MSF Primary Math Curriculum (2022)

In this document you will find the revised Singapore Math Curriculum for which MSF intends to adopt and adapt. The Singapore Math Curriculum staged as a starting point from which committee members then revised and improved based on the vision/mission of IB/PYP/MSF, the student needs, and professional opinions of the committee members to better suit MSF. The British Columbia, New York NextGen and England curricula were also considered and in some cases, used to improve sections of the Singapore Math Curriculum. To view such amendments, please refer to Working document of Singapore Math editable.

To assist in the successful shift in mathematical teaching and learning, staff prepared a MSF Primary Math Vision. This vision is a response to relevant research, teacher experiences and discussions. The creation and development of the MSF Primary Math Curriculum is a response to the needs and direction set out by the vision. It is our responsibility to uphold and implement this vision.

Below is a list of overviews and guidelines to assist in understanding and implementing the curriculum. Follow the link to Math Curriculum Overview and Guidelines to familiarize yourself with the content which includes…

- Learning Mathematics as a ***21st Century Necessity***
- ***3 Teaching Principles*** that go alongside the curriculum
- Details pertaining to the ***Learning Experiences*** section of the curriculum
- Details pertaining to the ***Mathematical Processes*** strand of the curriculum

For your additional information, here is the MSF Early Years Math Curriculum.

Aims of Curriculum

The MSF Primary Mathematics Curriculum 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
- build confidence and foster interest in mathematics

PRIMARY 1-5 1. Mathematical Processes				
PRIMARY ONE	**PRIMARY TWO**	**PRIMARY THREE**	**PRIMARY FOUR**	**PRIMARY FIVE**
1. Number and Algebra 2. Statistics 3. Measurement and Geometry	1. Number and Algebra 2. Statistics 3. Measurement and Geometry	1. Number and Algebra 2. Statistics 3. Measurement and Geometry	1. Number and Algebra 2. Statistics 3. Measurement and Geometry	1. Number and Algebra 2. Statistics 3. Measurement and Geometry

PRIMARY GRADE 1 - 5

MATHEMATICAL PROCESSES	
Content (Outcomes-reported on)	**Learning Experiences (Indicators- suggested curriculum implementation)**
1. Reasoning, Communication and Connections (Outcomes)	**Students should have opportunities to: (Indicators)**
1.1 Use mathematical vocabulary and language to contribute to mathematical discussions 1.2 Explain and justify mathematical ideas and decisions 1.3 Represent mathematical ideas in concrete, pictorial, and symbolic forms	(a) observe patterns, similarities and differences (b) find and share logical conclusions and make inferences (c) explain or justify solutions and write out the solutions mathematically
2. Applications	**Students should have opportunities to: (Indicators)**
2.1 Apply mathematical understanding to solve problems in everyday life 2.2 Make sense of problems and persevere in solving them.	(a) identify the appropriate mathematical representations for a problem (b) use appropriate mathematical concepts, skills (including tools and algorithm) to solve a problem (c) interpret the mathematical solution in the context of the problem and make sense of the solution (d) make connections and apply mathematical understanding between mathematics and everyday life
3. Thinking Skills and Strategies	**Students should have opportunities to: (Indicators)**
3.1 Develop and use multiple strategies to engage in problem-solving and support mathematical thinking	(a) develop and evaluate the usefulness and efficiency of a strategy within the context of the problem (b) use mathematical thinking to identify and apply the most effective strategy in the context of the problem (c) practice using the identified strategies (listed below) in the correct setting to solve a problem ● Drawing a diagram ● Tabulating make a list or table ● Guess and check ● Working backwards ● Simplifying a problem ● Considering special cases ● Act it out ● Look for a pattern ● Try all possibilities ● Make a model ● Polya's Model

PRIMARY ONE

NUMBER AND ALGEBRA	
Overall Expectations	**Conceptual Understanding**
SUB-STRAND: WHOLE NUMBERS	
1. Numbers up to 100 (Outcomes)	**Students should have opportunities to: (Indicators)**
1.1 counting to tell the number of objects in a given set 1.2 use number notation, representations and place values (tens, ones) 1.3 reading and writing numbers in numerals, expanded form and in words 1.4 comparing the number of objects in two or more sets 1.5 comparing and ordering numbers 1.6 identify patterns in number sequences 1.7 use ordinal numbers (first, second, up to tenth) and symbols (1st, 2nd, 3rd, etc) 1.8 use number bonds for numbers up to 10 1.9 count in steps (skip count) of 2, 3, and 5 from 0, and in 10s from any number, forward and backward	(a) use number-bond posters and make number stories to build and consolidate number bonds for numbers up to 10. (think subitization) (b) work in groups using concrete objects to ● make a group of ten and count on from 10 to tell the number (less than 20). ● make groups of ten and count tens and ones to tell the number (more than 20). ● estimate the number of objects up to 100, before counting. ● make sense of the size of 100. (c) use concrete objects and the base-ten set to represent and compare numbers in terms of tens and ones, and use language such as 'more than', 'fewer than', 'the same as' and 'as many as' greater, less than, equal too, and include the symbols to describe the comparison. (d) play games using dot cards, picture cards, numeral cards and number-word cards etc. for number recognition and comparison. (e) describe a given number pattern using language such as '1 more/less' or '10 more/less' before continuing the pattern or finding the missing number(s). (f) Use number talks, dot charts, number bonds, ten-frames,etc to solidify knowledge of "facts to ten" (1+9, 2+8, 3+7, 4+6, 5+5) (nearly automatic) (throughout the year) (g) practice and discuss estimation strategies (h) place a given number on a number line between two consecutive tens and determine which ten is nearer to the given number. (i) given a number, identify one more and one less
2. Addition and Subtraction	**Students should have opportunities to:**
2.1 understands concepts of addition and subtraction 2.2 use of +, – and = 2.3 recognise inverse 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 equations, with unknowns in all positions 2.7 solving 1-step word problems involving addition and subtraction within 20 2.8 mental calculation involving addition and subtraction within 20	(a) work in groups to make addition and subtraction stories using concrete objects/pictures and write an addition or subtraction equation for each story. (b) write two addition facts and two subtraction facts for a given number bond within 20. (c) use strategies such as 'count on', 'count back', 'make ten' and 'subtract from 10' for addition and subtraction within 20 (before committing the number facts to memory) and thereafter, within 100. (d) compare two numbers within 20 to tell how much one number is greater (or smaller) than the other by subtraction. (e) achieve mastery of basic addition and subtraction facts within 20 through playing a wide range of games. (f) use the base-ten set to illustrate the standard strategies for addition and subtraction of 2-digit numbers. (g) Use addition and subtraction within 20 ...adding to, taking from, putting together, taking apart, and/or

• of a 2-digit number and ones without renaming • of a 2-digit number and tens	comparing, with unknowns in all positions (and equations on left and right side of equal sign) (h) = sign means balanced or same on both sides (i) show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot
3. Multiplication and Division	**Students should have opportunities to:**
3.1 count in steps (skip count) of 2, 3, and 5 from 0, and in 10s from any number, forward and backward 3.2 create and combine equal groups (with repeated addition and subtraction)	Explore early concepts of multiplication and division through: (a) make equal groups using concrete objects and count the total number of objects in the groups by repeated addition using language such as '2 groups of 5' and '2 fives'. (b) share a given number of concrete objects/picture cutouts and explain how the sharing is done and whether the objects can be shared equally. (c) divide a set of concrete objects into equal groups, and discuss the grouping and sharing concepts of division. (d) Use number lines and 100s charts and arrays (e) solve one-step problems involving repeated addition and subtraction, by calculating the answer using concrete objects, pictorial representations and arrays
SUB-STRAND: MONEY	
4. Money	**Students should have opportunities to:**
4.1 counting amount of money • in cents up to €1 • in euros up to €100 4.2 solving 1-step word problems involving addition and subtraction of money in euros only (or in cents only)	(a) communicate and share their shopping experiences. (b) recognise coins and notes of different denominations, count money from the highest to the lowest denomination and represent money using € and ¢ symbols (c) match coin/note of one denomination to an equivalent set of coins/notes of another denomination using play money, and realise that a greater number of coins/notes is not necessarily a greater amount of money. (d) compare amounts of money using play money, and realise that when comparing two sets of notes (or coins), it is their values that are being compared and not the number of notes (or coins). (e) work in groups using play money to add, subtract and make change during shopping activities.
STATISTICS	
SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION	
1. Graphs	**Students should have opportunities to:**
1.1 reading and interpreting data from simple graphs 1.2 constructing picture graphs	(a) work in groups to collect data from the class to answer relevant, meaningful questions such as "What kind of fruits do we like?" and use the data to make a picture graph for display. (b) discuss and describe the data presented in a picture graph using language such as 'most', 'least', 'greatest', 'smallest', 'as much as' and 'as many as'. (c) construct graphs in both vertical and horizontal forms, and make a story using information from a graph. (d) interpret and construct simple pictograms, tally charts, bar graph and tables

	(e) ask-and-answer questions about totalling and comparing categorical data Introducing probability: (f) introduce probability through vocabulary: likelihood of familiar life events ● using comparative language (e.g., certain, uncertain; more, less, or equally likely)
MEASUREMENT AND GEOMETRY	
SUB-STRAND: MEASUREMENT	
1. Length, Mass, and Volume	**Students should have opportunities to:**
1.1 measuring and comparing the length, mass, volume of objects in non-standard units	(a) work in groups to measure length using a variety of non-standard units such as body parts, paper clips and common objects in their environment and explain their choices of units and how the measurement is done. (b) estimate the length of an object before measuring it and use the word 'about' to describe the measurement. (c) work in groups to measure mass using a variety of non-standard units such as blocks, toothpicks, items that are the same, and common objects in their environment and explain their choices of units and how the measurement is done. (d) work in groups to measure volume using a variety of non-standard units such as buckets, cups, sand, marbles, and common objects in their environment and explain their choices of units and how the measurement is done.
2. Time	**Students should have opportunities to:**
2.1 telling time to the hour/half hour 2.2 recognise and use language relating to dates, including days of the week, weeks, months and years	(a) tell time from a clock face and an analogue clock and relate time to the events of a day using 'o'clock' and 'half past'. (b) sequence events according to time and explain the appropriateness of events at different times of the day, e.g. lunch at 3 o'clock in the afternoon. ● time [for example, quicker, slower, earlier, later] (c) know the number of minutes in a hour, and hours in a day (d) Understand the difference between the hour and minute hand and draw the hands on a clock face to show these times.
SUB-STRAND: GEOMETRY	
3. 2D Shapes	**Students should have opportunities to:**
3.1 describing and classifying 2D shapes ● rectangle ● square ● circle ● triangle 3.2 completing and creating patterns with 2D shapes according to one or two of the following attributes ● size	(a) recognise, name and describe the 4 basic 2D shapes (rectangle, square, circle and triangle) from real objects, pictures (drawings and photographs) and real world examples. (b) trace the outline of 2D shapes from 3D objects. (c) identify and describe 2D shapes in different sizes and orientations. (d) form a 2D shape from cut-out pieces of the shape. (e) guess a 2D shape from a description of the shape. (f) recognise and describe the differences/similarities between two 2D shapes according to attributes such as sides, corners, sizes and colours.

● shape ● colour ● orientation	(g) describe other common 2D shapes (trapezium/trapezoid, pentagon, hexagon, octagon) (h) work in groups to sort 2D shapes in different ways and explain how the shapes are sorted. (i) use 2D shapes to create patterns according to one or two attributes (size, shape, colour and orientation) and describe the patterns. (j) work in groups to create a pattern and invite other groups to guess the missing shape(s) in the pattern and explain the pattern.

PRIMARY TWO

NUMBER AND ALGEBRA

Overall Expectations	**Conceptual Understanding**
SUB-STRAND: WHOLE NUMBERS	
Content (Outcomes-reported on)	**Learning Experiences (Indicators- suggested curriculum implementation)**
1. Numbers up to 1000	**Students should have opportunities to:**
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, expanded form and in words 1.4 comparing and ordering numbers 1.5 identify and extend patterns in number sequences 1.6 identify odd and even numbers	(a) give examples of numbers in everyday situations, and talk about how and why the numbers are used. (b) work in groups using concrete objects/the base-ten set/play money to ● count in tens/hundreds to establish 10 tens make 1 hundred and 10 hundreds make 1 thousand. ● represent and compare numbers. (c) make sense of the size of 100 and use it to estimate the number of objects in the size of hundreds (visually estimate quantities with hundreds up to 1 000). (d) use the base-ten set/play money to represent a number that is 1, 10 or 100 more than/less than a 3-digit number. (e) use place-value cards to illustrate and explain place values, e.g. the digit 3 stands for 300, 30 or 3 depending on where it appears in a number. (f) use place-value cards to compare numbers digit by digit from left to right, and use language such as ‘greater than’, ‘greatest’, ‘smaller than’, ‘smallest’ and ‘the same as’ to describe the comparison. (g) describe a given number pattern before continuing the pattern or finding the missing number(s). (h) place a given number on a number line between two consecutive tens and determine which ten is nearer to the given number. (i) recognizing zero as a place holder and invisible zeroes in numbers (03 = 3) in numbers in all forms (written, expanded and numeral). (j) patterning should include whole number/place value (add 10, 100, etc), addition and subtraction, and skip counting
2. Addition and Subtraction	**Students should have opportunities to:**
2.1 understands and uses addition strategies (up to 3 digits) 2.2 understands and uses subtraction strategies (up to 3 digits) 2.3 solving up to 2-step word problems involving addition and subtraction 2.4 uses mental calculation involving addition and subtraction of a 3-digit number and a multiple of ones/tens/ hundreds	(a) write addition and subtraction equations for number stories and explain the meaning of the equal sign. (b) achieve mastery of basic addition and subtraction facts within 20 by ● writing a family of 4 basic facts within 20 given any one of the basic facts (e.g. 9 + 7 = 16, 7 + 9 = 16, 16 – 9 = 7 and 16 – 7 = 9 are a family of addition and subtraction facts). ● playing games, including applets and digital games. (c) work in groups using the base-ten set/play money to illustrate the strategies for addition and subtraction up to 3 digits. (d) use the part-whole, cuisenaire rods and comparison models to illustrate the concepts of addition and subtraction and use the models to determine which operation (addition or subtraction) to use when solving 1-step word problems. (e) use the comparison model to reinforce the language of comparison such as “Ali has 30 more stickers than Siti.” (f) solve 2-part word problems (1 step for each part) before solving 2-step word problems. (g) achieve mastery of addition and subtraction algorithms up to 3 digits by playing games, including applets and digital games. (h) work in groups to create word problems involving addition and subtraction for other groups to solve. (i) using strategies such as looking for multiples of 10, friendly numbers (e.g., 48 + 37, 37 = 35 + 2, 48 + 2 = 50, 50 + 35 = 85), decomposing into 10s and 1s and recomposing (e.g., 48 + 37, 40 + 30 = 70, 8 +7 = 15, 70 +15 = 85), and

	compensating (e.g., 48 + 37, 48 +2 = 50, 37 – 2 = 35, 50 + 35 = 80)
3. Multiplication and Division	**Students should have opportunities to:**
3.1 understanding concepts of multiplication (e.g., groups of, arrays, repeated addition) for multiples of 2, 3, 4, 5 and 10. 3.2 solving 1-step word problems involving multiplication of 2, 3, 4, 5 and 10.	Explore early concepts of multiplication and division through: (a) work in groups to make multiplication and division stories, write a multiplication or division equation for each story and explain the meaning of the equal sign. (b) use concrete objects and pictorial representations to illustrate the concepts of multiplication and division such as 'multiplying 3 by 5' and 'dividing 12 by 4'. (c) explore number patterns of the multiples for 2, 3, 4, 5 and 10 through activities such as colouring the hundred chart. (e) work in groups to create word problems (with pictorial representation if necessary) involving multiplication and division for other groups to solve. (f) solve non-routine problems using heuristics such as 'act it out' and 'draw a diagram' and share their ideas. (g) work with equal groups of objects to gain foundations for multiplication. (h) determine whether a group of objects (up to 20) has an odd or even number of members. (i) write an equation to express an even number as a sum of two equal addends (j) use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and 5 columns. Write an equation to express the total as a sum of equal addends.
SUB-STRAND: FRACTIONS	
4. Fraction of a Whole	**Students should have opportunities to:**
4.1 understands concept of fraction as part of a whole 4.2 uses notation and representations of fractions 4.3 comparing and ordering unit fractions (numerators are 1) with denominators of the given fractions not exceeding 12 4.4 comparing and ordering like fractions (denominators are the same) with denominators of the given fractions not exceeding 12	(a) give examples of fractions in everyday situations and use language such as '2 out of 3' to describe fractions. (b) use concrete objects, fraction discs and pictorial representations to represent and interpret fractions in terms of unit fractions, e.g. ⅗ is 3 units of ⅕, ⅕ + ⅕ +⅕, or 3 fifths, and to compare the sizes referring to the same whole. (c) use fraction discs to represent and compare two unit fractions and explain why the greater the denominator, the smaller the unit fraction, e.g. ⅙ is smaller than ⅓ . (d) use fraction discs to represent and compare two like fractions (i.e. fractions with the same denominator) and explain why the greater the numerator, the greater the quantity of the fraction, e.g 6/7 is greater than 4/7. (e) achieve mastery of fraction recognition and comparison by playing games using fraction cards (pictures and symbols), number lines.
5. Addition and Subtraction of Fractions	**Students should have opportunities to:**
5.1 adding like (same denominators) fractions within one whole with fractions not exceeding 12 as a denominator 5.2 subtracting like fractions within one whole with fractions not exceeding 12 as a denominator	(a) write addition and subtraction stories involving like fractions within one whole. (b) use fraction discs to illustrate addition and subtraction of like fractions within one whole, e.g. ⅗ + ⅕ = ⅘ (3 fifths + 1 fifth = 4 fifths)

SUB-STRAND: MONEY	
6. Money	**Students should have opportunities to:**
6.1 counting amount of money in euros and cents 6.2 reading and writing money in decimal notation 6.3 comparing two or three amounts of money 6.4 converting an amount of money in decimal notation to cents only, and vice versa 6.5 solving word problems involving money in euros only (or in cents only)	(a) read the prices of items from a supermarket advertisement or a grocery shopping list, write the prices in euros and cents and in decimal notation, e.g. €3.45 is 3 euros and 45 cents, and use play money to make up an amount of money to pay for a selected item. (b) use play money to make up a given amount of money in different ways (e.g. €1 is made up of 2 fifty-cent coins or 5 twenty-cent coins), and write the amount in different ways (e.g. €1, €1.00 and 100 cents). (c) use play money to make different amounts of money and to add, subtract and make change during shopping activities up to 1000 euros. (d) work in groups to create word problems involving shopping using data from supermarket advertisements etc. for other groups to solve.

STATISTICS

SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION	
1. Graphs with Scales	**Students should have opportunities to:**
1.1 reading and interpreting data from graphs with scales 1.2 solving 1-step problems using data from picture graphs 1.3 collecting data and constructing simple graphs	Scales should be simple (ie, by 1, 2, 5, or 10) (a) work in groups to write a question and answer it by collecting data from more than one class (b) make a picture graph and explain why a scale or key is used instead of one-to-one representation. (c) represent and interpret picture graphs in both vertical and horizontal forms, and make a story using information from a graph. (d) interpret and construct simple pictograms, tally charts,bar graph, tables, timetables (schedules) (e) collecting data, creating a graph, and describing, comparing, and discussing the results (f) ask-and-answer questions about totalling and comparing categorical data Introducing probability: (g) introduce probability through vocabulary: likelihood of familiar life events ● using comparative language (e.g., certain, uncertain; more, less, or equally likely)

MEASUREMENT AND GEOMETRY

SUB-STRAND: MEASUREMENT	
1. Length, Mass and Volume	**Students should have opportunities to:**
1.1 measuring ● length in metres/centimetres ● mass in kilograms/grams ● volume of liquid in litres 1.2 measuring and drawing a line segment to the nearest cm	(a) work in groups to measure length using a variety of non-standard units such as body parts, paper clips and common objects in their environment and explain their choices of units and how the measurement is done. (b) recognise that the term ‘weight’ is commonly used to mean mass in everyday situations. (c) compare masses of objects using balance scales. (d) use everyday examples to develop a sense of ● how long 1 m/1 cm is, e.g. using a metre ruler, width of a fingernail.

1.3 using appropriate units of measurement and their abbreviations cm, m, g, kg, ℓ 1.4 comparing and ordering ● lengths ● masses ● volumes 1.5 solving word problems involving length / mass / volume	● estimating length in metres using their arm span to show 1 m ● how heavy 1 kg/1 g is, e.g. using a packet of sugar/flour/ rice, a pin, a piece of paper. ● how much 1 litre of liquid is, e.g. using a bottle of mineral water/cooking oil, and 1-litre containers in different shapes. (e) work in groups to measure the length of curves using a string. (f) work in groups to measure length/mass using appropriate units and explain their choices of units and how the measurement is done, e.g. measure the length of a longer object in metres and the mass of a heavier object in kg. (g) estimate length/mass/volume before measuring it and use the word 'about' (e.g. about 20 cm) to describe the estimation and measurement. (h) compare and order lengths, mass, volume/capacity and record the results using >, < and =
2. Time	**Students should have opportunities to:**
2.1 telling time to 5 minutes 2.2 use of 'a.m.' and 'p.m.' 2.3 drawing hands on the clock face to show time 2.4 estimate the duration of 1hour/half hour by providing examples	(a) use a geared clock to tell time to 5 minutes and relate it to the events of a day. (b) count aloud in steps of 5 while the minute hand of a geared clock moves from one number to the next and makes connections to the multiplication table of 5. (c) show time using a geared clock for others to read the time. (d) tell time and relate words such as 'morning', 'afternoon', 'noon', 'midnight', 'night' to a.m. and p.m., and give examples such as "I watched a movie with my father at 7.30 p.m." (e) relate a.m. and p.m. to the 24 hour clock (f) use everyday examples such as TV programme and bus schedules to tell and write time and to identify events that last about 1 hour/half hour, e.g. the Mathematics lesson lasted half an hour. ' (g) use of abbreviations h and min (h) estimate the duration of 1hour/half hour by providing examples
SUB-STRAND: GEOMETRY	
3. 2D Shapes	**Students should have opportunities to:**
3.1 describing and classifying 2D shapes 3.2 identifying the basic shapes that make up a given figure 3.3 forming different 2D figures with known shapes	(a) relate semicircle and quarter circle to circle. (b) guess 2D shapes from given descriptions of the shapes (rectangle, square, triangle, circle, trapezoid/trapezium, pentagon, hexagon, octagon, semicircle, quarter circle) (c) recognise, name and describe shapes from real objects, pictures (drawings and photographs) and real world examples. (d) recognise and describe the differences/similarities between two 2D shapes according to attributes such as straight lines, curves, sizes and colours. (e) work in groups to create composite figures (e.g. picture of a boat) using 2D shapes, and get other groups to identify the basic shapes that make up the composite figures. (f) make/complete patterns with 2D shapes according to one or two attributes (size, colour, shape and orientation) and explain the patterns. (g) copying figures on dot grid or square grid (h) classify 2D figures as polygons or non-polygons
4. 3D Shapes	**Students should have opportunities to:**
4.1 describing and classifying	(a) recognise, name and describe 3D shapes found in their environment.

3D shapes	(b) make a guess of the 3D shapes in a bag by touch and feel only. (cube, cuboid, cone, cylinder, sphere, square-based pyramid, triangle-based pyramid, triangular prism) (c) recognise and describe the differences/similarities between two 3D shapes according to attributes such as faces, edges, corners, sizes, colours and rolling. (d) work in groups to sort 3D shapes in different ways and explain how the shapes are sorted. (e) work in groups to create different 3D figures using 3D shapes (f) make/complete patterns with 3D shapes (except sphere) according to one or two attributes (size, shape, colour and orientation) and explain the patterns. (g) work in groups to create a pattern and invite other groups to guess the missing shape(s) and explain the pattern.
5. Line Symmetry	**Students should have opportunities to**
5.1 identifying symmetric figures 5.2 determining whether a straight line is a line of symmetry of a symmetric figure 5.3 completing a symmetric figure with respect to a given line of symmetry on square grid	(a) work in groups to look for examples of symmetric figures in their environment and determine the lines of symmetry. (b) visualise folding a symmetric figure along a line of symmetry, justify that the figure is symmetric about the line of symmetry, and relate the two halves of the symmetric figure as reflections of each other in the line of symmetry. (c) work in pairs to create symmetric figures with materials such as pattern blocks, paper, origami paper ect.

PRIMARY THREE

NUMBER AND ALGEBRA

SUB-STRAND: WHOLE NUMBERS	
Content (Outcomes-reported on)	**Learning Experiences (Indicators- suggested curriculum implementation)**
1. Numbers up to 10 000	**Students should have opportunities to:**
1.1 count in hundreds/thousands 1.2 use number notation, representations and place values (thousands, hundreds, tens, ones) 1.3 read and write numbers in numerals and in words 1.4 compare and order numbers 1.5 identify and extend patterns in number sequences 1.6 Estimate reasonably by comparing to something familiar 1.7 Round to the nearest 10, 100 and 1000	(a) discuss examples of big numbers (in thousands) in real life. (b) work in groups using manipulatives/number line to represent and compare numbers. (c) use manipulatives/play money to count in hundreds/thousands. (d) make sense of the size of 1000 and use it to estimate the number of objects in the size of thousands (visually estimate quantities up to 1,000) (e) use place-value cards to illustrate and explain place values, e.g. the digit 3 stands for 3000, 300, 30 or 3 depending on where it appears in a number. (f) use manipulatives/place-value cards to compare numbers digit by digit from left to right, and use language such as 'greater than', 'greatest', 'smaller than', 'smallest', 'the same as' to describe the comparison. (g) use manipulatives/play money to represent a number that is 1, 10, 100 or 1000 more than/less than a 4-digit number. (h) describe a given number pattern before continuing the pattern or finding the missing number(s). (i) place a given number on a number line between two consecutive tens, hundreds, thousands and determine which ten is nearer to the given number (j) read and write numbers using expanded form, word form, digit/standard form, and base ten (sketches and building) (k) identify, represent and estimate numbers using different representations. (l) patterning should include whole number/place value (add 10, 100, etc), addition and subtraction, skip counting and multiplication.
2. Addition and Subtraction	**Students should have opportunities to:**
2.1 addition strategies (up to 4 digits) 2.2 subtraction strategies (up to 4 digits) 2.3 solve up to 2-step word problems involving addition and subtraction 2.4 mental calculation involving addition and subtraction of two 2-digit numbers	(a) associate the terms 'sum' and 'difference' with the comparison model, e.g. "The sum of 35 and 60 is 95 and their difference is 25." (b) work in groups using manipulatives to illustrate the standard algorithms for addition and subtraction up to 4 digits. (c) achieve proficiency with addition and subtraction up to 4 digits through games and technology (d) solve a variety of problems: 1-step word problems, 2-part word problems (1 step for each part), 2-step word problems and non-routine problems to become familiar with the problem-solving process. (e) work in groups to create 2-step word problems involving addition and subtraction up to 4 digits for other groups to solve. (f) do mental addition and subtraction of two 2-digit numbers and discuss the different mental calculation strategies. (g) using addition and subtraction in real-life contexts and problem-based situations (h) estimate the answer to a calculation and use inverse operations to check answer
3. Multiplication and Division	**Students should have opportunities to:**
3.1 understanding concepts of multiplication (e.g., groups of, arrays, repeated addition) for multiples of 6, 7, 8, and 9 3.2 understanding concepts of division (e.g.	(a) work in groups to make multiplication and division stories, and write multiplication and division equations for the stories. (b) use concrete objects and pictorial representations to illustrate the concepts of multiplication and division such as 'multiplying 6 by 5' and 'dividing 49 by 7'.

equal groups, arrays, repeated subtraction) for multiples of 6, 7, 8, and 9 3.3 solving up to 2-step word problems involving the 4 operations 3.4 demonstrating fluency with multiplication and division strategies up to multiples of 10	(c) explore number patterns in the multiplication tables of 6, 7, 8 and 9 through activities such as, but not limited to, colouring the hundred chart. (d) work in groups using manipulatives to illustrate solving multiplication and division strategies up to 3 digits by 1 digit. (e) divide a number of concrete objects into equal groups to discover that sometimes there are objects left over as remainder and write the answer as quotient and remainder. (f) achieve proficiency of multiplica tion and division facts by ● Using flexible computation strategies ● Exploring arrays, equal groups, ● Applying repeated addition and subtraction ● writing a family of 4 basic facts within the multiplication tables given any one of the basic facts (e.g. 8 x 4 = 32, 4 x 8 = 32, 32 ÷ 4 = 8 and 32 ÷ 8 = 4 are a family of multiplication and division facts). (g) use the part-whole and comparison models to illustrate the concepts of multiplication and division and use the models to determine which operation (multiplication or division) to use when solving 1-step word problems. (h) use the comparison model to reinforce the language of comparison such as “Ali has 3 times as much money as Mary.” (i) work in groups to create 2-step word problems involving the 4 operations for other groups to solve. (j) solve non-routine problems using different strategies such as ‘act it out’ and ‘draw a diagram’ and share their ideas. (k) Apply properties of operations as strategies to multiply and divide. ● Commutative property of multiplication - If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. ● Associative property of multiplication - (the way in which factors are grouped in a *multiplication* problem does not change the product) - 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. ● Distributive property - Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56.
SUB-STRAND: FRACTIONS	
4. Equivalent fractions	**Students should have opportunities to:**
4.1 understands concepts of equivalent fractions 4.2 expressing a fraction in its simplest form 4.3 comparing and ordering unlike fractions with denominators of fractions not exceeding 12	(a) discuss examples of fractions in everyday situations. (b) represent fractions as numbers on a number line. ● represent a fraction 1/b on a number line by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part starting at 0 locates the number 1/b on the number line. ● Represent a fraction a/b on a number line by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line (c) use fraction strips or the part-whole model to represent two equivalent fractions, and explain why they are equal and how one can be obtained from the other, e.g ⅔ = 4/6 . (d) make a list of the equivalent fractions of a given fraction and use this method to compare two unlike fractions. (e) work in groups to compare fractions using different strategies such as drawing a diagram, comparing with respect to half, and explain the strategies used. (f) identify fractions that are not in their simplest form and reduce these fractions to their simplest form. (g) achieve proficiency of equivalent fractions and fraction comparison through playing games using fraction cards (pictures and symbols) and digital games.

	(h) Fractions are limited to those with denominators 2, 3, 4, 6, 8, 10 and 12. Equivalent Fractions: 1/1, 2/2, 3/3, 4/4, etc ½, 2/4, 3/6, 4/8, 5/10, 6/12 ⅓, 2/6, 4/12 ⅔, 4/6, 8/12 ¼, 2/8, 3/12 ¾, 6/8, 9/12 ⅙, 2/12 (i) Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Express 3 as 3=3/1, recognize 6/3=2, and locate 4/4 and 1 as being on the same point on a number line. (j) Record the results of comparisons with the symbols >, =, or <, and justify the conclusions. (k) Recognize that comparisons rely on the two fractions referring to the same whole. (l) writing the equivalent fraction of a fraction when given the denominator or the numerator only (eg. ¾ is x/12 or 9/x)
5. Addition and subtraction	**Students should have opportunities to:**
5.1 adding two related fractions (denominators with common multiples) within one whole, with denominators of fractions not exceeding 12 5.2 subtracting two related fractions within one whole, with denominators of fractions not exceeding 12	(a) use fraction discs,strips and number lines to represent two related fractions (i.e. fractions with related denominators), and explain how the two fractions are related. (b) use fraction discs, strips and number lines to illustrate addition and subtraction of related fractions within one whole, e.g. ¾ + ⅛ = 6/8 + ⅛ = ⅞ (c) work in groups to make addition and subtraction stories involving like fractions/related fractions.
SUB-STRAND: DECIMALS	
6. Decimals in the context of money	**Students should have opportunities to:**
6.1 adding and subtracting money in decimal notation 6.2 representation and notation of tenths and hundredths 6.3 comparing and ordering tenths and hundredths 6.4 solving word problems involving addition and subtraction of money in decimal notation	(a) discuss the value of €1000 (e.g. things that can be bought with a €1000 note), and use play money to illustrate that €1000 is 10 times €100. (b) use play money to illustrate the addition and subtraction algorithms and make connections between the algorithms for money and for whole numbers. (c) use a variety of strategies for adding and subtracting money, e.g. make €1, make a whole number of euros first, and explain the process. (d) work in groups to solve problems in real-world situations such as shopping and budgeting. (e) look for decimals in everyday situations e.g. advertisements from newspapers and magazines. (f) recognise that a decimal is made up of a whole-number part and a fractional part, represent the decimal on a number line, and make connections between decimals, fractions and measurement. (g) use manipulatives to extend the place-value concept of whole numbers to decimals. (h) count in tenths/hundredths using manipulatives from 0.1 to 1.2, or from 0.01 to 0.12, e.g. 11 tenths is 1.1. (i) write whole numbers and decimals, arrange these numbers in increasing/ decreasing order and explain how it is done. (j) use manipulatives to represent a number that is 0.1, 0.01 more than/less than a given decimal. (k) create, describe and continue number sequences such as 0.4, 0.8, 1.2, 1.6, ...

	(l) compare decimals using number line. (m) compare two decimals by first comparing the whole-number parts, and then compare the tenths, hundredths in that order. (n) represent equivalent decimals such as 0.2, 0.20 and 0.200, and explain that they are the same number. (o) in the context of money, place a given decimal on a number line between two consecutive whole numbers/tenths/ hundredths, and determine which whole number/tenth/ hundredth is nearer to the given decimal.
STATISTICS	
SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION	
1. Graphs	**Students should have opportunities to:**
1.1 reading and interpreting data from graphs 1.2 using different scales on axis 1.3 collecting data and constructing a bar graph 1.4 solving simple 2 step problems using data from bar graphs 1.5 calculating mode and range	Scales could include: 1, 2-5, 10, multiples of 10, 100, 1000 (a) work in groups to discuss how to collect data, e.g. through interview or survey, and how to represent the data in a bar graph. (b) construct a bar graph using software ● Excel / google spreadsheet ● make a story using information from ~~the~~ a graph. (c) discuss real-world examples of data presented in bar graphs. (d) introduce vocabulary: title, minimum, maximum, lowest, highest, y-axis, x-axis, origin, scale (e) Exploring different graphs and charts, and their specific uses. ● Tape diagrams, venn diagrams, line graphs, bar graphs, tally charts, timetable (schedules) etc (f) Discuss the usefulness of mode and range, and use this to analyze data and answer questions
2. Probability	**Students should have opportunities to:**
2.1 explaining the likelihood of familiar events	(a) using comparative language (e.g., certain, uncertain; more, less, or equally likely) (b) developing an understanding of chance (e.g., tossing a coin creates a 50-50 chance of landing a head or tail; drawing from a bag, using spinners, and rolling dice all simulate probability events)
MEASUREMENT AND GEOMETRY	
SUB-STRAND: MEASUREMENT	
1. Length, Mass and Volume	**Students should have opportunities to:**
1.1 measuring in standard units 1.2 measuring length/mass/volume (of liquid) in compound units 1.3 converting a linear measurement in compound units to the smaller unit, and vice versa (numbers involved should be within easy manipulation) ● kilometres and metres	*(Conversions should not include decimals in G3)* (a) develop a sense of ● how far 1 km is by relating it to the distance between two familiar landmarks or identifying/ locating a spot which is 1 km away from the school. ● how much 1 ml is using everyday examples, e.g. a drop of water from a dropper. (b) collect familiar objects with varying volume/capacity, e.g. cough syrup spoons, syrup bottles, food containers. (c) count aloud in steps of 10 mm to make 1 m and relate 1 m with 1000 mm

● metres and centimetres 1.4 solving word problems involving length/mass/volume/capacity excluding fractions and compound units	(d) count aloud in steps of 10 cm to make 1 m and relate 1 km with 1000 m (e) work in groups to measure the volume of liquid in millilitres using cough syrup spoons, measuring beakers etc. (f) work in groups to estimate and measure using appropriate tools ● length of more than 1 m using measuring tapes. ● mass of more than 1 kg using measuring scales. ● volume of liquid more than 1 l using measuring cups. (g) work in groups to measure the capacities of different sized containers using measuring tools such as measuring cups and beakers. (h) estimate length/mass/volume before measuring it and use the word 'about' (e.g. about 20 cm) to describe the estimation and measurement. (i) measure to the nearest cm and mm to understand 10 mm = 1 cm
2. Time	**Students should have opportunities to:**
2.1 tell and write the time to the minute using 24 hour and 12 hour clocks. 2.2 use of 'past' and 'to' to tell time 2.3 measuring time in hours and minutes 2.3 converting time in hours and minutes to minutes only, and vice versa 2.4 finding the starting time, finishing time or duration given the other two quantities 2.5 solving problems involving elapsed time	(a) observe the movement of the hour and minute hands on a real/geared clock. (b) develop a sense of duration of 1 minute, and describe what can be done in a duration of 1 minute, e.g. number of squares drawn in 1 minute. (c) practise telling and writing time using everyday examples such as TV programmes, bus schedules, S-bahn/U-bahn/DB operating hours and examination timetables. (d) represent given information such as starting time, finishing time and duration of activity on a timeline, and use it to solve problems. (vocabulary to teach: elapsed time) (e) work in groups to create problems involving time in hours and minutes for other groups to solve. (f) tell time and relate words such as 'morning', 'afternoon', 'noon', 'midnight', 'night' to a.m. and p.m., and give examples such as "I watched a movie with my father at 7.30 p.m."
SUB-STRAND: AREA AND VOLUME	
3. Area and Perimeter	**Students should have opportunities to:**
3.1 concepts of area and perimeter of a plane figure 3.2 Use square units, cm^2 and m^2 to label area and square units, cm, and m to label perimeter and be able to discern the difference. 3.3 find the perimeter of ● rectangle ● square ● rectilinear figure 3.4 find the area of rectangle/squares	Note: area is a 2 dimensional shape - perimeter is a 1 dimensional shape/line. (a) compare and measure the areas of rectangles using different non-standard units, e.g. use their Mathematics textbook as an area unit to estimate and measure their desk and teacher's desk. (b) use real-life examples to explain the concepts of area and perimeter, and compare the sizes of rectangles/squares using area. (c) visualise the sizes of 1 cm^2 and 1 m^2, e.g. use newspaper to measure and make a square of area 1 m^2 (i.e. 1 m by 1 m). (d) work in groups to make different rectangles and squares using square tiles, study the relationship between the area/perimeter and length(s) of each side, and observe that shapes with the same area can have different perimeters, and shapes with the same perimeter can have different areas. (e) work in pairs to find the area of squares and rectangles drawn on a square grid by counting and by formula. (Understanding that 1 square = 1 cm^2) (f) estimate the area of a figure drawn on a square grid by counting whole and partial squares within the figure. (g) Discuss the differences between labeling a measurement as cm vs cm^2 (h) partition a rectangle into rows and columns of same size squares and count to find the total number of them.

SUB-STRAND: GEOMETRY	
4. Angles	**Students should have opportunities to:**
4.1 understanding concepts of angles ● rays ● degrees ● vertex 4.2 understand the difference between right angles, acute angles and obtuse angles	(a) identify an angle as an amount and use language such as ‘acute angle’ and ‘obtuse angle’ to describe angles. (b) find angles in the environment and use a ‘paper right angle’ to identify right angles, acute angles and obtuse angles (c) Connect 90 degrees in a right angle to 360 degrees in a circle. Make connections with vocabulary between quarter turn, 90 degree turn, semi-circle and 180 degrees, etc. ---ICT Connection: coding and Minecraft
5. Perpendicular and Parallel Lines	**Students should have opportunities to:**
5.1 identify perpendicular and parallel lines 5.2 draw perpendicular and parallel lines on square grid	(a) recognise the relationship between two straight lines on a plane that are perpendicular/parallel and give examples of perpendicular/parallel lines from 2D figures and the environment. (b) identify horizontal and vertical lines and explain how to determine if a line is horizontal/vertical, e.g. a line is vertical when it is parallel to a plumb line. (c) recognise that two vertical lines are parallel, and that a horizontal line and a vertical line are perpendicular when they intersect. (d) work in pairs to explore how to construct perpendicular and parallel lines using set squares, and to check whether two given straight lines are perpendicular or parallel. (e) work in pairs to explore how different pairs of perpendicular and parallel lines can be drawn on a square grid.
6. 2D and 3D Shapes	**Students should have opportunities to:**
6.1 describing the attributes of 2D shapes 6.2 describing the attributes of 3D objects 6.3 identify congruence of 2D shapes (same size, same shape)	Vocabulary and attributes to include and encourage: 2D: sides, angles types, line types, symmetry, etc. 3D: faces, edges, vertices, point, etc (a) recognise and describe the differences/similarities between two shapes according to attributes such as faces, edges, vertices, sizes, colours and rolling. (b) work in groups to sort shapes in different ways and explain how the shapes are sorted. (c) create nets from 3D shapes and be able to identify a 3D shape from a net (d) look at congruent shapes that have been rotated, translated, reflected (turned, flipped, slide) (e) identify congruent shapes in a group

PRIMARY FOUR

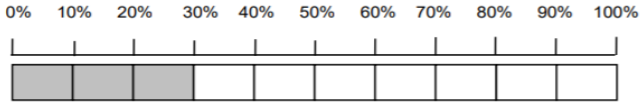
NUMBER AND ALGEBRA

SUB-STRAND: WHOLE NUMBERS

Content (Outcomes-reported on)	Learning Experiences (Indicators- suggested curriculum implementation)
1. Numbers up to 100 000	**Students should have opportunities to:**
1.1 use number notation, representations and place values (ten thousands, thousands, hundreds, tens, ones) 1.2 read and write numbers in numerals and in words 1.3 compare and order numbers 1.4 identify and extend patterns in number sequences 1.5 round numbers to the nearest 10, 100 or 1000	(a) work in groups to ● look for examples of big numbers up to 100 000 from newspapers and magazines. ● estimate a big number (e.g. the seating capacity of the Singapore Indoor Stadium) and discuss how the estimation is done. (b) work in groups using number discs/number line to represent and compare numbers. (c) use place-value cards to illustrate and explain place values e.g. the digit 3 stands for 30 000, 3000, 300, 30 or 3 depending on where it appears in a number. (d) use number discs/place-value cards to compare numbers digit by digit from left to right, and use language such as 'greater than', 'greatest', 'smaller than', 'smallest' and 'the same as' to describe the comparison. (e) use number discs or digital manipulatives to represent a number that is 10, 100 or 1000 more than/less than a 5-digit number. (f) describe a given number pattern before continuing the pattern or finding the missing number(s). ● patterning should include whole number/place value (adding 10, 100, etc), addition and subtraction, multiplication and division. (g) place a given number on a number line between two consecutive tens/hundreds, and determine which ten/hundred is nearer to the given number. (h) read and write numbers using expanded form, word form, digit/standard form, and base ten models (i) use of ≈ as symbolic communication of approximation or estimating/rounding.Enforces students understanding of =.
2. Factors and Multiples	**Students should have opportunities to:**
2.1 define factors, multiples and their relationship 2.2 determine if a 1-digit number is a factor of a number within 100 2.3 find the common factors of two numbers 2.4 determine if a number is a multiple of a 1 digit number 2.5 find the common multiples of two 1-digit numbers	(a) relate the concepts of factor and multiple to multiplication and division. (b) work in groups to express a given number within 100 as a product of two factors and share the different ways of writing the products e.g. 36 = 9 x 4 and 36 = 3 x 12. (c) make a list of the first 12 multiples of a given 1-digit number and use this method to identify the common multiples of two given 1-digit numbers. (d) make connections between the concept of common factor and simplifying a fraction, and between the concept of common multiple and finding a common denominator for two fractions. (e) explore and define patterns that lead to divisibility rules (all multiples of 5 have a 0 or 5 in the units...) to assist in finding multiples and factors.
3. Multiplication and Division	**Students should have opportunities to:**
3.1 use multiplication strategies ● up to 3 digits by 1 digit ● up to 2 digits by 2 digits 3.2 use division strategies (up to 3 digits by 1	(a) use number discs or concrete manipulatives to visualise, illustrate and explain the multiplication of a number by 10 and a multiple of 10 (b) use the part-whole and comparison models to represent and solve word problems involving the four operations. (c) use a variety of mental strategies for the 4 operations and explain the process.

digit) 3.3 solving up to 2-step word problems involving the 4 operations 3.4 multiply by 10, 100, 1000 and their multiples 3.5 divide by 10, 100, 1000 and their multiples 3.6 follow order of operations 3.7 demonstrate use of parentheses	(d) estimate the answer before doing the calculation and check the reasonableness of the calculated answer by comparing it with the estimated answer. (e) work in groups to create 2-step word problems involving the 4 operations for other groups to solve. (f) solve non-routine problems using different strategies and share their ideas. ● multiplication strategies include: box method, expanded algorithm (partial products), traditional/standard algorithm, Japanese (line) method, lattice method, split (distributive) method ● division strategies include: visual models, long division, big 7, array/area model, (g) Understand division as an unknown-factor problem (working backwards, inverse operations) (h) solving word problems and interpreting (discussing) remainders. (rounding up, splitting it, ignoring it) and explaining why. (i) Apply properties of operations as strategies to multiply and divide. ● Commutative property of multiplication - If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. ● Associative property of multiplication - (the way in which factors are grouped in a *multiplication* problem does not change the product) - 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. ● Distributive property - Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56.
SUB-STRAND: FRACTIONS	
4. Mixed Numbers and Improper Fractions	**Students should have opportunities to:**
4.1 define mixed numbers, improper fractions and their relationships 4.2 expressing a fraction or mixed number in its simplest form 4.3 comparing and ordering mixed numbers and improper fractions with denominators of fractions not exceeding 12 4.4 writing the equivalent fraction of a fraction when given the denominator or the numerator only (eg. ¾ is x/12 or 9/x)	(a) give examples of fractions in everyday situations, including measurements, e.g. ½ kg, 1 ¼ liters, ½ m, etc. (b) use fraction strips/number lines to represent and interpret fractions greater than one whole as improper fractions and mixed numbers. (c) compare two fractions using fraction strips, and then without using fraction discs by changing to common denominators. (d) compare and order whole numbers and fractions on a number line. (e) achieve proficiency of conversion between mixed numbers and improper fractions by playing games using fraction cards (pictures and symbols) including digital games. (f) explain how fractions and division are related, e.g. ⅗ is 3 divided by 5; when 3 pies are shared equally among 5 children, each child gets ⅗ of a pie.
5. Fraction of a Set of Objects	**Students should have opportunities to:**
5.1 identify fractions as part of a set of objects	(a) divide a given set of concrete objects into equal parts and use this to ● illustrate the concept of fraction of a set (e.g. when a set of objects is divided into 3 equal parts, ' ⅔ of the set' is 2 out of the 3 equal parts). ● find a fraction of a set by adding up the objects in the parts (e.g. when a set of 24 objects are divided into 4 equal parts, ' ¾ of the set' is 6 + 6 + 6 or 3 x 6 = 18 objects). (b) Use pictorial model to illustrate the concept of fraction of a quantity.
6. Fractions: Addition and Subtraction	**Students should have opportunities to:**

6.1 adding and subtracting fractions with denominators not exceeding 12 6.2 solving word problems involving addition and subtraction of fractions	Instructional note: No more than two different denominators should be used in one equation (a) use fraction strips to illustrate addition and subtraction of fractions with answers greater than one whole, and express the answer as a mixed number or improper fraction. (b) work in groups to create 2-step word problems involving addition and subtraction of fractions for other groups to solve.
SUB-STRAND: DECIMALS	
7. Decimals up to 3 decimal places	**Students should have opportunities to:**
7.1 notation, representations and place values (tenths, hundredths, thousandths) 7.2 comparing and ordering decimals 7.3 converting decimals to fractions 7.4 converting fractions to decimals when the denominator is a factor of 10 or 100 7.5 rounding decimals to the nearest whole number, tenths and hundredths	(a) look for decimals in everyday situations e.g. advertisements from newspapers and magazines. (b) record length/mass/volume of liquid in decimal notation e.g. 1 m 62 cm is 1.62 m, and identify the whole-number parts, tenths and hundredths in the decimal. (c) recognise that a decimal is made up of a whole-number part and a fractional part, represent the decimal on a number line, and make connections between decimals, fractions and measurement. (d) use number discs to extend the place-value concept of whole numbers to decimals. (e) count in tenths/hundredths using number discs from 0.1 to 1.2, or from 0.01 to 0.12, e.g. 11 tenths is 1.1. (f) write whole numbers and decimals in 3 digits (or 4 digits), arrange these numbers in increasing/ decreasing order and explain how it is done. (g) use number discs to represent a number that is 0.1, 0.01 or 0.001 more than/less than a given decimal. (h) create, describe and continue number sequences such as 0.4, 0.8, 1.2, 1.6, ... (i) compare decimals using number line. (j) compare two decimals by first comparing the whole-number parts, and then compare the tenths, hundredths, thousandths in that order. (k) represent equivalent decimals such as 0.2, 0.20 and 0.200, and explain that they are the same number. (l) place a given decimal on a number line between two consecutive whole numbers/tenths/ hundredths, and determine which whole number/tenth/ hundredth is nearer to the given decimal (in the context of money). (m) dividing a whole number by a whole number with the resulting quotient as a decimal instead of remainder (extension). Example: 13 / 2 is 6 remainder 1, then the remainder is divided by 2 to equal 6.5.
8. Addition and Subtraction	**Students should have opportunities to:**
8.1 adding and subtracting decimals (up to 2 decimal places)	(a) use number discs or digital manipulatives to illustrate the addition and subtraction algorithms and make connections between the algorithms for decimals and for whole numbers. (b) use a variety of mental strategies for addition and subtraction and explain the process. (c) work in groups on problems involving decimals in everyday situations such as shopping receipts, food prices in school canteen, and budgeting. (d) estimate the answer before doing the calculation and check the reasonableness of the calculated answer by comparing it with the estimated answer.
9. Percentages, Fractions and Decimals	**Students should have opportunities to:**
9.1 expressing a part of a whole as a percentage	Instructional note: conversions are limited to decimal fractions and common conversions (½, ¾, ⅕, 1/10, etc)

<table>
<tr><td>9.2 converting between decimals, fractions, and percentages
9.3 solving word problems involving percentages</td><td>(a) look for examples where percentages are used in real life, e.g. newspaper cuttings showing discounts, bank brochures showing interest rates, and discuss their usage.
(b) discuss different ways of expressing a part of a whole, e.g. the number of squares shaded to show 30% on 100-square and 200-square grids.
(c) use a percentage scale to illustrate the part-whole concept of percentage, and to show the relationship between percentage and fraction, e.g. 30% =3/10
 

(d) use a linear scale/number line to show the relationship between percentage and decimal
<table>
<tr><td>0%</td><td>10%</td><td>20%</td><td>30%</td><td>40%</td><td>50%</td><td>60%</td><td>70%</td><td>80%</td><td>90%</td><td>100%</td></tr>
<tr><td>0</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td><td>0.6</td><td>0.7</td><td>0.8</td><td>0.9</td><td>1.0</td></tr>
</table>
(e) play card games/online games involving equivalent fractions, decimals and percentages, e.g. 20% is equivalent to ⅕ or 0.2
(f) use the part-whole and comparison models to represent and solve percentage problems.
(g) finding a percentage part of a whole.</td></tr>
<tr><td>10. Multiplication and Division</td><td>Students should have opportunities to:</td></tr>
<tr><td>10.1 multiply and divide decimals (up to 3 decimal places) by 10, 100 and 1000</td><td>(a) use manipulatives to illustrate multiplication and division of a decimal by 10/100/1000, e.g. the result of multiplying 6 ones 2 tenths 3 hundredths (6.23) by 10 is 6 tens 2 ones 3 tenths (62.3), and relate the process to multiplication and division of a whole number by 10/100/1000.
(b) collect and talk about real-life examples of the uses of different units of measurement, e.g. specifications of furniture in a manual, weighing scales, height of a mountain in metres (m), car capacity in cubic centimetres (cm^3 or cc).
(c) measure and compare amounts of liquid using measuring cylinders (l) and beakers (ml) to determine the equivalence between the measurements, e.g. 0.2 l = 200 ml.
(d) use a linear scale to show the relationship between larger and smaller units of measurement.
(e) extension for this would include multiplying with multiples of 10, 100, 1000, etc</td></tr>
<tr><td colspan="2">STATISTICS</td></tr>
<tr><td colspan="2">SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION</td></tr>
<tr><td>1. Tables and Line Graphs</td><td>Students should have opportunities to:</td></tr>
<tr><td>1.1 identify appropriate ways to collect and organise data
1.2 reading and interpreting data from tables/line graphs
1.3 collect data and create a line graph
1.4 solve 2-step problems using data from</td><td>(a) relate the data represented in a table to the corresponding graph (bar, line, line plot), and explain why the data is presented in a graph instead of a table.
(b) discuss examples of data presented in bar graphs/composite bar graphs found in newspapers and magazines, and how the data was collected and displayed in graphical form.
(c) construct a line graph using a spreadsheet e.g. Excel, and make connections between bar and line graphs, and explain which type of graph should be used or both can be used.</td></tr>
</table>

tables/graphs 1.5 calculates mean, median, mode, and range	(d) discuss examples of inappropriate representations of data from newspapers, e.g. whether certain representations are misleading. (e) conduct meaningful explorations into effective ways to organise data and display the data in a graph (f) relationship between average, total value and number of data
2. Probability	**Students should have opportunities to:**
2.1 finding simple probabilities as fractions or percentages 2.2 predicting single outcomes	(a) developing an understanding of chance (e.g., tossing a coin creates a 50-50 chance of landing a head or tail; drawing from a bag, using spinners, and rolling dice all simulate probability events) (b) predicting single outcomes (e.g., when you spin using one spinner and it lands on a single colour) (c) using spinners, rolling dice, pulling objects out of a bag to promote conversations around probabilities
MEASUREMENT AND GEOMETRY	
SUB-STRAND: MEASUREMENT	
1. Length, Mass and Volume	**Students should have opportunities to:**
1.1 converting a measurement in compound units to the smaller unit, and vice versa ● kilometres and metres ● metres, centimetres and millimetres ● kilograms and grams ● litres and millilitres 1.2 solving word problems involving length/mass/volume/capacity excluding fractions and compound units	G4 - converts between mm, cm and m. Also between cm, m, and km, with decimals needed. (a) converting a measurement from a smaller unit to a larger unit in decimal form, and vice versa ● • kilometres and metres ● • metres and centimetres and millimeters ● • kilograms and grams ● • litres and millilitres ****b-d are also found in Number and Algebra- multiplying with decimals* b) collect and talk about real-life examples of the uses of different units of measurement, e.g. specifications of furniture in a manual, weighing scales, height of a mountain in metres (m), car capacity in cubic centimetres (cm^3 or cc). (c) measure and compare amounts of liquid using measuring cylinders (l) and beakers (ml) to determine the equivalence between the measurements, e.g. 0.2 l = 200 ml. (d) use a linear scale to show the relationship between larger and smaller units of measurement. (e) measure, compare, and convert 1000 ml to make 1 L (f) measure, compare, and convert 1000 mg to make 1 g and 1000 g to make 1 kg
2. Time	**Students should have opportunities to:**
2.1 measuring and converting time in seconds 2.2 solving problems involving time in 24-hour clock	(a) develop a sense of 1 second or 10 seconds, e.g. what they can do in 1 second or the number of words they can write in 10 seconds. (b) read and write time in 24-hour clock from flight schedules or train schedules, and give reasons why 24-hour clock is used instead of 12-hour clock. Practise telling and writing time using everyday examples such as TV programmes, bus schedules, S-bahn/U-bahn/DB operating hours and exam timetables. (c) describe everyday events using 24-hour clock, including starting time, finishing time and duration. (d) represent given information such as starting time, finishing time and duration of activity on a timeline and use it to solve problems. (e) work in groups to create word problems involving time in 24-hour clock for other groups to solve.

	(f) finding the starting time, finishing time or duration given the other two quantities (g) converting time in hours to minutes and minutes to seconds, and vice versa
SUB-STRAND: AREA AND VOLUME	
3. Area and Perimeter	**Students should have opportunities to:**
3.1 finding one dimension of a rectangle/square given the other dimension and its area/perimeter 3.2 finding the area of figures made up of rectangles and squares	(a) apply multiplication and division concepts to find one dimension of a rectangle given its area/ perimeter and the other dimension. (using the formula-- A = l x w) (b) draw and cut out squares of different sizes, from 1 cm^2 to 100 cm^2 (c) make a composite figure using cutouts of rectangles and squares or draw the figure on a square grid, and calculate its area and perimeter. (d) visualise how a L-shaped (rectilinear) figure can be partitioned into rectangles and squares, or can be formed by removing a rectangle/square from a bigger rectangle/square, and calculate the area and perimeter from given lengths.
SUB-STRAND: GEOMETRY	
4. Angles	**Students should have opportunities to:**
4.1 using notation such as ∠ABC and ∠ b to name angles 4.2 measuring angles in degrees 4.3 drawing an angle of given size 4.4 relating quarter, half and complete turns to angles in degrees	(a) associate the amount of turning (rotation), clockwise or anti-clockwise, with an angle measured in degrees • ¼ turn is 90°. • ½ turn is 180°. • ¾ turn is 270°. • a complete turn with 360°. (b) estimate before measuring angles using a protractor. (c) draw angles using a protractor. (d) find the angles (in degrees) between two 8-point compass directions. (e) use vocabulary such as axis, straight angle, right angle, obtuse angle, acute angle, complementary angles and supplementary angles
5. Quadrilaterals	**Students should have opportunities to:**
5.1 properties of quadrilaterals excluding diagonal properties 5.2 drawing quadrilaterals on square grid	Quadrilaterals: *square, rectangle, parallelogram, rhombus, trapezoid/trapezium, kite, quadrangl*e (a) describe the properties of quadrilaterals in terms of perpendicular and parallel lines, e.g. two pairs of parallel sides, and discuss how rectangles and squares are related, e.g. a square is a special rectangle. (b) work in pairs to explore how to draw different squares and rectangles on square grid. (c) observe the different orientations of a parallelogram, rhombus, trapezium/trapezoid, rectangle, or square when it is rotated through 90° (quarter turn), 180° (half turn), 270° (three-quarter turn) and 360° (a complete turn), clockwise or anti-clockwise. (d) sketch and draw quadrilaterals according to given length(s) using a ruler, protractor and set squares. (e) sort, discuss, and classify quadrilaterals based on properties. (f) explore quadrilaterals through translations, rotations, and reflection

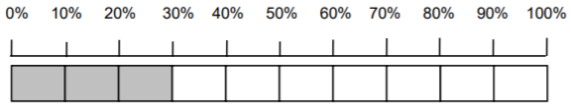
PRIMARY FIVE
NUMBER AND ALGEBRA
SUB-STRAND: WHOLE NUMBERS

Content (Outcomes-reported on)	Learning Experiences (Indicators- suggested curriculum implementation)
1. Numbers up to 10 million	**Students should have opportunities to:**
1.1 reading and writing numbers in numerals and in words 1.2 identify and extend patterns in number sequences	(a) extend the number system to millions, and read and write large numbers in millions and thousands up to 10 million. (b) develop a sense of the size of 1 million by ● discussing examples of numbers in millions up to 10 million e.g. population of Germany, the price of a property. ● searching for examples of 1 million from the internet. ● estimating the size of an indoor stadium that will have a capacity of 1 million spectators as compared to Frankfurt stadiums. (c) use manipulatives/place-value cards to compare numbers digit by digit from left to right, and use language such as 'greater than', 'greatest', 'smaller than', 'smallest' and 'the same as' to describe the comparison. (d) identify the number that is 10, 100 or 1000 more than/less than a 5-digit number. (e) place a given number on a number line between two consecutive tens/hundreds/thousands, and determine which ten/hundred/thousand is nearer to the given number. (f) comparing and ordering numbers (g) rounding numbers to the nearest 10, 100, 1000, etc (h) use of ≈ as symbolic communication of approximation or estimating/rounding.Enforces students understanding of =. (i) describe a given number pattern before continuing the pattern or finding the missing number(s). ● patterning should include whole number/place value (adding 10, 100, etc), addition and subtraction, multiplication and division. Patterns with decimals, fractions, and negative numbers should be introduced throughout the year. *Time is not explicitly taught in Grade 5, however concepts of elapsed time should be reviewed and integrated into grade 5 math curriculum.* (a) practise telling and writing time using everyday examples such as TV programmes, bus schedules, MRT operating hours and exam timetables. (b) represent given information such as starting time, finishing time and duration of activity on a timeline, and use it to solve problems. (c) read and write time in 24-hour clock from flight schedules or train schedules, and give reasons why 24-hour clock is used instead of 12-hour clock. (d) describe everyday events using 24-hour clock, including starting time, finishing time and duration. (e) represent given information such as starting time, finishing time and duration of activity on a timeline and use it to solve problems.
2. Factors and Multiples	**Students should have opportunities to:**
2.1 define and determine factors, multiples and their relationship	(a) relate the concepts of factor and multiple to multiplication and division. (b) work in groups to express a given number within 100 as a product of two factors and share the different ways of writing the products e.g. 36 = 9 x 4 and 36 = 3 x 12. (c) make a list of the first 12 multiples of a given 1-digit number and use this method to identify the common multiples of two given 1-digit numbers. (d) make connections between the concept of common factor and simplifying a fraction, and between the concept of

	common multiple and finding a common denominator for two fractions. Determine if a 1-digit number is a factor of a number within 100. (e) finding the common factors or multiples of two numbers (f) determining if a number is a multiple of a 1-digit number
3. Multiplication and Division	**Students should have opportunities to:**
3.1 follow order of operations 3.2 use multiplication strategies ● Up to 4 digits by 1 digit ● Up to 3 digits by 2 digits 3.3 use division strategies (up to 4 digits by 1 digit) 3.4 solving word problems involving the 4 operations	(a) use number discs to illustrate multiplication and division of a whole number by 10/100/1000, e.g. the result of multiplying 6 hundreds 2 tens 3 ones (623) by 10 is 6 thousands 2 hundreds 3 tens (6230). (b) discover the rules for the order of the 4 operations with a scientific calculator and explain why the rules are necessary. (c) estimate the answer before doing the calculation and check the reasonableness of the calculated answer by comparing it with the estimated answer. (d) solve problems using the part-whole and comparison models. (e) solve non-routine problems using different strategies and share their ideas. ● multiplication strategy names: box method , expanded algorithm (partial products), old-school/traditional/standard algorithm, ● division strategy names: long division, big 7, array/area model, (f) work in groups to illustrate the standard algorithms for ● addition and subtraction up to 3 digits by playing games including applets and digital games. ● multiplication and division up to 2 digits by 1 digit. ● multiplication and division of a whole number by 10/100/1000 (g) divide a number of concrete objects into equal groups to discover that sometimes there are objects left over as remainder and write the answer as quotient and remainder. (h) achieve proficiency of multiplication and division facts by: ● using multiplication-fact cards, division-fact cards. ● playing games including applets and digital games. ● writing a family of 4 basic facts within the multiplication tables given any one of the basic facts (e.g. 8 x 4 = 32, 4 x 8 = 32, 32 ÷ 4 = 8 and 32 ÷ 8 = 4 are a family of multiplication and division facts). (i) Apply properties of operations as strategies to multiply and divide. ● Commutative property of multiplication - If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. ● Associative property of multiplication - (the way in which factors are grouped in a *multiplication* problem does not change the product) - 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. ● Distributive property - Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56.
SUB-STRAND: FRACTIONS	
4. Equivalent Fractions, Mixed Numbers and Improper Fractions	**Students should have opportunities to:**

4.1 define mixed numbers, improper fractions and their relationships 4.2 calculate an equivalent for a mixed number and/or improper fraction 4.3 understands concepts of equivalent mixed numbers and improper fractions.	(a) use fraction strips or the part-whole model to represent two equivalent fractions, and explain why they are equal and how one can be obtained from the other, e.g. ⅔ = 4/6. (b) work in groups to compare fractions using different strategies such as drawing a diagram, comparing fractions with respect to half, and explain the strategies used. (c) identify fractions that are not in simplest form and reduce fractions to their simplest form. (d) achieve proficiency of equivalent fractions and fraction comparison by playing games using fraction cards (pictures and symbols) including digital games. (e) give examples of fractions greater than one whole in everyday situations. (f) use fraction strips/number lines to represent and interpret fractions greater than one whole as improper fractions and mixed numbers. (g) compare two fractions using fraction strips, and then without using fraction strips by changing to common denominators. (h) achieve proficiency of conversion between mixed numbers and improper fractions by playing games using fraction cards (pictures and symbols) including digital games.
5. Fraction and Division	**Students should have opportunities to:**
5.1 dividing a whole number by a whole number with quotient as a fraction	(a) divide a whole number by a 1-digit whole number and write the answer as a fraction, instead of as quotient and remainder, or as a decimal. (b) explain how fractions and division are related, e.g. ⅗ is 3 divided by 5; when 3 pies are shared equally among 5 children, each child gets ⅗ of a pie. (c) use the part-whole model to illustrate the concepts of fractions and division, and their relationship, e.g. draw a model to show 12 ÷ 3 as a whole divided into 3 equal parts which is also ⅓ of 12.
6. Four Operations	**Students should have opportunities to:**
6.1 adding and subtracting mixed numbers 6.2 adding and subtracting fractions with unlike denominators 6.3 multiplying a proper/improper fraction and a whole number 6.4 multiplying a proper fraction and a proper/ improper fraction 6.5 multiplying two improper fractions 6.6 multiplying a mixed number and a whole number 6.7 solving word problems involving addition, subtraction and multiplication	(a) use fraction strips to illustrate addition and subtraction of mixed numbers which involve adding/ subtracting the whole-number parts, followed by adding/subtracting the fractional parts. (b) use fraction strips to illustrate addition and subtraction of fractions with answers greater than one whole, and express the answer as a mixed number or improper fraction. (c) relate multiplication of whole numbers and fractions to finding the number of objects in a fraction of a set, e.g. ¾ x 60 = ¾ of 60. (d) discuss the advantages of doing ‘cancellation’ before multiplying out the fractions. (e) solve problems using the part-whole and comparison models. (f) work in groups to solve multi-step word problems.
SUB-STRAND: DECIMALS	

7. Decimals up to 3 decimal places	**Students should have opportunities to:**
7.1 converting decimals to fractions 7.2 converting fractions to decimals 7.3 rounding decimals to ● the nearest whole number ● 1 decimal place ● 2 decimal places	(a) recognise that a decimal is made up of a whole-number part and a fractional part, represent the decimal on a number line, and make connections between decimals, fractions and measurement. (b) write whole numbers and decimals in 3 digits (or 4 digits), arrange these numbers in increasing/ decreasing order and explain how it is done. (c) use manipulatives to represent a number that is 0.1, 0.01 , 0.001 more than/less than a given number. (d) create, describe and continue number sequences such as 0.4, 0.8, 1.2, 1.6... (e) compare decimals using a number line. (f) represent equivalent decimals such as 0.2, 0.20 , 0.200 and explain that they are the same number. (g) divide a whole number by a 1-digit whole number and write the answer as a decimal instead of as quotient and remainder. (h) place a given decimal on a number line between two consecutive whole numbers/tenths/ hundredths, and determine which whole number/tenth/hundredth is nearer to the given decimal.
8. Four Operations	**Students should have opportunities to:**
8.1 multiplying and dividing decimals (up to 2 decimal places) by a 1-digit whole number 8.2 rounding answers to a specified degree of accuracy 8.3 solving word problems involving the 4 operations	(a) use number discs to illustrate multiplication and division of a decimal by 10/100/1000, e.g. the result of multiplying 6 ones 2 tenths 3 hundredths (6.23) by 10 is 6 tens 2 ones 3 tenths (62.3), and relate the process to multiplication and division of a whole number by 10/100/1000. (b) collect and talk about real-life examples of the uses of different units of measurement, e.g. specifications of furniture in a manual, weighing scales, height of a mountain in metres (m), car capacity in cubic centimetres (cm^3 or cc). (c) measure and compare amounts of liquid using measuring cylinders (l) and beakers (ml) to determine the equivalence between the measurements, e.g. 0.2 l = 200 ml. (d) convert 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 (e) use a linear scale to show the relationship between larger and smaller units of measurement. (f) estimate the answer before doing the calculation and check the reasonableness of the calculated answer by comparing it with the estimated answer.
SUB-STRAND: PERCENTAGE	
9. Percentage	**Students should have opportunities to:**
9.1 expressing a part of a whole as a percentage 9.2 finding a percentage part of a whole 9.3 solving up to 2-step word problems involving percentage	(a) look for examples where percentages are used in real life, e.g. newspaper cuttings showing discounts, bank brochures showing interest rates, and discuss their usage. (b) use of % symbol to communicate percentage. (c) discuss different ways of expressing a part of a whole, e.g. the number of squares shaded to show 30% on 100-square and 200-square grids. (d) use a percentage scale to illustrate the part-whole concept of percentage, and to show the relationship between percentage and fraction, e.g. 30% = 3/10



(e) use a linear scale to show the relationship between percentage and decimal

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0

(f) play card games/online games involving equivalent fractions, decimals and percentages, e.g. 20% is equivalent to 1/5 or 0.2
(g) use the part-whole and comparison models to represent and solve percentage problems.
(h) collect receipts that show discounts, VAT, service charges etc., and use a calculator to check how these values are calculated.
(i) work in groups to plan a shopping list with a given budget using newspaper advertisements and promotion pamphlets.

STATISTICS

SUB-STRAND: DATA ANALYSIS

1. Mean, Median, Mode and Range	**Students should have opportunities to:**
1.1 calculates average/mean as 'total value ÷ number of data' 1.2 explains the relationship between average/mean, total value and number of data 1.3 calculates and uses mean, median, mode and range to analyse a set of data	(a) discuss the meaning of average in real-life situations such as average height, average load in a lift, average temperature in a day or month. (b) recognise that there are three related quantities in a set of data (average, total value and number of data) and given any two quantities, the third quantity can be calculated.

SUB-STRAND: DATA REPRESENTATION AND INTERPRETATION

2. Tables, Graphs and Charts	**Students should have opportunities to:**
2.1 reading and interpreting data from tables/graphs/charts 2.2 constructing digital pie charts 2.3 solving multi-step problems using data from tables/ graphs 2.4 differentiates between the purpose of various tables, graphs,	(a) work in groups to discuss how to collect data e.g. through interview or survey, and how to represent the data in a table/graph/chart. (b) relate the data represented in a table to the corresponding graph/chart and explain why the data is presented in a graph instead of a table. (c) discuss examples of data presented in graphs found in newspapers, magazines, and online and how the data was collected and displayed in graphical form. (d) construct a bar graph/line graph/pie chart using a spreadsheet, e.g. Excel, Sheets, and make connections between

and charts	bar and line graphs, and explain which type of graph should be used or both can be used. (e) discuss examples of inappropriate representations of data from newspapers and online e.g. whether certain representations are misleading.

MEASUREMENT AND GEOMETRY	
SUB-STRAND: MEASUREMENT	
1. Area and Perimeter	**Students should have opportunities to:**
1.1 find area and perimeter of rectangle/square 1.2 finding one dimension of a rectangle/square given the other dimension and its area/perimeter 1.3 finding the area of figures made up of rectangles and squares	(a) discuss the use of appropriate units of measurement (length, area and perimeter) (b) use real-life examples to explain the concepts of area and perimeter, and compare the sizes of rectangles/squares using area. (c) observe that shapes with the same area can have different perimeters, and shapes with the same perimeter can have different areas. (d) apply multiplication and division concepts to find one dimension of a rectangle given its area/ perimeter and the other dimension. (e) use square tiles to build squares of different sizes, from 1 cm^2 to 100 cm^2 (f) make a composite figure using cutouts of rectangles and squares or draw the figure on a square grid, and calculate its area and perimeter. (g) visualise how a rectilinear (eg - L-shaped) figure can be partitioned into rectangles and squares, or can be formed by removing a rectangle/square from a bigger rectangle/square, and calculate the area and perimeter from given lengths.
2. Area of Triangle and Parallelograms	**Students should have opportunities to:**
2.1 identify the base and height of a triangle 2.2 find area of triangles 2.3 find area of parallelograms 2.4 find the area of figures made up of rectangles, squares and triangles	(a) associate the base and height of a triangle with the length and breadth of its related rectangle, and recognise the relationship between the area of the triangle and its related rectangle. (b) draw different triangles and parallelograms on a square grid and identify the height of each shape corresponding to a given base. (c) work in groups to determine the basic shapes (rectangle, square and triangle) that make up a composite figure, or use basic shape cutouts to form different composite figures.
3. Volume of Cube and Cuboid	**Students should have opportunities to:**
3.1 building solids with unit cubes 3.2 measuring volume in cubic units, cm^3 and m^3, excluding conversion between cm^3 and m^3 3.3 find the volume of a	(a) use unit cubes (or connecting cubes) to build different solids (3D figures) and express their volumes in cubic units. (b) compare the sizes of solids in terms of their volumes. (c) build cuboids and cubes layer by layer using unit cubes (or connecting cubes) to establish the formula for the volume of a cuboid/cube. (d) build cubes of sizes 1 x 1 x 1, 2 x 2 x 2, 3 x 3 x 3, ... using unit cubes (or connecting cubes) and find the volumes of

cube/cuboid	the cubes by counting and by formula. (e) pour 1 litre of water into a container measuring 10 cm by 10 cm by 10 cm to establish the equivalence of 1 litre (1000 ml) and 1000 cm^3. (f) make connections between 1 cm^2 and 1 cm^3, and between 1 m^2 and 1 m^3, e.g. use newspaper and masking tape to make a square of area 1 m^2 and a cube of volume 1 m^3. (g) work in groups to draw a cube or a cuboid taking into consideration size and orientation. (h) work in pairs to draw on a square grid the top/side/front view of a solid made up of unit cubes. (i) drawing cubes and cuboids on isometric grid (j) finding the volume of liquid in a rectangular tank (k) relationship between i (or ml) and cm^3
SUB-STRAND: GEOMETRY	
4. Angles	**Students should have opportunities to:**
4.1 label, measure and classify angles on a straight line and angles that share a point 4.2 identify and measure vertical angles 4.3 finding unknown angles	(a) describe and illustrate the various angle properties. (b) look for examples of different types of angles in the environment. (c) use the angle properties to find unknown angles and explain how they obtain the answers. (complementary, supplementary, straight, reflex, vertical) (d) using notation such as ∠ ABC and ∠ *a* to name angles (e) measuring angles in degrees (f) drawing an angle of a given size (g) Use vocabulary such as axis, straight angle, right angle, obtuse angle, acute angle, complementary angles and supplementary angles, vertical angles, and adjacent angles.
5. Triangles	**Students should have opportunities to:**
5.1 describe properties of various triangles 5.2 finding unknown angles in geometric figures without additional construction of lines	Triangles: isosceles, equilateral, right-angled, scalene (a) sort a set of different triangles into groups by their angles/lengths, explain how it is done and use terms such as ‘acute-angled triangle’, ‘obtuse-angle triangle’, ’right-angled triangle’, ‘isosceles triangle’ and ‘equilateral triangle’ to describe the triangles. (b) look for the various types of triangles in the environment. (c) investigate and discover that the angle sum of any triangle is 180° using triangle cutouts (d) identify and justify the angle properties of triangles, e.g. fold an isosceles triangle cutout to show that the base angles are equal. (e) draw special triangles on square grid paper. (f) use the angle properties of triangles to find unknown angles and explain how they obtain the answers. (g) sketch and draw different triangles according to given angles and lengths using ruler, protractor and set squares.
6. Properties of 2D shapes	**Students should have opportunities to:**
6.1 describe properties of polygons 6.2 finding unknown angles	All 2D shapes and polygons (a) make a collection of quadrilaterals (4-sided figures) from pictures and photographs, and identify the various special quadrilaterals besides square and rectangles.

without additional construction of lines	(b) discuss how each special quadrilateral is different from the others, and explore its properties using cutouts or applets. (c) draw special quadrilaterals on a square grid. (d) use the properties of special quadrilaterals to find unknown angles and explain how they obtain the answers. (e) sketch and draw special quadrilaterals according to given angles and lengths using ruler, protractor and set squares. (f) investigate and discover that the angle sum of any quadrilateral is 360° using quadrangle cutouts or apps. (g) define and explore what makes a shape a *polygon.* (h) Use vocabulary such as: pairs of parallel lines, regular, concave, convex, angle, side, symmetrical, perpendicular, etc. (i) explore shapes through translations, rotations, and reflection