Shuqun Primary

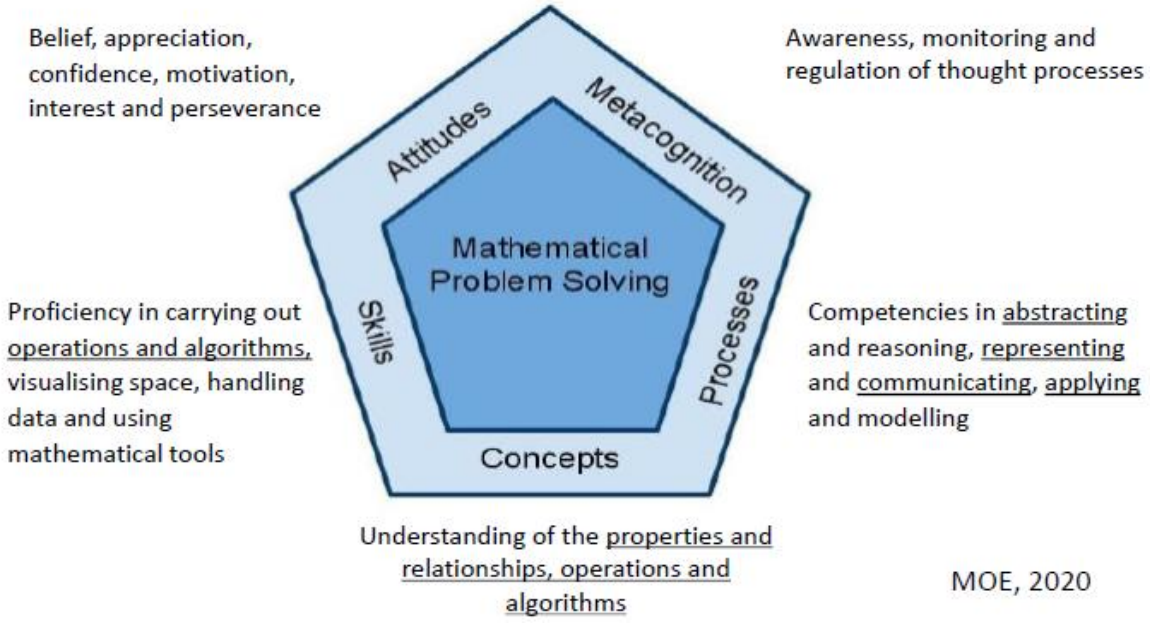
To Serve with Quality

MATHEMATICS PRIMARY FIVE (Foundation)

Overview of Mathematics Curriculum

The Mathematics framework shows the underlying principles of an effective mathematics programme. It sets the direction for the teaching, learning, and assessment of mathematics.

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



The understanding of mathematical concepts is essential for solving problems. In the primary mathematics curriculum, concept in numbers, algebra, measurement, geometry and statistics are explored.

Mathematical processes refer to the practices of mathematicians that are important to solve problems and build new knowledge. This includes abstracting, reasoning, representing and communicating. Justifying a result, deriving new results and generalising patterns involve reasoning. Expressing one's ideas, solutions and arguments involves representing and communicating.

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 awareness of one's affective responses towards a problem.

Mathematics Syllabus

The teaching of Mathematics in Singapore primary school uses the spiral curriculum. This means that many of the topics that have been taught in the lower primary, such as whole numbers, fractions and measurement will be introduced again in both middle and upper primary at a higher complexity. This progression allows the students to grasp Mathematical concepts that are appropriate to their age. It is therefore important for the students to be grounded in such foundation concepts.

The syllabus is organised along 3 content strands with a listing of mathematical processes that cut across the 3 strands.

<table>
<tr><td colspan="3">3 Content Strands + 1 Process Strand</td></tr>
<tr><td>Number and Algebra</td><td>Measurement and Geometry</td><td>Statistics</td></tr>
<tr><td colspan="3">Mathematical Processes</td></tr>
</table>

Primary 5 (**Foundation Mathematics**) students will learn the following:

STRAND: NUMBER AND ALGEBRA	**STRAND : MEASUREMENT AND GEOMETRY**	**STRAND: STATISTICS**
SUB-STRAND 1: WHOLE NUMBERS	**SUB-STRAND 1: MEASUREMENT**	**SUB-STRAND 1: DATA REPRESENTATION AND INTERPRETATION**
Numbers up to 10 million - reading and writing numbers in numerals and in words - comparing and ordering numbers up to 100 000 - rounding numbers to the nearest 10,100 or 1000 - patterns in number sequence - use of ≈ **Four operations** - addition and subtraction algorithms (up to 3 digits) **without calculator** - multiplication and division algorithm (up to 2 digits by 1 digit) **without calculator** - multiplying and dividing by 10,100,1000 and their multiples **without calculator** - order of operations - use of brackets - mental calculation involving: • addition and subtraction of a 3-digit number and ones/tens/hundreds • multiplication and division within the multiplication tables	**Time** - measuring time in hours and minutes - converting time in hours and minutes to minutes only, and vice versa - finding the starting time, finishing time or duration given the other two quantities - 24-hour clock	**Tables, Bar Graphs and Line Graphs** - reading and interpreting data from tables/graphs - completing a table from given data

STRAND: NUMBER AND ALGEBRA	STRAND : MEASUREMENT AND GEOMETRY	STRAND: STATISTICS
Factors and multiples - factors and multiples and their relationship - determining if a 1-digit number is a factor of a given number within 100 - finding the common factors of two given numbers - determining if a number is a multiple of a given 1-digit number - finding the common multiples of two given 1-digit numbers		
SUB-STRAND 2: FRACTION	**SUB-STRAND 2: AREA AND VOLUME**	
Concepts of fractions - fraction as part of a whole - fraction as part of a set **Equivalent fractions** - equivalent fractions - expressing a fraction in its simplest form - comparing and ordering unlike fractions with denominators of given fractions not exceeding 12 - writing the equivalent fraction of a fraction given the denominator or the numerator	**Area and perimeter** - concepts of area and perimeter of a plane figure - measuring area in square units, cm^2 and m^2, excluding conversion between cm^2 and m^2 - area and perimeter of rectangle/square - 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 - finding the area and perimeter of composite figures made up of rectangles and squares	

STRAND: NUMBER AND ALGEBRA	STRAND : MEASUREMENT AND GEOMETRY	STRAND: STATISTICS
Mixed numbers and improper fractions - mixed numbers and improper fractions, and their relationships **Four operations** - adding and subtracting fractions with denominators of given fractions not exceeding 12 and not more than two different denominators **without calculator** - adding and subtracting mixed numbers - multiplying a proper/improper fraction and a whole number **without calculator** - multiplying a proper fraction and a proper/improper fraction **without calculator**	**Volume of cube and cuboid** - building solids with unit cubes - measuring volume in cubic units, cm^3 and m^3, excluding conversion between cm^3 and m^3 - drawing cubes and cuboids on isometric grid	

STRAND: NUMBER AND ALGEBRA	STRAND : MEASUREMENT AND GEOMETRY	STRAND: STATISTICS
SUB-STRAND 3: DECIMALS	**SUB-STRAND 3: GEOMETRY**	
Decimals up to 3 decimal places - notation, representations and place values (tenths, hundredths, thousandths) - comparing and ordering decimals - expressing decimals and fractions - expressing fractions as decimals when the denominator is a factor of 10 or 100 - rounding decimals to the nearest • whole number • 1 decimal place • 2 decimal places **Four operations** - adding and subtracting decimals (up to 2 decimal places) **without calculator** - multiplying and dividing (up to 3 decimal places) by 10,100,1000 and their multiples **without calculator** - 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	**Perpendicular and parallel lines** - perpendicular and parallel lines - draw perpendicular and parallel lines **Angles** - using notation such as $\angle$ ABC and $\angle a$ to name angles - measuring angles in degrees - drawing an angle of a given size - angles on a straight line - angles at a point - vertically opposite angles - finding unknown angles **Rectangle and square** - properties of rectangle and square, excluding diagonal properties - drawing rectangle and square	

STRAND: NUMBER AND ALGEBRA	STRAND : MEASUREMENT AND GEOMETRY	STRAND: STATISTICS
SUB-STRAND 4: RATE		
Rate - rate as the amount of a quantity per unit of another quantity - finding rate, total amount, or number of units given the other two quantities		

Content covered for the other levels can be found in https://www.moe.gov.sg/primary/curriculum/syllabus

Mathematical Processes

Mathematical processes refer to the process skills involved in the process of acquiring and applying mathematical knowledge. This includes:

- Reasoning, communication and connection
- Application
- Thinking skills and heuristics

The table below describe some of the indicators related to each

Mathematical Processes	**Indicators**
Reasoning, Communication and Connection	• Use appropriate notations and symbols to present and communicate mathematical ideas • Reason by: - Observing patterns, similarities and differences - Drawing logical conclusion and making inferences - Explaining or justifying solutions • Make connections within mathematics and between mathematics and everyday life
Application	• Apply mathematical concepts and skills to solve problems in a variety of contexts within or outside mathematics, including: - Identifying the appropriate mathematical representation for a problem - Using appropriate mathematical concepts and skills to solve a problem - Interpreting the mathematical solution in the context of the problem and making sense of the solution
Thinking skills and heuristics	• Use thinking skills such as comparing, sequencing, and deduction • Use a problem-solving model • Use heuristics such as: - Drawing a diagram - Making a list - Guess and check - Working backwards

Mathematics Curriculum at SQPS

1. Teaching Approaches

Math lessons are delivered using the Concrete-Pictorial-Abstract (C-P-A) approach. To introduce a Mathematical concept, teachers will use manipulatives to provide hands-on experience. This age-appropriate approach will provide scaffolding for the primary students to help them grasp abstract mathematical concepts.

The concrete manipulatives will be followed by pictorial representations to help the students visualise the concepts. Finally, the students will move on to the abstract representation in the form of mathematical equations.

2. Topical Review

To supplement workbook practices, the students are given topical reviews. The reviews serve as summary of the concepts and skills learnt as stated in the syllabus. The reviews are done periodically at the end of the topics. The results will provide feedback to both teachers and parents on students' learning progress.

3. Heuristic Curriculum

One important aspect in Mathematical problem solving is the development of Mathematical processes and thinking skills. The heuristic curriculum will expose students to the different problem-solving strategies that they need to learn such as:

- drawing a diagram
- looking for patterns
- guess and check
- making a list
- working backwards

Each heuristic worksheet will focus on one specific heuristic with scaffolding and sufficient practice in the form of parallel questions. These strategies will be repeated periodically to help the students achieve subject mastery.

Mathematical Problem-Solving Approach

To equip students with better problem-solving skills, the school makes a deliberate effort to teach Mathematical process skills through problem solving. The students are taught a systematic problem-solving model called STAR approach.

How do you do solve Mathematics problem sum?

- **S**tudy the problem carefully
- **T**hink of a strategy
- **A**ct on the solution
- **R**eflect on the final answer

STAR approach in Math Problem solving

	My Actions
Study	What am I given? *(annotate objects and values, show connections)*
	What am I asked to find?
Think	What strategy should I use?
	Can I use model or diagram/table?
Act	I will apply the strategy
	I write out my steps and number equations
Reflect	Have I answered the question?
	Have I checked for • Number Transfer? • Unit? • Calculation?

During Math lessons, teachers will 'think aloud' to give attention to these processes and make them visible to students. Through practice, students will develop habits and strategies to help them be better and more independent learners.

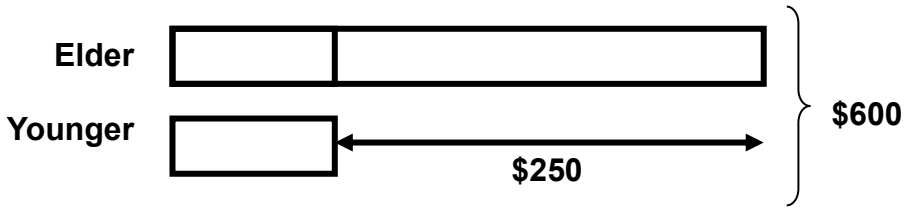
Example of problem-solving using STAR approach:

Study: annotation strategy

*Note: for clarity of annotation process, students are advised to use a pen or pencil instead of highlighter.

Mr Lim gave $600 to his two daughters. The elder daughter received $250 more than the younger daughter. How much did the younger daughter receive?

Think: model drawing



Act: equation and working

600 – 250 = 350
350 ÷ 2 = 175

$$\begin{array}{r} 600 \\ -\ 250 \\ \hline 350 \end{array} \qquad \begin{array}{r} 175 \\ 2\overline{)350} \\ 2 \\ \hline 15 \\ 14 \\ \hline 10 \\ 10 \\ \hline 0 \end{array}$$

Reflect: check for number transfer, unit and calculation

The younger daughter received $175

4. Remediation Class for Mathematics

With reference to results obtained at semestral assessment, students who did not perform well will be supported with remediation class where they will be coached in a small group setting. This will enable the teachers to do targeted teaching. Teachers teaching these classes will adjust the pace of the lesson according to the profile of the students.

During remediation class, there will be re-teaching of the concepts that they have learnt in class. Additional written work will also be provided to give enough opportunity for the students to practice and learn from their mistakes. In addition, students are expected to have additional revision time at home to ensure retention of important concepts that have been taught in class.

5. Use of ICT

As part of the effort to cultivate self-directed learning, the school make use of Koobits and SLS (Student Learning Space) learning portal to supplement the teaching and learning of Mathematics. Koobits platform allows the students to do daily challenge through bite-size Math quizzes and games. This will help improve the students' basic numeracy skills and strengthen their factual fluency. In addition, the SLS portal is used by the teachers to assign ICT lessons that will reinforce the concepts that have been taught in class.

6. Math Activities Outside Classroom

To increase students' interest in learning Mathematics, the school uses its broadcast system and notice boards to engage students with Math quizzes and puzzles. The puzzles and displays will create awareness of Mathematics application beyond classroom learning.

Assessment

School-based Assessment

To ascertain students' progress in learning, students will sit for a formal assessment at the end of the year. Prior to the conduct of the examinations, the school will provide practice paper based on previous year's assessment. This will help the students build the rigour required to do well during the examination.

The following table shows the P5 end-of-year examination format for Foundation Mathematics (FMA). This format is similar to the PSLE format.

Paper	Booklet	Item Type	Number of questions	Number of marks per question	Total marks	Duration
1 (No calculator)	A	Multiple-choice	10	1	10	1 h
			10	2	20	
	B	Short-Answer	8	2	16	
2 (Calculator)		Short-Answer	10	2	20	45 min
		Long-Answer/ Structured	4	3 or 4	14	
Total			**42**	**-**	**80**	**1 h 45 min**

Notes:

1. Both papers will be scheduled on the same day with a break between the two papers.
2. Paper 1 comprises two booklets. The use of calculators is **not** allowed.
3. Paper 2 comprises one booklet. The use of calculators is allowed.

In addition, the teachers will conduct termly assessment periodically to evaluate student's understanding of the topics taught. This will help both the teachers and students to identify learning gaps and address any misconceptions.

	Term 1	Term 2	Term 3	Term 4
Mode of assessment	-	WA1	WA2	End-of-year examination
Weighting	-	15%	15%	70%

Assessment Objectives

The questions in Mathematics paper can be grouped into categories based on their cognitive demand. There are 3 levels of assessment objectives (AO):

- AO1: recall Mathematical facts, concepts, rules and formulae: perform straightforward computations.

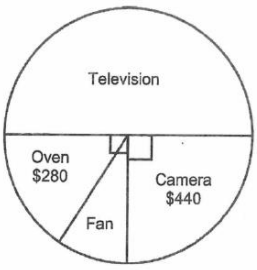
  Example:
  Find the value of
  (a) 156 + 79
  (b) 92 ÷ 4

- AO2: interpret information; understand and apply mathematical concepts and skills in a variety of simple contexts.

  Example:
  A total of 96 children were at a library. There were 10 more boys than girls. How many girls were there?

- AO3: reason mathematically; analyse information and make inferences in simple situations

  Example:
  The pie chart below shows the money spent by Mr Ong on four items.



How much money did Mr Ong spend on the fan?

Expectation of Students

Students are expected to complete all the homework assigned by the subject teachers neatly. This will provide opportunities for students to revise and evaluate the learning that has taken place in school. This will also provide feedback to their teachers on the misconceptions that need to be addressed pertaining to the topic.

To do well in Mathematics, students are taught to present their Math solutions in a clear and systematic way. This will ensure that they will be awarded the full mark allocated for each question. This standardisation is made according to the standards used by MOE during PSLE marking.

In general, students are expected to:

- commit certain knowledge to memory to allow for more speed. For example, students must know the multiplication tables very well in order to cut down time while working out the solution.

- highlight mathematical key words and processes. There is a tendency to attempt questions without careful reading of the information given. When students missed out critical information, made assumptions or did not consider all the conditions of a problem, errors would be made.

- know the terminologies and have conceptual understanding. For example, students must know whether to measure the length of the radius or diameter in questions related to Geometry. Students must be able to identify the height or base in a triangle and for questions on Percentage, students must know how to identify the correct base in a given context. They must not assume a common base for two percentages given as they were based on different quantities.

- be proficient in unit conversion, e.g. kg-g conversion as well as h-min conversion.

- represent the problem using model to help in visualisation (when needed). There must also be correct use of Math equation / number sentence.

- present the Math Working/calculation logically and neatly (unless when calculator is allowed).

- finalise and conclude the solution to the problem with a word statement.

Additional example:

1. Linda had a sum of money. She spent $\frac{3}{10}$ of it on a book and $\frac{1}{10}$ of it on a pen. Both the book and the pen cost $80 altogether. How much money had she left?

$\frac{3}{10} + \frac{1}{10} = \frac{4}{10}$

$\frac{4}{10}$ ---- 80 →

$\frac{1}{10}$ ---- 80 ÷ 4 = 20

$\frac{6}{10}$ ---- 6 x 20 = 120

He had $120 left.

<u>Common mistake in writing the equation:</u>
40% = 80
(40% is equal to 0.4, not 80)
It should be written as 40% ---- 80
or 40% → 80
(40% represents $80)

How Parents Can Support the Child's Learning at Home

Parents are important partners in ensuring a child's mathematical success. A warm, inviting numeracy rich learning environment at home is the first step to fostering a love of mathematics in children. The following are some strategies and opportunities to encourage and sustain math learning in the home:

- ✓ Parents as models of mathematical learning
  - Engage your child in interesting mathematical activities helps stimulate a lifelong enjoyment of mathematics.
  - Build your child's self-confidence and optimism and help them see math learning as valuable as well as fun.
  - Set a positive mindset for the mathematics learning that takes place at school. Parents cannot replace the school experience but they are a significant influence on their children's developing attitudes towards, and enjoyment of, mathematics.

- ✓ Have a growth mindset
  - Believe that every child can be successful in math. Encouragement and practice will help.
  - Encourage persistence. (Some math problems take time to solve) It is alright if your child does not get it right at the first attempt or takes a longer time to figure out the math problem.
  - Encourage your child to experiment with different approaches to mathematics. There is often more than one way to solve a math problem.

- ✓ Promote mathematical reasoning
  - Encourage your child to talk about and show a math problem in a way that makes sense (i.e., draw a picture, explain using concrete objects, etc)
  - When your child is solving math problems ask questions such as:
    - What operation do you use? Why?
    - Do you see any patterns?
    - Does the answer make sense? How do you know?

- ✓ Connect math to everyday life and help your child understand how math influences them (i.e. shapes of traffic signs, walking distance to school, telling time, weighing and reading mass of objects).

- ✓ Use of Games and Storybooks to practise Mathematical concepts

- ✓ Use of ICT resources effectively
  The following websites can be explored to introduce math concepts through fun computer games.
  - https://member.koobits.com
  - https://www.mathplayground.com/

Resources

The following resources are used to facilitate Math lesson in the classroom. The materials for the different levels will be specified in the book list provided by the school before the beginning of the school year.

- Math textbook and practice book
- Math exercise book
- Topical worksheet
- Practice papers
- Koobits