Time

2.1 telling time to 5 minutes
2.2 use of 'am' and 'pm'
2.3 use of abbreviations h and min
2.4 duration of one hour/half hour

SUB-STRAND: GEOMETRY

1. 2D Shapes

1.1 identifying, naming, describing and classifying 2D shapes
- rectangle
- square
- triangle
- circle
- half circle
- quarter circle

1.2 forming different 2D figures with
- rectangle
- square
- triangle
- half circle
- quarter circle

1.3 identifying the 2D shapes that make up a given figure
1.4 copying figures on dot grid or square grid

STATISTICS

SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION

1. Picture Graphs

1.1 reading and interpreting data from picture graphs

PRIMARY TWO

NUMBER AND ALGEBRA

SUB-STRAND: WHOLE NUMBERS

1. Numbers up to 1000

1.1 counting in tens/hundreds
1.2 number notation, representations and place values (hundreds, tens, ones)
1.3 reading and writing numbers in numerals and in words
1.4 comparing and ordering numbers
1.5 patterns in number sequences
1.6 odd and even numbers

2. Addition and Subtraction

2.1 addition and subtraction algorithms (up to 3 digits)
2.2 mental calculation involving addition and subtraction of a 3-digit number and ones/tens/hundreds

3. Multiplication and Division

3.1 multiplication tables of 2, 3, 4, 5 and 10
3.2 use of ÷
3.3 relationship between multiplication and division
3.4 multiplying and dividing within the multiplication tables
3.5 mental calculation involving multiplication and division within multiplication tables of 2, 3, 4, 5 and 10

SUB-STRAND: FRACTIONS

1. Fraction of a Whole

1.1 fraction as part of a whole
1.2 notation and representations of fractions
1.3 comparing and ordering fractions with denominators of given fractions not exceeding 12
- unit fractions
- like fractions

2. Addition and Subtraction

2.1 adding and subtracting like fractions within one whole with denominators of given fractions not exceeding 12

SUB-STRAND: MONEY

1. Money

1.1 counting amount of money in dollars and cents
1.2 reading and writing money in decimal notation
1.3 comparing two or three amounts of money
1.4 converting an amount of money in decimal notation to cents only, and vice versa

PRIMARY TWO

MEASUREMENT AND GEOMETRY

SUB-STRAND: MEASUREMENT

1. Length, Mass and Volume

1.1 measuring
- length in metres
- mass in kilograms/grams
- volume of liquid in litres

1.2 using appropriate units of measurement and their abbreviations m, g, kg, ℓ

1.3 comparing and ordering
- lengths
- masses
- volumes

2. Time

2.1 telling time to the minute

2.2 measuring time in hours and minutes

2.3 converting time in hours and minutes to minutes only, and vice versa

SUB-STRAND: GEOMETRY

1. 2D Shapes

1.1 making/completing patterns with 2D shapes according to one or two of the following attributes
- size
- shape
- colour
- orientation

2. 3D Shapes

2.1 identifying, naming, describing and classifying 3D shapes
- cube
- cuboid
- cone
- cylinder
- sphere

STATISTICS

SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION

1. Picture Graphs with Scales

1.1 reading and interpreting data from picture graphs with scales

PRIMARY THREE

NUMBER AND ALGEBRA

SUB-STRAND: WHOLE NUMBERS

1. Numbers up to 10 000

1.1 counting in hundreds/thousands
1.2 number notation, representations and place values (thousands, hundreds, tens, ones)
1.3 reading and writing numbers in numerals and in words
1.4 comparing and ordering numbers
1.5 patterns in number sequences

2. Addition and Subtraction

2.1 addition and subtraction algorithms (up to 4 digits)
2.2 mental calculation involving addition and subtraction of two 2-digit numbers

3. Multiplication and Division

3.1 multiplication tables of 6, 7, 8 and 9
3.2 multiplying and dividing within the multiplication tables
3.3 division with remainder
3.4 multiplication and division algorithms (up to 3 digits by 1 digit)
3.5 mental calculation involving multiplication and division within multiplication tables

SUB-STRAND: FRACTIONS

1. Equivalent fractions

1.1 equivalent fractions
1.2 expressing a fraction in its simplest form
1.3 comparing and ordering unlike fractions with denominators of given fractions not exceeding 12
1.4 writing the equivalent fraction of a fraction given the denominator or the numerator

2. Addition and Subtraction

2.1 adding and subtracting two related fractions within one whole with denominators of given fractions not exceeding 12

SUB-STRAND: MONEY

1. Money

1.1 adding and subtracting money in decimal notation

PRIMARY THREE

MEASUREMENT AND GEOMETRY

SUB-STRAND: MEASUREMENT

1. Length, Mass and Volume

1.1 measuring
- length in kilometres (km)
- volume of liquid in millilitres (ml)

1.2 measuring length/mass/volume (of liquid) in compound units

1.3 converting a measurement in compound units to the smaller unit, and vice versa
- kilometres and metres
- metres and centimetres
- kilograms and grams
- litres and millilitres

(numbers involved should be within easy manipulation)

2. Time

2.1 measuring time in seconds

2.2 finding the starting time, finishing time or duration given the other two quantities

2.3 24-hour clock

SUB-STRAND: AREA AND VOLUME

1. Area and Perimeter

1.1 concepts of area and perimeter of a plane figure

1.2 measuring area in square units, cm^2 and m^2, excluding conversion between cm^2 and m^2

1.3 perimeter of
- rectilinear figure
- rectangle
- square

1.4 area of rectangle/square

SUB-STRAND: GEOMETRY

1. Angles

1.1 concepts of angle

1.2 right angles, angles greater than/smaller than a right angle

2. Perpendicular and Parallel Lines

2.1 perpendicular and parallel lines

2.2 drawing perpendicular and parallel lines

STATISTICS

SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION

1. Bar Graphs

1.1 reading and interpreting data from bar graphs

1.2 using different scales on axis

PRIMARY FOUR

NUMBER AND ALGEBRA

SUB-STRAND: WHOLE NUMBERS

1. Numbers up to 100 000

1.1 number notation, representations and place values (ten thousands, thousands, hundreds, tens, ones)
1.2 reading and writing numbers in numerals and in words
1.3 comparing and ordering numbers
1.4 patterns in number sequences
1.5 rounding numbers to the nearest 10, 100 or 1000
1.6 use of ≈

2. Factors and Multiples

2.1 factors, multiples and their relationship
2.2 determining if a 1-digit number is a factor of a given number within 100
2.3 finding the common factors of two given numbers
2.4 determining if a number is a multiple of a given 1-digit number
2.5 finding the common multiples of two given 1-digit numbers

3. Four Operations

3.1 multiplication algorithm
- up to 4 digits by 1 digit
- up to 3 digits by 2 digits

3.2 division algorithm (up to 4 digits by 1 digit)

SUB-STRAND: FRACTIONS

1. Mixed Numbers and Improper Fractions

1.1 mixed numbers, improper fractions and their relationship

2. Fraction of a Set

2.1 fraction as part of a set

3. Addition and Subtraction

3.1 adding and subtracting fractions with denominators of given fractions not exceeding 12 and not more than two different denominators

PRIMARY FOUR

SUB-STRAND: DECIMALS

1. Decimals up to 3 decimal places

1.1 notation, representations and place values
(tenths, hundredths, thousandths)
1.2 comparing and ordering decimals
1.3 expressing decimals as fractions
1.4 expressing fractions as decimals when the denominator is a factor of 10 or 100
1.5 rounding decimals to
- the nearest whole number
- 1 decimal place
- 2 decimal places

2. Addition and Subtraction

2.1 adding and subtracting decimals (up to 2 decimal places)

3. Multiplication and Division

3.1 multiplying and dividing decimals (up to 2 decimal places) by a 1-digit whole number
3.2 dividing a whole number by a whole number with quotient as a decimal
3.3 rounding answers to a specified degree of accuracy

PRIMARY FOUR

MEASUREMENT AND GEOMETRY

SUB-STRAND: AREA AND VOLUME

1. Area and Perimeter

1.1 finding one dimension of a rectangle given the other dimension and its area/perimeter
1.2 finding the length of one side of a square given its area/perimeter
1.3 finding the area and perimeter of composite figures made up of rectangles and squares

SUB-STRAND: GEOMETRY

1. Angles

1.1 using notation such as ∠ABC and $\angle a$ to name angles
1.2 measuring angles in degrees
1.3 drawing an angle of given size

2. Rectangle and Square

2.1 properties of rectangle and square, excluding diagonal properties
2.2 drawing rectangles and squares

3. Line Symmetry

3.1 identifying symmetric figures
3.2 determining whether a straight line is a line of symmetry of a symmetric figure
3.3 completing a symmetric figure with respect to a given line of symmetry on square grid

4. Nets

4. Nets

4.1 identifying 2D representations of
- cube
- cuboid
- cone
- cylinder
- prism
- pyramid

4.2 drawing 2D representations of
- cube
- cuboid
- prism
- pyramid

4.3 identifying the nets of 3D solids
- cube
- cuboid
- prism
- pyramid

4.4 identifying the solid which can be formed by a given net

PRIMARY FOUR

STATISTICS
SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION
1. Tables, Line Graphs and Pie Charts
1.1 completing a table from given data 1.2 reading and interpreting data from tables/line graphs/pie charts

PRIMARY FIVE

NUMBER AND ALGEBRA

SUB-STRAND: WHOLE NUMBERS

1. Numbers up to 10 million

1.1 reading and writing numbers in numerals and in words

2. Four Operations

2.1 multiplying and dividing by 10, 100, 1000 and their multiples **without calculator**
2.2 order of operations **without calculator**
2.3 use of brackets **without calculator**

SUB-STRAND: FRACTIONS

1. Fraction and Division

1.1 dividing a whole number by a whole number with quotient as a fraction
1.2 expressing fractions as decimals

2. Four Operations

2.1 adding and subtracting mixed numbers
2.2 multiplying a proper/improper fraction and a whole number **without calculator**
2.3 multiplying a proper fraction and a proper/ improper fractions **without calculator**
2.4 multiplying two improper fractions
2.5 multiplying a mixed number and a whole number

SUB-STRAND: DECIMALS

1. Four Operations

1.1 multiplying and dividing decimals (up to 3 decimal places) by 10, 100, 1000 and their multiples **without calculator**
1.2 converting 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

SUB-STRAND: PERCENTAGE

1. Percentage

1.1 expressing a part of a whole as a percentage
1.2 use of %
1.3 finding a percentage part of a whole
1.4 finding discount, GST and annual interest

SUB-STRAND: RATE

1. Rate

1.1 rate as the amount of a quantity per unit of another quantity
1.2 finding rate, total amount or number of units given the other two quantities

PRIMARY FIVE

MEASUREMENT AND GEOMETRY

SUB-STRAND: AREA AND VOLUME

1. Area of Triangle

1.1 concepts of base and height of a triangle
1.2 area of triangle
1.3 finding the area of composite figures made up of rectangles, squares and triangles

2. Volume of Cube and Cuboid

2.1 building solids with unit cubes
2.2 measuring volume in cubic units, cm^3/m^3, excluding conversion between cm^3 and m^3
2.3 drawing cubes and cuboids on isometric grid
2.4 volume of a cube/cuboid
2.5 finding the volume of liquid in a rectangular tank
2.6 relationship between ℓ (or ml) with cm^3

SUB-STRAND: GEOMETRY

1. Angles

1.1 angles on a straight line
1.2 angles at a point
1.3 vertically opposite angles
1.4 finding unknown angles

2. Triangle

2.1 properties of
- isosceles triangle
- equilateral triangle
- right-angled triangle

2.2 angle sum of a triangle
2.3 finding unknown angles without additional construction of lines

3. Parallelogram, Rhombus and Trapezium

3.1 properties of
- parallelogram
- rhombus
- trapezium

3.2 finding unknown angles without additional construction of lines

PRIMARY SIX

NUMBER AND ALGEBRA

SUB-STRAND: FRACTIONS

1. Four Operations

1.1 dividing a proper fraction by a whole number **without calculator**
1.2 dividing a whole number/proper fraction by a proper fraction **without calculator**

SUB-STRAND: PERCENTAGE

1. Percentage

1.1 finding the whole given a part and the percentage
1.2 finding percentage increase/decrease

SUB-STRAND:RATIO

1. Ratio

1.1 notation, representations and interpretation of a:b and a:b:c, where a, b and c are whole numbers, excluding ratios involving fractions and decimals
1.2 equivalent ratios
1.3 dividing a quantity in a given ratio
1.4 expressing a ratio in its simplest form
1.5 finding the ratio of two or three given quantities
1.6 finding the missing term in a pair of equivalent ratios
1.7 relationship between fraction and ratio

SUB-STRAND: ALGEBRA

1. Algebra

1.1 using a letter to represent an unknown number
1.2 notation, representations and interpretation of simple algebraic expressions such as
- $a \pm 3$
- $a \times 3$ or $3a$
- $a \div 3$ or $\frac{a}{3}$

1.3 simplifying simple linear expressions excluding brackets
1.4 evaluating simple linear expressions by substitution
1.5 simple linear equations involving whole number coefficient only

PRIMARY SIX

MEASUREMENT AND GEOMETRY

SUB-STRAND: AREA AND VOLUME

1. Area and Circumference of Circle

1.1 area and circumference of circle
1.2 finding the area and perimeter of
- semicircle
- quarter circle

1.3 finding the area and perimeter of composite figures made up of square, rectangle, triangle, semicircle and quarter circle

2. Volume of Cube and Cuboid

2.1 finding one dimension of a cuboid given its volume and the other dimensions
2.2 finding the length of one edge of a cube given its volume
2.3 finding the height of a cuboid given its volume and base area
2.4 finding the area of a face of a cuboid given its volume and one dimension
2.5 use of $\sqrt{\ }$, $\sqrt[3]{\ }$

SUB-STRAND: GEOMETRY

1. Special Quadrilaterals

1.1 finding unknown angles, without additional construction of lines, in composite geometric figures involving
- square
- rectangle
- triangle
- parallelogram
- rhombus
- trapezium

STATISTICS

SUB-STRAND: DATA ANALYSIS

1. Average of a Set of Data

1.1 average as 'total value ÷ number of data'
1.2 relationship between average, total value and number of data

PRIMARY FIVE (FOUNDATION)

NUMBER AND ALGEBRA

SUB-STRAND: WHOLE NUMBERS

1. Numbers up to 10 million

1.1 reading and writing numbers in numerals and in words
1.2 comparing and ordering numbers up to 100 000
1.3 rounding numbers to the nearest 10, 100 or 1000
1.4 patterns in number sequences
1.5 use of ≈

2. Four Operations

2.1 addition and subtraction algorithms (up to 3 digits) **without calculator**
2.2 multiplication and division algorithms (up to 2 digits by 1 digit) **without calculator**
2.3 multiplying and dividing by 10, 100, 1000 and their multiples **without calculator**
2.4 order of operations
2.5 use of brackets
2.6 mental calculation involving

- addition and subtraction of a 3-digit number and ones/tens/hundreds
- multiplication and division within the multiplication tables

3. Factors and Multiples

3.1 factors, multiples and their relationship
3.2 determining if a 1-digit number is a factor of a given number within 100
3.3 finding the common factors of two given numbers
3.4 determining if a number is a multiple of a given 1-digit number
3.5 finding the common multiples of two given 1-digit numbers

SUB-STRAND: FRACTIONS

1. Concepts of Fractions

1.1 fraction as part of a whole
1.2 fraction as part of a set

2. Equivalent Fractions

2.1 equivalent fractions
2.2 expressing a fraction in its simplest form
2.3 comparing and ordering unlike fractions, with denominators of given fractions not exceeding 12
2.4 writing the equivalent fraction of a fraction given the denominator or the numerator

3. Mixed Numbers and Improper Fractions

3.1 mixed numbers and improper fractions and their relationships

4. Four Operations

4.1 adding and subtracting fractions with denominators of given fractions not exceeding 12 and not more than two different denominators **without calculator**
4.2 adding and subtracting mixed numbers
4.3 multiplying a proper/improper fraction and a whole number **without calculator**
4.4 multiplying a proper fraction and a proper/improper fraction **without calculator**

PRIMARY FIVE (FOUNDATION)

SUB-STRAND: DECIMALS

1. Decimals up to 3 decimal places

1.1 notation, representations and place values (tenths, hundredths, thousandths)
1.2 comparing and ordering decimals
1.3 expressing decimals as fractions
1.4 expressing fractions as decimals when the denominator is a factor of 10 or 100
1.5 rounding decimals to
- the nearest whole number
- 1 decimal place
- 2 decimal places

2. Four operations

2.1 adding and subtracting decimals (up to 2 decimal places) **without calculator**
2.2 multiplying and dividing decimals (up to 3 decimal places) by 10,100,1000 **without calculator**
2.3 converting 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

SUB-STRAND: RATE

1. Rate

1.1 rate as the amount of a quantity per unit of another quantity
1.2 finding rate, total amount or number of units given the other two quantities

PRIMARY FIVE (FOUNDATION)

MEASUREMENT AND GEOMETRY

SUB-STRAND: MEASUREMENT

1. Time

1.1 measuring time in hours and minutes
1.2 converting time in hours and minutes to minutes only, and vice versa
1.3 finding the starting time, finishing time or duration given the other two quantities
1.4 24-hour clock

SUB-STRAND: AREA AND VOLUME

1. Area and Perimeter

1.1 concept of area and perimeter of a plane figure
1.2 measuring area in square units, cm^2 and m^2, excluding conversion between cm^2 and m^2
1.3 area and perimeter of rectangle/square
1.4 finding one dimension of a rectangle given the other dimension and its area/perimeter
1.5 finding the length of one side of a square given its area/perimeter
1.6 finding the area and perimeter of composite figures made up of rectangles and squares

2. Volume of Cube and Cuboid

2.1 building solids with unit cubes
2.2 measuring volume in cubic units, cm^3 and m^3 excluding conversion between cm^3 and m^3
2.3 drawing cubes and cuboids on isometric grid

SUB-STRAND: GEOMETRY

1. Perpendicular and Parallel Lines

1.1 perpendicular and parallel lines
1.2 drawing perpendicular and parallel lines

2. Angles

2.1 using notation such as $\angle$ ABC and $\angle a$ to name angles
2.2 measuring angles in degrees
2.3 drawing an angle of a given size
2.4 angles on a straight line
2.5 angles at a point
2.6 vertically opposite angles
2.7 finding unknown angles

3. Rectangle and Square

3.1 properties of rectangle and square, excluding diagonal properties
3.2 drawing rectangle and square

PRIMARY FIVE (FOUNDATION)

STATISTICS
SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION
1. Tables, Bar Graphs and Line Graphs
1.1 reading and interpreting data from tables/graphs 1.2 completing a table from given data

PRIMARY SIX (FOUNDATION)

NUMBER AND ALGEBRA

SUB-STRAND: FRACTIONS

1. Fraction and Division

1.1 dividing a whole number by a whole number with quotient as a fraction
1.2 expressing fractions as decimals

2. Four Operations

2.1 dividing a proper fraction by a whole number
2.2 dividing a whole number/proper fraction by a proper fraction

SUB-STRAND: DECIMALS

1. Multiplication and Division

1.1 multiplying and dividing decimals
1.2 dividing a whole number by a whole number with quotient as a decimal **without calculator**
1.3 rounding answers to a specified degree of accuracy

SUB-STRAND: PERCENTAGE

1. Percentage

1.1 expressing a part of a whole as a percentage
1.2 use of %
1.3 finding a percentage part of a whole
1.4 finding discount, GST and annual interest

MEASUREMENT AND GEOMETRY

SUB-STRAND: AREA AND VOLUME

1. Area of Triangle

1.1 concepts of base and height of a triangle
1.2 area of triangle
1.3 finding the area and perimeter of composite figures made up of squares, rectangles and triangles

2. Volume of cube and cuboid

2.1 volume of a cube/cuboid
2.2 finding the volume of liquid in a rectangular tank excluding conversion between cm^3 and m^3
2.3 relationship between ℓ (or ml) with cm^3

SUB-STRAND: GEOMETRY

1. Rectangle, square and triangle

1.1 properties of
- isosceles triangle
- equilateral triangle
- right-angled triangle

1.2 angle sum of a triangle
1.3 finding unknown angles, without additional construction of lines, in composite geometric figures involving
- square
- rectangle
- triangle

PRIMARY SIX (FOUNDATION)

STATISTICS
SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION
1. Pie Charts
1.1 reading and interpreting data from pie charts
SUB-STRAND: DATA ANALYSIS
1. Average of a set of data
1.1 average as 'total value ÷ number of data' 1.2 relationship between average, total value and number of data