MIS Junior School

Mathematics Scope and Sequence

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How Children Learn Mathematics

It is important that learners acquire mathematical understanding by constructing their own meaning through ever increasing levels of abstraction, starting with exploring their own personal experiences, understandings and knowledge. Additionally, it is fundamental to the philosophy of the PYP that, since it is to be used in real life situations, mathematics needs to be taught in relevant, realistic contexts, rather than by attempting to impart a fixed body of knowledge directly to students.

Constructing meaning about mathematics

Learners construct meaning based on their previous experiences and understanding, and by reflecting upon their interactions with objects and ideas. Therefore, involving learners in an active learning process, where they are provided with possibilities to interact with manipulatives and to engage in conversations with others, is paramount to this stage of learning mathematics.

When making sense of new ideas all learners either interpret these ideas to conform to their present understanding or they generate a new understanding that accounts for what they perceive to be occurring. This construct will continue to evolve as learners experience new situations and ideas, have an opportunity to reflect on their understandings and make connections about their learning.

Transferring meaning into symbols

Only when learners have constructed their ideas about a mathematical concept should they attempt to transfer this understanding into symbols. Symbolic notation can take the form of pictures, diagrams, modelling with concrete objects and mathematical notation. Learners should be given the opportunity to describe their understanding using their own method of symbolic notation, then learning to transfer them into conventional mathematical notation.

Applying with understanding

Applying with understanding can be viewed as the learners demonstrating and acting on their understanding. Through authentic activities, learners should independently select and use appropriate symbolic notation to process and record their thinking. These authentic activities should include a range of practical hands-on problem-solving activities and realistic situations that provide the opportunity to demonstrate mathematical thinking through presented or recorded formats. In this way, learners are able to apply their understanding of mathematical concepts as well as utilize mathematical skills and knowledge.

As they work through these stages of learning, students and teachers use certain processes of mathematical reasoning.

- They use patterns and relationships to analyse the problem situations upon which they are working.
- They make and evaluate their own and each other's ideas.
- They use models, facts, properties and relationships to explain their thinking.
- They justify their answers and the processes by which they arrive at solutions. In this way, students validate the meaning they construct from their experiences with mathematical situations. By explaining their ideas, theories and results, both orally and in writing, they invite constructive feedback and also lay out alternative models of thinking for the class. Consequently, all benefit from this interactive process.

Number	Phase 1	Phase 2	Phase 3	Phase 4
Conceptual Understanding	• Numbers are a naming system. • Numbers can be used in many ways for different purposes in the real world. • Numbers are connected to each other through a variety of relationships. • Making connections between our experiences with number can help us to develop number sense.	• The base 10 place value system is sued to represent numbers and number relationships. • Fractions are ways of representing whole part relationships. • The operations of addition and subtraction are related to each other and are used to process information to solve problems. • Number operations can be modeled in a variety of ways.	• The base 10 place value system can be extended to represent magnitude. • Fractions and decimals are ways of representing whole-part relationships. • The operations of multiplication and division are related to each other and are used to process information to solve problems. • Even complex operations can be modeled in a variety of ways, for example, an algorithm is a way to represent an operation.	• The base 10 place value system extends infinitely in two directions. • Fractions, decimals and percentages are ways of representing whole part relationships. • For fractional and decimal computation, the ideas developed for whole number computation can apply. • Ratios are comparisons of two numbers or quantities.
Constructing Meaning *When constructing meaning, learners:*	• Understand one-to-one correspondence. • Understand that, for a set of objects, the number name of the last object counted describes the quantity of the whole set. • Understand that numbers can be constructed in multiple ways, for example, by combining and partitioning. • Understand conservation of number. • Understand the relative magnitude of whole numbers. • Recognize groups of zero to five objects without counting (subitizing). • Understand the whole-part relationships. • Use the language of mathematics to compare quantities, for example, more, less, first, second.	• Model numbers to hundreds or beyond using the base 10 place value system. • Estimate quantities to 100 or beyond. • Model simple fraction relationships. • Use the language of addition and subtraction, for example, add, take away, plus, minus, sum, difference. • Model addition and subtraction of whole numbers. • Develop strategies for memorizing addition and subtraction number facts. • Estimate sums and differences. • Understand situations that involve multiplication and division. • Model addition and subtraction of fractions with the same denominator.	• Model numbers to thousands or beyond using the base 10 place value system. • Model equivalent fractions. • Use the language of fractions, for example, numerator, denominator. • Model decimal fractions to hundredths or beyond. • Model multiplication and division of whole numbers. • Use the language of multiplication and division, for example, factor, multiple, product, quotient, prime numbers, composite number. • Model addition and subtraction of fractions with related denominators. • Model addition and subtraction of decimals.	• Model numbers to millions or beyond using the base 10 place value system. • Model ratios. • Model integers in appropriate contexts. • Model exponents and square roots. • Model improper fractions and mixed numbers. • Simplify fractions using manipulatives. • Model decimal fractions to thousandths or beyond. • Model percentages. • Understand the relationship between fractions, decimals and percentages. • Model addition, subtraction, multiplication and division of fractions. • Model addition, subtraction, multiplication and division of decimals.

1. COUNTING	**Phase 1**		**Phase 2**		**Phase 3**		**Phase 4**	
Transferring Meaning **When transferring meaning into symbols, learners:**	**1.0 Correspondence**	Count with one-to-one correspondence to 10.	Count with one-to-one correspondence to 20.					
	1.1 and Backward Counting	Count backwards by one from 10.	Count backwards by one from 20.	Count forwards and backwards by one to/from 100	Count forwards and backwards by one to/from 1,000			
	1.2 Skip Counting		Count forwards by 2s, 5s, and 10s to 100	Count forwards and backwards by 2s, 5s and 10s.	Count forwards and backwards by 2s, 5s and 10s			
	1.3 Rounding			Round to multiples of 10	Round to multiples of 10 and 100	Round up to multiples of 1,000	Round up to multiples of 100,000 and 0.01	Round to multiples of 1,000,000 and 0.001	Round to multiples of 1,000,000 and 0.001 and beyond

2. PLACE VALUE		Phase 1		Phase 2		Phase 3		Phase 4	
Transferring Meaning When transferring meaning into symbols, learners:	2.0 Reading Numbers	Read numbers to 10	Read numbers to 20	Read numbers in numerals, words, and expanded form to 100	Read numbers in numerals, words and expanded form to 1,000	Read numbers in numerals, words and expanded form to 10,000	Read numbers in numerals, words, and expanded form to 100,000 and 0.01	Read numbers in numerals, words, and expanded form to millions and 0.001	Read number in numerals, words, and expanded form beyond millions and thousandths
	2.1 Writing Numbers	Write numerals to 10	Write numerals to 20	Write numbers in numerals, words, and expanded form to 100	Write numbers in numerals, words and expanded form to 1,000	Write numbers in numerals, words and expanded form to 10,000	Write numbers in numerals, words, and expanded form to 100,000 and 0.01	Write numbers in numerals, words, and expanded form to 1,000,000 and 0.001	Write number in numerals, words, and expanded form beyond millions and thousandths
	2.2 Composing and Decomposing Numbers	Demonstrate knowledge of numbers to 10 using manipulatives	Demonstrative knowledge of numbers up tot 20 using manipulatives	Compose and decompose numbers in multiple ways to 100 using base 10 manipulatives	Compose and decompose numbers in multiple ways 1,000	Compose and decompose numbers in multiple ways to 10,000	Compose and decompose numbers in multiple ways to 100,000 and 0.01	Compose and decompose numbers in multiple ways to 1,000,000 and 0.001	Compose and decompose numbers in multiple ways to 1,000,000 and 0.0001 and beyond
	2.3 Identifying Place Value			Identify the value of any digit in a 2 digit number	Identify the value of any digit in a 3 digit number	Identify the value of any digit in a 4 digit number	Identify the value of any digit in a 5 digit number and up to the hundredths	Identify the value of any digit in a 6 digit number and up to the thousandths	Identify the value of any digit up to and beyond 1,000,000 and 0.0001

3. COMPARING		Phase 1		Phase 2		Phase 3		Phase 4	
Transferring Meaning When transferring meaning into symbols, learners:	3.0 Comparing and Ordering	Compares and orders sets of objects and numbers using appropriate terminology (equal, more/less, most) up to 10.	Compares and orders sets of objects and numbers using appropriate terminology (equal, more/less, most) up to 20.	Compares and orders sets of objects and numbers using appropriate terminology (equal, more/less, most) and symbols (>,<, =) up to 100.	Compares and orders sets of objects and numbers using appropriate terminology (equal, more/less, most) and symbols (>,<, =) up to 1,000.	Compares and orders sets of objects and numbers using appropriate terminology (equal, more/less, most) and symbols (>,<, =) up to 10,000.	Compares and orders sets of objects and numbers using appropriate terminology (equal, more/less, most) and symbols (>,<, =) up to 10,000 and to the hundredths .	Compares and orders sets of objects and numbers using appropriate terminology (equal, more/less, most) and symbols (>,<, =) up to 1,000,000 and to the thousandths . Compares numbers less than 0 using familiar real-life applications.	Compares and orders sets of objects and numbers using appropriate terminology (equal, more/less, most) and symbols (>,<, =) beyond 1,000,000 and the thousandths. Compares and orders integers.
	3.1 Ordinal	Uses ordinal numbers to identify position of objects in a sequence 1^{st} to 5^{th} and last.	Uses ordinal numbers to identify position of objects in a sequence 1^{st} to 10^{th} and last.	Uses ordinal numbers to identify position of objects in a sequence 1^{st} to 100^{th}.					

4. COMPUTING		Phase 1		Phase 2		Phase 3		Phase 4	
When transferring Meaning between transferring meaning into symbols, learners:	**4.0 Addition**	Use manipulatives to show additive combinations to 10	Use manipulatives to show additive combinations up to 20	Compute 1digit+1digit; 1digit+2digit; 2digit+2digit without regrouping	Adds 3 digit numbers with regrouping. Add fractions with like denominators.	Adds whole numbers up to and including 4 digit numbers. Add fractions with similar denominators.	Adds whole numbers up to 5 digits and two decimal places Add fractions with related denominators.	Adds whole numbers up to 6 digits and three decimal places Add fractions with unlike denominators	Adds whole numbers up to and beyond 7 digits and four decimal places
	4.1 Subtraction	Use manipulatives to show missing addends up to 10	Use manipulatives to show missing addends up to 20	Subtract 1digit numbers from 2digit without regrouping	Subtract whole numbers up to and including 3 digit numbers Subtract fractions with like denominators.	Subtract whole numbers up to and including 4 digits. Subtract fractions with similar denominators.	Subtract whole numbers up to five digits and two decimal places. Subtract fractions with related denominators.	Subtract whole numbers up to 6 digits and three decimal places. Subtract fractions with unlike denominators.	Subtract whole numbers up to and beyond 7 digits and four decimal places Subtract fractions.
	4.2 Multiplication			Skip count multiples of 2s 5s and 10s	Use arrays and manipulative to multiply whole numbers.	Multiply 1 digit x 1 digit; and 1 digit x 2 digit numbers	Multiplies 2 digit x 2 digit; and 2 digit x 3 digit numbers.	Multiplies fractions and decimals by whole numbers.	Multiply whole numbers, decimals, fractions, and integers.
	4.3 Division				Use strategies to solve basic division problems, such as equal sharing, equal groups	Divide whole numbers to 100 by 1 digit divisor without a remainder.	Divide whole numbers by 1 digit divisor with a remainder Explain what the remainder represents.	Divide whole numbers by 2 digit divisors and decimals to the hundredths.	Divide whole numbers, decimals, fractions and integers
	4.4 Fluency		Demonstrate computational fluency for all additive pairs up to 10	Demonstrate computational fluency in addition and subtraction in numbers up to 20.	Demonstrate computational fluency in addition and subtraction with numbers up to 100.	Demonstrates computational fluency in multiplication and division facts with products and dividends up to 100	Demonstrates computational fluency in multiplication and division facts with products and dividends up to 144		

New Zealand Numeracy Project Stage	Phase 1				Phase 2		Phase 3	Phase 4
	Stage 1 One-to-one counting	**Stage 2** Counting from one on materials	**Stage 3** Counting from one by imaging	**Stage 4** Advanced counting	**Stage 5** Early additive part-whole	**Stage 6** Advanced additive/early multiplicative part-whole	**Stage 7** Advanced multiplicative part-whole	**Stage 8** Advanced proportional part-whole

5. RATIONAL #s		Phase 1		Phase 2		Phase 3		Phase 4	
Transferring Meaning **When transferring meaning into symbols, learners:**	**5. 0 Parts of a Whole and Set**	Demonstrate equal sharing	Describe, represent and count parts of a whole and set using simple fraction names (1/2; 1/3; 1/4)	Describe, represent and count parts of a whole and set using fractions with denominators up to 12	Describe, represent and count common fractions (halves to sixteenths) as part of a set of a whole				
	5.1 Position on a Number Line			Identifies and represents on a number line positive integers	Identifies and represents on a number line positive integers, simple fractions and decimals.	Identifies and represents on a number line positive and negative integers.	Identifies and represents on a number line positive mixed numbers, complex fractions, and decimals.	Identifies and represents on a number line positive and negative fractions, mixed numbers, and decimals.	
	5.2 Converting and Modeling Fractions					Convert simple equivalent fractions	Write fractions in equivalent forms Models mixed numbers and improper fractions	Finds simplest form of fractions Converts between mixed numbers and improper fractions	
Applying Understanding When applying with understanding, learners:		• Count to determine the number of objects in a set. • Use number words and numerals to represent quantities in real-life situations. • Use the language of mathematics to compare quantities in real-life situations, for example, more, less, first, second. • Subitize in real-life situations. • Use simple fraction names in real-life situations.		• Use whole numbers up to 1,000 in real-life situations. • Use cardinal and ordinal numbers in real-life situations. • Use fast recall of addition and subtraction number facts in real-life situations. • Use fractions in real-life situations. • Use mental and written strategies for addition and subtraction of two digit numbers or beyond in real-life situations. • Select an appropriate method for solving a problem, for example, mental estimation, mental or written strategies, or by using a calculator. • Use strategies to evaluate the reasonableness of answers.		• Use whole numbers to 100,000 in real-life situations. • Use fast recall of multiplication and division facts in real-life situations. • Use decimal fractions in real-life situations. • Use mental and written strategies for multiplication and division in real-life situations. • Select an efficient method for solving a problem, for example, mental or written strategies, or by using a calculator. • Use strategies to evaluate the reasonableness of answers. • Add and subtract fractions with related denominators in real life situations. • Add and subtract decimals in real life situations, including money. • Estimate sum, difference, product and quotient in real life situations, including fractions and decimals.		• Use whole numbers up to millions and beyond. • Use rations in real-life situations. • Use integers in real-life situations. • Convert improper fractions to mixed numbers and vice versa in real-life situations. • Simplify fractions in computation answers. • Use fractions, decimals, and percentages interchangeably in real-life situations. • Select and use an appropriate sequence of operations to solve word problems. • Select an efficient method for solving a problem: mental estimation, mental computation, written algorithms, by using a calculator. • Use strategies to evaluate the reasonableness of answers. • Use mental and written strategies for adding, subtracting, multiplying and dividing fractions and decimals in real life situations. • Estimate and make approximations in real life situations involving fractions, decimals, and percentages.

Data Handling		Phase 1		Phase 2		Phase 3		Phase 4	
Conceptual Understanding		• We collect information to make sense of the world around us. • Organizing objects and events helps us to solve problems. • Events in daily life involve chance.		• Information can be expressed as organized and structured data. • Objects and events can be organized in different ways. • Some events in daily life are more likely to happen than others.		• Data can be collected, organized, displayed and analyzed in different ways. • Different graph forms highlight different aspects of data more efficiently. • Probability can be based on experimental events in daily life. • Probability can be expressed in numerical notation.		• Data can be presented effectively for valid interpretation and communication. • Range, mode, median and mean can be used to analyze statistical data. • Probability can be represented on a scale between 0-1 or 0-100%. • The probability of an event can be predicted theoretically.	
Constructing Meaning *When constructing meaning, learners:*		• Understand that sets can be organized by different attributes. • Understand that information about themselves and their surroundings can be obtained in different ways. • Discuss chance in daily events (impossible, maybe, certain)		• Understand that sets can be organized by one or more attributes. • Understand that information about themselves and their surroundings can be collected and recorded in different ways. • Understand the concept of chance in daily events (impossible, less likely, maybe, most likely, certain).		• Understand that data can be collected, displayed and interpreted using simple graphs, for example, bar graphs, line graphs. • Understand that scale can represent different quantities in graphs. • Understand that the mode can be used to summarize a set of data. • Understand that one of the purposes of a database is to answer questions and solve problems. • Understand that probability is based on experimental events.		• Understand that different types of graphs have special purposes. • Understand that the mode, median, mean and range can summarize a set of data. • Understand that probability can be expressed in scale (0K1) or per cent (0% K 100%). • Understand the difference between experimental and theoretical probability.	
Transferring Meaning When transferring meaning into symbols, learners:	**1.0 Organizing and Representing Data**	Sort realKlife objects into sets by attribute	Sort and label real objects and data into sets and describe how they are sorted. Represent information through pictographs and tally marks.	Collect, record and represent data using tallies, charts, and diagrams.	Collect, record and represent data in different types of graphs, for example, tally marks, bar graphs,	Collect, display and interpret data using simple graphs, for example, bar graphs.	Collect, display and interpret data using simple graphs, for example, bar graphs, line graphs.	Collect, display and interpret data in circle graphs and line graphs.	Collect, display and interpret data in a variety of forms, given a problem.
	1.1 Interpreting and Analyzing Data	Being to interpret simple graphs to answer questions.	Interpret simple graphs to answer questions.	Explain and describe reasoning for data collection and sorting.	Interprets a variety of graphs using Venn, tree, and Carroll diagrams to draw conclusions and make predictions based upon the data collected.	Identify, read and interpret range on graphs.	Identify, read and interpret scale on graphs. Identify, read and interpret the mode and median of a set of data	Identify, describe and explain the mean of a set of data.	Identify, describe and explain the correlation among the range, mode, median and mean in a set of data.
	1.2 Chance	Describe every day events as possible or not possible	Discuss chance in daily events (impossible, maybe, certain)	Express the chance of an event happening using words or phrases (impossible, less likely, maybe, more likely, certain)	Express the chance of an event happening using a broader range of words or phrases	Records and displays outcomes for simple chance events using simple fractions.	Records and displays outcomes for simple chance events using tables, grids, tree diagrams, etc.	Begin to use scales (0 - 1) or percentages (0 - 100%) to express probabilities.	Express probabilities using scale (0-1) or percent (0-100%)
Applying Understanding When applying with understanding, learners:		• Create pictographs and tally marks • Create living graphs using real objects and people. • Describe real objects and events by attributes.		• Collect, display, and interpret data for the purpose of answering questions. • Create a pictograph and simple bar graph of real objects and interpret data by comparing quantities (for example, more, fewer, less than, greater than). • Use tree, Venn and Carroll diagrams to explore relationships between data. • Identify and describe chance in daily events (impossible, less likely, maybe, more likely, certain).		• Design a survey and systematically collect, organize and display data in pictographs and bar graphs. • Select appropriate graph forms to display data • Interpret range, scale, mode and median on graphs. • Use probability to determine mathematically fair and unfair games and to explain possible outcomes. • Express probability using simple fractions.		• Design a survey to systematically collect, record, organize, and display the data in a bar graph, circle graph, line graph. • Identify, describe and explain the range, mode, median, and mean in a set of data. • Create an manipulate an electronic database for their own purposes (Excel, Numbers) • Determine the theoretical probably of an event and explain why it might differ from experimental probability.	

Measurement		Phase 1		Phase 2		Phase 3		Phase 4	
Conceptual Understanding		• Measurement involves comparing objects and events • Objects have attributes that can be measured using non-standard units. • Events can be ordered and sequenced.		• Standard units allow us to have a common language to identify, compare, order and sequence objects and events • Estimation allows us to measure with different levels of accuracy		• Objects and events have attributes that can be measured using appropriate tools. • Relationships exist between standard units that measure the same attributes.		• Accuracy of measurement depends on the situation and precision of the tool. • Conversion of units and measurements allows us to make sense of the world we live in. • A range of procedures exists to measure different attributes of objects and events.	
Constructing Meaning *When constructing meaning, learners:*		• Understand that attributes of real objects can be compared and described, for example, longer, shorter, heavier, empty, full, hotter, colder • Understand that events in daily routines can be described and sequenced, for example, before, after, bedtime, storytime, today, tomorrow.		• Understand the use of standard units to measure, for example, length, mass, money, time, temperature. • Understand that tools can be used to measure. • Understand that calendars can be used to determine the date, and to identify and sequence says of the week and months of the year. • Understand that time is measured using universal units of measure, for example, years, months, days, hours, minutes and seconds.		• Understand the use of standard units to measure perimeter, area and volume. • Understand that measures can fall between numbers on a measurement scale, for example, 3 ½ kg, between 4 cm and 5 cm. • Understand relationships between units, for example, meters, centimeters and millimeters. • Understand an angle as a measure of rotation.		• Understand procedures for finding area, perimeter and volume. • Understand the relationships between area and perimeter, between area and volume, and between volume and capacity.	
Transferring Meaning When transferring meaning into symbols, learners:	**1.0 Comparing Measurable Attributes**	Identify, compare and describe attributes of real objects, for example, longer, shorter, heavier	Make indirect and indirect comparisons of objects.				Calculate basic equivalent metric units, e.g. cm to m, m to cm, g to kg, kg to g, ml to L, L to ml.	Calculate complex equivalent metric units, eg. mm to dm, mg to kg, dl to ml.	
	1.1 Measuring	Measure length, mass and capacity of objects using non-standard units.	Compare the length, mass and capacity of objects using non-standard units.	Make reasonable estimations of object attributes using standard measures of length, weight and capacity.	Estimate and measure objects using standard units of measurement and decimal notation: length (cm/m), mass (g/kg), capacity (ml, l, money (cents) and temperature (C).	Measure using standard units of measurement: perimeter, area and volume of simple figures and simple 2D and 3D shapes.	Estimate and measure using standard units of measurement: perimeter, area of 2D and volume of 3D shapes. Measure angles using a protractor.	***Read and interpret scales on a range of measuring instruments.*** Measure and construct angles using a protractor	Develop and describe formulas for finding perimeter, area and volume.
	1.2 Sequence/Time	Identify, describe and sequence the seasons.	Identify, describe and sequence events in their daily routine, for example, before, after, bedtime, storytime, today, tomorrow.	Reads time to the nearest half-hour and hour using analogue (12 hour) and digital time.	Reads, writes, draws time to the minute. Describes time with standard language, quarter till, half past etc.	Read and write digital and analogue time on 12 hour and 24 hour clocks Measure elapsed time to the hour. Describes a timeline.	Measure elapsed time to the minute. Describes and constructs a timeline.	Read and write basic timetables and schedules	Read and write complex timetables and schedules Determine times around the world
Applying Understanding When applying with understanding, learners:		Describe observations about events and objects in real-life situations. Use non-standard units of measurement to solve problems in real-life situations involving length, mass and capacity.		Use standard units of measurement to solve problems in real-life situations involving length, mass, capacity, money and temperature. Use measures of time to assist with problem solving in real-life situations.		Use standard units of measurement to solve problems in real-life situations involving perimeter, area and volume. Select appropriate tools and units of measurement. Use timelines in units of inquiry and other real< life situations.		Select and use appropriate units of measurement and tools to solve problems in real-life situations Determine and justify the level of accuracy required to solve problems in real-life situations involving measurement Use decimal and fractional notation in measurement, for example, 3.2cm, 1.47kg, 1 ½ miles Use timetables and schedules (12<hour and 24< hour clocks) in real-life situations Determine time worldwide	

Pattern and Function		Phase 1		Phase 2		Phase 3		Phase 4	
Conceptual Understanding		• Patterns and sequences occur in everyday situations. • Patterns repeat and grow.		• Whole numbers exhibit patterns and relationships that can be observed and described. • Patterns can be represented using numbers and other symbols.		• Functions are relationships or rules that uniquely associate members of one set with members of another set. • By analyzing patterns and identifying rules for patterns it is possible to make predictions.		• Patterns can often be generalized using algebraic expressions, equations or functions. • Exponential notations Is a powerful way to express repeated products of the same number.	
Constructing Meaning *When constructing meaning, learners:*		• Understand that patterns can be found in everyday situations, for example, sounds, actions, objects, nature.		• Understand that patterns can be found in numbers, for example, odd and even numbers, skip counting. • Understand the inverse relationship between addition and subtraction. • Understand the associative and commutative properties of addition.		• Understand that patterns can be analyzed and rules identified. • Understand that multiplication is repeated addition and that division is repeated subtraction. • Understand the inverse relationship between multiplication and division. • Understand the associative and commutative properties of multiplication.		• Understand that patterns can be generalized by a rule. • Understand exponents as repeated multiplication. • Understand the inverse relationship between exponents and roots. • Understand that patterns can be represented, analyzed and generalized using tables, graphs, words, and when possible, symbolic rules.	
Transferring Meaning **When transferring meaning into symbols, learners:**	**1.0 Recognizing Patterns**	Recognize, describe and extend more complex patterns to two variables: color, shape, size, number, sounds, nature, actions	Recognize, describe and extend more complex patterns to four variables: color, shape, size, number, sounds, nature, actions	Recognize, describe and extend complex patterns.	Recognize, describe and extend complex patterns.	Describe the rule for a pattern in a variety of ways	Describe the rule for a pattern in a variety of ways	Analyze pattern and function using words, tables and graphs, and when possible, symbolic rules.	Analyze pattern and function using words, tables and graphs, and when possible, symbolic rules.
	1.1 Constructing Patterns	Construct patterns with two variables.	Construct patterns with four variables.	Represent patterns in a variety of ways, for example, using words, drawings, symbols, materials, actions, numbers.	Represent patterns in a variety of ways, for example, using words, drawings, symbols, materials, actions, numbers.	Represent rules for patterns using words, symbols and tables.	Represent rules for patterns using words, symbols and tables.	Represent the rule of a pattern by using a function	Represent the rule of a pattern by using a function
	1.2 Number Patterns			Recognize and describe patterns in numbers for example, odd and even numbers, skip counting (1s, 2s, 5s, 10s)	Use skip counting to solve problem solving situations	Describes, creates and continues number patterns to and from 100 Use repeated addition to model multiplication problems.	Describes, creates and continues number patterns to and from 1000 Use repeated subtraction to model division problems.	Identify patterns and use rules for divisibility. Use repeated multiplication to model exponential problems.	Explain patterns found in number systems (prime, composite, etc)
	1.3 Relationship			Recognize, describe and use the inverse relationship between addition and subtraction.	Recognize, describe and use the associative and communicative properties of addition	Recognize, describe and use the associative and communicative properties of multiplication	Recognize, describe and use the inverse relationship between multiplication and division.	Recognize, describe, and use the order of operations (PEMDAS)	Recognize, describe and use the inverse relationship between exponents and roots
Applying When applying with understanding,		• Extend and create patterns		• Extend and create patterns in numbers, for example, odd and even numbers, skip counting. • Use number patterns to represent and understand real-life situations. • Use the properties and relationship of addition and subtraction to solve problems.		• Select appropriate methods for representing patterns, for example, using words, symbols and tables. • Use number patterns to make predictions and solve problems. • Use the properties and relationships of the four operations to solve problems.		• Select appropriate methods to analyze patterns and identify rules. • Use functions to solve problems	

Shape and Space		Phase 1		Phase 2		Phase 3		Phase 4	
Conceptual Understanding		• Shapes can be described and organized according to their properties. • Objects in our immediate environment have a position in space that can be described according to a point of reference.		• Shapes are classified and named according to their properties. • Some shapes are made up of parts that repeat in some way. • Specific vocabulary can be used to describe an object's position in space.		• Changing the position of a shape does not alter its properties. • Shapes can be transformed in different ways. • Geometric shapes and vocabulary are useful for representing and describing objects and events in real-world situations.		• Manipulation of shape and space takes place for a particular purpose. • Consolidating what we know of geometric concepts allows us to make sense of and interact with out world. • Geometric tools and methods can be used to solve problems relating to shape and space.	
Constructing Meaning *When constructing meaning, learners:*		• Understand that 2D and 3D shapes have characteristics that can be described and compared. • Understand that common language can be used to describe position and direction, for example, inside, outside, above, below, next to, behind, in front of, up, down.		• Understand that there are relationships among and between 2D and 3D shapes. • Understand that 2D and 3D shapes can be created by putting together and/or taking apart other shapes. • Understand that examples of symmetry and transformations can be found in their immediate environment. • Understand that geometric shapes are useful for representing real-world situations. • Understand that directions can be used to describe pathways, regions, positions and boundaries of their immediate environment.		• Understand the common language used to describe shapes. • Understand the properties of regular and irregular polygons. • Understand congruent or similar shapes. • Understand that lines and axes of reflective and rotational symmetry assist with the construction of shapes. • Understand an angle as a measure of rotation. • Understand that directions for location can be represented by coordinates on a grid. • Understand that visualization of shape and space is a strategy for solving problems.		• Understand the common language used to describe shapes. • Understand the properties of regular and irregular polyhedra. • Understand the properties of circles. • Understand how scale (ratios) is used to enlarge and reduce shapes. • Understand systems for describing position and direction. • Understand that 2D representations of 3D objects can be used to visualize and solve problems. • Understand that geometric ideas and relationships can be used to solve problems in other areas of mathematics and in real life.	
Transferring Meaning **When transferring meaning into symbols, learners:**	**1.0 Identifying, Describing and Modeling Shapes and Solids**	Identifies by name 2D shapes: circle, square, triangle, rectangle, diamond, oval, hexagon and trapezoid.	Describe, models and compare 2D shapes and simple 3D shapes such as sphere, cube and cone.	Describe, sort, and model regular polygons (octagon, hexagon, etc.) using mathematical language. Sort, describe and model 3D shapes: sphere, cube, triangular pyramid, square pyramid, rectangular prism, triangular prism, cylinder, and cone.	Analyze and describe the relationships between 2D and 3D shapes. Relate similarities and differences among quadrilaterals (parallelograms, rhombi, trapezoids, squares and rectangles)	Identifies types of triangles by sides (scalene, isosceles, equilateral) and by angles (obtuse, acute, right)	Describe, sort, and model regular and irregular polygons	Classify, sort and label regular, ***semi-regular and irregular solids.***	Analyze, describe, classify and visualize 2D (including circles, triangles and quadrilaterals) and 3D shapes, using geometric vocabulary
	1.1 Lines and Angles				Identify, describe and model different lines: horizontal, vertical, parallel, perpendicular and intersecting Identify, describe and model rays, line segments, and lines.	Identify, describe and model acute, obtuse, and right angles. Analyze angles by comparing and describing rotations: whole turn; half-turn; quarter turn.	Identify, describe and model acute, obtuse, right, straight and reflex angles. Analyze angles by comparing and describing rotations: whole turn; half-turn; quarter turn; north, south, east and west on a compass		

Shape and Space		Phase 1		Phase 2		Phase 3		Phase 4	
Transferring Meaning **When transferring meaning into symbols, learners:**	**1.2 Congruence**					Describe and model congruency and similarity in basic 2D shapes.	Describe and model congruency and similarity in 2D and 3D shapes	Identify scale (ratios) used to enlarge or reduce shapes.	Identify and use scale (ratios) to enlarge and reduce shapes
	1.3 Symmetry and Transformation			Recognize symmetry in simple 2D shapes and in simple real world objects.	Identify lines of reflective symmetry Create and describe symmetrical and tessellating patterns	Identify slides, flips and turns of 2D figures.	Rotates figures clockwise and counter (anti-)clockwise to fractions of a turn		
	1.4 Relative Position		Describe position and direction, for example, inside, outside, above, below, next to, behind, in front of, up, down.	Specify location as a relative position including left and right, vertical and horizontal	Interpret and create simple directions, describing paths, regions, positions and boundaries of their immediate environment.			Identify the language and notation of bearing to describe direction and position.	Identify and use the language and notation of bearing to describe direction and position.
	1.5 Maps				Interpret maps using the language of mapping to describe a small number of points, objects or locations.	Use mathematical language to describe position on a compass rose to eight directions: N, NE, NW, S, SE, SW, W, E	Interprets maps according to spatial and distance relationships.	Identifies different scales on maps and grids	Identifies and uses scale to measure distances on maps. Represents a point on the Earth's surface in terms of its latitude and longitude
	1.6 Coordinate			Describe the position of an object using a simple grid	Use a coordinate grid and the language of coordinates (x and y axes and origin) to describe the location of points.	Read and plot coordinate points, graph lines, and simple figures in the first quadrant using positive integers	Read and plot coordinate points, graph lines and simple figures in the first and second quadrant using positive and negative integers	Read and plot coordinate points, graph lines and simple figures in the four quadrants using positive and negative integers	
Applying Understanding When applying with understanding, learners:		• Explore and describe the paths, regions and boundaries of their immediate environment (inside, outside, above, below) and their position (next to, behind, in front of, up, down).		• Analyzes and use what they know about 3D shapes to describe and work with 2D shapes • Recognize and explain simple symmetrical designs in the environment. • Apply knowledge of symmetry to problem solving situations. • Interpret and use simple directions, describing paths, regions, positions and boundaries of their immediate environment.		• Analyze and describe 2D and 3D shapes, including regular and irregular polygons, using geometrical vocabulary. • Identify, describe and model congruency and similarity in 2D shapes. • Recognize and explain symmetrical patterns, including tessellation, in the environment. • Apply knowledge of transformations to problem solving situations.		• Use geometric vocabulary when describing shape and space in mathematical situations and beyond • Use scale (ratios) to enlarge and reduce shapes • Apply the language and notation of bearing to describe direction and position. • Use 2D representations of 3D objects to visualize and solve problems, for example using drawings or models.	